FM 3-34
April 2009

ENGINEER OPERATIONS

HEADQUARTERS, DEPARTMENT OF THE ARMY

*FM 3-34

Field Manual No.
3-34

Headquarters
Department of the Army
Washington, DC, 2 April 2009

Engineer Operations

Contents

***This publication supersedes FM 3-34, 2 January 2004.**

Figures

Tables

Preface

Field Manual (FM) 3-34 describes the Engineer Regiment's keystone operational doctrine. The manual is linked to joint and Army doctrine to ensure its usefulness for all joint and Army-level commanders and staff. All other engineer FMs (see Appendix A) are based on the foundations described in this manual and are synchronized with their respective joint publications. The foundations of engineer operations are based on the successful employment of engineers, past and present. This manual describes engineer support to Army forces conducting full spectrum operations within the framework of joint operations. As in FM 3-0, this version of FM 3-34 increases the emphasis on simultaneous offensive, defensive, and stability or civil support operations.

This manual has been revised to align with revisions to FM 3-0 and other Army and joint doctrine. A series of conferences at the United States Army Engineer School (USAES) convened to guide the changes in this version of FM 3-34. This revision has been driven by major changes to Army and joint doctrine, including the—

- Revision of the Army's capstone manual, FM 3-0.
- Revision of Joint Publication (JP) 3-34.
- Lessons learned from experience fighting the War on Terrorism.
- Conversion of the Army to a brigade combat team (BCT)-based modular force that is joint and expeditionary.
- Conversion of the Engineer Regiment to the modular engineer force.
- Change from maintaining readiness within the "band of excellence" to achieving readiness through the force pool progression dictated by the Army Force Generation (ARFORGEN) Model.

This manual is organized into six chapters and nine appendixes to provide additional details on selected operational topics. The first three chapters follow the flow of FM 3-0 and describe engineer aspects of the operational environment (OE), the Engineer Regiment, and the foundations of engineer operations. The remaining chapters discuss planning; preparing, executing, and continuously assessing; and sustaining engineer operations with focus on the operational to tactical levels of war. A brief description of each chapter is provided below—

- Chapter 1 examines the OE with a specific focus on engineer aspects. It discusses the nature and scope of modern conflict, as well as important variables of the OE as described in FM 3-0; FM 2-0; and other doctrine. The discussion is not a repeat of the more comprehensive description provided in FM 3-0, but rather it is focused specifically on those aspects that generate requirements for Army engineer support.
- Chapter 2 provides a comprehensive description of the Engineer Regiment. It describes engineer support of Army operations including in the context of joint, interagency, and multinational operations. It also addresses tailoring engineer force pool capabilities in support of engineer operations.
- Chapter 3 lays the foundations for engineer operations. It includes discussion of categorizing capabilities within the engineer functions, synchronizing application through the warfighting functions, and integrating fully into the operations process. It concludes with a description of engineer combat power applications.
- Chapter 4 describes the engineer planning activities portion of the operations process. It includes discussion of the integration of staff planners and planning cells. It describes engineer integration in planning processes and specific processes to enhance engineer input.
- Chapter 5 provides engineer considerations for preparing, executing, and continuously assessing engineer operations. The chapter describes the focus of engineer support for each component of full spectrum operations.

- Chapter 6 discusses sustainment of engineer capabilities. Successful engineer operations include effective incorporation of sustainment support. This chapter describes the integrated sustainment effort required to support engineer operations.

FM 3-34 provides operational guidance for engineer commanders and trainers at all echelons and forms the foundation for established curriculum within the engineer portions of the Army's education system. Information contained in this manual will assist multinational forces and other Services and branches of the Army to plan and integrate engineer capabilities. This doctrine also will assist Army branch schools in teaching the integration of engineer capabilities into Army and joint operations.

Terms that have joint or Army definitions are identified in both the glossary and the text. Glossary terms: The glossary lists most terms used in FM 3-34 that have joint or Army definitions. Terms with an asterisk in the glossary indicate that this FM is the proponent FM (the authority). Text references: Definitions printed in boldface in the text indicate that this FM is the proponent FM. These terms and their definitions will be incorporated into the next revision of FM 1-02. For other definitions in the text, the term is italicized, and the number of the proponent FM follows the definition.

This publication applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the United States Army Reserve (USAR) unless otherwise stated.

The proponent for this publication is the United States Army Training and Doctrine Command (TRADOC). Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commandant, United States Army Engineer School, ATTN: ATZT-TDD-E, 320 MANSCEN Loop, Suite 220, Fort Leonard Wood, Missouri 65473-8929. Submit an electronic DA Form 2028 or comments and recommendations in the DA Form 2028 format by e-mail to <leon.mdottddengdoc@conus.army.mil>.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

Introduction

FM 3-34 is the Engineer Regiment's keystone manual for operating in today's OE within the framework of full spectrum operations and, although focused at the operational to tactical level, it is applicable for all levels of war. As the keystone doctrinal manual for engineer operations, FM 3-34 is linked to joint and Army doctrine to ensure its usefulness for all joint and Army-level commanders and staff. All other engineer FMs (see Appendix A) are based on the foundations described in this manual and are synchronized with their respective JPs and complementary Army FMs.

Engineers enable joint and maneuver commanders to achieve their objectives through strategic movement and tactical maneuver by providing unique combat, general, and geospatial engineering capabilities. It has been the engineer creed to support the maneuver commander since 16 June 1775, when the Continental Congress organized an Army with a chief engineer and two assistants. Engineers contributed to the hardest fought battles in the Revolutionary War, including Bunker Hill, Saratoga, and the final victory at Yorktown. At the end of the Revolutionary War, the engineers were mustered out of service. However, their unique skills were realized, and they were called back to active duty in 1794, when Congress organized a Corps of Artillerists and Engineers, and later in 1802 as a separate Corps of Engineers.

While the nature of warfare remains constant throughout history, the conduct of war is continually changing in response to new concepts, technologies, and requirements. This version of FM 3-34 is the 21st edition of this keystone manual and includes engineer doctrine that has evolved for over 200 years. It continues the evolution of engineer operations to support full spectrum operations and emphasizes simultaneous combinations of offensive, defensive, and stability or civil support operations during all operations. It describes engineer support to Army forces conducting full spectrum operations within the framework of joint operations. This manual also more extensively addresses engineer roles and functions within multinational operations, under potentially multinational or interagency leadership, and within diverse command relationships. One constant that is unchanged in this edition is that engineer operations continue to rely on the engineer Soldier to provide the leadership and flexibility required to integrate the application of engineer capabilities within combined arms operations.

FM 3-34 is built directly on the new and revised concepts of FM 3-0, FM 3-90, FM 3-07, (FM 3-28, when published); and FM 4-0. It is synchronized with key doctrine in JP 2-03; JP 3-15; and JP 3-34 to ensure that Army elements of a joint force use all engineer assets to their fullest extent.

The OE on which FM 3-34 is based is much more variable than the OE on which previous doctrine was based. Engineers must be prepared to go into any OE and conduct operations in support of the maneuver commander while dealing with a wide range of threats and other influences. The manual builds on the collective knowledge and wisdom gained through recent conduct of operations, numerous lessons learned and doctrine revisions, and the deliberate process of informed reasoning throughout the Army. It is rooted in time-tested principles and fundamentals, while accommodating new technologies and organizational changes.

This version of FM 3-34 is a significant revision from the previous edition and has been driven by changes in the OE, structure of the Army, availability of technologies, and a number of changes in Army and joint doctrine. Changes not already mentioned above that have directly affected this manual include the—

- Replacement of "battlefield operating systems" with "warfighting functions" and the subsequent splitting of the mobility, countermobility, survivability battlefield operating system between the movement and maneuver and protection warfighting functions.
- Restructuring of the engineer force to support the need for modularity in Army and joint operations. Development of multifunctional battalion- and brigade-level structures with significant engineer capabilities.
- Elimination of the term "battlespace" and the subsequent change from "engineer battlespace functions" to simply the "engineer functions" of combat, general, and geospatial engineering.
- Revision of the joint definitions for combat, general, and geospatial engineering.
- Elimination of the term "force protection" except as it applies to "force protection conditions" (FPCON) as a part of the antiterrorism element of the protection warfighting function.
- Acknowledgement of the range of engineer reconnaissance and its role and relationship to infrastructure reconnaissance. Staff proponency for infrastructure reconnaissance can be an additional requirement placed on the staff engineer.
- Revision and renaming of the "civil engineering plan" to simply the "engineer support plan" (ESP).
- Readjustment of the contingency construction standards.
- Maturation of the term "assured mobility." The application of assured mobility as a framework of processes, actions, and capabilities to proactively integrate engineer combat power.
- Elimination of the terms "combat," "combat support," and "combat service support" to describe categories for forces, functions, and capabilities.
- Conversion of the "engineer command" (ENCOM) to the "theater engineer command" (TEC) structure and its implications.

The foundations of engineer operations provided in this manual, together with related engineer doctrine, will support the actions and decisions of engineer commanders at all levels. But, like FM 3-0, the manual is not meant to be a substitute for thought and initiative among engineer leaders. No matter how robust the doctrine nor advanced the new engineer capabilities and systems, it is the engineer Soldier that must understand the OE, recognize shortfalls, and adapt to the situation on the ground. It is the adaptable and professional engineer Soldiers of the Regiment that are most important to our future and that must be able to successfully perform their basic skills and accomplish the mission with or without the assistance of technology.

Chapter 1
The Operational Environment

A general in all his projects should not think so much about what he wishes to do as much as what his enemy will do; that he should never underestimate this enemy, but he should put himself in his place to appreciate difficulties and hindrance the enemy could interpose; that his plans will be deranged at the slightest event if he has not foreseen everything and if he has not devised means with which to surmount the obstacles.

Frederick the Great: Instructions to his Generals, iii, 1747

Just as in Chapter 1 of FM 3-0, this chapter addresses the conceptual frameworks that leaders use to understand the OE. It is not, however, a restatement of the more detailed description provided in FM 3-0 or elsewhere (see FM 3-06, FM 3-07, and FM 3-90.6). Rather, this chapter provides a conceptual view of the OE through an engineer lens. It provides the basis for relevant engineer operations simultaneously supporting full spectrum operations in an uncertain and changing OE and provides linkage to the joint doctrine in JP 3-34. To more adequately describe the basis for engineer operations, this chapter adds a discussion of engineer aspects of the OE spanning the spectrum of conflict and the framing of those aspects using the levels of war. Finally, the chapter describes the engineer Soldier as the centerpiece of those forces conducting engineer operations.

UNDERSTANDING THE OPERATIONAL ENVIRONMENT

1-1. Operations on land are complex, dynamic, and uniquely tied to the theater's geography and airspace. The complexity of land combat stems from the geography; from the large number of Soldiers and weapons platforms involved; and from the close, continuous interaction of land forces with the enemy, noncombatants, and each other. Land operations differ fundamentally from maritime and aerospace combat, and the command and organization of land forces are substantially different from those in other environments. Complexity is also a function of the combined arms and joint nature of land combat, involving the interaction and mutual support of different arms and Services. Instantaneous global communications multiplies this complexity. Uncertainty and chaos characterize operations on land. Technology, intelligence, and the design of operations can reduce uncertainty. However, regardless of the effort allocated to intelligence, commanders still have to make decisions based on incomplete, inaccurate, or contradictory information. An understanding of the OE underpins the commander's ability to make decisions.

1-2. Joint doctrine describes the OE as the composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. The OE encompasses physical areas and factors (including geography, weather, infrastructure, and population), the information environment (including adversary, friendly, and neutral forces), and other variables relevant to a specific operation. Understanding the OE is essential to the successful execution of operations. To gain a broad understanding of these influences, commanders will normally consult with specialists in each area. Engineers are one of the specialists available to add breadth and depth to the overall understanding of the OE. See JP 3-34 for additional discussion of operational engineering at the joint level.

1-3. An engineer view of the OE is in addition to the common understanding being gained through the application of analytical tools by other specialists and leaders. The engineer view shares a common general understanding of the OE, while adding a degree of focus on those aspects within the purview of an

engineering background (see figure 1-1). Guided by the common general understanding, the engineer view seeks to identify potential challenges and opportunities associated with variables of the OE. Within each critical variable of the framework being employed, the engineer view shares a common level of understanding while seeking the added specialty view.

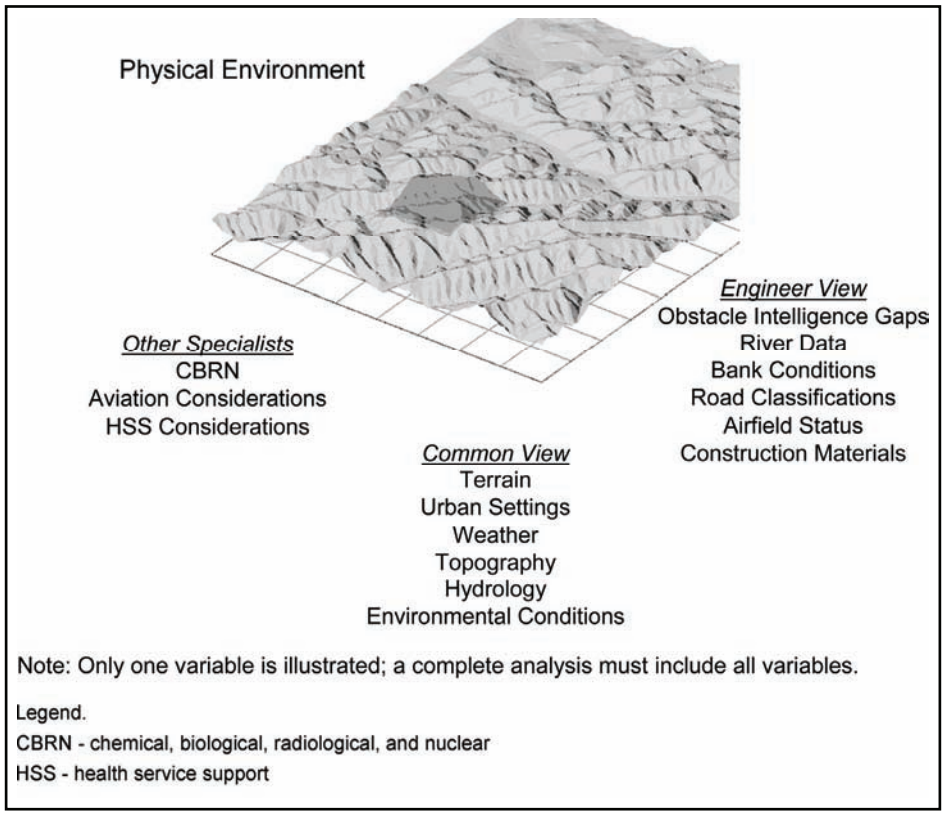


Figure 1-1. Illustration of an engineer view of the operational environment

1-4. Army doctrine describes an OE in terms of eight operational variables: political, military, economic, social, information, infrastructure, physical environment, and time (PMESII-PT). The following examples are provided to show the added focus sought within each of the operational variables by the engineer view of the OE. The examples are not meant to restate the more complete treatment of the variable in general terms provided in FM 3-0. The examples are not meant to be an all inclusive treatment of the engineer aspects within each of the variables.

- Political. Understanding the political circumstances within an OE will help the commander recognize key actors and visualize their explicit and implicit aims and their capabilities to achieve their goals. The engineer view might add challenges associated with political circumstances permitting or denying access to key ports of entry or critical sustainment facilities. Opportunities in the form of alternative access routes might be added. The engineer and others would be interested in the effect of laws, agreements, or positions of multinational partners that might prevent the shipment of hazardous materials across borders or a host of similar political considerations that might affect engineer planning and operations.
- Military. The military variable explores the military capabilities of all relevant actors in a given OE. The engineer view might add the challenges associated with an adversary's capability to employ explosive hazards (EH) or other obstacles, as well as the capability to challenge traditional survivability standards. Opportunities in the form of existing military installations and other infrastructure would be added. The engineer view includes a necessarily robust and growing understanding of engineer capabilities in a joint, interagency, and multinational context

within this variable of the OE. Additional discussion of the military variable is provided below, and engineer capabilities are discussed in detail in Chapter 2.

- Economic. The economic variable encompasses individual behaviors and aggregate phenomena related to the production, distribution, and consumption of resources. The engineer view might add challenges associated with production or availability of key materials and resources. Opportunities in the form of potential for new or improved production facilities might be added.
- Social. The social variable describes the cultural, religious, ethnic makeup, and social cleavages within an OE. The engineer view might add challenges associated with specific cultural or religious buildings or installations. Opportunities in the form of potential to provide for culturally related building requirements might be a consideration.
- Information. This variable describes the nature, scope, characteristics, and effects of individuals, organizations, and systems that collect, process, disseminate, or act on information. The engineer view might add challenges associated with deficiencies in the supporting architecture or nodes. Information flow may be affected by the available infrastructure to include power considerations. Opportunities in the form of provision for humanitarian projects or services might be added.
- Infrastructure. Infrastructure comprises the basic facilities, services, and installations needed for the functioning of a community or society. The engineer view might add challenges associated with specific deficiencies in the basic infrastructure. Opportunities in the form of improvements to existing infrastructure and specific new projects might be added. The engineer view provides for a detailed understanding of infrastructure by subcategories in the context of combat operations, as well as both stability and civil support operations, and this topic is discussed in detail throughout this manual; FM 3-34.400; and FM 3-34.170 (see FM 3-28, when published, for a discussion of critical infrastructure within the context of civil support operations).
- Physical environment. The defining factors are urban settings (super-surface, surface, and subsurface features) and other types of complex terrain, weather, topography, hydrology, and environmental conditions. The engineer view might add challenges associated with natural and man-made obstacles. Insights into environmental considerations are also a concern (see FM 3-100.4). Opportunities in the form of existing routes, installations, and resources might be added. The engineer view supports a broad understanding of the physical environment through geospatial engineering which is discussed in detail in Chapter 3 and Chapter 4 of this FM; FM 3-34.230*;* and JP 2-03.
- Time. The variable of time influences military operations within an OE in terms of the decision cycles, operational tempo, and planning horizons. The engineer view might add challenges associated with completing required construction projects in the time allotted. Opportunities in the form of potential to accelerate priority projects might be added.

1-5. Analysis of the OE in terms of the operational variables provides the relevant information that commanders can use to frame operational problems. While such analysis improves situational understanding (SU) at all levels, land operations require more specific information. When commanders receive a mission, they require a mission analysis focused on their specific situation. The Army uses the mission variables of mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC) as a framework for this mission analysis. When used together, the mission and operational variables help commanders visualize their situation. The relevant information required for consideration of the METT-TC variables during mission analysis can be drawn from the ongoing analysis of the operational variables (PMESII-PT). As in the examples above, illustrating the added focus sought within each of the variables by the engineer view of the OE, an engineer review using METT-TC seeks the shared common understanding and the added specialty view. Chapter 4 provides a more complete discussion of analysis using METT-TC in terms of planning engineer operations.

1-6. Engineers review the OE using operational variables to add to the shared common understanding by identifying potential challenges and opportunities within the operation before and during mission execution. The resulting understanding of the OE, an engineer view of the OE, does not and is not intended to be limited to considerations within the OE that may result in engineer functional missions. The resulting

engineer view of the OE is instead organized by engineer functions and linked to the common overall understanding through warfighting functions.

1-7. Combat power is the way Army leaders conceptualize capabilities. For Army and Marine Corps forces, the joint functions—intelligence, fires, movement and maneuver, protection, sustainment, and command and control (C2)—become the six warfighting functions. To these six warfighting functions, the Army adds two elements—leadership and information—which tie together and multiply the effects of the other six. These eight functions are the elements of combat power. The Army employs combat power through combined arms. Combined arms are organized through tailoring and task-organizing Army forces to optimize the elements of combat power for a particular mission. The engineer view of the OE, and engineer operations broadly, are synchronized to support combined arms using the warfighting functions. Chapter 3 and figure 3-3, page 3-9, provide a more detailed discussion of the application of engineer capabilities through the warfighting functions to synchronize support to combined arms operations.

THE MILITARY VARIABLE

1-8. Military forces seeking to transform the OE must consider all factors that bear on tactical, operational, and strategic objectives. In practice, reshaping fundamental conditions and human perceptions, behaviors, and actions is extremely difficult. Therefore, the ability of leaders and Soldiers to understand the OE, interact with people, and use capabilities effectively bears directly on the Army's ability to achieve its tactical, operational, and strategic objectives. Engineers contribute to the overall understanding by addressing potential challenges and opportunities associated with all variables of the OE. The military variable is examined more closely in this section because it includes military engineer capabilities which are the focus of Chapter 2 and, to some extent, this manual. It is a variable of the OE which may present challenges and opportunities requiring further understanding.

1-9. The military variable of the operational variables explores the military capabilities of all relevant actors in a given OE. Engineer capabilities can be a significant and relevant component within the military variable. Chapter 2 provides additional discussion of engineer capabilities including Army, joint, interagency, and multinational capabilities. Recent significant changes impacting the military variable can be summarized as—

- A complex, noncontiguous area of operations (AO).
- A threat scenario in which potential adversaries are not readily identifiable.
- Simultaneous, geographically dispersed operations that will result in extremely long and potentially unsecured lines of communication (LOCs).
- Increased coordination of organizations and functions to achieve appreciable gains.
- The prevalence of joint organizations at the operational-level and single-Service organizations operating in a collaborative or interdependent joint environment at the tactical level.
- A significant degree of joint and single-service interaction with other governmental organizations and nongovernmental organizations (NGOs), multinational forces, and contractors.

1-10. Understanding the theater structure commonly used to array military capabilities enables an understanding of engineer capabilities within the context of the OE. A theater is a geographical area for which a geographic combatant commander (GCC) is assigned military responsibility. The command views a theater from a strategic perspective and assesses the level of international military cooperation available with the degree of dedicated U.S. military resources necessary. These factors influence prospective Army operations in each theater or GCC area of responsibility (AOR).

1-11. To conduct operations within the assigned geographic AOR, the GCC may designate a specific area within his AOR as a theater of war, theater of operations, or joint operations area (JOA). Commanders may use these terms independently or in conjunction with one another, depending on the needs of the operation. If used in conjunction, the theater of war would encompass the larger area with smaller theaters of operation and JOAs within it. JP 3-0 describes the criteria for each designation in more detail. This manual uses the more generic term AO to refer to any area where engineer capabilities may

deploy to conduct operations. The GCC (or subordinate unified commander) maintains responsibility for the operations of U.S. forces in an AOR or designates a joint task force (JTF) to command forces in a designated area. The Army Service component commander (ASCC) provides Army forces to the joint force commander (JFC) and JTF to support those operations. Figure 1-2 shows a notional JOA and how corps and divisional AOs may be arrayed.

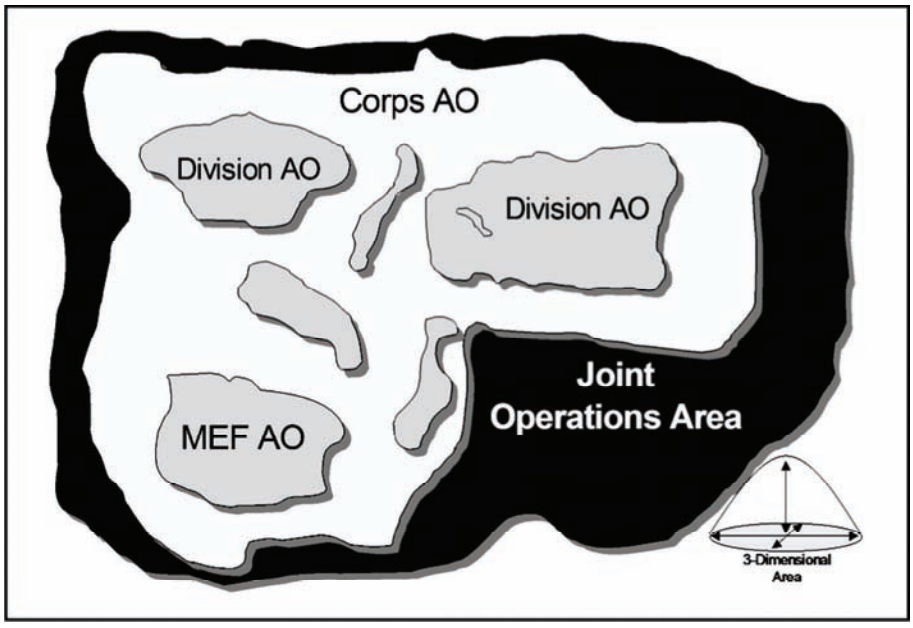


Figure 1-2. Notional joint operations area

SPECTRUM OF REQUIREMENTS

1-12. The United States employs its joint military capabilities at home and abroad in support of its national security goals in a variety of ways. These operations vary in size, purpose, and combat intensity within a spectrum of operations that extends from military engagement, security cooperation, and deterrence activities to crisis response and limited contingency operations and, if necessary, major operations and campaigns. The nature of the security environment is such that the U.S. military often will be engaged in several types of joint operations simultaneously across a spectrum of conflict. The spectrum of conflict is a scale of graduated violence ranging from stable peace to general war. It is a descriptive model that categorizes conflict with common characteristics. The spectrum of conflict is not a linear progression. The four primary descriptors (stable peace, unstable peace, insurgency, and general war) along the spectrum are not static points, and they are not exclusive. The levels of conflict and corresponding politically motivated violence may vary in different areas of the world and within a theater. It is common to conduct operations at different points along the spectrum within a theater or even within an AO.

1-13. An engineer view of the OE is not limited to any one point on the spectrum of conflict. The engineer view, including a shared general understanding and an added degree of focus on those aspects within the purview of an engineering background, seeks to identify potential challenges and opportunities across the spectrum of conflict. While the magnitude of violence varies over a spectrum of conflict, the magnitude of challenges and opportunities from an engineer view of the OE may remain consistently high (see figure 1-3, page 1-6). This spectrum of engineer requirements provides a menu of actions available in support of desired military operations.

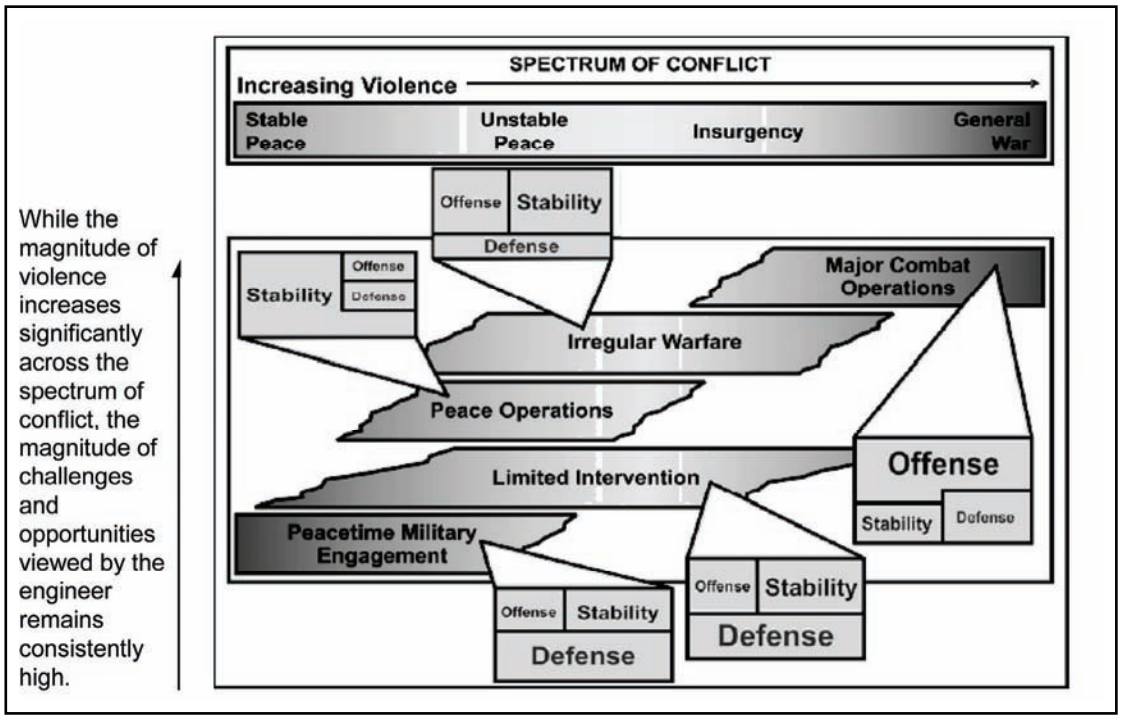


Figure 1-3. Challenges and opportunities from the engineer view

1-14. At one end of the spectrum is "stable peace," an ideal situation characterized by little or no violence. Peaceful interaction may include competition, cooperation, and assistance. Engineer activities may include geospatial engineering support to provide a clear understanding of the physical environment. Military engagement, security cooperation, and deterrence activities sometimes require large numbers of forces. These forces will need infrastructure, facilities, LOCs, and bases to support their sustainment. Even in areas with well-developed existing infrastructure, significant engineer effort will often be required to plan, design, construct, acquire, operate, maintain, or repair it to support operations in-theater. Assistance in response to disaster and humanitarian relief usually includes significant engineering challenges and opportunities to immediately and positively impact the situation.

1-15. Where one or more factions threaten or use violence to achieve their objectives, stable peace may degenerate into "unstable peace." Unstable peace may also result when violence levels decrease after violent conflict. In some cases, outside powers may apply force to limit conflict. Preventing a return to violent conflict may require peace operations. Sometimes stable peace is not immediately achievable. At those times, the goal of conflict termination is establishing conditions in which peace operations can prevent conflict from recurring. Doing this allows the other instruments of national power to work toward stable peace. Opportunities to improve the stability might be available through infrastructure, creating or improving host nation (HN) technological capacity, or other engineering projects. Opportunities may also include providing specialized engineer support to other agencies as necessary.

1-16. Continuing along the spectrum, the next category is insurgency. (An insurgency may include the widespread use of terrorist tactics.) Joint doctrine defines an *insurgency* as an organized movement aimed at the overthrow of a constituted government through the use of subversion and armed conflict. (JP 3-05) It is a condition of ongoing conflict involving significant intra- or interstate violence, but short of large-scale operations by conventional forces. Most common military operations here are either counterinsurgency or support to insurgencies termed unconventional warfare. The engineer view will seek to identify challenges to the commander's ability to move and maneuver freely, protect the forces employed, and sustain the operation. Opportunities include directly impacting the adversaries' freedom of action and improving stability.

1-17. At the far end of the spectrum is general war. *General war* is armed conflict between major powers in which the total resources of the belligerents are employed, and the national survival of a major belligerent is in jeopardy. (JP 1-02) In general war, conventional and unconventional forces vie for military supremacy, and major combat operations predominate. Major combat aims to defeat the armed forces of an enemy and eliminate (or at least severely limit) the military threat. Commanders do this primarily through offensive and defensive operations accompanied by stability operations. These stability operations primarily shape the OE to provide order and security in the areas controlled by friendly forces and to prepare for post-conflict operations. Commanders reduce the level of conflict to smaller, less coordinated actions by gradually decreasing numbers of disaffected parties. These actions move the situation down the spectrum of conflict until achieving stable peace. Major combat operations normally include insurgency or unconventional warfare simultaneously with conventional operations.

1-18. Major operations and campaigns frequently require ground combat (or the possibility of ground combat), as do crisis response and contingency operations. Such operations include the challenge of integrating engineer and other support activities with the fires and maneuver of ground combat forces to assure the mobility of friendly forces, alter the mobility of adversaries, and enhance the survivability of friendly forces. An engineer view also includes identifying challenges associated with sustaining the operation.

1-19. Engineers will be challenged to understand the OE they face and apply their knowledge and background to add to the overall understanding. The engineer view must be consistent with the shared framework and variables employed to analyze the OE. But while the levels of conflict and corresponding politically motivated violence may vary in different areas of the world and within a theater, the challenges and opportunities identified by an engineer understanding of the OE remains consistently high across the spectrum of conflict. Similarly the engineer view of the OE provides relevant and in some cases also unique added understanding at each level of war.

SUPPORT SPANNING THE LEVELS OF WAR

1-20. The levels of war are doctrinal perspectives that clarify the relationship between strategic objectives (ends), operational approach (ways), and tactical actions (means). No finite limits or boundaries exist between the levels of war; they correlate to specific levels of responsibility and planning, helping to organize thought and approaches to a problem. They provide a clear distinction between headquarters and the specific responsibilities and actions performed at each level. Despite advances in technology, digital information sharing, and the increased visibility of tactical actions, the levels of war retain great utility with the decisions at one level always impacting the other levels.

1-21. As previously discussed, Army doctrine describes an OE in terms of the operational variables of PMESII-PT. When commanders receive a mission, they require a more detailed mission analysis focused on their situation. The Army uses METT-TC. When used together, METT-TC and PMESII-PT help commanders visualize their situation. The engineer view of the OE is consistent with the common framework used and provides relevant added understanding at all levels of war.

1-22. The challenges of planning, preparing, executing, and continuously assessing operations within diverse theaters are numerous and varied. The engineer staff must be involved in the operations process activities at each level of war—strategic, operational, and tactical. Understanding the challenges and opportunities identified from an engineer view equips the staff with relevant information to form a more comprehensive understanding. The omission of engineer considerations at any echelon of an operation may adversely impact the effectiveness of the operation. The following paragraphs briefly describe some of the engineer considerations at each level of war.

1-23. Engineer activities at the strategic level include force planning, engineer policy and doctrine development, and the execution of campaigns and operations, focusing primarily on the means and capabilities to generate, mount, sustain, and recover forces. Additionally, infrastructure development is a critical aspect of enabling and sustaining force deployments and places a heavy demand on engineer requirements. Engineers at the strategic level advise on terrain and infrastructure, including seaports of debarkation (SPODs) and aerial ports of debarkation (APODs), force generation, priorities of engineer

support, LOCs, air base and airfield operations, base camp placement and design, joint targeting, foreign humanitarian assistance (FHA), environmental considerations, engineer interoperability, input to the rules of engagement (ROE), rules for the use of force, and support to protection. Environmental issues can have strategic implications and affect mission success and end states if not recognized early and incorporated into planning and operations. Natural resource protection can be a key strategic mission objective important to HN reconstruction. Failure to recognize environmental threats can result in significant risk to the JTF, adversely impacting readiness. If not appropriately addressed, environmental issues have the potential to negatively impact local community relations, affect insurgent activities, and create diplomatic problems for the JTF.

1-24. Engineer activities at the operational level focus on the impact of geography and force-projection infrastructure on the combatant commander's (CCDR's) operational design. Engineer planners must determine the basic yet broad mobilization, deployment, employment, and sustainment requirements of the CCDR's concept of operations. Operational planning merges the operation plan (OPLAN) or operation order (OPORD) of the joint force, specific engineer missions assigned, and available engineer forces to achieve success. JFC engineer planners also need to understand the capabilities and limitations of Service engineer forces. Many of the engineer activities conducted for strategic operations are also performed at the operational level. At the operational level, engineers prioritize limited assets and mitigate risks. Engineers conduct operational area and environmental assessments and work with intelligence officers to analyze the threat. Engineers conduct master planning and plan for the construction of contingency base camps and other facilities. Engineers anticipate requirements and request capabilities to meet them. They develop geospatial products and services and make recommendations on joint fires and survivability for the forces employed. As the link to tactical engineer integration, operational planning ensures that adequate engineer capabilities are provided to accomplish combat engineering support requirements.

1-25. Engineer activities at the tactical level focus on support to the ordered arrangement and maneuver of combat elements—in relationship to each other and to the enemy—that are required to achieve combat objectives. Tactical planning is conducted by each of the Services; in the context of engineer operations, this translates to a primary focus on combat engineering tasks and planning done within tactical organizations (see Chapter 3 for a discussion of the engineer functions including combat engineering). Operational planners set the conditions for success at the tactical level by anticipating requirements and ensuring that capabilities are available. Engineer tactical planning is typically focused on support to combat maneuver, survivability, and sustainment support that is not addressed by the higher-echelon commander. Construction planning at the tactical level will typically focus on security construction in support of the protection and sustainment warfighting functions. Engineer planners at the tactical level use the engineer assets provided by operational planners to support the tactical mission tasks assigned to those combat maneuver units they support. With the support of the engineer, the subordinate JFC ensures that engineer capabilities are effectively integrated into the scheme of maneuver and the performance of assigned tasks. Tactical missions are complex, and planning must consider both symmetric and asymmetric threat capabilities. Special consideration includes performing terrain analysis with an understanding of these threat capabilities. Engineer reconnaissance (both tactical and technical) is a critical capability to the combat maneuver commander at the tactical level. Threat information must be very specific. Engineers must discern and identify patterns and plan specific detection strategies based on the threat. The proliferation of mines and improvised explosive devices (IEDs) requires engineers to continuously develop new countering procedures. The tactical integration of explosive ordnance disposal (EOD) capabilities has become an increasing requirement.

1-26. As mentioned above, the engineer view of the OE and engineer operations more broadly are synchronized to support combined arms through the framework of the warfighting functions. The resulting understanding of the OE is not limited to considerations within the OE that may result in engineer functional missions. Neither is engineer planning at each level of war limited or constrained to the development of engineer functional tasks. The warfighting functions and the parallel joint functions are used to synchronize engineer operations at every level of war. While there are significant linkages to each of the warfighting functions, planning support at the strategic to operational level is focused primarily within the movement and maneuver, intelligence, and sustainment functions. At the operational to tactical level, planning support focuses primarily on the movement and maneuver, intelligence, C2, sustainment,

and protection warfighting functions. While the primary focus and, in many cases, the staff organization for engineer considerations vary among levels of war, the engineer Soldier remains consistently central to the capability to provide and integrate an engineer view of the OE. Chapter 3 includes a more detailed discussion of engineer support to combined arms, the linkages to all of the warfighting functions, and the engineer staff organization.

ENGINEER SOLDIERS

1-27. Engineer Soldiers are the centerpiece of those forces conducting engineer operations. They are the irreducible unit of engineer forces and repository of both the expertise and skills required to provide engineer support to the combined arms. Regardless of the importance of equipment or the expansion of technological capabilities, engineer Soldiers accomplish the missions that enable engineer operations and support.

1-28. The rigors of service and combat bind together today's Soldiers. Their character comes from professional standards and experiences. They hold fast to the professional standards embodied in the "Army Values" and "Warrior Ethos". The "Warrior Ethos" describes the mindset of the professional Soldier and proclaims a selfless commitment to the nation, mission, unit, and fellow Soldiers. When internalized, it produces a tenacious will to win and moves Soldiers to fight through all conditions to victory. Engineer Soldiers complement the "Warrior Ethos" with a curiosity for the technological aspects of their environment.

1-29. Frequently, Soldiers operate in areas characterized by chaos and disorder—this is the nature of land operations. They may encounter populations with diverse cultures and political orientations. These populations may support, oppose, or remain ambivalent to a U.S. presence. In any operation, Soldiers prepare to encounter dislocated civilians or persons of unknown status. The cornerstone of successful interaction with local populations and displaced persons—and the key to successful stability and civil support operations—is discipline. When the local populace supports Army forces, the Soldiers' discipline cements the relationship. In circumstances where the populace is ambivalent or unfriendly, discipline fosters respect and prevents tension from flaring into open hostility. ROE guide the use of lethal and nonlethal means, not to inhibit action and initiative but to channel it in ways that support the nation's stated goals. The disciplined application of lethal and nonlethal force is more than a moral issue; it is a critical contributor to operational success. The Soldier's rules—set forth in Army Regulation (AR) 350-1—distill the essence of the law of war and regulate the conduct of Soldiers in operations (see figure 1-4, page 1-10).

1-30. Engineer Soldiers must be technically and tactically proficient. Their character and competence represent the foundation of a trained and ready Army. Soldiers must be able to accomplish tasks while operating alone or in groups. The contemporary OE requires Soldiers in all grades and in all specialties to have a fundamental understanding of the operational variables used to frame the analysis of the OE. Soldiers and leaders must exercise mature judgment and initiative under stressful circumstances and be capable of learning and adapting to meet the demands of full spectrum operations. Leadership links Soldiers' technical and tactical competence to operational success by employing and maintaining increasingly complex and sophisticated equipment and executing a variety of offensive, defensive, stability, and civil support tasks.

The Rules

- Soldiers fight only enemy combatants.
- Soldiers do not harm enemies who surrender.
- Soldiers disarm prisoners or turn them over to designated authorities.
- Soldiers do not kill or torture enemy prisoners of war.
- Soldiers collect and care for the wounded, whether friend or foe.
- Soldiers do not attack medical personnel, facilities, or equipment.
- Soldiers destroy no more than the mission calls for.
- Soldiers treat civilians humanely.
- Soldiers do not steal. Soldiers respect private property and possessions.
- Soldiers should do their best to prevent violations of the law of war.
- Soldiers report all violations to the law of war to their superior.

Figure 1-4. The Soldier's rules

1-31. Training is the means by which Soldiers, leaders, and units achieve the tactical and technical competence required to conduct successful operations across the spectrum of conflict. This entails specific, dedicated training on offensive and defensive tasks and a wide range of stability and civil support tasks. The Army trains Soldiers and units daily to accomplish tasks to standard while developing leaders that are able to function under all conditions.

1-32. Chapter 2 discusses engineer capabilities available to Army and joint commanders. These capabilities include Army engineer organizations with Active Army, ARNG, USAR, and the professional DA Civilians in the United States Army Corps of Engineers (USACE). Additional capabilities may be available from other Services, government agencies, allies, and contractors. The centerpiece of these capabilities is the engineer Soldier, willing and able to make conventional and innovative attempts until the task is accomplished.

Chapter 2
Engineering in Unified Action

Essayons (Let us try!)

Motto of the Corps of Engineers

Unified action describes the wide scope of actions (including the synchronization of activities with governmental organizations and NGOs) taking place within combatant commands, subordinate unified commands, or JTFs under the overall direction of the commanders of those commands. Unified action highlights the synergistic application of all the instruments of national and multinational power and includes the actions of nonmilitary organizations and military forces. Engineer capabilities are a significant force multiplier in joint operations, facilitating the freedom of action necessary for the JFC to meet mission objectives. Engineer operations modify, maintain, provide understanding of, and protect the physical environment. In doing so, they assure the mobility of friendly forces; alter the mobility of adversaries; enhance the survivability and enable the sustainment of friendly forces; contribute to a clear understanding of the physical environment; and provide support to noncombatants, other nations, and civilian authorities and agencies. This chapter describes the engineer capabilities available to the JFC and the framework for generating and organizing these capabilities.

SECTION I–THE ENGINEER REGIMENT

2-1. FM 3-0 emphasizes operations that combine offensive, defensive, and stability or civil support by defining a distinct operational concept around full spectrum operations. Such operations require the flexible application of combat power in the simultaneous execution of up to three elements of full spectrum operations. Chapter 5 provides a complete discussion of engineer support to full spectrum operations. Army forces conduct full spectrum operations within the larger framework of joint operations. Combat power is the way Army leaders conceptualize capabilities. Engineer capabilities are key enablers for success in full spectrum operations.

2-2. The Engineer Regiment represents the Army's engineer capabilities in both the operational Army and the generating force. **The *Engineer Regiment* consists of all Active Army, Army National Guard, and United States Army Reserve engineer organizations (as well as Department of Defense [DOD] civilians and affiliated contractors and agencies within the civilian community) with a diverse range of capabilities that are all focused toward supporting the Army and its mission.** The Active Army consists of USACE and active duty Army military engineer units within the combatant commands and Army commands. The RC consists of the ARNG and USAR and provides the TEC headquarters. The RC engineer force constitutes more than three-fourths of Army engineer forces and includes a wide range of specialized capabilities. In addition, certain types of units are found only in the RC. The Regiment is joint in its integration capabilities and supports the planning, preparing, executing, and assessing of joint operations. The Regiment is experienced at interagency support and leveraging nonmilitary and nongovernmental engineer assets to support mission accomplishment.

2-3. The Chief of Engineers leads the Engineer Regiment and is triple-hatted as the Chief of the Engineer Branch, the Commander of USACE, and the staff officer advising the Chief of Staff of the Army (CSA) on engineering matters and force capabilities. The Chief is assisted in these roles by the Engineer Branch;

Headquarters, USACE; and the Office of the Chief of Engineers (OCE). The Engineer Branch and USACE are discussed further in this chapter. OCE is a staff element assigned to the Army Staff to assist the Chief of Engineers in advising the CSA and the Army Staff.

2-4. At the operational to strategic level, the Regiment is represented as shown in figure 2-1. The Regiment is represented by the various engineer organizations and capabilities reflected in table 2-1, at the tactical to operational level. Appendix B provides a more in-depth view of the organizations depicted in table 2-1.

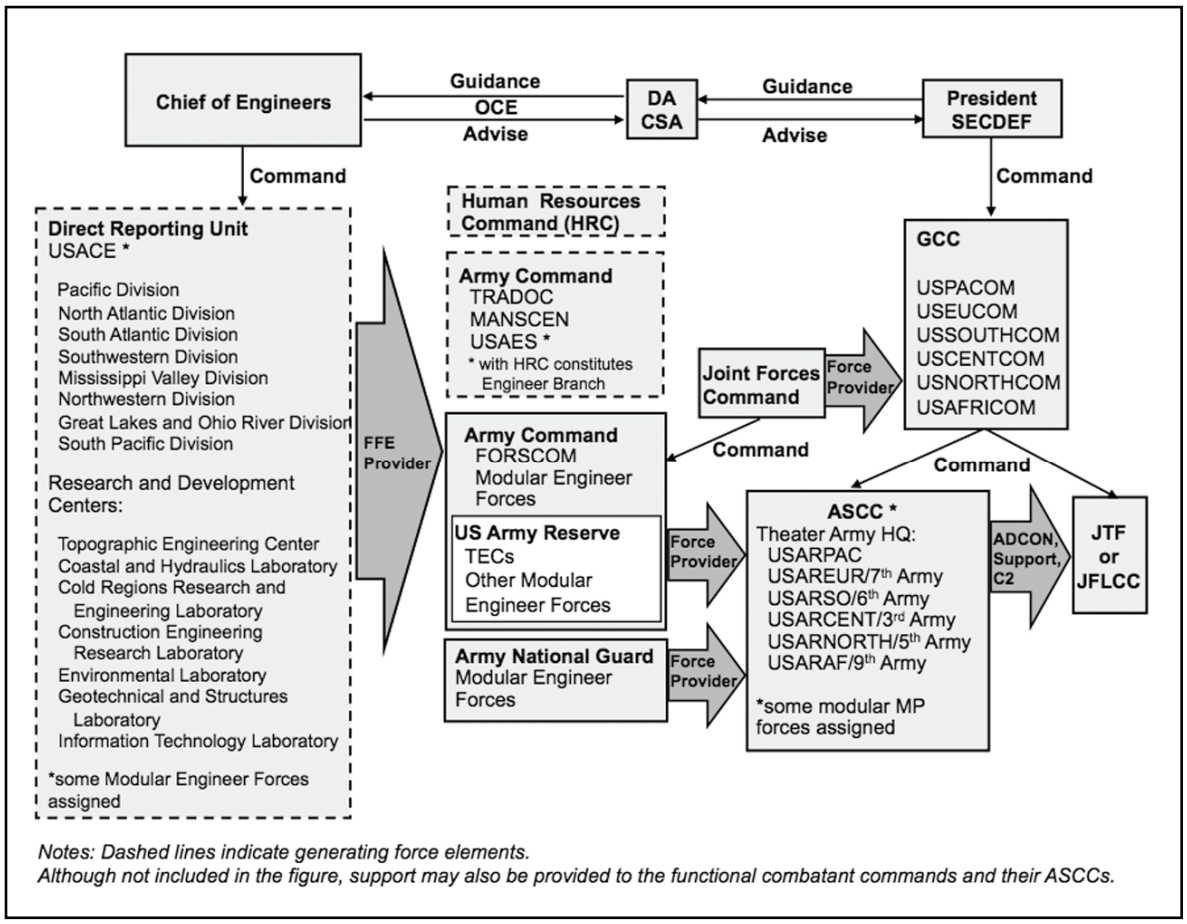


Figure 2-1. The Engineer Regiment from strategic to operational level

Table 2-1. Elements of the Engineer Regiment

Engineer Element		*Force Provider*			
		FORSCOM			
		Active Army	*USAR*	*ARNG*	*Other ASCC*
Organic Engineer Forces	BCT Engineer Company	■		■	■
	Geospatial Team	■		■	■
Engineer Headquarters	Engineer Battalion Headquarters	■	■	■	■
	Engineer Brigade Headquarters	■	■	■	■
	Theater Engineer Command		■		
Baseline Engineer Forces	Sapper Company	■	■	■	
	Mobility Augmentation Company	■	■	■	
	Clearance Company	■	■	■	
	Engineer Support Company	■	■	■	■
	Horizontal Construction Company	■	■	■	■
	Vertical Construction Company	■	■	■	■
	Multirole Bridge Company	■	■	■	
Specialized Engineer Forces	Survey and Design Team	■	■	■	*
	Concrete Section	■	■	■	
	Asphalt Team	■	■	■	
	Firefighting Team	■	■	■	
	Explosive Hazards Team or Coordination Cell	■		■	*
	Engineer Squad (Canine)	■		■	
	Diving Team	■		■	
	Topographic Company or Geospatial Planning Cell	■		■	*
	Construction Management Team	■	■	■	*
	Engineer Facilities Detachment		■	■	*
	Prime Power Company				■
	Well-Drilling Team			■	
	Quarry Platoon			■	
	Real Estate Team		■		*
	Forward Engineer Support Team				■

Note: * USACE may provide some capabilities from its generating force organization.

THE ENGINEER BRANCH

2-5. The Engineer Branch includes both the human resource managers in the Human Resources Command (HRC) and the Engineer Branch proponent under TRADOC. Together, these components generate and manage the centerpiece of those forces conducting engineer operations. The Branch trains,

educates, and manages engineer Soldiers in a variety of military occupational specialties (MOSs). The Engineer Branch proponent is USAES, which is colocated with the United States Army Military Police School and the United States Army Chemical, Biological, Radiological, and Nuclear School at the Maneuver Support Center (MANSCEN). Collocation at MANSCEN complements efforts of these three branch proponent schools to synchronize their doctrine, organization, training, materiel, leader education, personnel, and facilities (DOTMLPF) functions and other support capabilities across the warfighting functions.

2-6. USAES provides engineer Soldier education, including core, tactical, technical, and leader education for officers, noncommissioned officers (NCOs), and enlisted personnel. Additionally, specialized training is also provided (such as the Joint Engineer Operations Course, Explosive Ordnance Clearance Agent [EOCA] Course, Search Advisor Course, and Sapper Leader Course). Additional training is developed and provided as required. As part of the officer education program at USAES, selected officers are provided the opportunity to complete postgraduate education and obtain professional engineer certification.

2-7. USAES also hosts and manages several boards, centers, conferences, and cells, both standing and ad hoc, as a means to support DOTMLPF functions of the Army staff, generating force, and ASCCs and gather feedback from leaders in the engineer forces. One example of an annual conference is the Engineer Force Conference (ENFORCE) that provides direct communication among senior engineer leaders. The Counter Explosive Hazards Center at MANSCEN coordinates DOTMLPF solutions and integration for counter EH tactics, techniques, and procedures (TTP). Operational support is provided to engineer forces and staffs through reachback, mobile training teams, and other mechanisms.

2-8. The Engineer Branch produces tactically and technically competent engineer Soldiers capable of serving in engineer forces or as engineer staff of a joint force assisting the JFC by furnishing advice and recommendations to the commander and other staff officers (Chapter 4 discusses engineer staff roles and responsibilities in greater detail). The engineer branch proponent works closely with USACE to leverage a vast pool of additional technical competence provided by DOD civilians and affiliated contractors and agencies within the civilian community working with USACE. Technical support is available directly in support of engineer staff and forces through reachback. Significant technical development benefits those engineer Soldiers assigned to work within USACE.

UNITED STATES ARMY CORPS OF ENGINEERS

2-9. USACE is the Army's direct reporting unit assigned responsibility to execute Army and DOD military construction, real estate acquisition, and development of the nation's infrastructure through the civil works program. Most of its assets are part of the generating force (see FM 1-01), but selected elements are a part of the operational Army, to include forward engineer support teams (FESTs) and the 249th Engineer Battalion (Prime Power). Other services include wetlands and waterway management and disaster relief support operations (USACE has primary responsibility to execute Emergency Support Function [ESF] #3, Public Works and Engineering, for DOD). With its subordinate divisions, districts, laboratories, and centers, USACE provides a broad range of engineering support to military departments, federal agencies, state governments, and local authorities in a cost-reimbursable manner. USACE districts provide research, design, contracting, construction, and operation of hydroelectric power generation and river navigation while reducing overall environmental impact. USACE also provides technical assistance and contract support to joint forces deployed worldwide. USACE operates the U.S. Army Engineer Research and Development Center (ERDC), a comprehensive network of laboratories and centers of expertise that includes the following facilities:

- Geotechnical and Structures Laboratory.
- Coastal and Hydraulics Laboratory.
- Environmental Laboratory.
- Information Systems Laboratory.
- Engineer Waterways Experiment Station.
- Cold Regions Research and Engineering Laboratory.
- Construction Engineering Research Laboratory.

- Topographic Engineering Center.

2-10. USACE capabilities include access to the expertise of ERDC's centers and laboratories and all of the resources within the divisions, districts, and other sources. Within USACE, the Chief of Engineers has aligned USACE divisions with and assigned liaison officers (LNOs) to CCDR and Army commanders as they reinforce and extend the capabilities of the Regiment (see figure 2-1, page 2-2). This relationship with the CCDR and the operational force allows direct access to USACE resources to support engagement strategies and wartime operations. The USACE mission supports full spectrum operations with the following five major functions:

- Warfighting—provides engineering and contingency support for full spectrum operations.
- Disasters—responds to and supports recovery from local, national, and global disasters.
- Infrastructure—acquires, builds, and sustains critical facilities for military installations, theater support facilities, and public works.
- Environment—restores, manages, and enhances ecosystems, local and regional.
- Water resources development—balance requirements between water resources development and environment.

2-11. USACE support provides for technical and contract engineering support, integrating its organic capabilities with those of other Services and other sources of engineering-related reachback support. USACE may have assets directly integrated into the military C2 structure and linked to a TEC or senior engineer headquarters or already operating under contract in-theater. Whether providing construction contract and design support in the AO or outside of the contingency area, USACE can obtain necessary data, research, and specialized expertise not present in-theater through Tele-engineering and other reachback capabilities. ***Tele-engineering*** **is assisting engineers and the commanders they support in planning and executing their missions with capabilities inherent in field force engineering (FFE) through exploitation of the Army's command, control, and communications architectures to provide a linkage between engineers and the appropriate nondeployed subject matter experts for resolution of technical challenges. Tele-engineering is under the proponency of the United States Army Corps of Engineers.**

2-12. USACE is the primary proponent of FFE and related generating force support which enables the engineer functions and the operational Army. ***FFE*** **is the application of the Engineer Regiment's capabilities from the three engineer functions (although primarily general engineering) to support full spectrum operations through both reachback and forward presence.** This is provided through USACE personnel and assets (deployed and participating through reachback) or through operational force engineer Soldiers linked into reachback capabilities through tele-engineering. The engineer commander maintains his flexibility and determines the mix of capabilities (troop, USACE civilian, and contractor) based on the tactical situation, time-phased requirements, capabilities required, available funding, and force caps. The USACE division commander task-organizes the division's capabilities to meet the varying time-phased requirements. The capability relies heavily on reachback through systems such as tele-engineering. The FFE concept is applicable in joint and multinational operations to provide a better engineer solution that can be implemented faster and with a smaller footprint. The United States Air Force (USAF) and United States Navy (USN) have similar capabilities—the Air Force uses its Geo-Reach program while the Navy has the capability to conduct engineer reconnaissance with reachback to the Naval Facilities Engineering Command (NAVFAC).

2-13. The USACE objective for FFE is to more effectively execute its generating force roles (engineering expertise, contract construction, real estate acquisition and disposal, and environmental engineering) in all operations and maximize use of reachback to provide technical assistance and enable the engineer functions in support of operational force engineers and the CCDR or JTF commander. One of the ways USACE accomplishes this is by training, equipping, and maintaining specialized deployable FESTs. A "FEST" is a deployable USACE organization that executes the USACE mission in the AO. It is usually subordinate to the senior engineer commander in the AO. Another way that USACE supports the operational force is through its infrastructure assessment team. The "infrastructure assessment team" is a nondeployable team that provides engineering infrastructure assessments for military deployments and

civil-military operations (CMO) in forward areas. Focus areas for the teams are infrastructure related to the USACE missions and aspects of the AO impacting contract construction, to include roads, utilities, water resources, and HN support. A third way that USACE supports the operating force is through its base development teams. A "base development team" is a nondeployable team that can quickly provide base development engineering and planning and facilities design for base camps. Base camps include intermediate staging base, forward operating bases (FOBs), displaced persons camps, and any similar requirement.

2-14. USACE has expertise that may support the strategic, operational, or tactical levels in engineer planning and operations and can leverage reachback to technical subject matter experts in districts, divisions, laboratories and centers of expertise, other Services, and private industry in its role as part of the generating force. USACE FFE is a means to access specialized engineer capabilities that can augment JFC planning staffs. Teams can rapidly deploy to meet requirements for engineering assessments and analyses in support of the full array of engineer operations. The two types of FESTs provide support to primarily general engineering efforts through forward-deployed engineer elements that can communicate with tele-engineering kits and reachback to technical experts within USACE. Engineer facility detachments (EFDs) provide a wide variety of services to forward deployed forces in a public works capacity including assistance in the reception and staging of troops.

- Forward Engineer Support Team-Advance (FEST-A). Its mission is to provide additional planning capability to combatant command and Army service component command engineer staffs. It can also deploy in support of a JTF with a limited execution capability. Its capabilities include multiple engineer planning and design, real estate acquisition and disposal, and contracting personnel. The FEST-A may provide an initial technical infrastructure assessment or survey, technical engineer assistance, contracting support, and real estate acquisition support.
- Forward Engineer Support Team-Main (FEST-M). Its mission is to provide C2 for USACE teams in the AO and sustained USACE engineering execution capability within an AO. This team generally supports a JTF or the land component of a JTF. The FEST-M provides LNOs and USACE engineering planning modules to supported units, as required. It is a flexible, self-sustaining organization with a mission of providing USACE capabilities through forward presence and reachback for the following primary mission areas: infrastructure engineering planning and design, technical engineering expertise, contract construction, real estate acquisition and disposal, environmental engineering, and geospatial engineering support.
- EFD. A 15-Soldier unit whose mission is to provide additional facility engineering planning and support to the CCDR. It supports base development including master planning, construction design and supervision, and contractor supervision. The unit can support multiple sites.

2-15. Department of Defense Construction Agents. The Secretary of Defense has designated USACE and NAVFAC as construction agents for the design and construction execution within assigned areas of responsibility for U.S. military facilities worldwide. (The Air Force is the designated DOD construction agent for military construction in the British Isles). USACE and NAVFAC provide a significant engineering capability to be leveraged in joint operations. Both USACE and NAVFAC have the capability to support general engineering operations with technical assistance and contract support to joint forces deployed worldwide. They also maintain in-depth expertise in engineering research and development. Inherent in their mission support capabilities is a planning and engineering capability for advanced base and infrastructure development. The CCDR may use USACE and NAVFAC to provide technical engineering assistance for design and award of construction contracts to civilian companies in support of military operations.

ENGINEER OPERATIONAL FORCE CAPABILITIES

2-16. Army engineer forces of the operational force operate at the strategic, operational, and tactical levels across the spectrum of conflict. Units are organized in a scalable, modular, adaptable manner to support combat, general, and geospatial engineering requirements. Army engineer forces operate as an integral member of the combined arms team during peace and war to provide a full range of engineering capabilities. They execute combat engineering tasks at the tactical and operational levels of war in support

of combined arms forces and execute general and geospatial engineering tasks at the tactical to strategic levels throughout the JOA.

THE MODULAR CONSTRUCT

2-17. The modular construct of the Army engineer operational force is a complementary and interdependent relationship among four major categories of units (and includes USACE-provided technical engineering and contract support as already discussed). The four categories include organic engineers (and staff elements) and three other categories held in an engineer force pool (all operational force engineer units not organic to a BCT, organic to the armored cavalry regiment [ACR], or in a headquarters staff). The assets in the force pool exist to augment organic BCT engineers and provide echelons above the BCT with necessary engineer capabilities. The force pool consists of engineer headquarters units, baseline units, and specialized engineer units.

- Organic engineer capabilities are engineer units and staff cells in the three types of BCTs and the ACR which provide the baseline requirements for combat and geospatial engineering. These units have very limited general engineering capability.
- Engineer headquarters units provide C2 for engineer operations, elements, and capabilities. They consist of the TEC, the engineer brigade, and the engineer battalion. Each has a staff that allows the commander to C2 assorted and various engineer organizations. They are each capable of C2 of other selected nonengineer units to support multifunctional missions such as combined arms breaching and combined arms gap crossing.
- Baseline engineer units consist primarily of tactically to operationally focused combat and general engineering units that may augment the organic forces of the BCTs or be assigned to other supporting operations, to include those typically performed under the C2 of the maneuver enhancement brigade (MEB) or engineer brigade at the division or corps levels. All of these units may perform roles and missions under the C2 of a functionally focused engineer brigade, TEC, or the multifunctional MEB.
- Specialized engineer units are a variety of typically low-density engineer forces that provide the remaining category of engineer support. These units are technically focused units that while providing selected support at the tactical level are focused on providing their specialized engineering capabilities in support of the operational to strategic levels in full spectrum operations. These specialized forces include modules for construction support, infrastructure development, EH mitigation, geospatial support, well drilling, real estate management, and firefighting.

ORGANIC CAPABILITIES

2-18. Each of the three types of BCTs has a single organic combat engineer company. In the infantry brigade combat team (IBCT) and the heavy brigade combat team (HBCT), this company is located within the brigade special troops battalion (BSTB); in the Stryker brigade combat team (SBCT), this company is positioned as a separate unit under the brigade. The combat engineer company of the ACR is also positioned as a separate unit under the regiment, similar to that of the SBCT. Geospatial engineering capabilities are assigned at brigade level and higher staffs. These organic combat engineer units and geospatial elements provide the minimum combat and geospatial engineering capability to support BCT operations and may also perform some very limited and selected general engineering tasks. Capabilities of organic engineers include—

- Providing geospatial data management and analysis, except in the ACR which does not have organic geospatial elements.
- Providing support to close combat (mobility, countermobility, and survivability).
- Providing mobility assessments.
- Supporting mobility through urban terrain.
- Providing C2 for engineer forces.

2-19. During offensive and defensive operations, they will require augmentation by baseline elements and potentially include an engineer battalion headquarters. Other specialized engineer units and equipment may also provide mission-tailored engineer support when their specialized engineer capabilities are required. EOD elements may be included in this augmentation. Organic engineers train with and remain an integral part of their parent BCT. Additionally, engineers are organic within the staffs of all Army command level echelons, providing engineer staff planning functions and integrating geospatial engineering support.

FORCE POOL CAPABILITIES

Engineer Headquarters Units

2-20. C2 of engineer forces is provided by three echelons of engineer headquarters units. Multifunctional units (discussed later in this chapter) at both brigade and battalion echelons may also provide C2 for engineer forces in cases where engineer support is integral to the multifunctional mission. C2 for engineer functional capabilities and missions is provided by the TEC, the engineer brigade, and the engineer battalion. The TEC is the only organization designed for operational command without augmentation of engineer capabilities at echelons-above-corps level and often will provide C2 for the JFC if an operational engineer headquarters is required. The TEC provides C2 for all assigned or attached Army engineer brigades and other engineer units and missions for the joint force, land component, or Army commander. When directed, it may also provide C2 for engineers from other Service, multinational, and contract construction engineers. The TEC is focused on operational C2 of engineer operations across all three of the engineer functions and typically serves as the senior theater or land component engineer headquarters.

- Tasks performed by the TEC include providing the support for all operational planning for the theater across all of the engineer functions. The TEC synchronizes all engineer planning and support for the CCDR or JTF commander, providing peacetime training and support of military engagement for their supported respective CCDRs. It plans and operates in close coordination with the senior contract construction agents (CCAs) in the AO.
- Both the TEC and USACE are capable of rapid deployment of modular deployable staff elements and organizations to support the needs of the operational commander. Together they are capable of providing a wide range of technical engineering expertise and support from USACE, other Service technical laboratories and research centers, and other potential sources of expertise in the civilian community. They are enabled by the global reachback capabilities associated with FFE. TEC resources are synchronized with USACE for peacetime engagements and to provide FFE capabilities to the operational force. These capabilities include technical assistance, project planning and design, contract construction, real estate acquisition, infrastructure support, and support to nation-building capacities.

2-21. The engineer brigade is one of the Army's functional brigades and is capable of conducting engineer missions and controlling up to five mission-tailored engineer battalions, including capabilities from all three of the engineer functions. It may also provide C2 for other nonengineer units focused on the performance of such missions as support of a deliberate gap (river) crossing.

- One or more engineer brigades is required in the division or corps whenever the number of engineer units or the functional nature of engineer missions exceed the C2 capability of the multifunctional MEB. Once deployed, engineer brigades become the focal point for apportioning and allocating mission-tailored engineer forces within the AO. The engineer brigade is capable of supporting a JTF or component commander (land, air, or sea) and providing C2 of all Service engineers and contracted engineering within an AO. The engineer brigade has the ability to provide deployable command posts (DCPs) and staffs' expertise for C2 of engineer operations as required. With augmentation, it may serve as a joint engineer headquarters and may be the senior engineer headquarters deployed in a JOA if full TEC deployment is not required.
- The engineer brigade has the capability to simultaneously provide two DCPs. It provides engineer-specific technical planning, design, and quality assurance and quality control during

24-hour operations. The engineer brigade provides C2 for up to five assigned engineer battalions, preparing them for deployment in support of the brigade or other organizations.

2-22. The engineer battalion is capable of conducting engineer missions and controlling any mix of up to five mission-tailored engineer companies. They are typically found within the engineer brigade, the MEB, or in support of a BCT. With the exception of the prime power battalion, which performs a specific technical role, all engineer battalion headquarters are capable of providing C2 for either combat, general, or mixed engineering missions when they have been task-organized to perform those roles. Selected battalion headquarters include additional capabilities such as being airborne or air assault capable. Training relationships will make certain battalion headquarters more capable in either combat or general engineering roles. For the conduct of construction or EH clearance missions, the battalion should receive survey and design or explosive hazards teams (EHTs) to facilitate those missions.

- Whenever two or more engineer modules are task-organized in support of a BCT, MEB, engineer brigade, or other unit, an engineer battalion headquarters may be required for the C2 and sustainment of those modules.
- An engineer battalion may support an MEB for combat or general engineering missions. The engineer battalion provides C2 for up to five assigned engineer companies, including preparing them for deployment in support of the battalion or other organizations.
- When in support of a BCT, an engineer battalion will provide C2 of engineer operations. The battalion may be focused on a single mission, such as route clearance, security construction, or cache interrogation and reduction. The engineer battalion may be organized to perform as a breach force command when the BCT is conducting a combined arms breach. During a gap (river) crossing operation, the engineer battalion provides the option to be designated as the crossing site command.

Baseline Engineer Units

2-23. Baseline engineer units include both combat and general engineer units (see table 2-2). They are the primary building blocks for the organization of most engineer battalions. These units are used to augment the organic engineer capabilities of a BCT and may be task-organized under an engineer battalion headquarters to serve under a variety of larger headquarters, providing the specific tailored capabilities needed to support particular mission requirements.

Table 2-2. Baseline engineer units

Combat Engineer Units	*General Engineer Unit*
Sapper Company	Engineer Support Company
Mobility Augmentation Company	Multirole Bridge Company
Clearance Company	Horizontal Construction Company
	Vertical Construction Company

Combat Engineer Units

2-24. Baseline combat engineer units are focused on support to combined arms operations at the tactical level and are designed to participate in close combat as necessary. All have the capability of fighting as engineers or, if required, as infantry. An engineer battalion headquarters will typically be included to provide the necessary C2, logistics, and staff supervision for attached and assigned units when two or more are assigned to a BCT, MEB, or other organization. Combat engineer (Sapper) units may construct tactical obstacles, defensive positions, and fixed and float bridges and repair command posts (CPs), LOCs, tactical routes, culverts, fords, and other selected general (horizontal and vertical construction-related) engineering tasks. Combat engineer units also provide engineer support for gap (river) crossing operations, assist in assaulting fortified positions, and conduct breaching operations. Airborne and air assault capable engineer units also have the unique ability to employ air-droppable rapid runway repair kits in support of forcible entry operations. The more specialized combat engineering capabilities of assault bridging, breaching, and

route and area clearance are added to the organic engineer capabilities in BCTs (or to deployed baseline Sapper companies) to allow them to accomplish their broader mission requirements.

General Engineer Units

2-25. These general engineer units are comprised of bridging, support, and construction capabilities. The horizontal and vertical companies have a construction focus and are capable of constructing, rehabilitating, repairing, maintaining, and modifying landing strips, airfields, CPs, main supply routes (MSRs), supply installations, building structures, bridges, and other related aspects of the infrastructure. These units may also perform repairs and limited reconstruction of railroads or water and sewage facilities. The basic capabilities of these construction units can be expanded significantly. Through the augmentation of specialized personnel and equipment, these baseline construction units can provide bituminous mixing and paving, quarrying and crushing, and major horizontal construction projects, to include highways, storage facilities, and airfields. Additional augmentation could also include pipeline construction or dive support, depending on the type and scope of the construction mission.

Specialized Engineer Units

2-26. The specialized engineer unit's portion of the force pool provides for general and geospatial engineering capabilities at the operational and strategic levels and for specific augmentation to the tactical level (see table 2-3). Some specialized capabilities are only available through the FFE capabilities provided as part of the generating force by USACE. These key capabilities translate into units that are typically of a lower availability and density than the baseline engineer units. These smaller, more specialized units are designed to typically support larger engineer-related missions and tasks or provide augmentation to selected headquarters elements.

Table 2-3. Specialized Army engineer force pool units

Explosive Hazards Support	*Construction Support*	*Infrastructure Support*	*Geospatial Support*	*USACE*
• Explosive Hazards Coordination Cell (EHCC) • EH team • Engineer squad (canine) • EOD[1]	• Survey and design team • Construction management team • Real estate team • Diving team • Asphalt team • Concrete section • Well-drilling team • Quarry platoon	• Engineer facility detachments (EFDs) • Firefighting team • Pipeline	• Topographic engineer company • Geospatial planning cell	• FFE (FESTs with embedded environmental, contingency real estate, and other support teams as needed) • Prime power company, platoon, or detachment

[1] Army capability is limited in scope for Army engineers and is primarily resident in the EOD specialty of the ordnance branch.

Explosive Hazards Support

2-27. EH support provides C2 for specialized elements and integrates other EH capabilities. These capabilities include the linkage to Army EOD capabilities found in the ordnance branch. The engineer squad (canine) includes both specialized search dog teams and mine dog teams. These teams assist in locating firearms, ammunition, and explosives in both rural and urban environments. They may be used to augment a variety of route and area clearance capabilities found in the clearance company.

Construction Support

2-28. Construction support provides C2 for management, procurement, and contract support. It also provides for enhanced performance for asphalt, concrete, and haul operations. All of these capabilities have a role in infrastructure support.

Infrastructure Support

2-29. Engineer prime power units generate electrical power and provide advice and technical assistance on all aspects of electrical power and distribution systems. Prime power units have a limited electrical engineering capability (design and analysis); provide electrical surveys; and operate, maintain, and perform minor repairs to other electrical power production equipment, to include HN fixed plants. EFDs support theater opening and closing, base development, construction management, contractor coordination, base operations, and master planning. Pipeline companies construct and rehabilitate pipeline systems. Firefighting teams provide first responder support for facilities and aviation operations.

Geospatial Support

2-30. Geospatial engineer units provide terrain and digital imagery analysis and support the integration of other geospatial information. ***Geospatial information*** **is the foundation information upon which all other information about the physical environment is referenced to form the common operational picture (COP)** to the headquarters that they support. Topographic engineer companies provide geospatial support to deployed units that require augmentation. The companies provide modules tailored to support the GCC, JTF headquarters, ASCC, corps and division headquarters, sustainment brigades, other joint or multinational division and brigade-size elements, and the Federal Emergency Management Agency (FEMA) regions with analysis, collection, generation, management, finishing, and printing capability. Geospatial planning cells have a specific mission of generating, managing, and disseminating geospatial data, information, and products in support of the ASCC headquarters and GCC.

2-31. Although the Army has no dedicated engineer reconnaissance units, except for an element in the combat engineer company of the HBCT, commanders routinely form mission-tailored engineer reconnaissance teams to collect engineer-specific tactical and technical information. These teams are a critical source of information for engineers and combined arms commanders and staffs, playing an important role in the intelligence preparation of the battlefield (IPB). FM 3-34.170 provides detailed discussion on the range of engineer reconnaissance capabilities.

SECTION II–UNIFIED ACTION: JOINT/INTERAGENCY/MULTINATIONAL

JOINT/INTERAGENCY/MULTINATIONAL CAPABILITIES

2-32. In full spectrum operations, Army engineers operate as part of a joint force and often within a multinational and interagency environment. Each Service has core engineering units and capabilities that stem from their traditional roles and associations to meet specific operational needs and to support accomplishing a variety of mission requirements in any OE. An understanding of the Services' combat, general, and geospatial engineering capabilities and limitations allows the JFC and the joint force engineer to tailor the engineer force to effectively and efficiently accomplish the mission. The JFC should understand multinational, interagency, NGO, and intergovernmental organization (IGO) engineer capabilities to better coordinate coherent activity, develop viable courses of action (COAs) and, when appropriate, to properly integrate them into the joint operation. The joint force engineer is responsible for providing comprehensive recommendations to the JFC on the effective employment of all engineer capabilities in support of joint operations. The JFC, with the assistance of the joint force engineer, analyzes mission requirements to tailor optimal engineer force packages. The engineering capabilities of each Service component may provide engineering support to the other components to meet joint force requirements. See JP 3-34; JP 3-08*;* Allied Joint Publication (AJP)-3.12; and Standardization Agreement (STANAG) 2394/Allied Tactical Publication (ATP)-52(B), for further discussion of engineer participation in joint, interagency, and multinational operations.

2-33. Services use the engineer functions to categorize forces and assets based on their primary function (combat engineers, general engineers, and geospatial engineers). Forces can sometimes perform tasks from other functions, but engineer forces and assets are not interchangeable. Planners must be careful to accurately identify the capabilities required for an operation and the forces that have those capabilities. A brief summary of Service engineer capabilities is provided in the following paragraphs (see Appendix C for more information on other Service engineer capabilities). Some capabilities categorized as engineering by other Services reside in other branches of the Army, such as EOD and chemical, biological, radiological, and nuclear (CBRN) capabilities.

Navy Engineers

2-34. Naval civil engineering forces are organized and equipped within the Department of the Navy to meet the requirements of expeditionary operations. The term Naval civil engineering forces is an overarching reference to all Naval civil engineers, including officers, enlisted personnel, civilians, and units. It combines the complementary but distinct capabilities of the engineering operating forces of the First Naval Construction Division (1NCD), the amphibious construction battalions (ACBs) organized under the Atlantic and pacific naval beach groups (NBGs) and the business enterprise of NAVFAC. 1NCD, its subordinate units, and the ACBs make up the Naval Construction Force (NCF), also referred to as Seabees. The NCF has rapidly deployable units of various sizes and configurations tailored to provide responsiveness and flexibility. Seabees provide advanced base construction, to include airfields, LOCs, upgrade and maintenance, battle damage repair, underwater and amphibious construction, and logistic facilities construction. Both NAVFAC and the NCF provide engineering support to the JFC, and more specifically, Marines at various levels, including a task-tailored Naval construction element (NCE) that can function as a major subordinate element in a Marine air-ground task force (MAGTF). Refer to Naval Warfare Pamphlet (NWP) 4-04 for additional information on these units.

Marine Corps Engineers

2-35. Marine Corps engineers' primary tasking is combat engineering and general engineering in support of MAGTFs. The Marine Corps has limited geospatial engineering capabilities (which reside in the intelligence branch of the Marine Corps), with one topographic platoon supporting each Marine expeditionary force (MEF).

Air Force Engineers

2-36. A primary tasking for Air Force engineers is to enable rapid global mobility for airlift, bombers, and fighters and to support other manned and unmanned aerial weapon systems. Air Force engineers are trained and equipped with organic capabilities to support all aspects of airfield operations where heavy strategic airlift, bombers, or fighters will operate on a daily or frequent basis. The Air Force has the capability to rapidly deploy general engineer units organized as part of an air and space expeditionary task force (AETF) to open, establish, and maintain air base power projection platforms. These same units can deploy as detached units operating in support of specific missions and operational tasks, such as airfield pavement evaluations; crash and fire rescue; EOD; emergency management response; airfield damage repair; facility construction and maintenance; utility systems construction, maintenance, aircraft arresting system installation and maintenance; and airfield lighting, marking, and installation of navigation aids. Organized as prime base emergency engineer force (Prime BEEF) and rapid engineer deployable heavy operational repair squadron, engineer (RED HORSE) units, they provide a broad array of general and geospatial engineering capabilities.

Other Engineering Capabilities

2-37. In addition to U.S. military engineer forces, multinational engineers can provide valuable capabilities. Multinational military units and civilian contractors—in addition to providing labor, material, infrastructure, and services—may possess certain engineering capabilities specifically adapted to the local environment. There are other benefits to the use of multinational military units and civilian contractors, but these need to be weighed against their potential limitations. This mixture of capabilities may change during the phases of an operation and may require management across Service lines to ensure that the JFC has appropriate forces in place.

2-38. HN engineer capabilities may be available if an adequate infrastructure exists. Potentially, this could include a wide array of civil and public works organizations. It is also increasingly common to contract for a wide range of engineer services with local or third party national organizations and civilian contractors. These assets are typically used to free up military assets, minimizing the military footprint in a theater when requirements exceed military capabilities or when the engineer operations and requirements are to be conducted in areas that are relatively safe from active combat. See Appendix D for more information on other multinational, interagency, and HN engineer capabilities.

Civil Augmentation Programs

2-39. Civil augmentation programs, such as the Army's Logistics Civil Augmentation Program (LOGCAP), the Navy's global contingency construction and contingency service contract programs, and the Air Force contract augmentation program (AFCAP), also play a significant role in mission accomplishment by providing the JFC and joint force engineer with additional options and flexibility in general engineering and logistic support. Construction may be within the scope of any of these contract services.

INTEGRATION OF CAPABILITIES

2-40. Joint integration does not require joint commands at all echelons; it does require understanding joint synergy at all levels of command. Joint synergy extends the principles of combined arms to operations conducted by two or more Service components. The strengths of each Service or functional component combine to overcome the limitations or reinforce the effects of the other components. The combination of multiple and diverse joint force capabilities generates combat power more potent than the sum of its parts.

Integrating the variety and special capabilities of engineer organizations requires an understanding of the various capabilities and limitations of the engineer assets available for any given mission. Integration also requires a common understanding of the C2 structure and processes in place to employ the engineer capabilities in unified action.

2-41. Unified action describes the wide scope of actions (including the synchronizing of activities with governmental organizations and NGOs) taking place within unified commands, subordinate unified commands, or JTFs under the overall direction of the commanders of those commands. Public law charges CCDRs with employing military forces through unified action. Under unified action, commanders integrate joint, single-Service, special, and supporting operations with interagency, nongovernmental, and multinational operations, to include United Nations (UN) operations (see JP 0-2).

2-42. Combatant command (command authority) (COCOM) is the command authority over assigned forces vested only in commanders of combatant commands by Title 10, U.S. Code, section 164 (or as directed by the President or the Secretary of Defense in the Unified Command Plan). Multinational, interagency, and nonmilitary forces work with the CCDR through cooperation and coordination. Regardless of the task or the nature of the threat, CCDRs employ air, land, sea, space, and special operations forces (SOF) and coordinate with multinational and interagency partners to achieve strategic and operational objectives. They formulate theater strategies and campaigns, organize joint forces, designate operational areas, and provide strategic guidance and operational focus to subordinate commanders. The aim is to achieve unity of effort among many diverse agencies in a complex OE. Subordinate JFCs synchronize joint operations in time and space, direct the action of other military forces (multinational operations), and coordinate with governmental organizations and NGOs (interagency coordination) to achieve the same goal.

CHAIN OF COMMAND

2-43. The Secretary of Defense exercises authority and control of the armed forces through a single chain of command with two branches (see JP 1). One branch goes from the Secretary of Defense to CCDRs to the various service component commands and subordinate joint commands for the conduct of operations and support. The other branch goes from the Secretary of Defense to the military departments to their respective major service commands. An administrative control (ADCON) relationship exists between the secretary of the military department to the respective service component commands to carry out their Title 10 responsibilities of recruiting, manning, equipping, training, and providing service forces to the CCDRs. Although the service branch of the chain of command is separate and distinct from the operating branch, the ASCC and the Army forces operate within the CCDR's chain of command in the theater.

2-44. At the theater level, when Army forces operate outside the United States, they are assigned under a JFC (see JP 0-2 and JP 3-0). A JFC is a CCDR, subunified commander, or JTF commander authorized to exercise COCOM or operational control (OPCON) over a joint force. At the theater level, the CCDR provides strategic direction and operational focus to forces by developing strategy, planning the theater campaign, organizing the theater, and establishing command relationships for effective unified action. The JFC plans, conducts, and supports the campaign in the theater of war, subordinate theater campaigns, major operations, and battles. The four joint command relationships are COCOM, OPCON, tactical control (TACON), and support.

2-45. An ASCC is responsible for Army Title 10 requirements in support of a CCDR. This includes recruiting, organizing, supplying, equipping, training, servicing, mobilizing, demobilizing, and administering forces; maintaining, outfitting, and repair of military equipment; the construction, maintenance, and repair of buildings, structures, and utilities; and the acquisition of real property. The ASCC may also be responsible for significant DOD and CCDR-designated common-user logistics functions. The ASCC provides administrative and logistic services to assigned Army forces and the ARFORs of subordinate JFCs. When appropriate, the ASCC may delegate authority for support tasks to a single theater support command (TSC) or another subordinate Army headquarters, such as the TEC or the United States Army Medical Command (MEDCOM), when the focus of support suggests this as the best solution. USACE is often involved with supporting the ASCC as well and will generally operate through the TEC, if one is present. Chapter 3 provides additional discussion of joint C2 considerations and options.

INTERAGENCY COORDINATION

2-46. Because of the leverage of their wide range of expertise and funding resources, U.S. government agencies can support the JFC's mission objectives and can greatly expand the capabilities of the joint force. This is true whether the response is international in nature or within the United States (for example, during consequence management in the United States, engineers might provide support in the cleanup stage that requires close coordination with government agencies). Coordination and a clear understanding of the commander's intent are critical when synchronizing operational efforts involving multiple U.S. government agencies. The JFC will be required to coordinate with government agencies to achieve overall U.S. objectives. Joint force engineers should have an understanding of the capabilities of these agencies and their support functions. While government agencies may increase the resources engaged in a given operation, they may also increase and complicate the coordination efforts. Stability operations are now regarded as a core U.S. military mission and are given priority comparable to combat operations. Since integrated civilian and military efforts are key to successful stability operations, DOD engineer personnel must be prepared to conduct or support stability operations by working closely with U.S. departments and agencies, foreign governments and security forces, global and regional international organizations, United States organizations, foreign NGOs, private sector individuals, and for-profit companies.

2-47. The intricate linkages among the instruments of national power demand that commanders consider all capabilities and agencies to help achieve the common end state. Interagency coordination forges a vital link between military operations and activities conducted by such organizations as U.S. government agencies; agencies of partner nations; NGOs; regional, international, and UN organizations; and HN agencies. Interagency coordination is inherent in unified action. Because engineers are likely to operate with other agencies, foreign governments, NGOs, and IGOs in a variety of circumstances, their participation in the JFC's interagency coordination is critical. Two methods for facilitating such coordination are the civil-military operations center (CMOC) and the joint interagency coordination group (JIACG). Additional information on the CMOC and JIACG is provided in the discussion of boards, workgroups, and cells in Appendix E.

MULTINATIONAL OPERATIONS

2-48. During multinational operations, U.S. forces establish liaison with assigned multinational forces early. Army forces exchange specialized liaison personnel in fields such as aviation, fire support, engineer, intelligence, military police (MP), public affairs, and civil affairs (CA) based on mission requirements. Missions to multinational units should reflect the capabilities and limitations of each national contingent. Some significant factors are relative mobility and size, intelligence collection assets, long-range fires, SOF, and organic sustainment capabilities. When assigning missions, commanders should also consider special skills, language, and rapport with the local population, as well as the national pride of multinational partners. Multinational commanders may assign HN forces home defense or police missions, such as sustainment area and base security.

2-49. Commanders should give special consideration to "niche" capabilities, such as mine clearance that may exceed U.S. capabilities. Multinational engineer forces may possess other engineering specialties that exceed or enhance U.S. capabilities.

SECTION III–ENGINEER FORCE TAILORING

2-50. Within the modular Army, the organization of forces is dynamic at all levels. Army forces are organized and reorganized continuously to meet mission requirements. Actual requirements for forces in a campaign are seldom identical to planning figures. As a consequence, the theater Army commander recommends the appropriate mix of forces and the deployment sequence for forces to meet the GCC's actual requirements. This is force tailoring (selecting forces based on a mission and recommending their deployment sequence) and may include both operating Army and generating force elements.

2-51. Tailoring the engineer force requires an altogether different mindset—one that thinks in terms completely divested from how the force is organized in garrison. It requires a leader's mindset that thinks

beyond garrison structures to embrace combinations of modular engineer capabilities and scalable C2 to provide each echelon of the force with the right support. While the Engineer Regiment is organized and equipped to support full spectrum operations, engineers can expect serious challenges in the OE when trying to execute the broad range of potential tasks. Careful prioritization must occur for the limited engineer resources typical in the OE. To accomplish all identified tasks in the desired timeframes, commanders must consider augmentation requirements and recognize which mission requirements can be supported through reachback rather than enlarging the engineer footprint in the AO. Within the modular structure, engineer units are more narrowly designed to accomplish specific types of tasks. Therefore, it is imperative that when tailoring the engineer force, the broad range of capabilities need to be allocated from the engineer force pool.

2-52. Engineer force packages must contain the right mix of capabilities to assure timely and relevant engineer support to the JFC. This mix will often need to change drastically during transitions and the joint force engineer must anticipate and plan for these changes. For example, combat engineers often make up the majority of engineer forces in-theater during sustained combat operations, but they must be reinforced during transition to stability operations as they typically do not have the right capabilities to accomplish all of the general engineering tasks required. Also, since EOD support requirements during transition operations are often significantly higher than during combat operations, more EOD capabilities will be required.

2-53. Tailoring the engineer force should not be confused with task-organizing. Tactical and operational commanders organize groups of units for specific missions. They reorganize for subsequent missions when necessary. This process of allocating available assets to subordinate commanders and establishing their command and support relationships is called task-organizing. Considerations for task-organizing engineer units are discussed in Chapter 3.

MODULAR FORCE ORGANIZATION

2-54. In addition to the organic engineer capabilities of the BCT, the JFC is able to draw from a force pool of modular engineer units available to be integrated into joint forces at various echelons. This structure enables expeditionary action and flexible tailoring of forces to meet changing situations.

THE BRIGADE SPECIAL TROOPS BATTALION

2-55. The BSTB is a multifunctional battalion within the HBCT and IBCT. The BSTB provides the BCT with military intelligence (MI) support, communications, engineer, MP, and CBRN reconnaissance capabilities. The BSTB is responsible for training, C2, administrative/logistical operations, and health service support (HSS) to subordinate units. The command and support relationship dictates whether the BSTB will logistically support them or coordinate their support with the BCT brigade support battalion (BSB) or the unit's higher headquarters. The BSTB also secures all BCT CPs and plans and prepares and executes operations within the BSTB AO. It is able, with the organic MP platoon or other assets provided by the BCT commander, to defeat Level I and Level II and delay Level III enemy threats until the tactical combat force (TCF) arrives. Figure 2-2 shows the battalion structure (see FM 3-90.61 for additional information on the BSTB).

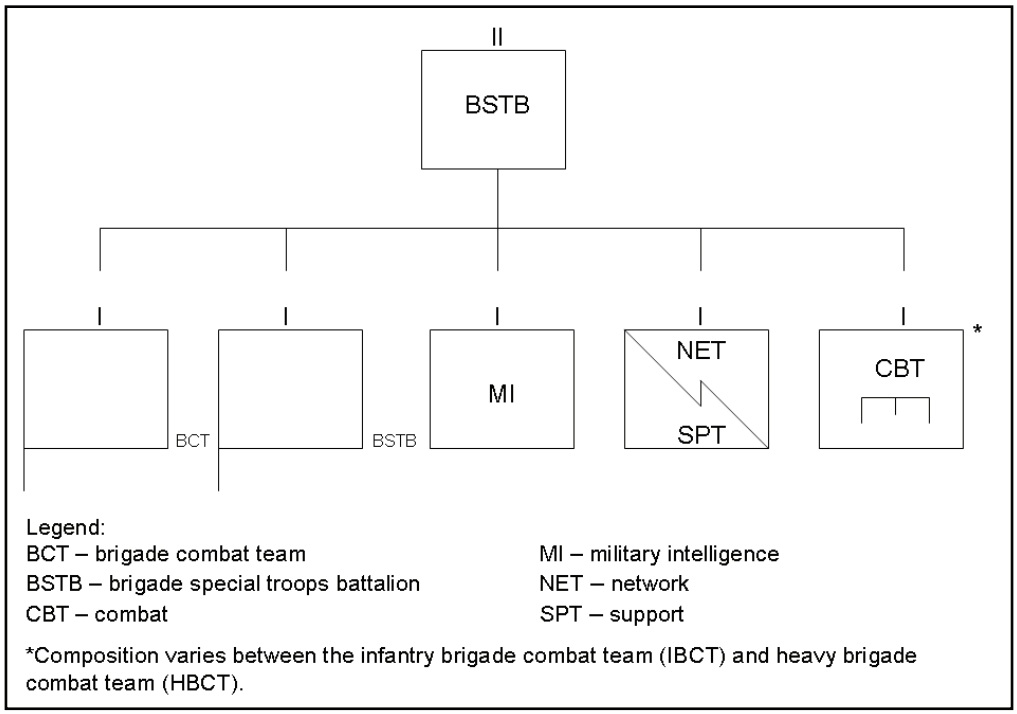


Figure 2-2. Brigade special troops battalion

2-56. For the IBCT and HBCT, the BSTB is organized with a BSTB headquarters and headquarters company (HHC), the BCT HHC, an MI company, and a network support company (NSC). The BSTB of the IBCT and HBCT each have an engineer company, although the composition varies. The BSTB HHC has command and staff sections, an MP platoon, a CBRN reconnaissance platoon, a support platoon (with medical support, maintenance, Class III, and field feeding), and a security section. The sustainment assets in the HHC include maintenance, medical support, and Class III (petroleum, oil, and lubricants [POL]) sections.

2-57. A key to modularity is the ability to task-organize units to BCTs based on the mission variables of the operation. Depending on the command and support relationship between the incoming or outgoing unit and the BSTB, the BSTB may be responsible for providing or coordinating for their sustainment. The BSTB's sustainment capability may have to be augmented by the attached units' parent organization or by the BCT. The BCT can expect to routinely receive a set of units for most missions. These units may include—

- Engineer forces.
- Air and missile defense (AMD) forces.
- MP company.
- CA company.
- EOD company.
- CBRN company.
- Psychological operations (PSYOPs) detachment.

THE MANEUVER ENHANCEMENT BRIGADE

2-58. BCTs are the primary organizations designed to fight tactical engagements and battles. A mix of other functional and multifunctional brigade types is available to support theater Army, corps, and division commanders. The multifunctional supporting brigade types include the battlefield surveillance brigade (BFSB), combat aviation brigade (CAB), the MEB, the fires brigade, and the sustainment brigade. These

brigades may be combined arms units and are designed to support BCTs and carry out specific tasks in support of echelons above BCT. The MEB, one of the multifunctional brigades, is designed as a headquarters to organize and C2, primarily, the units providing CA, CBRN, engineer, EOD, and MP capabilities. Most support brigades are not fixed organizations. All support brigades except the CAB are designed around a small base of organic elements, to which a mix of additional capabilities is added based on the factors of METT-TC. To make the support brigades both tailorable and effective, the brigade headquarters includes the necessary expertise to control many different capabilities. Each type of support brigade's base includes organic signal and sustainment capabilities. When published, FM 3-90.31 will provide the doctrine for the MEB.

2-59. The MEB is designed as a C2 headquarters with a robust multifunctional brigade staff that is optimized to conduct MANSPT operations. *Maneuver support operations* integrate the complementary and reinforcing capabilities of key protection, movement and maneuver, and sustainment functions, tasks, and systems to enhance freedom of action. The MEB contains no organic units other than its headquarters and headquarters company, NSC, and BSB. The staff includes chemical, biological, radiological, nuclear, and high yield explosives (CBRNE); engineer; and MP functional operations/planning cells. The staff also includes a fires cell, area operations section, and airspace management section which support the capability of the MEB to be assigned an AO. Each MEB is uniquely tailored with augmentation for its directed mission. An MEB typically includes a mix of several types of battalions and separate companies which may include CA, chemical, biological, radiological, and nuclear (CBRN), engineer, EOD, and MP units. It may also contain other units to include MI assets and a TCF when assigned an AO with a Level III threat. In certain circumstances, the MEB may also include AMD units.

2-60. An MEB is a combined arms organization that is task-organized based on mission requirements. The MEB is not a maneuver brigade although it can be assigned an AO and control terrain. The MEB receives, commands, and controls forces to conduct operations. These brigades will typically be called upon to control terrain and potentially facilities as well. While the MEB has no direct antecedents in today's force structure, it combines many functions previously performed by the division/corps rear operations centers, division engineer brigade, and other division-level engineer, EOD, MP, and CBRN assets when supporting a division. MEBs provide capabilities to enhance freedom of movement and maneuver for operational and tactical commanders. The MEB has a combined arms staff and C2 capabilities that optimize it for many missions and facilitating necessary and frequent transitions between those missions or in the conduct of multiple concurrent or consecutive missions. Some of the C2 roles previously performed by the engineer group headquarters may now be performed by the MEB headquarters.

2-61. An MEB is a combined arms organization that is task-organized based on mission requirements. The MEB receives, commands, and controls forces to conduct operations. These brigades will typically be called on to control terrain and potentially facilities as well. While the MEB has no direct antecedents in today's force structure, it combines many functions previously performed by the division/corps rear operations centers, division engineer brigade, and other division-level engineer, EOD, MP, and CBRN assets when supporting a division. MEBs preserve freedom of movement and maneuver for operational and tactical commanders. The MEB has a combined arms staff and C2 capabilities that optimize it for many missions, as well as facilitating necessary and frequent transitions between those missions or in the conduct of multiple concurrent or consecutive missions.

2-62. The four primary mission sets performed by the MEB include conduct maneuver support operations, conduct support area operations, conduct consequence management operations, and conduct stability operations. These four mission sets comprise the core capability mission essential tasks (CCMETs) for this organization. Typical key tasks that are related to these four primary MEB mission sets are listed below:

- Conduct maneuver support operations.
  - Perform mobility and maneuver.
  - Perform protection.
  - Perform sustainment.
- Conduct support area operations.
  - Conduct operational area security.

  - Conduct response force operations (area damage control [ADC]).
  - Perform ADC.
  - Conduct terrain management.
  - Perform fire support coordination.
  - Conduct airspace management.
- Conduct consequence management.
  - Respond to CBRNE incident.
  - Provide support to law enforcement.
  - Conduct post incident response operations.
- Conduct stability operations.
  - Establish civil security.
  - Establish civil control.
  - Restore essential civil services.

2-63. The MEB is normally assigned an AO in which it performs a portion of its missions. It will also perform support missions outside of its AO. Normally, the MEB AO is also the supported echelon's support area. A *support area* is a specific surface area designated by the echelon commander to facilitate the positioning, employment, and protection of resources required to sustain, enable, and control tactical operations. (FMI 3-0.1) The support area normally includes the echelon's MSRs. For each echelon, the support area is annotated with the echelon size, such as a brigade support area or a division support area. If the supported echelon has more than one MEB assigned, then the support area can be split into two or more AOs, one for each MEB.

2-64. When assigned an AO, the MEB performs terrain management, movement control, clearance of fires, security, personnel recovery, ISR, stability operations, ADC, and infrastructure development. An MEB is not responsible for the supported echelon's unassigned areas. For example, movement control of sustainment operations in the division AO as a whole stays the division transportation officer's responsibility even when it passes through the MEB AO. The division transportation officer coordinates those movements with the MEB.

2-65. Division and higher commanders should employ a BCT or armored cavalry regiment (ACR) when an AO will require more than a single maneuver task force (TF) to secure the AO. The MEB is organized and trained to execute selected area security missions, including route and convoy security. It is not designed to conduct screen, guard, and cover operations. These operations are assigned to BCTs, or in the case of screening operations, possibly to a CAB. The MEB coordinates and synchronizes the collective self-defense capabilities of bases and base clusters within its AO. When the situation requires, the MEB provides the C2 and is able to execute limited offensive and defensive operations, using response forces and/or a TCF against threats within its AO. The TCF may include ground maneuver, aviation, and fires assets. Division and higher commanders should employ a BCT or ACR when an AO will require more than a single maneuver task force to secure the AO. The MEB is not designed to C2 multiple maneuver battalions. When published, FM 3-90.31 will introduce the doctrine for movement corridors. A "movement corridor" is a technique for setting conditions to secure movement along a route within an AO to apply protection and movement.

2-66. The MEB does not supplant unit self-defense responsibilities. Units remain responsible for self-protection against Level I threats. The MEB provides reaction forces to respond to Level II threats in its AO. If the brigade is assigned an area security mission, it may need to be task-organized with a TCF when the likelihood of Level III threats is high. Those portions of a division's supporting sustainment brigade or other tenant units positioned in the MEB AO remain responsible for their own unit security and base and base cluster defense operations. To accomplish this task, one method to consider is to place the tenant units under tactical control (TACON) of the MEB for certain aspects of security. The MEB oversees area, not local, security operations in its AO. This includes response and TCF operations directed against Level II and Level III threats.

2-67. The MEB conducts operations in areas external to its previously assigned AO when directed by its supported commander. This decision requires the supported headquarters to either temporarily change boundaries for the AO of the MEB or have some other headquarters assume AO responsibilities for the terrain on which the MEB units are tasked to conduct operations. One of these solutions allows the MEB to conduct route security or convoy security operations along a ground LOC between the division sustainment area and the AO of a subordinate BCT through what may have previously been an unassigned area within the division AO.

2-68. The supported MEB higher headquarters may assign missions for assets assigned or attached to an MEB executed outside its AO, such as CBRN, CA, engineer, MP, and EOD assets. This requires careful coordination between the tasked unit, the MEB headquarters, and the headquarters of the unit in which the mission occurs.

2-69. When the supported headquarters is task-organized with functional brigades, the MEB may also be required to provide support to these brigades. An example is an MEB providing support to an MP brigade focused on providing control of dislocated civilians and handling detainees. In this case, the MEB may be tasked to provide general engineering support to construct detainee facilities for the MP brigade.

HIGHER-ECHELON HEADQUARTERS

2-70. Command headquarters above the BCT consist of divisions, corps, and theater Army headquarters. The division is optimized for TACON of brigades during land operations. The corps provides a headquarters that specializes in operations as a JTF or joint force land component command (JFLCC) headquarters or may be employed as an intermediate tactical headquarters. The theater Army headquarters serves as the ASCC with ADCON over Army forces and some theaterwide planning and controlling support to joint forces. The ASCC focuses at combatant command-level landpower employment and support to joint, interagency, and multinational forces. All three headquarters are modular entities designed to employ expeditionary forces, tailored to meet the requirements of specified joint operations.

2-71. In major combat operations, divisions operate in an AO. Divisions can typically control up to six BCTs in major combat operations. They can control more BCTs in protracted stability operations. A division force package may include any mix of HBCTs, IBCTs, and SBCTs. In addition to BCTs, each division controls a tailored array of modular support brigades and functional brigades. They may also control functional groups, battalions, or separate companies; however, these are normally task-organized to a brigade. Each division is tailored for a specific operation; the composition of the division is completely variable. Figure 2-3 shows two possible division organizations. Many more combinations are possible.

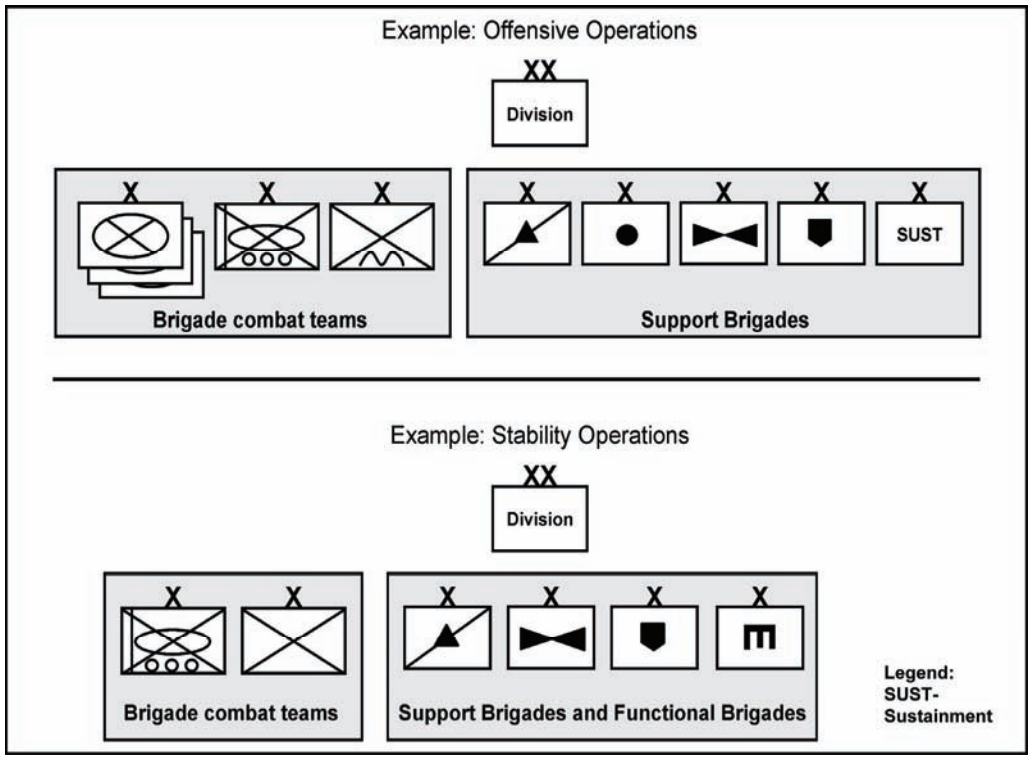


Figure 2-3. Examples of tailored divisions

2-72. The tailored engineer force supporting a division is not set by rules of allocation. Rather, the force will be tailored to meet anticipated requirements based on an analysis of the situation. The divisional engineer force may be organized under a multifunctional headquarters, such as the MEB, or may be organized under a functional engineer headquarters. In some situations, the division may require a combination of engineer forces organized both functionally and multifunctionally. While either battalion or brigade echelons of engineer or multifunctional headquarters may be allocated as the divisional engineer headquarters, a brigade echelon headquarters is more typical for most operations. Figure 2-4, page 2-22, provides a notional organization for both an engineer brigade headquarters and an MEB supporting a division.

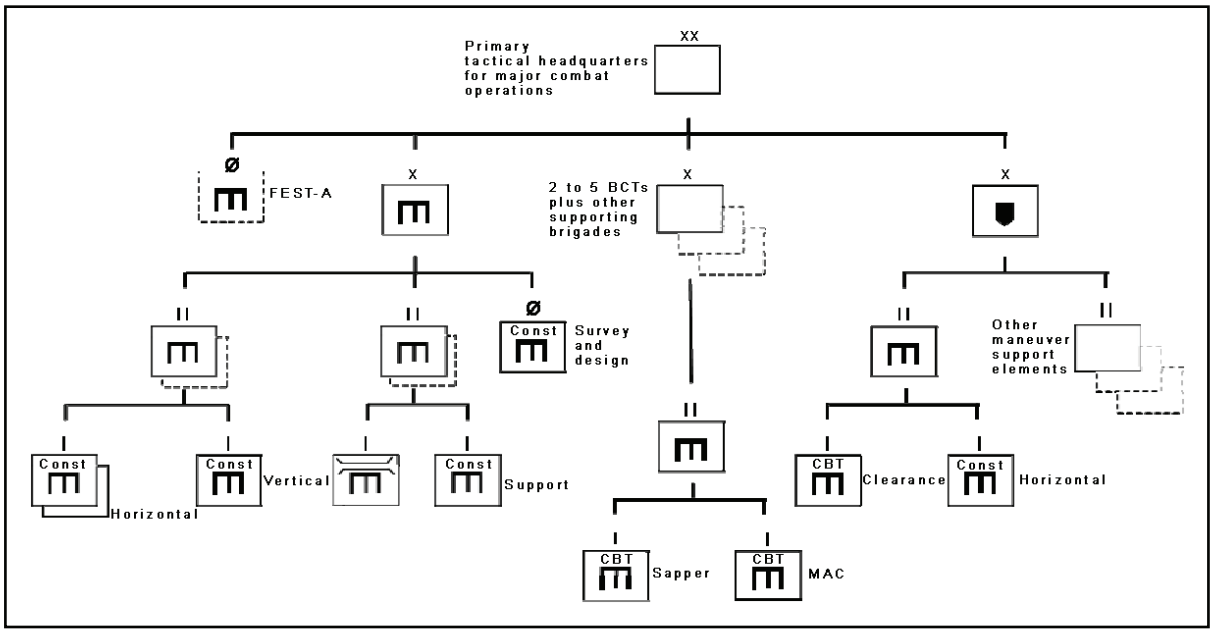


Figure 2-4. Notional division engineer force

2-73. Corps are the Army's premier headquarters for joint operations and can rapidly transition to either a JTF or a JFLCC headquarters for contingency operations. When required, a corps may become an intermediate tactical headquarters under the JFLCC with OPCON of two or more divisions (to include multinational or United States Marine Corps [USMC] formations) or other large tactical formations (see figure 2-5). Corps can deploy to any AOR to provide C2 for Army, joint, and multinational forces.

2-74. Corps do not have any echelon-specific units other than the organic corps headquarters. They can control any mix of modular brigades and divisions, as well as other-Service or multinational forces. The ASCC headquarters tailors the corps headquarters to meet mission requirements.

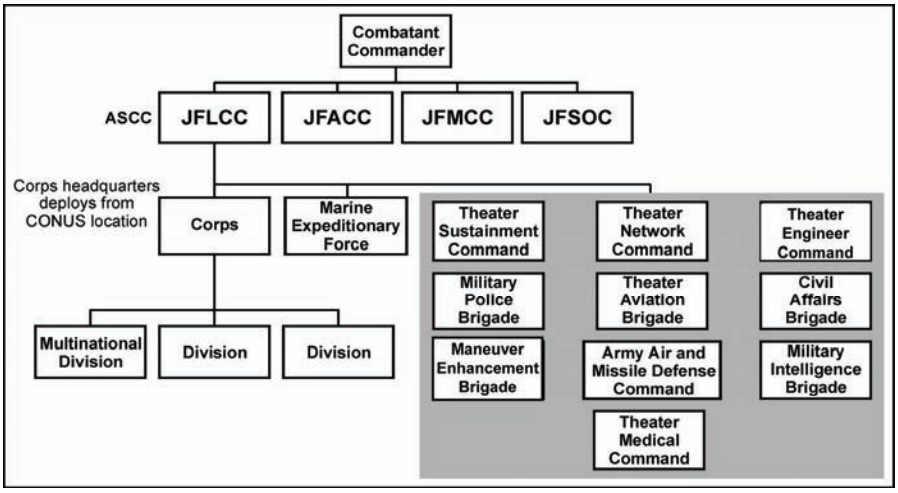


Figure 2-5. Corps as an intermediate land force headquarters

2-75. Like the division, the tailored engineer force supporting a corps is not set by rules of allocation. Rather, the force will be tailored to meet anticipated requirements based on an analysis of the situation. The corps force is likely to include joint engineer elements or a joint engineer headquarters. In some situations, the corps may require a combination of engineer forces organized both functionally and multifunctionally.

Typically, an engineer brigade headquarters will be allocated to a corps for most operations. Figure 2-6 shows a notional organization for both an engineer brigade headquarters and a joint engineer headquarters supporting a corps.

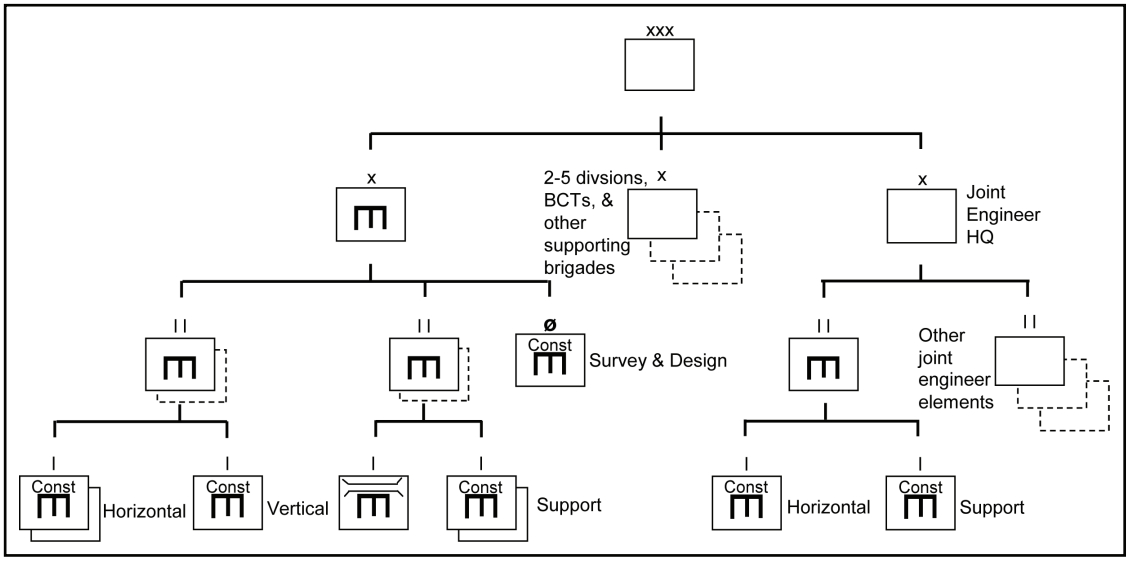


Figure 2-6. Notional corps engineer force

2-76. The theater Army (the doctrinal name for the ASCC of a GCC) is the primary vehicle for Army support to Army, joint, interagency, and multinational forces operating across the AOR. The theater Army commander performs the functions and tasks of the ASCC for the GCC. As the Army headquarters supporting the GCC, the theater Army provides various combinations of Army capabilities and orchestrates their employment. The theater Army provides ADCON of all Army personnel, units, and facilities in the AOR and is responsible for providing Army support to other services and common user logistics as directed by law or the GCC. In major combat operations, where the GCC is the JFC, the theater Army commander may become the JFLCC and exercise OPCON over committed land forces. The theater Army headquarters continues to perform AOR-wide ASCC functions, to include joint reception, staging, onward movement and integration (RSOI), joint logistics over the shore, and joint sustainment area coordination. Figure 2-7, page 2-24, shows a theater Army as a JFLCC. When required for crisis-response or limited contingency operations, the theater Army can provide a JTF-capable headquarters to control forces within a JOA.

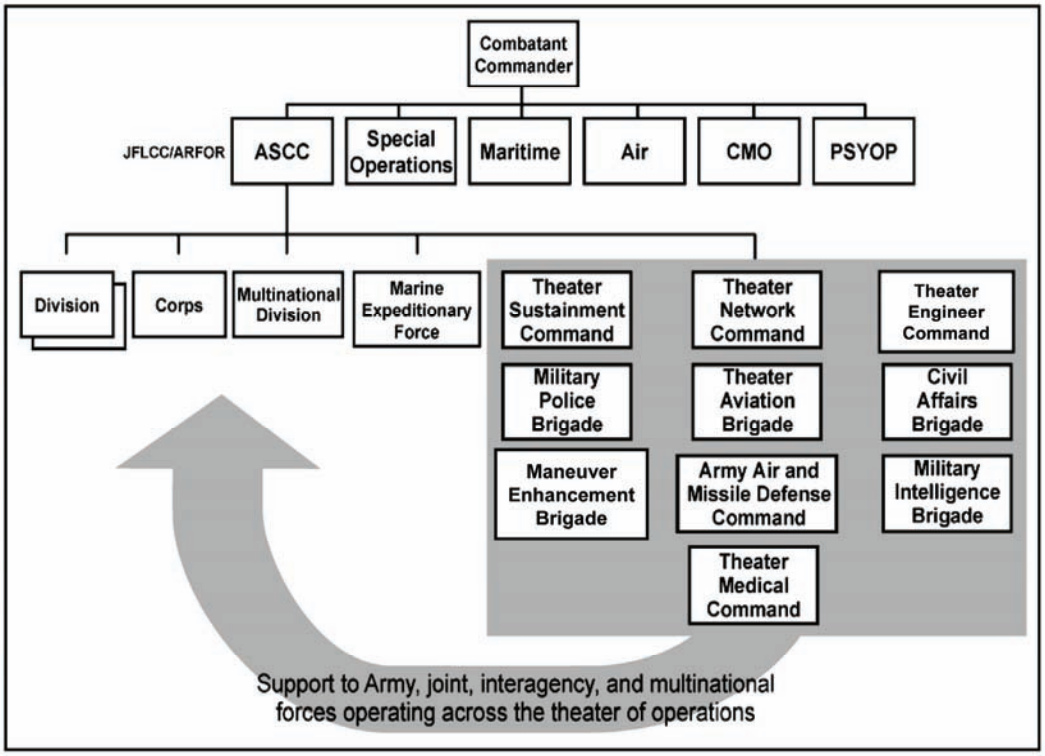


Figure 2-7. The theater Army as a joint force land component command while continuing Army support

2-77. Each theater Army headquarters consists of three different table of organization and equipment (TOE) organizations: a main command post (MCP) with its associated HHC, the operational command post (OCP), and the OCP's associated special troops battalion (STB). The theater Army commander exercises ADCON over all Army forces in the AOR. He uses his MCP to integrate Army forces into the execution of regional security cooperation plans and provides Army support to joint forces, interagency elements, and multinational forces as directed by the GCC.

2-78. The theater Army controls an assigned mix of regionally focused, supporting commands and brigades, including sustainment, signal, MI, CA, and medical. In addition to these regionally focused commands, the theater Army receives additional attachments in the form of brigades and commands requisite for the campaign or missions in the AOR. These latter forces are not regionally focused, but are drawn from the "pool" of available forces assigned to general warfighting and maintained in the continental United States (CONUS) and around the world. The situation in each theater dictates the size of these formations; that is, commands, brigades, or groups. Command relationships also vary across theaters between the theater Army and supporting capabilities. In some theaters, the commands are assigned; in others, they are OPCON or aligned for planning only.

2-79. In major combat operations, the theater Army normally receives one TEC (see figure 2-8). The TEC is a modular organization that can be tailored based on mission requirements. Within the TEC, there are two DCPs that provide flexibility and rotational capability. Each TEC can deploy its MCP and two DCPs. The DCP can be augmented with FFE assets from USACE. Typical capabilities that may be included with this augmentation might be contracting, real estate support, and interagency coordination. The TEC is able to leverage reachback capabilities to capitalize on CONUS-based assets.

2-80. The TEC provides C2 and an organizational framework for the operational-level engineer effort within the AOR. The TEC focuses on reinforcing and augmenting tactical-level engineer efforts and

developing the theater sustainment base. This focus involves planning, ensuring operational mobility, and coordinating all operational engineering assets. It also supervises the direction of geospatial operations, construction, real-property maintenance activities, LOC sustainment, engineer logistics management, and base development. The TEC has primary responsibility for theater infrastructure development.

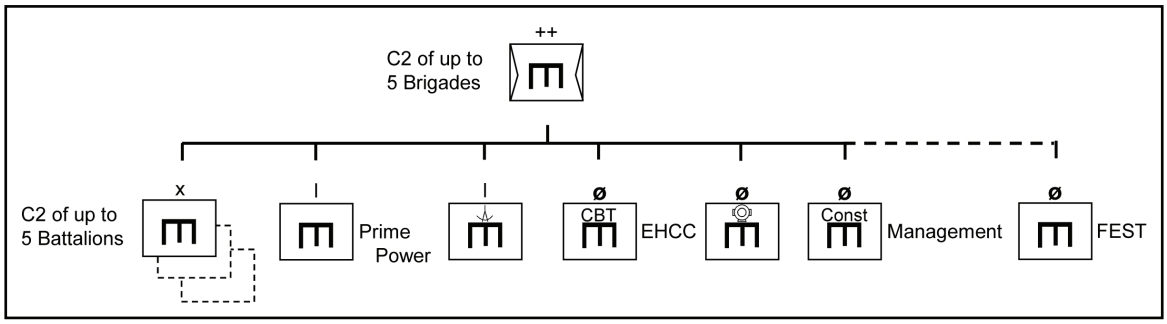


Figure 2-8. Notional theater engineer command

2-81. The TEC develops plans, procedures, and programs for engineer support for the theater Army, including requirements determination, operational mobility and countermobility, general engineering, power generation, ADC, military construction, geospatial engineering, engineering design, construction materiel, and real property maintenance activities. Engineer units are responsible for infrastructure planning, development, construction, and maintenance. The TEC commander receives policy guidance from the theater Army based on the guidance of the GCC's joint force engineer. The TEC headquarters element provides staff supervision over operational-level engineer operations in the AO and reinforces engineer support to all theater Army forces. The TEC may also support joint and multinational commands and other elements according to lead Service responsibilities as directed by the supported JFC. It provides policy and technical guidance to all Army engineer units in the AO. This headquarters maintains a planning relationship with the theater Army and joint force staff engineers to help establish engineer policy for the theater. It maintains required coordination links with other Service and multinational command engineering staffs. In some theaters, a tailored engineer brigade may provide theater-level engineer support. The engineer brigade provides expertise and capability that is similar to the TEC, but at a reduced level.

This page intentionally left blank.

Chapter 3
Foundations of Engineer Operations

I would desire to have companies of Sappers formed—they should be instructed in every thing that relates to the construction of Field works—how to dispose of the Earth—to cut the Slopes—face with turf or sods—make fascines—arrange them properly—cut and fix Palisades, etc.

Louis Duportail
Chief of Engineers, Continental Army
January 18, 1778

The new version of FM 3-0 emphasizes operations that combine offensive, defensive, and stability or civil support by defining a distinct operational concept around full spectrum operations. Army forces conduct full spectrum operations within the larger framework of joint operations. Engineer capabilities are a significant force multiplier in joint operations, facilitating the freedom of action necessary to meet mission objectives. Engineer operations modify, maintain, provide understanding of, and protect the physical environment. In doing so, they enable the mobility of friendly forces, alter the mobility of adversaries, enhance the survivability and enable the sustainment of friendly forces, contribute to a clear understanding of the physical environment, and provide support to noncombatants, other nations, and civilian authorities and agencies. This chapter describes the foundations necessary for effective engineer operations. It defines engineer functions that broadly categorize the array of engineer capabilities and enable clear linkages from those capabilities to the warfighting functions. It discusses linkages to the operational concept, full spectrum operations, and the warfighting functions that provide the integrating framework. It discusses the operations process as the context for integration into combined arms application and multiple C2 interactions throughout engineer operations within that context. Finally, this chapter describes engineer combat power applications linked through the intelligence, movement and maneuver, protection, and sustainment warfighting functions that also provide the primary framework for engineer tasks in the Army universal task list.

SECTION I–ENGINEER FUNCTIONS

3-1. ***Engineer functions*** **are categories of related engineer capabilities and activities grouped together to help JFCs integrate, synchronize, and direct engineer operations. One of the three engineer functions are combat engineering, general engineering, and geospatial engineering** (see figure 3-1, page 3-2).

- *Combat engineering* is defined as those engineering capabilities and activities that support the maneuver of land combat forces and that require close support to those forces. Combat engineering consists of three types of capabilities and activities: mobility, countermobility, and survivability (M/CM/S). (JP 3-34)
- *General engineering* is defined as those engineer capabilities and activities, other than combat engineering, that modify, maintain, or protect the physical environment (the definition was shortened, and the complete definition is printed in the glossary). (JP 3-34) Examples include the construction, repair, maintenance, and operation of infrastructure, facilities, LOCs, and

bases; protection of natural and cultural resources; terrain modification and repair; and selected EH activities.

- ***Geospatial engineering*** **is the art and science of applying geospatial information to enable understanding of the physical environment for military operations. The art is the ability to understand METT-TC and the geospatial information available, including intent of use and limitations, in order to explain the military significance of the terrain to the commander and staff and create geospatial products for decision making; the science is the ability to exploit geospatial information, producing spatially accurate products for measurement, mapping, visualization, modeling, and all types of analysis of the terrain**.

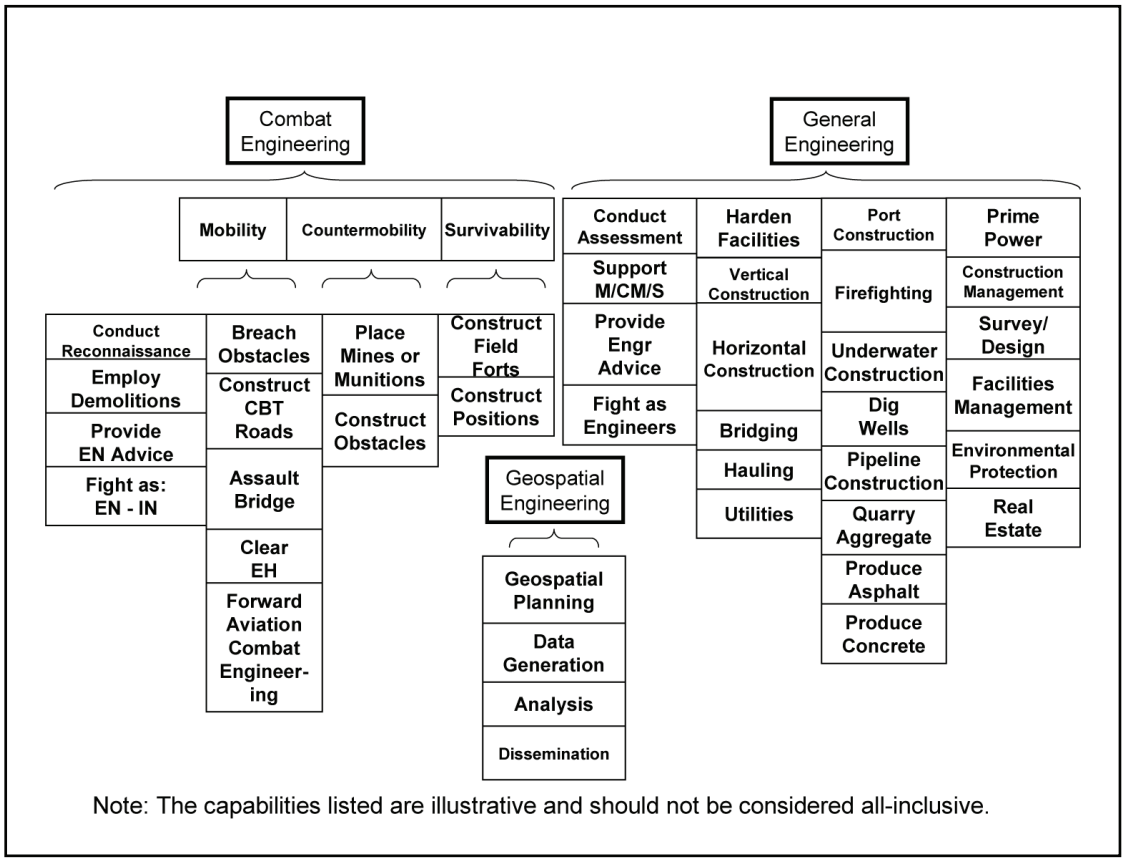


Figure 3-1. Engineer functions

3-2. Engineer reconnaissance, although not a separate engineer function, is a critical part of each of the engineer functions. See FM 3-34.170 for additional discussion of engineer reconnaissance and Section IV of this chapter for additional discussion of integration of engineer reconnaissance support.

COMBAT ENGINEERING

3-3. Combat engineering is an integral part of combined arms units' ability to maneuver. It is focused on support of close combat forces. Combat engineers enhance the force's momentum by shaping the physical environment to make the most efficient use of the space and time necessary to generate mass and speed while denying the enemy maneuver. By enhancing the unit's ability to maneuver, combat engineers accelerate the concentration of combat power, increasing the velocity and tempo of the force necessary to exploit critical enemy vulnerabilities. By reinforcing the natural restrictions of the physical environment, combat engineers limit the enemy's ability to generate tempo and velocity. These limitations increase the enemy's reaction time and physically and psychologically degrade his will to fight.

3-4. Combat engineering includes those capabilities organic to and augmenting the BCTs. Combat engineering provides tactical-level engineer support to combat (offensive and defensive), stability, or civil support operations. In combat operations, it is typically (although not always) focused on the support of close combat. It may be augmented at times with general engineering support but retains its focus on the integrated application of engineer capabilities to support the combined arms team's freedom of maneuver (mobility and countermobility) and survivability.

MOBILITY

3-5. ***Mobility operations*** **are defined as obstacle reduction by maneuver and engineer units to reduce or negate the effects of existing or reinforcing obstacles. The objective is to maintain freedom of movement for maneuver units, weapon systems, and critical supplies.** For combat engineering it is focused on the movement and maneuver warfighting function. See FM 3-34.2 for information on combined arms mobility operations. Mobility tasks are typically expressed as essential tasks and may require integration into the synchronization matrix to account for the assets and time required to implement them. See Chapter 4 for a discussion of planning for M/CM/S.

3-6. Maneuver warfare depends on freedom of movement and seeks to avoid enemy strengths to focus efforts on enemy weaknesses whenever possible. The enemy will use firepower, terrain, and man-made obstacles to deny us freedom of maneuver. Friendly forces will first attempt to bypass such obstacles; however, this may not always be an option. Challenges that limit maneuver must be overcome. Breaching, including breaching of gates, fences, or walls in an urban environment, and gap crossing operations are employed to restore the ability to wage maneuver warfare. Clearing operations, including route or area clearance, are employed to eliminate current or recurring obstacle threats. Combat roads and trails support tactical maneuver, and forward aviation combat engineering (FACE) produces mobility support to tactical maneuver in the form of forward airfields, landing zones (LZs), and the immediate facilities that support them.

3-7. Mobility operations, a combined arms task, enable maneuver as envisioned in the application of combat power. Operations that support mobility involve more than engineers. For example, maneuver and mobility support are those MP missions performed to support and preserve the commander's freedom of movement and enhance the movement of friendly resources in all environments. Tasks include route reconnaissance and surveillance, MSR regulation and enforcement, temporary route signing, support to river crossings, and straggler and refugee control. Route reconnaissance as a form of reconnaissance described in FM 3-90 is another example. Mobility operations within the context of this manual, however, are those Army tactical tasks conducted by combat engineers task-organized with appropriate combat and other supporting forces to enable freedom of movement either by overcoming barriers, obstacles, and EH or by enhancing movement and maneuver.

COUNTERMOBILITY

3-8. ***Countermobility operations*** **are operations that deny the enemy freedom of maneuver through the employment of reinforcing obstacles.** Reinforcing obstacles are a component of terrain reinforcement. ***Terrain reinforcement*** **is the development of terrain using obstacles to degrade enemy mobility or to enhance friendly survivability through the construction of fighting positions and cover.** The primary purpose of countermobility operations is to slow or divert the enemy, to increase time for target acquisition, and to increase weapon effectiveness. Countermobility operations include the construction of entry control points and other barriers to deny free access to fixed sites. The advent of rapidly-emplaced, remotely controlled, networked munitions enables engineers to conduct effective countermobility operations as part of offensive, defensive, and stability operations, as well as during the transitions among these operations.

3-9. At every level of war, commanders consider the use of obstacles when planning offensive, defensive, and stability operations. Combined arms obstacle integration is the process that synchronizes countermobility operations into the scheme of maneuver and the fire support plan. The engineer advises the commander on how to integrate obstacles through the military decision-making process (MDMP) and operations processes. During these processes, the engineer coordinates for obstacle emplacement authority,

establishes obstacle control, recommends directed targets, supervises the employment of obstacles, and maintains obstacle status throughout the operation. **A *directed target* is a target directed by the responsible commander to be prepared for demolition or destroyed to support his intent.** Most obstacles have the potential to deny freedom of maneuver to friendly forces, as well as to enemy forces. Therefore, it is critical that the engineer accurately understands the countermobility capabilities and limitations of the available engineer forces and properly weighs the risks of employing various types of obstacles. The engineer must also plan for clearing of obstacles at the cessation of hostilities and for minimizing obstacle effects on noncombatants and their environment.

3-10. Engineers must be familiar with the specific ROE concerning mines. U.S. forces use ROE to ensure that the employment of conventional (persistent or nonself-destructing) and scatterable mines (SCATMINEs) is consistent with the numerous international laws and U.S. laws and policies governing their use. The current U.S. Land Mine Policy acknowledges the importance of protecting noncombatants while enabling legitimate warfighter requirements. Under this policy, the United States has committed to end the use of persistent land mines of all types after the end of 2010 and will no longer use nondetectable land mines of any type (see JP 3-15). Until the end of 2010, the President must authorize the employment of conventional antitank mines outside of Korea. The U.S. will continue to employ self-destructing/self-deactivating mines, such as SCATMINEs, to provide countermobility for the force. Additionally, newly developed weapon systems called networked munitions provide the flexible and adaptive countermobility and survivability capability required by the Army conducting full spectrum operations. Networked munitions are remotely controlled (man in the loop), ground-emplaced weapon systems that provide lethal and nonlethal antipersonnel and antitank effects with the ability to be turned on/off/on from a distance and recovered for multiple employments.

SURVIVABILITY

3-11. ***Survivability operations*** **are defined as the development and construction of protective positions, such as earth berms, dug-in positions, overhead protection, and countersurveillance means, to reduce the effectiveness of enemy weapon systems.** Survivability tasks are typically expressed as essential tasks and may require integration into the synchronization matrix to account for the assets and time required to implement them. These tasks tend to be equipment intensive and the use of equipment timelines may be required to properly optimize the work performed. For more information on survivability operations, see FM 5-103.

3-12. The concept of survivability in today's OE includes all aspects of protecting personnel, equipment, supplies, and information systems while deceiving the enemy. Survivability considerations are applied in support of battle positions, combat outposts, FOBs, base camps, and in many cases HN and other infrastructure support. Today's OE requires commanders to know all survivability tactics and techniques available to provide this protection. The construction of fighting positions and protective positions by itself cannot eliminate vulnerability of personnel and resources. It will, however, limit personnel and equipment losses and reduce exposure to hostile enemy action.

3-13. Two key factors in the development of defensive fighting positions are proper siting in relation to the surrounding terrain and proper siting for the most effective employment of key weapon systems, such as antitank guided missiles (shoulder-launched munitions and close combat missiles), crew-served weapons, and tanks. Defensive protective positions include, but are not limited to, C2 facilities or communications sites, critical equipment (to include radars), supply and ammunition storage or holding areas, and other items that are likely to be targeted first by enemy action. Consider protecting hazardous material and POL storage areas that present a threat to personnel if the storage containers are damaged or destroyed. The degree of protection actually provided for these items is based on the availability of time, equipment, and resources to the commander. An additional consideration is the probability or risk of acquisition and attack and the risk assessment made for each site and facility. Facilities emitting a strong electromagnetic signal or substantial thermal or visual signature may require full protection against potential enemy attack. Electronic countermeasures and deception activities are mandatory considerations and an integral part of planning for all activities in the defense.

GENERAL ENGINEERING

3-14. General engineering may be performed in support of combat operations, which may cause uncertainty in distinguishing purely combat engineering from general engineering tasks at the tactical level. General engineering capabilities are not organic to the BCTs and will typically not be associated with close combat. More distinguishable at the operational level, general engineering capabilities are applied to establish and maintain the infrastructure necessary for sustaining military operations in-theater. At times, the military operation may extend general engineering support to restore facilities, power, and life-support systems within the infrastructure of the AO or build technical capacity of the HN. This effort aids in the recovery and the transition to preconflict conditions or may be the objective of stability or civil support operations. For more information on general engineering, see FM 3-34.400.

3-15. General engineering is the most diverse of the three engineer functions and is typically the largest percentage of all engineer support provided to an operation. Besides occurring throughout the AO, at all levels of war, and being executed during every type of military operation, it may employ all MOSs within the Engineer Regiment. General engineering tasks—

- May include construction or repair of existing logistics-support facilities, LOC and other supply routes (including bridging and roads), airfields, ports, water wells, power generation and distribution, water and fuel pipelines, and base camps or force beddown. Firefighting and engineer dive operations are two aspects that may be critical enablers to these tasks.
- May be performed by modified table of organization and equipment (MTOE) units or through the USACE.
- May also be performed by a combination of joint engineer units, civilian contractors, and HN forces or multinational engineer capabilities.
- Incorporate FFE to leverage all capabilities throughout the Engineer Regiment. This includes the linkages that facilitate engineer reachback.
- May require various types of reconnaissance and assessments to be performed before or early on in a particular mission (see FM 3-34.170).
- Include disaster preparedness planning, response, and support to consequence management.
- Include the acquisition and disposal of real estate and real property.
- Include those survivability planning and construction tasks that are not considered under combat engineering.
- May include camouflage, concealment, and deception tasks (see FM 20-3).
- May include the performance of environmental support engineering missions.
- May include base or area denial missions.
- Usually require large amounts of construction materials, which must be planned and provided for in a timely manner.
- May include the production of construction materials.
- Require the integration of environmental considerations (see FM 3-100.4).

GEOSPATIAL ENGINEERING

3-16. Geospatial engineering is generating, managing, analyzing, and disseminating positionally accurate terrain information that is tied to some portion of the earth's surface. These actions provide mission-tailored data, tactical decision aids, and visualization products that define the character of the zone for the maneuver commander. Key aspects of the geospatial engineering mission are databases, analysis, digital products, visualization, and printed maps. Both organic and augmenting geospatial engineer capabilities at the theater, corps, division, and brigade levels are responsible for geospatial engineering.

3-17. Geospatial engineering enables the commander and staff to visualize the OE discussed in Chapter 1. It collects, creates, and processes geospatial information and imagery that supports analysis of the OE, either by the operational or mission variables. Additionally, geospatial engineering provides foundational information enabling a more efficient and functional approach to analysis resulting in a quicker shared common understanding of the OE at all echelons thereby preserving the critical resource of time.

3-18. Geospatial engineering capabilities have experienced significant improvements due to organizational changes, doctrine updates, technology advancements, and emerging best practices. Geospatial engineering possesses ever-finer temporal and spatial resolutions from additional sensors and platforms that allow increased volumes and more complex data. New methods and technologies provide additional utility and the ability to work effectively within a broad pool of partners and allies.

3-19. The characterization of effective geospatial engineering lies in this ability to effectively go outside the engineer community and work with other staff sections, organizations, and agencies. As such, coordination across functional areas focused on supporting various missions becomes critical. This coordination contains, but is not limited to, the ability to fully define requirements; discover and obtain the geospatial data; put it into a usable form; and then use, share, and maintain with those mission partners. It is the geospatial engineer who, through this process, enables the commander and staff to leverage geospatial information to the fullest extent possible.

3-20. Geospatial information that is timely, accurate, and relevant is a critical enabler for the operations process. Geospatial engineers assist in the analysis of the meaning of activities and significantly contribute to anticipating, estimating, and warning of possible future events. They provide the foundation for developing shared situational awareness and improve understanding of our forces, our capabilities, the adversary, and other conditions of the OE.

3-21. Geospatial regional analysis product examples include the following:

- Statistical analysis—IED and insurgent networks.
- Significant activities database analysis to determine tactics and emerging trends.
- Capabilities and readiness of enemy forces.
- Climatic impacts on operations.
- Route analysis.
- Sectarian demographics.
- Nonstandard or mission-specific geospatial products.

3-22. Geospatial functional analysis sample products graphically describe the following:

- Industries and energy.
- Telecommunications infrastructure.
- Underground facilities and caves.
- Political boundaries.

3-23. The geospatial engineer uses analysis and visualization capabilities to integrate people, processes, and tools using multiple information sources and collaborative analysis to build a shared knowledge of the physical environment. Whether it is using one of the examples indicated above, or through some other special product, the geospatial engineer, in combination with other engineers and staff officers, provides support to the unit's mission and commander's intent. FM 3-34.230 and JP 2-03 are the primary references for geospatial engineering.

SECTION II–OPERATIONAL CONCEPT

ELEMENTS AND COMBINATIONS OF FULL SPECTRUM OPERATIONS

3-24. The Army's operational concept is full spectrum operations (see figure 3-2 and FM 3-0). Full spectrum operations are the purposeful, continuous, and simultaneous combinations of offense, defense, and stability or civil support to dominate the military situation at operational and tactical levels. In full spectrum operations, Army forces adapt to the requirements of the OE and conduct operations within it using synchronized action, joint interdependent capabilities, and mission command. They defeat adversaries on land using offensive and defensive operations, and operate with the populace and civil authorities in the AO using stability or civil support operations.

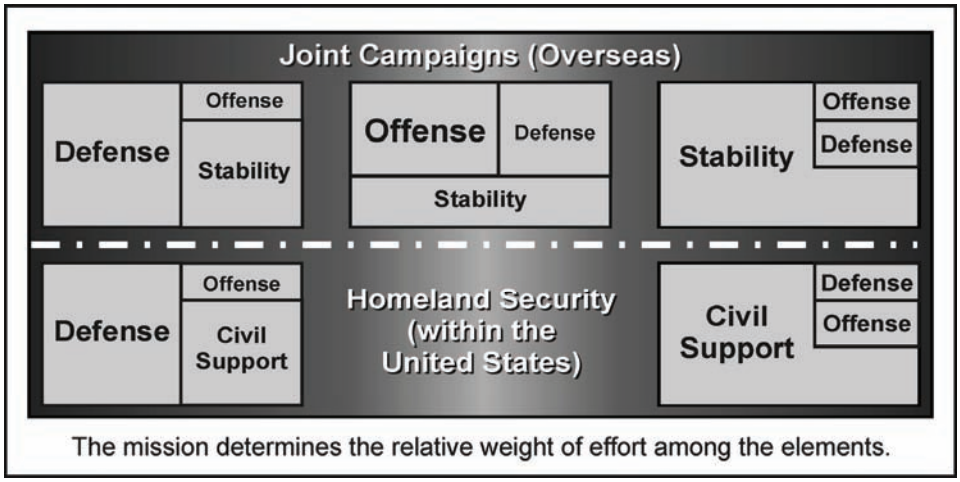


Figure 3-2. Full spectrum operations—the Army's operational concept

3-25. Commanders plan for the concurrent conduct of the elements of full spectrum operations in weighted combinations. Within broader combinations of full spectrum operations, Army forces conduct multiple component operations simultaneously. This is the ability to execute several similar operations in different locations at the same time, synchronizing them to produce a greater effect than if each were executed in sequence. Tactically, simultaneous execution of full spectrum operations requires the synchronized application of combat power. *Synchronization* is the arrangement of military activities in time, space, and purpose to produce maximum relative combat power at a decisive place and time (the definition was shortened, and the complete definition is printed in the glossary). (JP 2-0)

3-26. Simultaneity requires the ability to conduct operations in depth. Commanders consider the full depths of their AOs, the enemy, the information environment, and civil considerations and act in the times and places necessary to achieve their objectives. Army forces increase the depth of their operations through combined arms, advanced information systems, and joint capabilities. Because Army forces conduct operations across large areas, enemies face many potential friendly actions. Depth is equally important in stability operations to preclude threats from operating outside of the reach of friendly forces, where they can affect the campaign. In civil support operations, depth gives the Army its ability to reach all the citizens in an affected area, bringing relief and hope.

3-27. There is an inherent complementary relationship between the use of lethal force and the application of military capabilities for nonlethal purposes. Although each situation requires a different mix of violence and restraint, lethal and nonlethal actions used together complement each other and create dilemmas for the opponent. Lethal means are at the heart of offensive and defensive actions and their application is critical to success in these operations; however, nonlethal means are becoming increasingly important. Today's threat operates from populated areas, wary of U.S. combat capabilities and welcoming the potential carnage to noncombatants when combat erupts. They use information operations effectively to dramatize any harm inflicted on noncombatants by friendly forces. Nonlethal, constructive actions can persuade the local populace to withhold support for adversaries and provide intelligence to friendly forces. This can force the enemy to choose between abandoning an area and exposing his forces to lethal combat. Commanders analyze the factors of METT-TC to achieve a balance between lethal and nonlethal actions.

3-28. Engineer operations contribute significant combat power, both lethal and nonlethal in nature, to all of the elements of full spectrum operations. Organic engineer capabilities in each of the BCTs provide close support to the maneuver of those forces. Based on a METT-TC analysis, the BCTs will be task-organized with additional modular engineer capabilities to meet mission requirements. For offensive and defensive operations, engineer augmentation may consist of additional close support capabilities, as well as an engineer battalion headquarters to provide the necessary C2 for the mix of modular engineer units and capabilities augmenting the BCT. Other more technically specialized engineer capabilities support the

BCT's requirements related to the movement and maneuver, protection, and sustainment warfighting functions. These same capabilities may be employed at division, corps, and theater echelon to enable force mobility, survivability, and sustainment. Force tailored engineer capabilities from the force pool can provide critical nonlethal capabilities to conduct or support stability or civil support operations. Geospatial capabilities, both organic and from the force pool, support all four elements by adding to a clear understanding of the physical environment.

COMBINED ARMS THROUGH THE WARFIGHTING FUNCTIONS

3-29. Full spectrum operations require the continuous generation and application of combat power, often for protracted periods. Combat power is the actual application of force—the conversion of fighting potential into effective action. It includes the unit's constructive and information capabilities, and its disruptive or destructive force. There are eight elements of combat power: leadership, information, movement and maneuver, intelligence, fires, sustainment, C2, and protection. Leadership and information are applied through and multiply the effects of the other six elements of combat power. These six—movement and maneuver, intelligence, fires, sustainment, C2, and protection—are collectively described as the warfighting functions (see figure 3-3). In full spectrum operations, Army forces combine the elements of combat power to defeat the enemy and master each situation.

3-30. Commanders ensure that deployed Army forces have enough combat power to conduct necessary combinations of full spectrum operations appropriate to the situation. Commanders balance the ability to mass the effects of lethal and nonlethal systems with the requirements to deploy and sustain the units that employ those systems. Sustaining combat power throughout the operation is important to success. Tailored force packages maximize the capability of initial-entry forces consistent with the mission and the requirement to project, employ, and sustain the force. Follow-on forces increase the entire force's endurance and ability to operate in depth. Employing reserves, focusing joint support, arranging rest for committed forces, and staging sustainment assets to preserve momentum and synchronization all assist in applying combat power effectively over time and space.

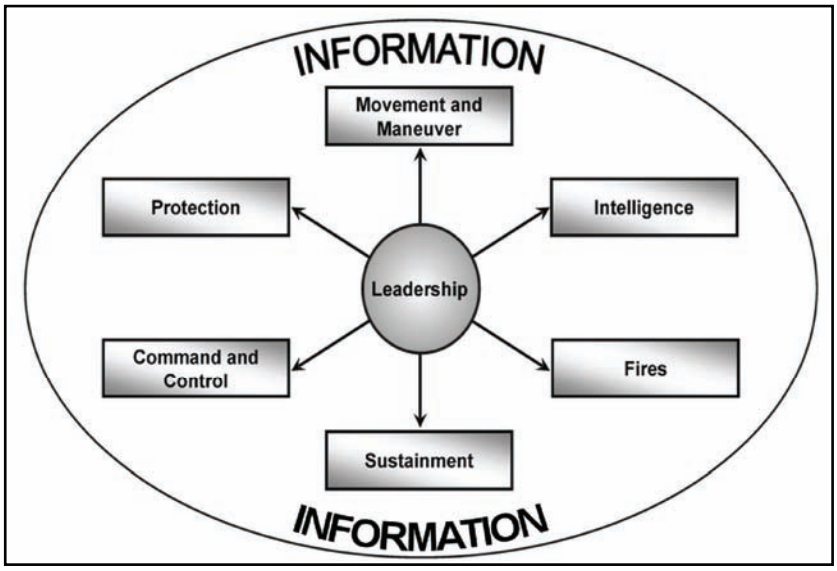


Figure 3-3. The elements of combat power

3-31. Every unit, regardless of type, generates combat power and contributes to the operation. A variety of engineer capabilities and unit types is available to contribute to combat power. Engineer functions are the categories of related engineer capabilities and activities grouped together to help JFCs integrate, synchronize, and direct engineer operations. These functions are each generally aligned in support of specific warfighting functions (see figure 3-4), although they have impact in and across the others. Combat engineering is aligned primarily with the movement and maneuver and the protection warfighting functions; general engineering aligns to focus its support on the sustainment and protection warfighting functions, as well as reinforcement of combat engineering outside of close combat; and geospatial engineering is primarily aligned with the C2 and intelligence warfighting functions.

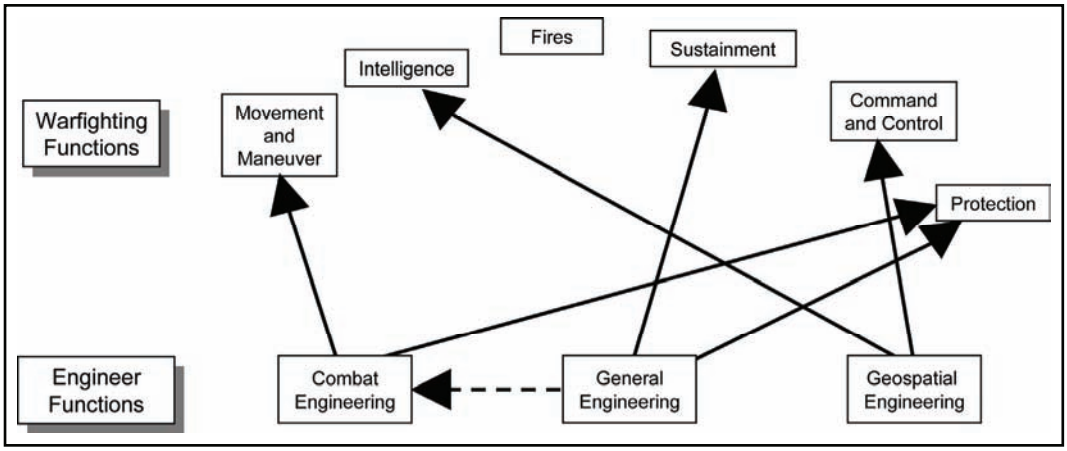


Figure 3-4. The primary relationships of engineer functions to the warfighting functions

3-32. Combined arms is the synchronized and simultaneous application of several arms—such as infantry, armor, field artillery, and engineers—to achieve an effect that is greater than if each arm was used separately or sequentially. The warfighting functions provide engineers a common framework within which to link the required engineer capabilities to the synchronized application of combined arms (see figure 3-5, page 3-10).

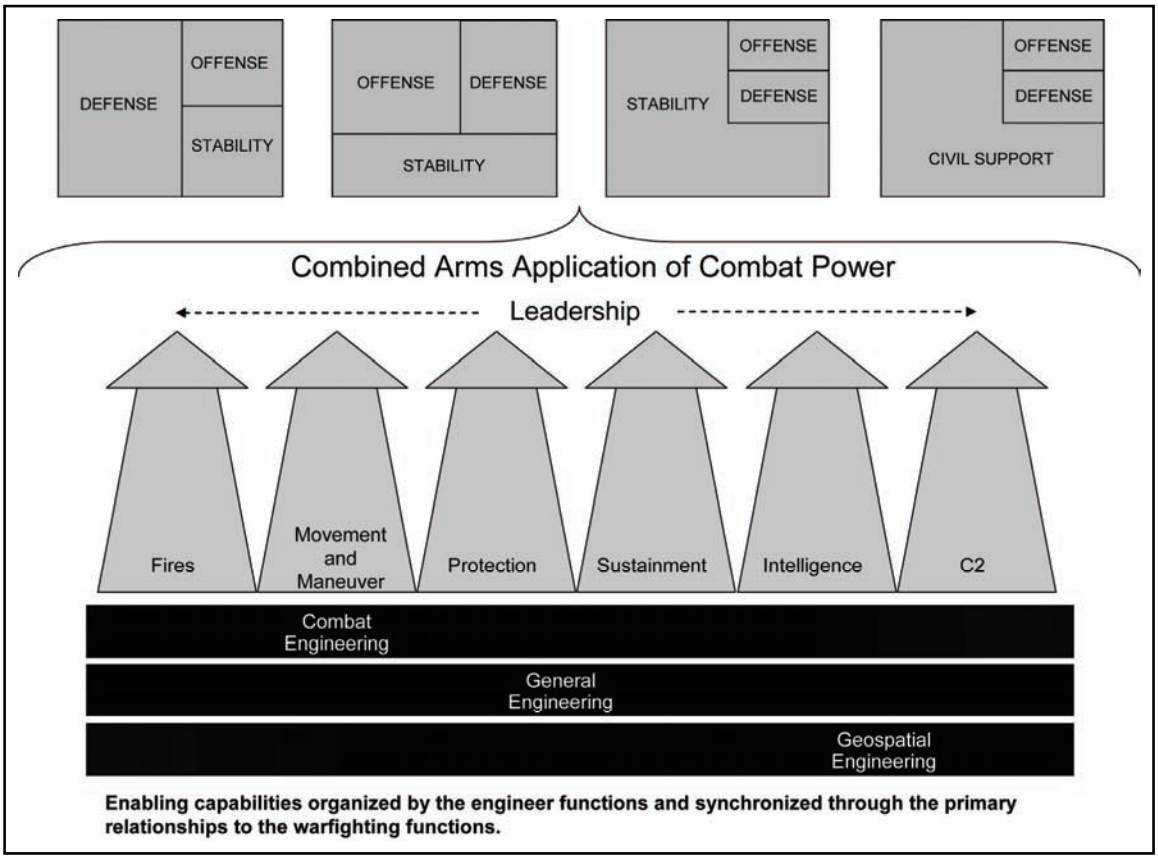


Figure 3-5. Application of engineer combat power

3-33. C2 is unique among the warfighting functions in that it integrates the activities of the other warfighting functions. Given the nature of operations, effective C2 is characterized by the ability to—

- Forecast or identify changes in the situation and react to them.
- Provide continuous reciprocal interaction and influence among the commander, staff, and forces.
- Reduce chaos, lessen uncertainty, and operate effectively despite the remaining uncertainty.

3-34. Whether a subordinate or supporting unit, engineer unit commanders and their staffs must understand and exercise the art and science of C2 as described in FM 3-0 (see also FM 5-0 and FM 6-0). Organic units operating within their assigned BCT operate within that structure as a matter of routine. However, augmenting units face challenges in quickly recognizing and integrating into the distinct character of their "new unit." Similarly, as modular units and headquarters elements are tailored and allocated to division, corps, and Army headquarters, those unit commanders and staff must recognize and integrate within the respective C2 structure. Thorough understanding of and practice with the C2 function and the operations process that it drives enable the flexibility necessary for modular engineer forces to plug into supported units. In unique cases where an engineer headquarters serves as the base around which a task force or JTF is formed, as in a disaster relief operation, it becomes even more critical that the C2 function and the operations process it drives adheres closely to the ideal described in the referenced FMs (and applicable joint doctrine when operating as a JTF).

3-35. Finding ways to accomplish the mission with an appropriate mix of lethal and nonlethal force is a paramount consideration for every Army commander. Through synchronization, commanders mass the lethal and nonlethal effects of combat power at the decisive place and time to overwhelm an enemy or dominate the situation. Engineer leaders and staff planners at each echelon play a pivotal role in ensuring the synchronization of the variety of engineer capabilities that are available to conduct or support full

spectrum operations. Engineer leaders and staff synchronize the application of engineer functions through the warfighting function framework by integrating into the operations process.

3-36. ***Assured mobility*** **is a framework of processes, actions, and capabilities that assures the ability of the joint force to deploy and maneuver where and when desired, without interruption or delay, to achieve the mission**. **The assured mobility fundamentals—predict, detect, prevent, neutralize, and protect—support the implementation of the assured mobility framework.** This construct is one means of enabling a joint force to achieve the commander's intent. Assured mobility emphasizes proactive mobility and countermobility actions and integrates all of the engineer functions in accomplishing this. Assured mobility should not be confused with the limited application of the mobility function. While focused primarily on the movement and maneuver warfighting function, it has linkages to each of the warfighting functions and both enables and is enabled by those functions. While the engineer has the primary staff role in assured mobility, other staff members support its integration and have critical roles to play. Chapter 4 provides additional discussion on assured mobility, including the application of its fundamentals in the planning process.

SECTION III–OPERATIONS PROCESS

3-37. Full spectrum operations follow a cycle of planning, preparation, execution, and continuous assessment. These cyclic activities may be sequential or simultaneous. They are usually not discrete; they overlap and recur as circumstances demand. As a whole, they make up the operations process. The operations process consists of the major C2 activities performed during operations: planning, preparation, execution, and continuous assessment. Battle command drives the operations process. Throughout the operations process, commanders synchronize forces and warfighting functions to accomplish missions. They use the operations process model to help them decide when and where to make decisions, issue guidance, and provide command presence. Commanders and staffs develop and use control measures for this coordination.

3-38. The operations process is the context within which engineer capabilities are integrated into combined arms application. This context gains importance because of multiple and distinct interactions throughout engineer operations with the C2 function. At every echelon from BCT to theater Army and JTF, engineer leaders and staff exercise C2, participate in their supported commander's C2, and provide geospatial and other support through their supported commander's C2 warfighting function.

COMMAND AND CONTROL OF ENGINEER OPERATIONS

3-39. C2 are interrelated. Command resides with commanders. It consists of authority, decision making, and leadership. Control is how commanders execute command. It resides with both commanders and staffs. Commanders cannot exercise command effectively without control. Conversely, control has no purpose without command to focus it. This manual addresses C2 of engineer forces separately from engineer staff participation in the supported commander's C2. All engineer units must execute C2 and the operations process activities for their own unit, and many engineer units will interact with the C2 activities of the unit being supported. The interaction may be primarily through an engineer staff assigned to the supported unit or through staff counterparts. In some cases, a supported unit may not have assigned engineer staff and the supporting unit will provide this support as well. This relationship and degree of interaction is determined by many factors including the type of unit and echelon being supported and the command or support relationship established. Engineers can expect challenges in the OE when trying to execute engineering tasks. Lack of engineer resources is typical in the OE and may impede the commander from executing all identified tasks. Careful prioritization must occur. Even more challenging is that once in the AO, force-tailored engineer units must be able to rapidly transition among elements of operations. Because the available force-tailored engineer units are designed for more specific types of tasks, engineer capabilities must be shifted within the AO to match the operational component requirements and the capabilities of the modular engineer units. Transitions will occur at the strategic, operational, and tactical levels and flexibility in the task organization at all levels will be required to permit the shifting of engineer capabilities. For engineer units, consideration must also be given to the administration and support, including control of resources and equipment, personnel management, unit logistics, individual and unit

training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions but inherent in ADCON responsibilities.

CONSIDERATIONS AND RELATIONSHIPS IN THE BRIGADE COMBAT TEAM

3-40. Each of the three types of BCTs and the ACR are organized with organic engineer company-level units (see Appendix B). These engineer companies support the BCT or its subordinate organizations by conducting engineer operations within the BCT as an element of the BSTB (as in the HBCT and the IBCT) or directly under the BCT headquarters (as in the SBCT and the ACR). The engineer companies organic to the BCT may be further task-organized to maneuver task forces or the reconnaissance squadron, or even to a subordinate company or troop. These unit commanders and leaders are fully integrated participants in the C2 structure and activities of the BCT or its subordinate elements which they routinely support.

3-41. C2 above the engineer company is multifunctional (including engineer staff as discussed later in this chapter) in nature, by a CAB, BSTB, or the BCT headquarters itself. The engineer company commander must provide C2 for his unit and may be required to participate in C2 activities at the battalion or BCT headquarters. The company has no staff capability to employ the MDMP, but instead will rely on higher level staff support, troop-leading procedures (TLP), and SOPs to effectively exercise C2 of the unit. The company has very limited capability to integrate augmenting engineer elements.

3-42. The limited structure for C2 of engineer forces within the BCT provides the greatest challenge to integrating engineer operations in any of the BCTs for either the organic engineers or potential augmentation by echelons above brigade (EAB) modular engineer organizations. In many situations the augmentation of a BCT by a task-organized engineer battalion task force will provide the necessary additional C2 to orchestrate engineer operations and support. Similarly, a task-organized engineer battalion may be required in situations requiring engineer operations supporting one of the various support brigades.

3-43. Additional engineer units augmenting the BCT (or a support or functional brigade) are task-organized to the BCT in either a command or support relationship as summarized in table 3-1 and table 3-2, page 3-14. Command relationships are used when the most responsive employment of the augmenting engineer units is required. Attached engineer units are temporarily associated with the gaining BCT. They return to their parent unit when the reason for the attachment ends. Engineer units are normally assigned OPCON to a gaining BCT for a given mission, lasting perhaps a few days. In both attached and OPCON relationships, the augmenting engineer unit is tasked and provided priorities by the gaining unit. A significant consideration in the OPCON relationship is that sustainment support and other ADCON responsibilities remain with the parent engineer unit unless coordinated with the gaining BCT for certain classes of supply. In both cases, the gaining BCT retains responsibility to furnish construction and barrier materials required to support their missions.

3-44. Commanders establish support relationships when subordination of one unit to another is inappropriate. Support relationships are graduated from an exclusive supported and supporting relationship between two units—as in DS—to a broad level of support extended to all units under the control of the higher headquarters—as in general support (GS). Support relationships do not normally alter ADCON. In a DS relationship, an engineer unit receives missions from the supported unit. A DS relationship is typically used when it is anticipated that a change to the engineer task organization may require frequent shifting of an engineer unit to multiple locations. The logistics system can best support this in a DS role where the parent unit remains responsible for logistics and other types of support to the unit. In a GS relationship, an engineer unit receives missions and all support from its parent engineer unit. In a GS relationship, the engineer unit supports the maneuver element as a whole, and is appropriate when central control and flexibility in employing limited engineer forces is required. A GS relationship is typically used when a BCT's higher headquarters either identifies a mission requirement within the BCT AO or accepts responsibility for a requirement identified by the BCT. In either case, the requirement must be coordinated with the impacted BCT and any missions must be executed through close coordination with the BCT.

CONSIDERATIONS AND RELATIONSHIPS AT ECHELONS ABOVE BRIGADE

3-45. Army command and support relationships allow for flexibly allocating Army capabilities among various echelons. Table 3-1 and table 3-2, page 3-14, list responsibilities inherent in the Army's command and support relationships. Command and support relationships are the basis for building task organizations. Command relationships define superior and subordinate relationships between unit commanders. Command relationships identify the degree of control of the gaining or supported commander. The type of command relationship often relates to the expected longevity of the relationship between the headquarters involved. Table 3-1 lists the Army's command relationships.

Table 3-1. Army command relationships

Relationship:	Inherent Responsibilities:							
	Have command relationship with:	May be task-organized by:[1]	Are ADCON by:	Are assigned position or AO by:	Provide liaison to:	Establish/ maintain communi-cations with:	Have priorities established by:	Can impose on gaining unit further command or support relationship by:
Organic	All organic forces organized with the headquarters	Organic head-quarters	Army delegated	Organic head-quarters	N/A	N/A	Organic head-quarters	Attached; OPCON; TACON; GS; GSR; R; DS
Assigned	Combatant command	Gaining head-quarters	Army delegated	OPCON chain of command	As required by OPCON	As required by OPCON	ASCC or Service-assigned head-quarters	As required by OPCON headquarters
Attached	Gaining unit	Gaining unit	Army delegated	Gaining unit	As required by gaining unit	Unit to which attached	Gaining unit	Attached; OPCON; TACON; GS; GSR; R; DS
OPCON	Gaining unit	Parent unit and gaining unit; gaining unit may pass OPCON to lower HQ[1]	Parent unit	Gaining unit	As required by gaining unit	As required by gaining unit and parent unit	Gaining unit	OPCON; TACON; GS; GSR; R; DS
TACON	Gaining unit	Parent unit	Parent unit	Gaining unit	As required by gaining unit	As required by gaining unit and parent unit	Gaining unit	GS; GSR; R; DS

Note: [1]In North Atlantic Treaty Organization (NATO), the gaining unit may not task-organize a multinational force (see TACON).

Legend:
ADCON – administrative control
ASCC – Army service component commander
AO – area of operations
DS – direct support
GS – general support
GSR: general support reinforcing
HQ - headquarters
N/A – not applicable
OPCON – operational control
R - reinforcing
TACON – tactical control

3-46. Table 3-2 lists support relationships. Commanders establish support relationships when subordination of one unit to another is inappropriate. They assign a support relationship when—

- The support is more effective when the supporting unit is controlled by a commander with the requisite technical and tactical expertise.

- The echelon of the supporting unit is the same as or higher than that of the supported unit. For example, the supporting unit may be a brigade, and the supported unit may be a battalion. It would be inappropriate for the brigade to be subordinate to the battalion, hence the use of an Army support relationship.
- The supporting unit supports several units simultaneously. The requirement to set support priorities to allocate resources to supported units exists. Assigning support relationships is one aspect of mission command.

Table 3-2. Army support relationships

Relationship:	Inherent Responsibilities:							
	Have command relationship with:	May be task-organized by:	Receives sustain-ment from:	Are assigned position or AO by:	Provide liaison to:	Establish/ maintain communi-cations with:	Have priorities established by:	Can impose on gaining unit further command or support relationship by:
Direct support[1]	Parent unit	Parent unit	Parent unit	Supported unit	Supported unit	Parent unit and supported unit	Supported unit	See note[1]
Reinforcing	Parent unit	Parent unit	Parent unit	Reinforced unit	Reinforced unit	Parent unit and reinforced unit	Reinforced unit then parent unit	Not applicable
General support–reinforcing	Parent unit	Parent unit	Parent unit	Parent unit	Reinforced unit and as required by parent unit	Reinforced unit and as required by parent unit	Parent unit; then reinforced unit	Not applicable
General support	Parent unit	Parent unit	Parent unit	Parent unit	As required by parent unit	As required by parent unit	Parent unit	Not applicable

Note: [1] Commanders of units in DS may further assign support relationships between their subordinate units and elements of the supported unit after coordination with the supported commander.

3-47. Several other relationships established by higher headquarters exist with units that are not in command or support relationships (see table 3-3). These relationships are limited or specialized to a greater degree than the command and support relationships. These limited relationships are not used when tailoring or task-organizing Army forces. Use of these specialized relationships helps clarify certain aspects of OPCON or ADCON. Experience has generally reflected that command relationships work well in offensive operations, but that support relationships allow for more efficient use of high demand, low density engineer capabilities during defensive and stability operations. However, each situation is different and requires careful analysis in determining the appropriate relationship of engineers to the supported force.

Table 3-3. Other relationships

	Operational use	*Established by*	*Authority and limitations*	*ADCON responsi-bilities*
Training and readiness oversight (TRO)	TRO is an authority exercised by a CCDR over assigned Reserve Component (RC) forces not on active duty. Through TRO, the CCDR shapes RC training and readiness. Upon mobilization of the RC forces, TRO is no longer applicable.	The gaining CCDR, who normally delegates TRO to the ASCC. For most RC forces, the CCDR is the United States Joint Forces Command (JFCOM) and the ASCC is FORSCOM.	TRO allows the CCDR to provide guidance on operational requirements and training priorities, review readiness reports, and review mobilization plans for RC forces. TRO is not a command relationship. ARNG forces remain under the C2 of their respective State Adjutant Generals until mobilized for federal service. USAR forces remain under the C2 of the USAR command until mobilized.	Parent unit responsibility for training and readiness of forces is inherent in ADCON.
Direct liaison authorized	Allows planning and direct collaboration between two units assigned to different commands, based on anticipated tailoring and task organization changes.	Chain of command.	Limited to planning and coordination between units. Any implementation of plans must be made through the current controlling parent unit.	Parent unit
Aligned	Informal relationship between an ASCC and other Army units identified for use in a specific GCC.	ASCC and supporting Army command or direct reporting unit.	Normally establishes coordinating authority between the gaining ASCC and units used to form force packages with priority of commitment to that ASCC.	Parent unit

JOINT CONSIDERATIONS AND RELATIONSHIPS

3-48. Army command relationships are similar but not identical to joint command authorities and relationships. Differences stem from the way Army forces task-organize and the need for a system of support relationships. CCDRs have broad authority and control over subordinate commands and forces. Particularly pertinent to engineer operations are—

- The directive authority for logistics that CCDRs have and their authority to delegate directive authority for common support capabilities, which includes engineering support.
- The authority to employ mines, which originates with the President. See JP 3-15 for more information.

3-49. A subordinate JFC normally exercises OPCON over assigned or attached forces and is responsible for the employment of their capabilities to accomplish the assigned mission or objective. Additionally, the JFC ensures that cross-Service support is provided and that all engineering forces operate as an effective, mutually supporting team. The JFC assigns engineering tasks to subordinate commanders. Most often, joint forces are organized with a combination of Service and functional component commands.

3-50. Service component commanders maintain OPCON over their Service engineer forces under this organizational option (see figure 3-6). This structure maintains traditional command relationships and is best used when the JFC chooses to conduct operations through Service component commanders and when engineer forces are used in DS of Service component missions. A Service component command may be delegated OPCON or TACON of engineer forces from another Service to accomplish the assigned mission or tasks. For example, a task tailored NCE may be placed under OPCON or TACON of the Marine component commander for general engineering support. In addition, the JFC may also establish support relationships between subordinate commanders to aid, protect, complement, or sustain another force.

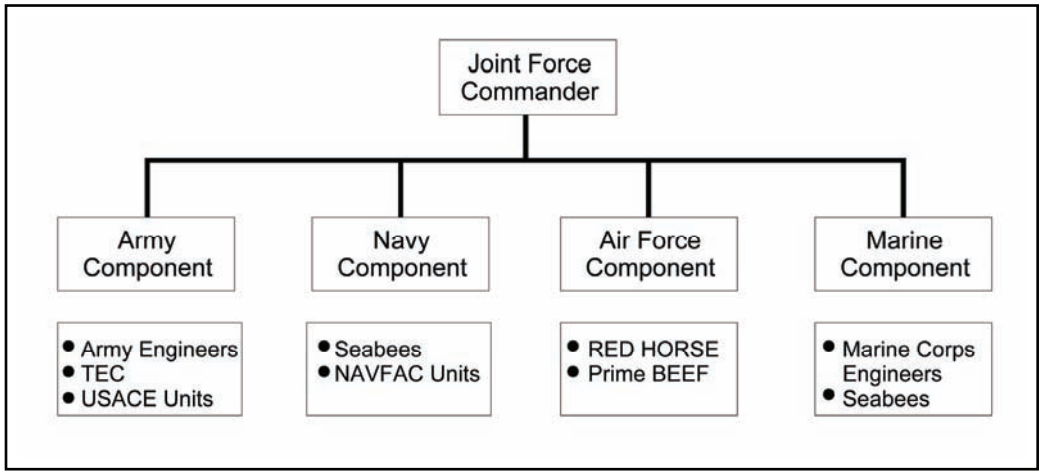


Figure 3-6. Service component command

3-51. The JFC may also organize using one or more functional component commands (see figure 3-7). Under this organizational option, the JFC establishes command relationships for engineer forces based on the requirement for engineer missions. The JFC is responsible for establishing the appropriate relationships between components to accomplish the required tasks. For example, Air Force engineers or NCF units may be placed in TACON to the JFLCC. Use of engineering forces either in DS or attached to a functional component commander is a viable option when providing capabilities tied directly to the functional component's mission. The functional component command will not normally be responsible for providing common logistic support (that is, beddown construction) to the joint force. When a joint force component commander does not have adequate engineer forces assigned, the component commander will coordinate engineering support requirements through the JFC to obtain the support from other components of the JTF. There are numerous variations in organizing engineer forces under this command structure that provide significant flexibility to the joint force. The key advantage of this option is that it provides the JFC with the ability to tailor the engineer capabilities within the joint force by crossing Service component lines to best achieve mission requirements.

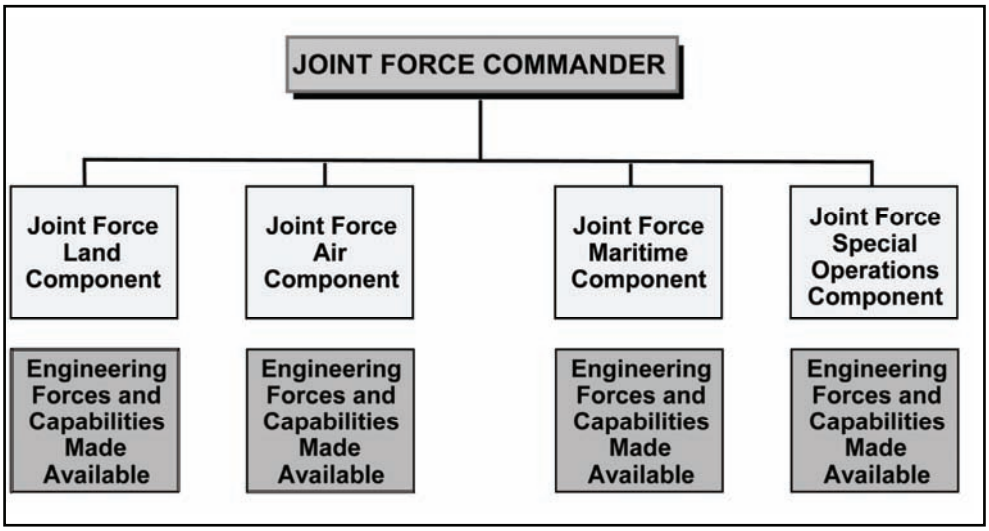


Figure 3-7. Functional component command

3-52. Establishing a support relationship between components (as described in JP 0-2) is a useful option to accomplish needed tasks. Support relationships can be established among all functional and Service component commanders, such as the coordination of operations in-depth, involving the JFLCC and the JFACC. Within a joint force, more than one supported command may be designated simultaneously, and components may simultaneously receive and provide support for different missions, functions, or operations. For instance, a joint force special operations component may be supported for a direct action mission while simultaneously providing support to a joint force land component for a raid. Similarly, a joint force maritime component may be supported for sea control while simultaneously supporting a joint force air component to achieve air superiority over the operational area.

3-53. Some operations, such as disaster relief or FHA, are engineer-intensive. In such cases, the JFC may opt to establish a subordinate JTF to control extensive engineer operations and missions. Such a JTF may be formed around an existing TEC or naval construction regiment. The JFC designates the military engineer capabilities that will be made available for tasking and the appropriate command relationships. Engineer forces could be placed under OPCON, TACON, or in a supporting role depending on the degree of control that the JFC desires to delegate to the subordinate JTF. The engineer assets attached to the subordinate JTF will normally be a mix of engineer assets drawn from the entire force's engineer resources. If the subordinate JTF is to provide a common support capability, it will require a specific delegation of directive authority from the CCDR for the common support capability that is to be provided.

THE ENGINEER COORDINATOR

3-54. Commanders cannot exercise control alone except in the simplest and smallest of units. The staff's primary function is to help the commander and subordinate commanders exercise control. Control allows commanders to direct the execution of operations. Unlike command functions—which remain relatively similar among echelons of command—control functions increase in complexity at each higher echelon. As the control function becomes increasingly complex, units are typically assigned larger staffs to ensure integration through the warfighting functions and synchronization of combat power. The staff assigned to BCT, division, corps, theater Army, GCC, and other joint organizations includes a number of engineers in various sections and cells. A senior engineer staff advisor, the engineer coordinator (ENCOORD), is designated among these engineer staff members to assist the commander in exercising control over engineer forces in the AO.

3-55. Previous editions of this manual recommended "dual hatting" the senior engineer unit commander as both the engineer force commander and the senior engineer staff advisor to the supported commander. Because of the transformation to a modular force and based on recent experience in projecting the tailored engineer force, dual hatting is no longer the preferred option for providing C2 for engineer forces and

meeting the supporting commander's requirement for engineer staff advice. Ultimately, the decision on whether the senior engineer unit commander will serve both roles will be made by each supported force commander and be situationally dependent. Some specific considerations for determining the relationship of the senior engineer staff advisor and the engineer force commander include—

- What staff assets are available to support the engineer staff advisor versus the engineer unit commander? Are these elements from the same unit or are separate units resourced for each role?
- What experience level is needed for the engineer staff advisor? Should this role be resourced with a current or former commander?
- What duration of time will the augmenting engineer element, commanded by the senior engineer unit commander, be working for or with the force? Is there enough time for this engineer commander to acclimate and effectively advise the force commander?
- What working relationship is established between an existing engineer staff advisor and the force commander? Similarly, is there an existing working relationship between the engineer unit commander and this force commander?

3-56. **The *engineer coordinator* is the special staff officer, usually the senior engineer officer on the staff, responsible for coordinating engineer assets and operations for the command.** Each maneuver force echelon down to brigade level has an organic engineer planner and staff element to integrate engineers into the combined arms fight. The task force and company levels may have a designated engineer planner, but their engineer will not be organic at these echelons. The engineer is a special staff member of the staff responsible for understanding the full array of engineer capabilities (combat, general, and geospatial engineering) available to the force and for synchronizing them to best meet the needs of the maneuver commander.

BRIGADE ENGINEER COORDINATOR

3-57. Each of the three types of BCTs and ACR are organized with organic engineer staff sections (see Appendix B). These engineer staff sections support the C2 of the BCT and its subordinate organizations while focusing on engineer operations within the BCT. They also provide the C2 framework for engineer augmentation in whatever form it may come to the BCT.

3-58. The brigade ENCOORD is responsible for coordinating engineer operations and may be the senior engineer officer in the force. When an engineer battalion is task-organized in support of the BCT, the BCT commander determines if a change will occur in the ENCOORD designation. This decision is based on the type of unit, duration of the task organization, and focus of the mission being performed by the supporting engineer battalion. If the attached engineer battalion commander is designated as the ENCOORD, he will rely heavily on the BCT staff engineer for integration into the BCT operations process. Regardless of the task organization, the brigade engineer is responsible for the functional control (through the brigade commander) of all engineer units in support of the brigade. At the maneuver battalion level, the ENCOORD is the engineer staff officer organic to the battalion headquarters or the senior engineer supporting that battalion if it has no organic engineer staff.

3-59. The brigade ENCOORD's primary duty is to coordinate the conduct of engineer operations in support of the combined arms operation. The ENCOORD integrates specified and implied engineer tasks into the brigade plan and ensures that supporting engineer units are integrated into brigade mission planning, preparation, execution, and assessment activities. The ENCOORD may also be tasked to coordinate the broader array of maneuver support operations conducted in support of the BCT. The ENCOORD is normally located in the BCT main. However, if the BCT is located in some type of sanctuary and the tactical CP is deployed forward, the ENCOORD may be located in the tactical CP. The following lists various ENCOORD activities in the conduct of engineer operations:

- Plan.
  - Assist the S-2 with the IPB, including information from the preparation of the engineer running estimate.
  - Determine and evaluate critical aspects of the engineer situation.

- Formulate ideas for engineer support to meet the BCT commander's intent.
- Decide what engineer missions must be accomplished to support current and future fights.
- Integrate the BCT geospatial engineer team in the planning process to explain the military significance of the terrain to the commander and staff, and create geospatial products for decision making.
- Advise the commander on using organic and nonorganic engineer assets, employing and reducing obstacles, and employing engineer reconnaissance.
- Identify any BCT requirements for EAB engineer and other related assets to support the brigade.
- Make the BCT commander aware of the capabilities, limitations, and employment considerations of supporting engineers and related assets.
- Develop a scheme of engineer operations concurrent with the BCT maneuver COAs.
- Recommend the engineer priorities of effort and support, essential tasks for M/CM/S, and acceptable mission risks to the BCT commander.
- Recommend the engineer organization for combat.
- Visualize the future state of engineer operations in the BCT.
- Integrate the engineer functions of combat, general, and geospatial engineering into future brigade plans.

- Prepare.
  - Train the brigade engineer cell located at the brigade main CP.
  - Issue timely instructions and orders to subordinate engineer units through the BCT base order to simplify preparation and integration. Develop the necessary input to BCT orders, annexes, and engineer unit orders (as required).
  - Coordinate production and distribution of maps and terrain products.
  - Recommend intelligence requirements to the intelligence staff officer (S-2) through the operations staff officer (S-3).
  - Participate in the targeting process.
  - Participate in appropriate working groups.
  - Plan and coordinate with the fires cell on the integration of obstacles and fires.
  - Recommend MSRs and logistics areas to the logistics staff officer (S-4) based on technical information.
  - Coordinate with BCT S-4 or maneuver battalion S-4 for additional resources to support the M/CM/S effort (supply Class III petroleum products and supply Class IV construction materials).
  - Coordinate with BCT S-4 to support base camp, facilities, and other sustainment related construction requirements.
  - Advise the commander on environmental issues, coordinate with other staff members to determine the impact of operations on the environment, and help the commander integrate environmental considerations into decision making.
  - Recommend when engineer diver support may facilitate specific engineer reconnaissance in support of the BCT.
  - Ensure EOD integration in the conduct of operations.

- Execute.
  - Alter the engineer plan using the feedback received from maneuver battalions, the engineer company, and any augmenting engineer units as required.
  - Provide information on the status of engineer assets on hand.
  - Make time-sensitive engineer decisions on requests for immediate support received from BCT engineers.
- Assess.
  - Track all templated and known obstacles, SCATMINEs, the survivability status, the route status, engineer missions, and any other engineer-specific information.
  - Establish and maintain a continuous, open link among all engineer cells, task force engineers, and (when applicable) supporting engineer CPs.
  - Use the running estimate and the continuous link with the supporting engineer staffs and engineer units to compute resource and force requirements and recommend engineer task organization.
  - Monitor the execution of engineer orders and instructions by tracking the current fight.
  - Use reporting from engineer unit CPs to measure and analyze engineer performance and anticipate change and unforeseen requirements.

ECHELONS ABOVE BRIGADE ENGINEER

3-60. While staffs differ by echelon and unit type, all staffs include similar staff sections. The staff consists of the chief of staff or executive officer and coordinating, special, and personal staff sections. A staff section is a grouping of staff members by area of expertise. Each staff section has a principle staff officer, who may be a coordinating, special, or personal staff officer for the commander. The commanding officer's grade determines whether the staff is a G staff (general officer) or an S staff (colonel or below). Organizations commanded by a general have G staffs; other organizations have S staffs. The number of coordinating, special, and personal staff officers and their corresponding staff sections varies with different command levels (see figure 3-8).

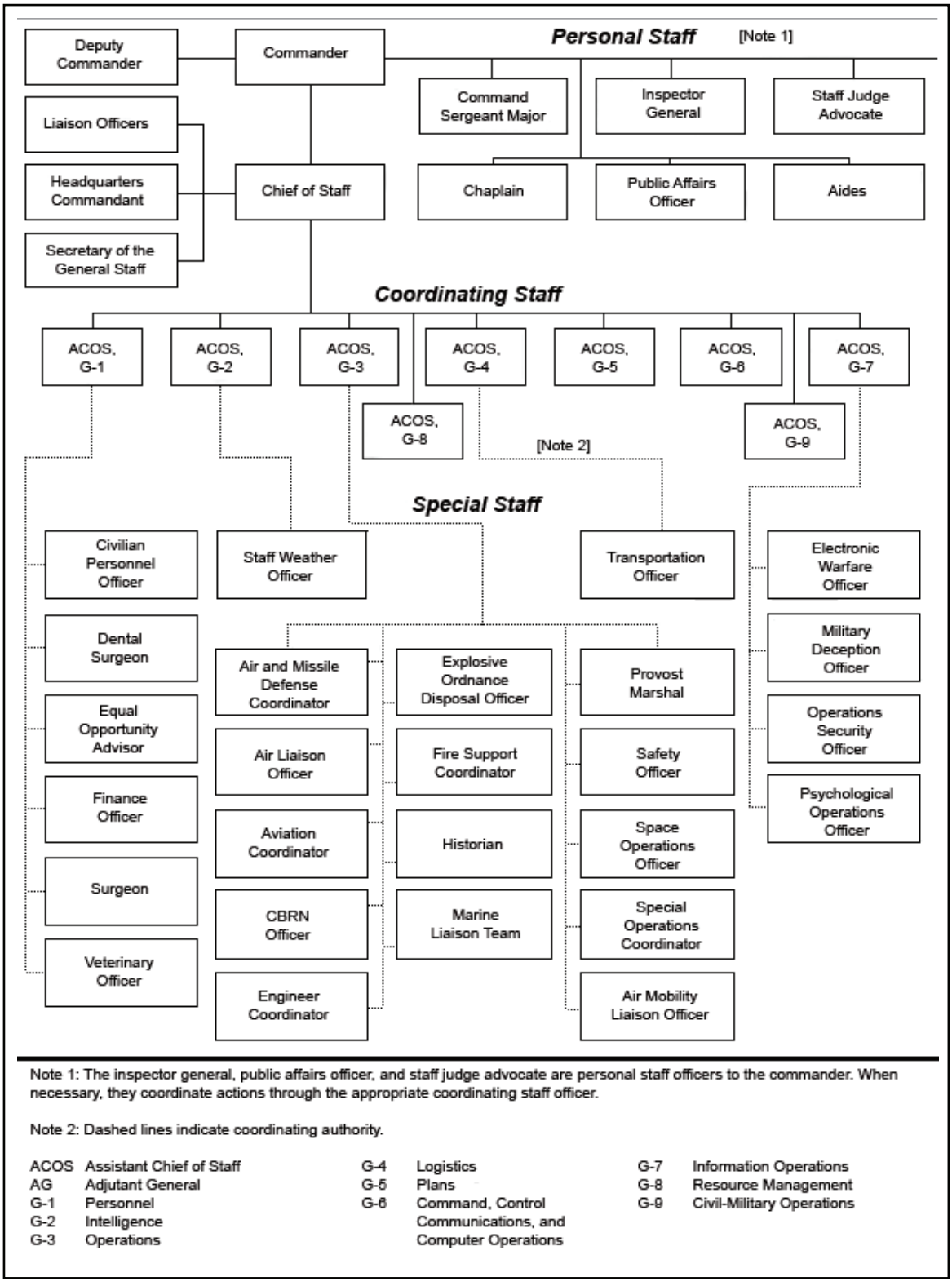


Figure 3-8. Basic staff structure and coordinating authorities

3-61. Depending on the echelon and type of unit, engineer staff members may be assigned under the ENCOORD section or may be assigned within other staff sections. The ENCOORD may be assigned

within the operations section (as shown), may be assigned within the logistics section (more common in joint staffs), or may be a separate section. Even though the division or corps headquarters may serve as a JTF headquarters, the division engineer and corps engineer staff duties and responsibilities are similar to those listed previously for the brigade engineer. Appendix E provides additional discussion of the division and corps engineer staff.

3-62. Commanders organize their headquarters into CPs to help them exercise C2 throughout the conduct of operations. By organizing into CPs, commanders disperse their staff and C2 capabilities in the AO. This expands the commander's ability to exercise C2 and makes the C2 system more survivable. They base the number and internal structure of CPs on available resources, planning horizons, and warfighting functions. Doctrine and a unit's MTOE provide commanders a starting point for organizing their staff into CPs. Each operation is unique based on the factors of METT-TC. Just as commanders organize their entire force for an operation, they organize headquarters for effective C2. The mission determines which activities to accomplish. These activities determine how commanders organize, tailor, or adapt their individual staffs to accomplish the mission. The mission also determines the size and composition of the staff. For example, a division headquarters may serve as the base for a JTF headquarters. Based on the factors of METT-TC, the division staff would be augmented with additional staff members and C2 capabilities to accomplish the mission.

3-63. Regardless of the mission, every Army staff has common areas of expertise that determine how commanders divide duties and responsibilities. Grouping related activities by area of expertise gives commanders an effective span of control. It also facilitates unified effort by the staff. Areas of expertise may vary slightly depending on the command echelon, mission, and environment. For example, at battalion level there is normally no resource manager and certain logistic units combine the intelligence and operations areas of expertise. As previously mentioned, the section of assignment and grouping of engineer staff varies among echelons and unit types. Regardless of the distribution of engineer staff or their section of assignment, the ENCOORD must ensure the synchronization of the engineer effort.

JOINT ENGINEER STAFF

3-64. The GCC engineer staff performs a variety of functions to synchronize engineer operations in the AOR. These include—

- Planning and coordinating theater engineering support.
- Providing recommendations to the CCDR on the assignment of engineering missions to subordinate commanders. Recommendations may include which subordinate commander (Service or functional component, subordinate JTF, or subunified commander) will be assigned the mission, the scope of the project, and which commanders will be placed in a supporting role.
- Furnishing recommendations on the tasking of components for theater engineering missions, tasks, or projects.
- Recommending policies and priorities for construction and real estate acquisition and for Class IV construction materials. Compiling a joint integrated priority list for construction projects for U.S. funded contingency construction as well as for HN funded construction.
- Furnishing advice on the effect of joint operations on the physical environment according to applicable U.S., international, and HN laws and agreements.
- Recommending construction standards.
- Identifying engineering support requirements that exceed component funding authorizations and organized engineer capabilities.
- Furnishing advice on the assessment of the risk to mission accomplishment of engineering support shortfalls.
- Furnishing advice on the feasibility, acceptability, and suitability of component engineering plans.
- Preparing, as part of the joint operation planning process, the engineer parts of OPLANs and OPORDs (discussed further in Chapter 4).
- Reviewing all engineer-related annexes and appendixes of OPLANs and OPORDs.

- Providing input to the theater security cooperation plan. Developing and programing construction projects to include Exercise-Related Construction (ERC) Program and Humanitarian and Civic Assistance (HCA) Program construction projects to support theater security cooperation strategies.
- Developing training and exercise programs to evaluate and improve preparedness for engineering missions.
- Planning and coordinating the procurement and distribution of Class IV construction materiel based on established priorities. Service components are responsible for procurement and distribution of their Class IV requirements.
- Coordinating with DOD and Department of State (DOS) construction agents and other engineer support agencies.
- Participating in joint engineering boards and engineer-related working groups, as required.

3-65. The subordinate JFC should establish an engineer staff for matters pertaining to the planning and execution of joint engineering support operations. When a functional component command employs forces from more than one Service, the staff should reflect each Service represented. The CCDR and subordinate JFC will organize their staffs to carry out their respective assigned duties and responsibilities. Based on mission-specific requirements, the engineer staff may be placed within the directorate for operations (J-3), directorate for logistics (J-4), or organized as a separate staff to the JFC. The JFC may choose to organize geospatial engineers or geospatial intelligence and services (GI&S) officers within the directorate for intelligence (J-2). Regardless of the option or combination of options used, the requirement for the staff engineer remains, as well as the need for constant communication, liaison, and coordination throughout the entire staff. A notional engineer staff is depicted in figure 3-9.

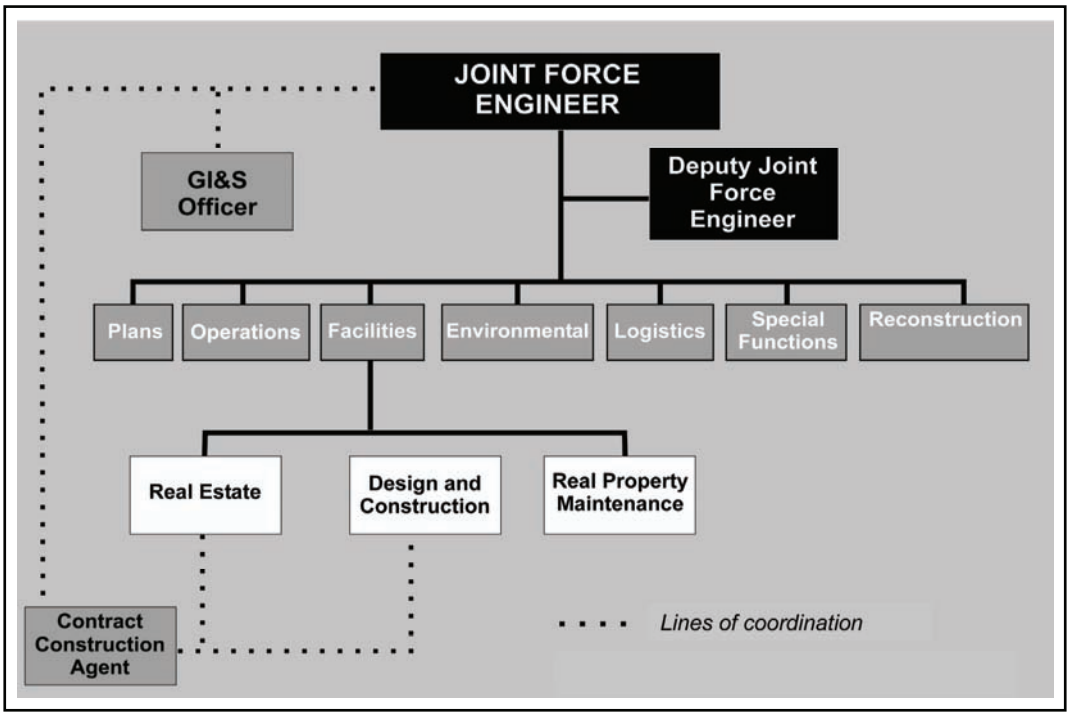


Figure 3-9. Notional joint engineer staff

3-66. Key joint force engineer staff functions are as follow:

- Develops and coordinates combat engineering, general engineering, and geospatial engineering requirements for the joint force.
- Acts as the intermediary, facilitator, and coordinator between JTF 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 (JEMB). Integrates actions from these boards, assigns tasking based on board recommendations, and monitors completion.
- Screens, validates, and prioritizes all engineering projects and mission assignments. Participates in management of LOGCAP, when utilized, to validate operations and maintenance services and construction requirements.
- Plans, programs, and controls facility use. Receives guidance and reports actions to JFUB, if established.
- Prepares logistic reports on engineer resources using the Joint Operation Planning and Execution System (JOPES).
- Develops the ESP.
- Plans and coordinates the distribution of construction and barrier materials and engineer munitions based on established priorities. Participates on the Joint Acquisition Review Board to validate requests for construction equipment leases and purchases.
- Functions as the primary interface between the joint force, HN, contingency contractors, and other theater construction organizations.
- Establishes the statement of work, development of contracts, and employment of services.
- Plans and provides guidance for environmental considerations that impact joint operations.
- Serves as the program manager for all engineer-related functions.

WORKING GROUPS, CELLS, AND BOARDS

3-67. Staff members are assigned to staff sections. Commanders organize staff sections in CPs into functional and integrating cells. Cells contain elements from staff sections. In the context of CPs, a cell is a grouping of personnel and equipment by warfighting function (movement and maneuver) or purpose (maneuver support) to facilitate C2. Periodically, or as required, ad hoc groupings form to solve problems and coordinate actions. These groups include representatives from within or outside of a CP. Their composition depends on the issue. These groups are called meetings, working groups, and boards. Each is a control mechanism for regulating a specific action, process, or function. A working group is a temporary grouping of predetermined staff representatives who meet to coordinate and provide recommendations for a particular purpose or function. A board is a temporary grouping of selected staff representatives delegated decision authority for a particular purpose or function. They are similar to working groups. When the process or activity being synchronized requires command approval, a board is the appropriate forum.

3-68. Commanders at each echelon may establish working groups, boards, or cells to manage and coordinate functional or multifunctional activities. The engineer staff will be key members on many of these and may chair construction-related groups. Working groups conduct staff coordination at the action officer level and prepare materials for decisions to be made at a board. Boards establish policies, procedures, priorities, and oversight to coordinate efficient use of resources. Cells group personnel from various sections on a headquarters authorization document to integrate key functions, such as cells focused on each of the warfighting functions. Appendix E discusses the various boards and cells on which the staff engineer may participate.

CONTROL MECHANISMS

3-69. *Control* is the regulation of forces and warfighting functions to accomplish the mission in accordance with the commander's intent (the definition was shortened, and the complete definition is printed in the glossary). (FM 3-0) Aided by staffs, commanders exercise control over all forces in their AO, including the airspace over it. Staffs provide their greatest support in providing control and keeping commanders informed. A control mechanism is a means of regulating forces or warfighting functions. Control mechanisms are established under the authority of a commander. Certain control mechanisms belong to the commander alone and may not be delegated. These include the commander's intent, unit mission statement, planning guidance, and commander's critical information requirements (CCIR). However, staff officers and subordinate leaders can establish others within the authority commander's delegate. Control mechanisms include, but are not limited to the following:

- Commander's intent.
- Planning guidance.
- CCIR.
- Assignment of priorities (such as, decisive, shaping, and sustaining operations; priority of fires; and the main effort).
- Delegation of authority.
- Assignment of missions and tasks to subordinates.
- Plans and orders (see Chapter 4), including their components and subordinate plans:
  - Unit mission.
  - Task organization.
  - Concept of operations.
  - Target lists.
  - ROE.
  - ISR and service support plans.
- Graphic control measures (including fire support coordination and air space control measures).
- Battle rhythm.
- Intelligence synchronization matrix.
- Information requirements.
- Routine reports and returns.

3-70. An engineer work line (EWL) is a graphic or functional control measure used at EAB to designate areas of work responsibility for subordinate engineer organizations. **An *engineer work line* is a coordinated boundary or phase line used to compartmentalize an area of operations to indicate where specific engineer units have primary responsibility for the engineer effort** (the definition was shortened, and the complete definition is printed in the glossary**).** EWLs are generally established in a corps unassigned area. EWLs may also be established to designate engineer support boundaries in stability or civil support operations. These lines generally match area support and HN military or political boundaries. EWLs will be adjusted as an operation transitions. Because engineers focus on mission requirements rather than area support, EWLs may be independent of other control measures—for example, to permit operational-level engineers to concentrate in an assigned area or to conduct specific missions on a task basis forward of the EWL.

SECTION IV–ENGINEER COMBAT POWER

3-71. Commanders apply combat power through the warfighting functions using leadership and information. To effectively support the combined arms team, engineer capabilities are organized by the engineer functions and synchronized in their application through the warfighting functions. This section will describe selected engineer operations directed through and primarily supporting additional warfighting functions (the C2 warfighting function is discussed above; see FM 3-34.22 for discussion of support to the

fires warfighting function). These warfighting functions also provide the framework for engineer tasks in the Army universal task list.

MOVEMENT AND MANEUVER

3-72. The *movement and maneuver warfighting function* is the related tasks and systems that move forces to achieve a position of advantage in relation to the enemy. Direct fire is inherent in maneuver, as is close combat (the definition was shortened, and the complete definition is printed in the glossary). (FM 3-0) The function includes tasks associated with force projection related to gaining a positional advantage over an enemy. One example is moving forces to execute a large-scale air or airborne assault; another is deploying forces to intermediate staging bases in preparation for an offensive. *Maneuver* is the employment of forces in the operational area through movement in combination with fires to achieve a position of advantage in respect to the enemy in order to accomplish the mission (this definition was shortened, and the complete definition is printed in the glossary). (JP 3-0) Maneuver is the means by which commanders mass the effects of combat power to achieve surprise, shock, and momentum. It requires close coordination with fires to be effective. Movement is necessary to disperse and displace the force as a whole when maneuvering. Usually, both tactical and operational maneuver require logistic support. The movement and maneuver warfighting function includes the following tasks:

- Deploy.
- Move.
- Maneuver.
- Conduct direct fires.
- Occupy an area.
- Conduct mobility and countermobility operations.
- Battlefield obscuration.

3-73. Combat engineer support applied through the movement and maneuver warfighting function includes mobility operations (see FM 3-34.2) and countermobility operations (see FM 90-7). Mobility operations include the following tasks:

- Overcome barriers, obstacles, and mines.
  - Conduct breaching operations.
  - Conduct clearing operations.
  - Conduct gap crossing operations (see also FM 3-90.12).
- Enhance movement and maneuver.
  - Construct and maintain combat roads and trails.
  - Construct and maintain forward airfields and LZs.
- Negotiate a tactical AO.
- Provide diver support.

3-74. Countermobility operations include the following tasks:

- Site obstacles.
- Construct, emplace, or detonate obstacles.
- Mark, report, and record obstacles.
- Maintain obstacle integration.

3-75. General engineer support to movement and maneuver accomplishes tasks exceeding the capability of the combat engineer force, as well as more extensive upgrades or new construction of LOCs and intermediate staging bases (see FM 3-34.400). General engineer support is typically applied through the sustain warfighting function, but may include many of the following tasks that also cross over to support movement and maneuver:

- Construct and repair combat roads and trails exceeding the capability of combat engineer assets.
- Provide FACE exceeding the capabilities of combat engineer assets, to include the repair of paved, asphalt, and concrete runways and airfields.

- Install assets that prevent foreign object damage (FOD) to rotary-wing aircraft.
- Construct tactical, support, and LOC bridging.
- Conduct ADC missions that support the mobility of the maneuver force.
- Ensure theater access through the construction and upgrade of ports; airfields; and RSOI facilities.

FIGHTING AS ENGINEERS

3-76. Combat engineers are at the vanguard because they fight beside maneuver units with a focus on close combat. When conducting combat operations, they must be prepared to fight and employ their combat skills, using fire and maneuver to accomplish their engineer mission. On today's battlefield, the enemy can detect and engage engineers quickly, regardless of their location. Consequently, all combat engineers are organized, trained, and equipped to fight and destroy the enemy in addition to their primary responsibilities within combat engineering. This section addresses aspects of engineers in close combat organized to fight as engineers. The next section addresses aspects of engineers organized to fight as infantry.

3-77. Combat engineers are organized, trained, and equipped to engage in close combat to accomplish their engineer missions and to—

- Support a movement to contact or attack as a part of a maneuver formation in the movement to accomplish the formation's mission.
- Fight as the breach force during BCT combined arms breaching operations.
- Assist the supported organization to defeat an unexpected attack.
- Protect a critical demolition target that must remain passable until friendly forces are able to withdraw.
- Maintain security at a work site.
- Protect themselves in an assembly area or on the march.

3-78. General and geospatial engineer units are armed primarily with small arms and have a limited number of crew-served weapons. They are not organized to move within combined arms formations or apply fire and maneuver. They are capable of engaging in close combat with fire and movement primarily in a defensive role.

3-79. During combat operations, combat engineer units are task-organized with maneuver units and are integrated into the combined arms formation. The engineer unit is designed to provide demolition, breaching, and hasty gap crossing capabilities to the combined arms team. The engineer unit can also employ direct-fire weapon systems to aid in employing demolitions and breaching assets. Regardless of the mission, armored engineer vehicles are combat vehicles and provide a significant contribution to the combat power of the entire formation. To accomplish the mission, engineers will fire and move under the direction of the formation commander, as necessary, using demolition, breaching, and gap crossing skills when appropriate. Fire and movement techniques are based on rifle, automatic rifle, and grenadier covering fire, allowing the placement of demolition charges within striking range.

3-80. When involved in an assault, engineers will fight dismounted on the objective. However, they will focus on breaching the close-in protective obstacles, as well as demolition tasks against positions and dug-in vehicles. Demolition charges produce significant shock and concussion effects on defenders and destroy critical positions, munitions, and combat vehicles.

3-81. Combat engineers employed on reserve demolition targets in the defense mainly execute the technical procedures necessary to ensure target destruction. However, the engineer demolition party responds to enemy contact. It assists the demolition guard in securing the target by holding it open or gaining time to ensure that it is destroyed. The engineer force may assist in target defense by installing antitank and self-destructing antipersonnel mines to support the defensive scheme.

3-82. Combat engineer units engaged in emplacing obstacle systems provide their own local security. Within their capability, they will employ close-combat techniques against attackers to ensure that the obstacle system is completed. General and geospatial engineer organizations also provide their own local security but may require support from combat units depending on where they are employed in the AO.

They participate in base cluster defense as required. They install local protective obstacles and fight from perimeter defensive positions. They also form reaction forces that can repel or destroy the enemy forces that penetrate a base cluster.

FIGHTING AS INFANTRY

3-83. Throughout history, engineer organizations have been required to fight as infantry as a secondary mission. The combat engineer organization is capable of executing infantry tasks in conjunction with other combat units. Organizational deficiencies include the lack of organic fire support, communications equipment, and medical personnel. If an engineer battalion has been designated to fight as infantry (a maneuver unit), then it requires the same support and potentially the integration of other maneuver elements (such as armor and fire support) into its task organization to accomplish the mission. Any commander who commands combat engineers has the authority to employ them as infantry, unless otherwise reserved. However, a commander must carefully weigh the gain in infantry strength against the loss of engineer support. Engineers provide far more combat power in their primary mission than when configured as infantry. Stopping the engineer work may reduce the combat power of a commander's entire force.

3-84. Reorganizing engineer units as infantry requires careful consideration and should normally be reserved to the operational-level command. Reorganizing involves extensive equipment and training specific to the reorganization and must be coordinated with the headquarters with ADCON responsibilities. Employing engineers merely implies the gaining commander using the engineers for a short period of time. On the other hand, reorganization requires resources, time, and training.

MANEUVER SUPPORT OPERATIONS

3-85. Engineer units may be called on to provide assets to contribute to maneuver support operations when assigned to an MEB. Missions assigned to engineers in the conduct of maneuver support operations will enable one or more key tasks related to the MEB primary missions. See FM 3-90.31 for more information on the MEB missions.

INTELLIGENCE

3-86. The *intelligence warfighting function* is the related tasks and systems that facilitate understanding of the enemy, terrain, weather, and civil considerations (the definition was shortened, and the complete definition is printed in the glossary). (FM 3-0) Intelligence is a continuous process that involves analyzing information from all sources and conducting operations to develop the situation. Commanders make decisions and direct actions based on their SU. They keep their SU current by continuously assessing the situation and stating the information they need in the CCIR. The required information is obtained through various detection methods and systematic observation, reconnaissance, and surveillance. Engineer capabilities can be employed during key activities in the operations process to add to the commander’s SU. Geospatial support improves understanding of the physical environment. Engineer reconnaissance can provide data that contributes to answering the CCIR.

CONDUCT GEOSPATIAL ENGINEERING OPERATIONS AND FUNCTIONS

3-87. The term geospatial intelligence (GEOINT) was created to describe and encompass both the standard and the advanced (integrated) capabilities of imagery, imagery intelligence, and geospatial information. The full power of GEOINT comes from the integration and analysis of all three capabilities, which results in more comprehensive, tailored intelligence products for a wider scope of problems and customers. Imagery, imagery intelligence, and geospatial information are now considered to be three complementary elements of GEOINT rather than separate entities. Advances in technology and the use of geospatial data have created the ability to integrate and combine elements of any or all of these areas.

3-88. The GEOINT discipline encompasses all activities involved in the planning, collection, processing, analysis, exploitation, and dissemination of spatial information to gain intelligence about the OE, visually

depict this knowledge, and fuse the acquired knowledge with other information through analysis and visualization processes.

3-89. Geospatial engineering contribution to GEOINT includes the standards, processes, Soldiers, and equipment required to generate, manage, analyze, and disseminate the geospatial information necessary to assemble the best view of the OE for the command. Geospatial engineers manage the enterprise geospatial database compiled from all sources, including the National Geospatial-Intelligence Agency (NGA), Topographic Engineering Center, other Services, other federal agencies, and multinational partners, as well as from deployed Soldiers and sensors. Geospatial engineers manage the geospatial foundation of the COP—synchronizing hard- and soft-copy products that are necessary components of all source intelligence and C2.

3-90. Geospatial engineer responsibilities are as follows:

- Advise commander on geospatial issues.
- Provide geospatial staff planning and coordination.
- Establish geospatial policies and procedures.
- Program management for geospatial databases.
- Establish and participate on geospatial working groups.
- Coordinate system requirements (such as communications, technology, hardware, and software).

3-91. Geospatial engineering functions include the following:

- Identify gaps in geospatial data and nominate collection.
- Manage the requirements process.
- Acquire geospatial data from multiple sources.
- Input field-collected and partner-added data.
- Validate, extract, analyze, fuse, and produce relevant data and products for decision making or operations.
- Provide foundation data for the COP.
- Integrate and synchronize with other staff.
- Manage databases and dissemination architecture.

3-92. Advanced technology provides the capability to use and combine geospatial data in different ways to create interactive, dynamic, and customized visual products. It allows the analyst to quickly make more complex connections between different types of data and information than previously possible. Geospatial products can now leverage a wider variety of data, including that from other intelligence sources (such as signals intelligence and human intelligence) through collaborative processes, to provide more accurate, comprehensive, and relevant products (see figure 3-10, page 3-30). A good example of this is the ability to add more dimensions to standard geospatial products. The third dimension provides the capability to visualize in-depth, while the fourth dimension integrates the elements of time and movement.

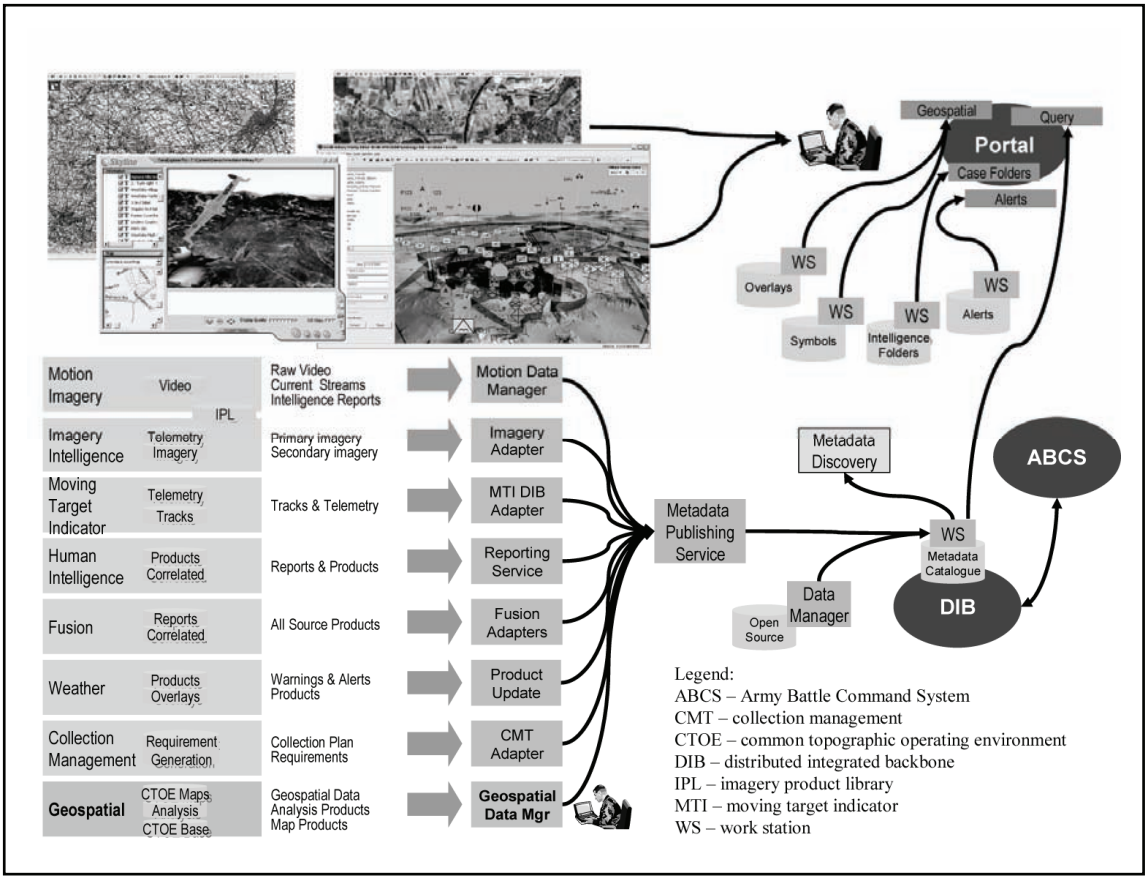


Figure 3-10. Geospatial data flow and fusion

3-93. Engineers play a major role in the IPB process by anticipating and providing terrain analysis products of likely contingency areas. Geospatial products assist in describing the OE's effects on enemy and friendly capabilities and broad COAs.

3-94. Many data management, analysis, and visualization tools are available to assist in the geospatial planning effort. Geospatial engineering provides commanders with terrain analysis and visualization, which improve situational awareness and enhance decision making. Examples of geospatial information useful for planning purposes are as follows:

- Three-dimensional terrain fly-throughs.
- Avenues and routes for joint forces, as well as likely enemy avenues of approach.
- Obstacle zone locations.
- Potential engagement areas.
- Potential unit positions or beddown sites.
- Airfield and port information and capabilities.
- Support to urban operations and other complex terrain.
- High-payoff target information.
- Deep-target information.
- Communications or visual line of sight.
- Locations of LOCs and MSRs and potential locations of base camps.
- Identification of flood plains and potential LZs.
- Fused data from multiple databases.

3-95. Terrain analysis is a key product of geospatial support. It is the study of the terrain's properties and how they change over time, with use, and under varying weather conditions. Terrain analysis starts with

the collection, verification, processing, revision, and construction of source data. It requires the analysis of climatology (current and forecasted weather conditions), soil conditions, and enemy or friendly vehicle performance metrics. Terrain analysis and GI&S are necessary to support mission planning and operational requirements. GI&S requires the management of an enterprise geospatial database at every echelon from combatant command to deployed BCT. Terrain analysis is a technical process and requires the expertise of geospatial information technicians and a geospatial engineer.

3-96. The geospatial engineering units available to the commander may become part of the command's GEOINT cell. The GEOINT cell is comprised of the people and capabilities that constitute the GEOINT support, to include the imagery and geospatial assets. The cell ensures GEOINT requirements are coordinated through appropriate channels as applicable and facilitates shared access of various domains. This cell may be centrally located or distributed throughout the command and connected by networks. Cell members do not have to work directly for a designated GEOINT officer; they still work for their parent unit, but coordinate efforts across staff directorates. The key to a successful process is collaboration across functional areas within the command and between the GEOINT cell, higher headquarters, and the rest of the stakeholders.

3-97. Geospatial engineering is provided to the Army and other Services based on echelon. It is focused on data generation, data management, and quality control at the numbered Army and combatant command level. At the corps and division levels, the majority of the workload is required to support database management, mission planning, and the IPB process. Below division level, geospatial engineering is increasingly focused on current operations and updating the geospatial database (database management).

3-98. Geospatial engineer units—supporting each echelon from BCT, through division and corps, to field Army—provide terrain analysis, terrain visualization, digitized terrain products, nonstandard tailored map products, map production, and terrain data management. Engineer staffs at every level coordinate support for terrain analysis and visualization using FalconView™ or another terrain visualization software program. Additional support is available through reachback.

3-99. The geospatial engineer team organic to the brigade headquarters (or supporting the ACR) performs analysis, management, and dissemination of geospatial data and products in support of brigade planning and execution. It maintains the brigade's common topographic operating picture on the brigade's server and provides updates to the brigade's portion of the theater geospatial database. The team supports the S-2 and S-3 to fuse intelligence and geospatial information into a common picture for the commander and offers GS to the staff and subordinate units. The brigade-level team is too small to provide continuous support to the S-2, but will form improvised GEOINT cells as necessary to conduct operations. The geospatial engineer team requires access to the classified tactical local area network (LAN) (SECRET Internet Protocol Router Network [SIPRNET]) to update and disseminate geospatial information and products.

3-100. The corps and division team supports the assistant chief of staff, intelligence (G-2) and assistant chief of staff, operations (G-3) planners to fuse intelligence and geospatial information into a common picture for the commander, staff, and subordinate units. The geospatial engineer team requires access to the SIPRNET to update and disseminate geospatial information and products. The geospatial engineer team organic to the corps and division collects and provides updated geospatial data and products in support of corps and division operations. The team—

- Performs analysis.
- Acquires, manages, and disseminates geospatial data and products in support of corps and division planning and execution.
- Maintains the corps and division common geospatial operating picture as part of the C2 systems on the corps's and division's server.
- Provides updates to the corps' and division's portion of the theater geospatial database.

3-101. A geospatial planning cell (GPC) is assigned to each Army command to provide geospatial operational planning; generation, analysis, and preparation of maps; map updates; tactical decision aids; and coordination with other geospatial engineer elements and higher headquarters. Topographic engineer companies and GPCs are the only units with unique, dedicated geospatial data generation capability within

the Army force structure. The topographic engineer company and the GPC require access to the global information grid and the SIPRNET to update and disseminate geospatial information and products.

3-102. NGA produces digital terrain and feature data which is available to users via the web or directly from NGA. The Defense Logistics Agency (DLA) distributes maps. The geospatial engineer can request imagery which can be used for spatial and temporal reasoning or multispectral analysis products that are customized to meet particular operational requirements. Imagery enhances three-dimensional and fly-through perspectives. NGA geospatial analysts may be attached to units, normally at division and above, to supplement the organic geospatial engineers and staffs. See FM 3-34.230 for more information on geospatial engineering.

ENGINEER RECONNAISSANCE

3-103. The responsibility for conducting reconnaissance does not reside solely with specifically organized units. Every unit has an implied mission to report information about the terrain, civilian activities, and friendly and enemy dispositions regardless of its location within the AO and primary function. Although all units conduct the implied reconnaissance mission, the commander typically focuses specifically organized reconnaissance units on the highest priority requirements. New BCT designs have more than doubled the reconnaissance capabilities available to brigade commanders and given them new surveillance and target acquisition capabilities.

3-104. Even with the robust reconnaissance capability now available in support of the BCT, the commander must know the capabilities and limitations of reconnaissance assets. This ensures that the employment of these assets is within their capabilities and on missions for which they have been trained and equipped. Although reconnaissance primarily relies on the human dynamic rather than technical means, the situation may require the collection of a higher degree of technical information than nonspecialized units possess. For example, an area with suspected contamination by toxic industrial materials must be targeted for reconnaissance by assets equipped to determine the type and level of contaminants present and protected from the contamination. Supporting units (such as engineer, CBRN, EOD, and MP) have specialized capabilities to collect technical information that complements the force's overall reconnaissance effort. It is this collection of necessary tactical and technical information that defines the range of engineer reconnaissance capabilities (see figure 3-11).

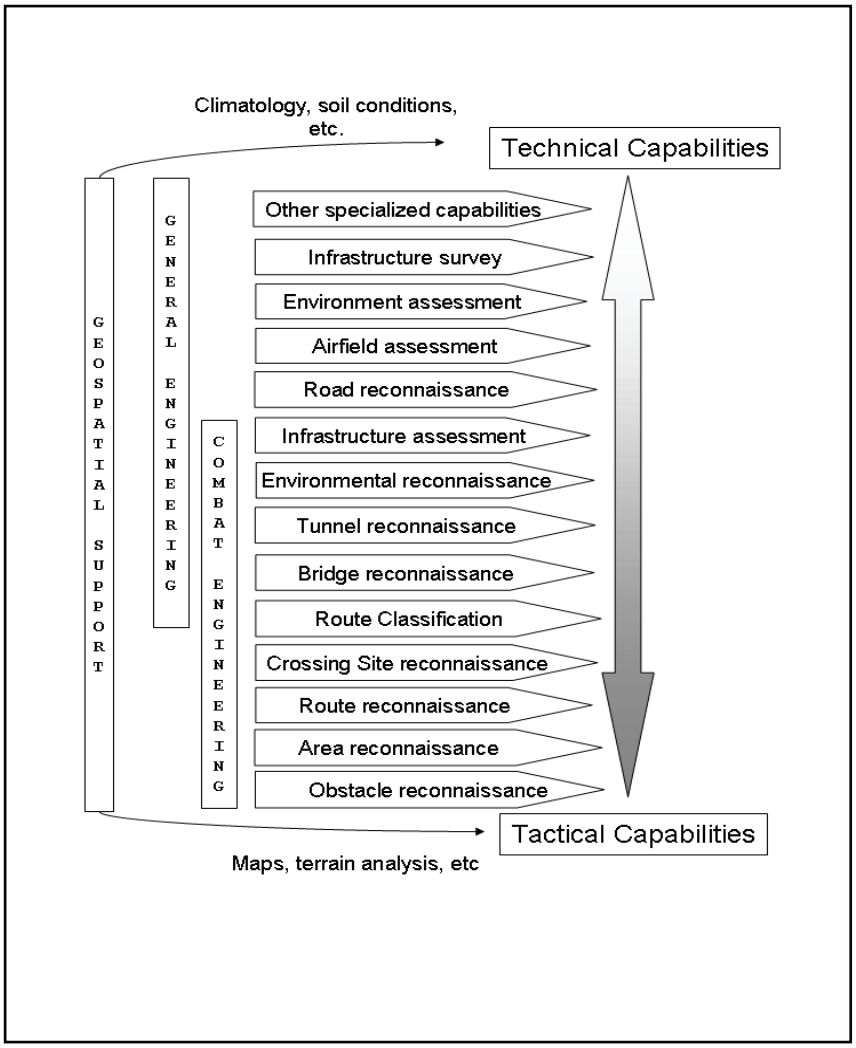


Figure 3-11. Range of engineer reconnaissance capabilities

3-105. The engineer functions provide a menu of reconnaissance capabilities varying in linkages to warfighting functions and varying in type and degree of tactical or technical expertise and effort applied to the assigned mission and tasks. The capabilities are generated from and organized by combat and general engineer units with overarching support from geospatial means. These units do not have organized and dedicated reconnaissance elements within their structure, except for the HBCT combat engineer company. Based on METT-TC factors, combat and general engineers are task-organized as required by the situation and may be teamed separately or with other elements from across the engineer functions or warfighting functions.

3-106. The majority of tactical engineer reconnaissance capabilities enable the collection of technical information in support of the combat engineer function. Reconnaissance in support of M/CM/S operations is conducted primarily by engineer reconnaissance teams (ERTs) comprised of combat engineers and focused on the collection of tactical and technical information to support the BCT's freedom of maneuver and survivability of friendly forces and facilities. FM 3-34.170 provides a detailed discussion of reconnaissance support of the five functional areas of mobility operations, support of obstacle integration, turnover in countermobility operations, support to fighting and other protective positions, and support to other tactical operations in the BCT. The specific combat engineer reconnaissance tasks include, but are not limited to—

- Obstacle reconnaissance focused on bypass or breach of obstacles to create obstacle intelligence (OBSTINTEL).
- Route reconnaissance focused on route clearance operations.
- Area reconnaissance focused on EH, such as mines and unexploded explosive ordnance (UXO) requiring area clearance operations.
- Crossing site reconnaissance focused on determining requirements for a gap crossing.
- Route reconnaissance focused on establishing a combat road or trail.
- Reconnaissance of planned or existing sites and facilities supporting forward aviation operations.
- Obstacle reconnaissance, including demolition obstacles, focused on establishing friendly obstacles integrated with fires.
- Obstacle reconnaissance in preparation for target turnover.
- Area reconnaissance focused on establishing vehicle fighting positions or protective works.
- Area reconnaissance in support of urban combat operations.
- Reconnaissance of tunnels and underground structures.
- Reconnaissance to establish an initial assessment of environmental factors.
- Reconnaissance to establish an initial assessment of infrastructure factors.
- Reconnaissance in complex terrain.

3-107. General engineering capabilities are employed in support of combat ERTs as required based on the factors of METT-TC, providing additional technical capabilities for the mission. Additionally, general engineer capabilities are teamed with ERTs, other BCT units, or stand-alone organizations to conduct tactical reconnaissance tasks that enable missions linked to BCT sustainment. These tasks are tactical missions that include the requirement to gather technical information needed for—

- MSR maintenance and upgrade.
- General engineering in support of airfields and heliports.
- Bridge construction or repair.
- General engineering in support of survivability and other protection tasks.
- Procurement or production of construction materials.
- General engineering in support of real estate support.

3-108. General engineers provide a range of technical reconnaissance capabilities. These capabilities are similar in focus to the reconnaissance tasks that enable missions linked to BCT sustainment. Technical capabilities are distinguished from the support provided to combat engineer missions and from tactical sustainment missions by the level at which the requirements are identified and addressed. At the tactical level, the BCT may have a general engineer element in DS and working to maintain or upgrade a specified MSR in the BCT AO. General engineers working at the operational level will conduct reconnaissance to identify requirements for construction along a ground LOC. Technical reconnaissance capabilities are typically conducted by general engineer assessment or survey teams to gather the technical information required for—

- Maintenance and upgrade ground LOCs.
- Bridge construction or repair.
- General engineering in support of airfields and heliports.
- General engineering in support of seaports.
- General engineering in support of survivability.
- Real estate and real property maintenance activities.
- Procurement or production of construction materials.
- General engineering in support of base camps and support areas.
- Power generation and distribution.
- Petroleum pipeline and storage facilities.
- Water supply and well drilling

- Underwater and other specialized construction support.
- Infrastructure assessment or survey.
- Assessment of HN technical capacity.
- Environmental baseline assessment or survey.
- Environmental remediation survey and assessment.

3-109. Technical capabilities include robust support from joint Service, multiagency, contractor, HN, and reachback elements. FFE is the broad range of primarily generating force activities linked through the general engineer element on the ground to apply a high degree of technical expertise to the engineer mission. FFE, as it relates to reconnaissance, is discussed in greater detail in FM 3-34.170.

SUSTAINMENT

3-110. The *sustainment warfighting function* is the related tasks and systems that provide support and services to ensure freedom of action, extend operational reach, and prolong endurance (this definition was shortened, and the complete definition is printed in the glossary). (FM 3-0) The endurance of Army forces is primarily a function of their sustainment. Sustainment determines the depth to which Army forces can conduct decisive operations, allowing the commander to seize, retain, and exploit the initiative. Sustainment is the provision of logistics, personnel services, and HSS necessary to maintain and prolong operations until mission accomplishment. It also includes internment and resettlement operations.

3-111. General engineer applications are primarily linked through and provide a major category of tasks under providing logistic support in the sustainment warfighting function. As already discussed, general engineer capabilities can also be applied in support of combat engineer applications and will have links across both the movement and maneuver and the protection warfighting functions. Providing general engineer support (see FM 3-34.400) includes—

- Restore damaged areas.
- Construct and maintain sustainment LOCs.
  - Construct and maintain roads and highways.
  - Construct and maintain over-the-shore facilities.
  - Construct and maintain ports.
  - Construct and maintain railroad facilities.
  - Construct and expand airfield facilities.
  - Construct and maintain pipelines and tank farms.
  - Construct and maintain standard and nonstandard fixed bridges.
- Provide engineer construction support.
- Supply mobile electric power.
- Provide facilities engineering support.
  - Provide waste management.
  - Acquire, manage, and dispose of real estate.
  - Provide firefighting support.
  - Construct, manage, and maintain bases and installations.

3-112. In stability or civil support operations, sustainment support may shift to the establishment of services that support civilian agencies, in addition to the normal support of U.S. forces. Stability operations tend to be of a long duration compared to the other elements in full spectrum operations. As such, the general engineering level of effort, including FFE support from USACE, is very high at the onset and gradually decreases as the theater matures. As the AO matures, the general engineering effort may transfer to theater or external support contracts, such as LOGCAP, AFCAP, or the Navy's global contingency construction contract.

PROTECTION

3-113. The *protection warfighting function* is the related tasks and systems that preserve the force so the commander can apply maximum combat power (this definition was shortened, and the complete definition is printed in the glossary). (FM 3-0) Preserving the force includes protecting personnel (combatants and noncombatants), physical assets, and information of the United States and multinational military and civilian partners. The protection warfighting function facilitates the commander's ability to maintain the force's integrity and combat power. Protection determines the degree to which potential threats can disrupt operations and counters or mitigates those threats. Protection efforts are continuous. They increase during preparation and continue throughout execution. Protection is a continuing activity; it integrates all protection capabilities to safeguard bases, secure routes, and protect forces. The protection warfighting function includes the following tasks:

- Employ air and missile defense.
- Conduct personnel recovery operations.
- Conduct information protection.
- Perform fratricide avoidance.
- Conduct operational area security.
- Apply antiterrorism measures.
- Conduct survivability operations.
- Conduct force health protection.
- Conduct CBRN operations.
- Employ safety techniques.
- Implement operations security.
- Provide EOD protection support.

3-114. Engineers have unique equipment and personnel capabilities that can be used to support survivability and related protection efforts. Combat engineers, supported by general engineer capabilities when required, provide selected survivability operations through the protection warfighting function (see FM 5-103). Survivability operations also include camouflage, concealment, and deception support to tactical ground maneuver forces. Combat engineers typically provide the basic hardening and camouflage, concealment, and deception support while general engineering support is focused on longer term survivability efforts. General engineer support is also applied through the protection warfighting function control pollution and hazardous materials as well as to harden facilities. Survivability operations include the following engineer tasks:

- Protect against enemy hazards within the AO.
  - Prepare fighting positions. Ensure that vehicle fighting positions, crew-served weapon fighting positions, and individual fighting positions are constructed.
  - Prepare protective positions. Ensure that protective earth walls, berms, and revetments are constructed and that vehicle system, equipment, and material protective positions are also constructed.
  - Employ protective equipment. Ensure that bridge protective devices are installed and that protective obstacles are installed or removed.
- Conduct actions to control pollution and hazardous materials (see FM 3-100.4).

3-115. When conducting stability operations or civil support operations, survivability remains a key commander concern. Although the likelihood of combat operations is reduced, key resources and personnel remain vulnerable to other types of hostile action or attack. Commanders must consider protecting vital resources (such as fuel sites, sustainment convoys, FOBs, and logistic support areas) since the entire AO has an equal potential for enemy attack. Therefore, priority of work for construction assets will be much more focused on protecting these types of resources than constructing fighting positions for combat vehicles or crew-served weapons. Vital resources requiring protection may also include facilities critical to the civilian infrastructure, such as key industrial sites, pipelines, water treatment plants, and government buildings. Engineers also employ protective obstacles as a key tool in protecting these important assets and

locations. Protective obstacles range from tetrahedrons and concrete barriers to networked munitions. Physical barriers provide relatively inexpensive, although inflexible, protection capability. Networked munitions, with their built-in sensor capabilities and central control over nonlethal and lethal fields, provide a flexible intrusion detection and denial system.

This page intentionally left blank.

Chapter 4
Planning Engineer Operations

In preparing for battle I have always found that plans are useless, but planning is indispensable.

Dwight D. Eisenhower

Full spectrum operations follow a cycle of planning, preparation, execution, and continuous assessment. These cyclic activities may be sequential or simultaneous. They are usually not discrete; they overlap and recur as circumstances demand. As a whole, they make up the operations process. As discussed in Chapter 3, engineer operations include multiple interactions with the C2 function and the operations process it drives. Whether a subordinate or supporting unit, engineer unit commanders and their staffs must understand and exercise the art and science of C2, including the cyclical activities of the operations process. Engineer planners and staff members in combined arms or other nonengineer headquarters must understand and become integral members during planning and other operations process activities at that headquarters. Engineers must also understand joint planning processes when supporting joint operations. Engineers use other problem solving activities that address specific engineer functional requirements. This chapter enters the operations process by discussing various planning activities required for effective engineer operations. It describes planning responsibilities, integration, and processes for engineer units and for engineer planners in nonengineer units. Finally, it describes responsibilities and processes for joint engineer planning and selected technical requirements.

SECTION I–INTEGRATED PLANNING

4-1. Planning is part of C2. Planning is the means by which the commander envisions a desired outcome; lays out effective ways of achieving it; and communicates to subordinates his visualization, intent, and decisions. The outcome of planning is a plan or an order that—

- Fosters mission command by clearly conveying the commander's intent.
- Assigns tasks and purposes to subordinates.
- Contains the minimum coordinating measures necessary to synchronize the operation.
- Allocates or reallocates resources.
- Directs preparation activities and establishes times or conditions for execution.

4-2. Commanders use their staffs and integrate input from subordinate commanders into their planning processes. Engineer leaders must understand and be integral participants in the planning processes impacting engineer operations at their echelon of employment. Supporting engineer unit commanders and leaders conduct parallel planning processes that provide both effective outcomes for the engineer units employed and appropriate input to the higher commander's process. Geospatial support elements and engineer staff planners integrate directly within the planning staff at each echelon to participate in the planning process.

4-3. Engineer operations are complex, resource intensive (time, manpower, equipment, and materials), and require extensive and proactive coordination. Additionally, a successful engineering effort requires an

understanding of all engineer requirements (combat, general, and geospatial) and their roles in the concept of operations. Planning, from the perspective of engineer operations, includes even more than the description ascribes to it. Engineer operations must be directed and synchronized through planning as one of the critical activities in the operations process, but many engineer activities also require the critical reasoning skills and problem solving techniques that form the base logic for the planning processes (see FM 5-0). Engineer operations will involve the use of some functionally unique analytic tools to solve construction, design, facilities, and other engineer-specific problems.

PLANNING AT EACH LEVEL OF WAR

4-4. It is important to understand planning within the context of the levels of war (see figure 4-1). Operational-level planning involves broader dimensions of time and space than tactical-level planning. It is often more complex and less defined. Operational-level planners are often required to define an AO, estimate forces required, and evaluate the requirements for the operation. In contrast, tactical-level planning proceeds from an existing operational design. Normally AOs are prescribed, objectives and available forces identified, and sequences of activities specified for tactical-level commanders. Operational- and tactical-level planning, however, are not limited to particular echelons. As echelons of responsibilities have blurred, essentially any engineer unit is capable of supporting a maneuver unit at any level of war. For example, an engineer battalion may deploy to support a JTF or an Army corps at the operational level, or a division or BCT at the tactical level. Engineer planning is conducted at the strategic, operational, and tactical levels and includes all of the engineer functions.

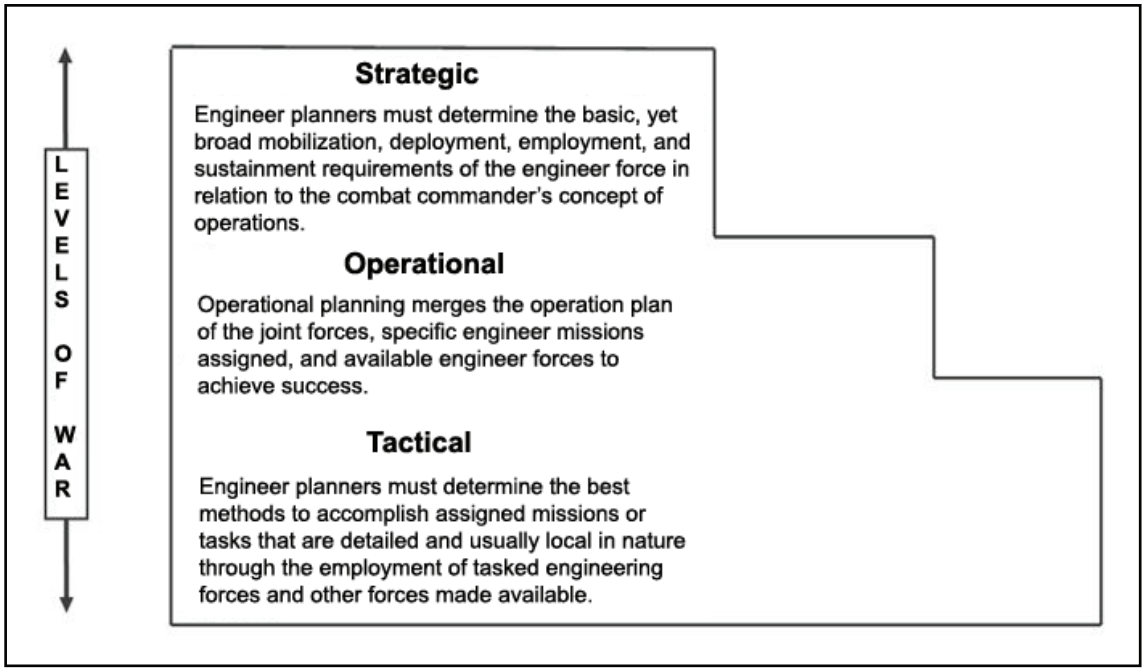


Figure 4-1. Engineer planning at each level of war

4-5. Operational and tactical planning complements one another but have different aims. Operational planning prepares the way for tactical activity on the most favorable terms (proper resourcing) and continually seeks to foster and exploit tactical success. Major operations depend on the creative use of tactical action to accomplish a strategic or operational purpose within a specific situational context against an adaptive opponent. Tactical planning emphasizes flexibility and options. Comprehensive planning may be feasible only for the first event or phase in an operation; succeeding actions depend on enemy response and circumstances. The art of tactical planning lies in anticipation and the development of sound branches and sequels.

4-6. Scope, complexity, and length of planning horizons differ between operational and tactical planning. Campaign planning coordinates major actions across significant time periods and distances to achieve operational objectives. Planners mesh service capabilities with joint and multinational formations, as well as interagency and NGOs. Tactical planning has the same clarity of purpose as operational planning, but has a shorter planning horizon. The plan guides subordinates as they progress through each phase of operations. Comprehensive, continuous, and adaptive planning characterizes successful operations at the operational and tactical levels of war.

4-7. The CCDR or senior Army 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 CCDR's concept of operations. At all levels of planning, the senior engineer commander or the ENCOORD at each echelon must support the development of the supported commander's OPLAN or OPORD, as well as an internal OPLAN or OPORD for the engineer organization. As previously discussed, the ENCOORD is the special staff officer responsible for coordinating engineer assets and operations for the command, including engineer planning. The ENCOORD is usually the senior engineer officer on the staff, but may be a senior engineer commander supporting the force. In select circumstances, the senior engineer commander may also be the supported commander.

4-8. In planning engineer operations at every level, the engineer planner should consider a number of general considerations, including speed, economy, flexibility, decentralization of authority, and establishment of priorities (see figure 4-2).

SPEED. Engineering tasks are resource intensive in terms of time, materials, manpower, and equipment. Practices that support speed include use of existing facilities, standardization, simplicity of design and construction, base-base construction, and construction in phases.

ECONOMY. Engineering demands efficient use of personnel, equipment, and materials. Practices that support economy include the conservation of manpower, equipment, and materials and the application of environmental consideration early in the process.

FLEXIBILITY. Standard plans that allow for adjustment, expansion, and contraction will be used whenever possible. For example, forward airfields should be designed and located so that they can be expanded into more robust facilities.

DECENTRALIZATION OF AUTHORITY. Dispersion of forces requires that engineer authority be decentralized as much as possible. The engineer commander at a particular location must have authority consistent with responsibilities.

ESTABLISHMENT OF PRIORITIES. Establish priorities and resource allocation to determine how much engineer effort must be devoted to a single task. All levels of command, beginning with the joint force commander, will issue directives establishing broad priorities. Resources are initially assigned to the highest priority tasks while low priority tasks may be left undone while recognizing and mitigating the risk.

Figure 4-2. Engineer planning considerations

OPERATIONAL COMPONENT CONSIDERATIONS

4-9. During combat operations, engineer units will tend to have command relationships to maneuver commanders. Engineer units are normally task-organized OPCON for a given offensive mission because it lets the gaining unit task-organize and direct the engineer forces. Although the forms of offensive maneuver have different intentions, the planning phase must always begin with predicting the adversary's intent through a thorough understanding of the threat, enemy engineer capabilities, and how the terrain will effect operations. Geospatial products and information become the foundation and common reference for planning. Of all the forms of maneuver, knowledge of the threat's disposition is especially critical and

required for an infiltration or penetration due to the requirements for stealth and surprise. Engineer planning tends to focus on mobility support including a robust reconnaissance effort. A greater degree of planning is required for a penetration from the breach to the ultimate control of the decisive objective.

4-10. Planning for defensive operations is inextricably linked to offensive operations and, for planning purposes, must consider the transition from offensive operations, as well as follow-on offensive operations. During defensive operations, engineers use terrain products to best position the units within the defense. Engineers then work with intelligence staff to describe the threat functions to predict where the threat is likely to attack friendly forces. Engineers work in conjunction with intelligence personnel to determine which sensor capabilities to leverage and best predict and prevent the threat from maneuvering freely into the defended area. Construction planning includes security and survivability considerations. The consideration of counterattack planning or support for the mobile strike force is the same as the typical mobility planning for offensive operations. The ENCOORD works with other staff members to ensure that the counterattack force can mass its effects on the enemy for decisive operations. The type of defensive operation will define the amount and focus of engineer effort required. An area defense will typically require a greater amount of effort due to the increased survivability requirements. A mobile defense's effort will be to a lesser degree (although mobility requirements may increase) because it has greater flexibility and takes advantage of the terrain in depth.

4-11. Stability and civil support operations emphasize nonlethal, constructive actions by Soldiers working among noncombatants. In planning for stability operations, engineers consider requirements necessary for the support of the primary stability tasks. Engineers are typically critical enablers and may lead in the restoration of essential services. The planner considers capabilities needed to establish or restore the most basic services for the provision of food and water, emergency shelter, and basic sanitation (sewage and garbage disposal); engineer assessment of the OE focuses on different aspects of the terrain, as well as friendly and threat capabilities. Terrain products continue to have a great deal of importance, but political and cultural considerations may be more important. Terrain analysts will work with the intelligence staff to develop usable products for the commander to reflect this information if it is available. When analyzing the troops available, the ENCOORD considers HN, third-party NGOs, or other multinational forces involved with engineering capabilities. Interaction with these parties requires engineers to address interoperability, common standards, and mutual agreements. CA forces have a major role in this interaction, working with and through HN agencies and other civilian organizations to enhance the HN government's legitimacy.

4-12. Planning for civil support operations is significantly different from offensive, defensive, or stability operations because of the unique nature of the threat, although the basic missions may be very similar to those of stability operations. The threat will likely be a natural or man-made disaster with unpredictable consequences. Additionally, planners must be aware of the number of statutes and regulations that restrict the Army's interaction with other government agencies and civilians during civil support operations. The local and state response normally leads the effort with a federal response providing support as required. Interagency response during civil support operations is governed by the National Response Framework (NRF), which delegates responsibility to various federal agencies for ESFs. Table 4-1 contains a list of the emergency support functions and federal and DOD coordinators. Each lead agency is responsible for planning within their ESF. Of note is that DOD may provide support to each ESF. USACE and other engineering capabilities of the generating force will have a prominent role in civil support operations.

Table 4-1. Emergency support functions and proponents

Emergency Support Function	*Federal Coordinating Agency*
#1–Transportation	Department of Transportation
#2–Communications	Department of Homeland Security, National Communication System
#3–Public Works and Engineering	Department of Defense, USACE
#4–Firefighting	Department of Agriculture
#5–Emergency Management	Department of Homeland Security, Federal Emergency Management Agency
#6–Mass Care, Housing, and Human Services	Department of Homeland Security, Federal Emergency Management Agency
#7–Resource Support	General Services Administration
#8–Public Health and Medical Services	Department of Health and Human Services
#9–Urban Search and Rescue	Department of Homeland Security, Federal Emergency Management Agency
#10–Oil and Hazardous Material Response	Environmental Protection Agency
#11–Agriculture and Natural Resources	Department of Agriculture
#12–Energy	Department of Energy
#13–Public Safety and Security	Department of Justice
#14–Long-Term Community Recovery	Department of Homeland Security, Federal Emergency Management Agency
#15–External Affairs	Department of Homeland Security

4-13. Army commanders will assume a support role to one or more designated agencies. Engineers can expect to be involved in planning for support of relief operations with geospatial products and analysis of potential areas to establish life-support areas. Engineers may be called on to provide manpower support or general engineering support from units with unique capabilities, such as water purification, temporary shelter, power generation, and firefighting. Engineer commanders and staff will work with the proponent planners to identify requirements and plan engineer applications. See Appendix F for a more detailed discussion of planning for engineer applications in civil support operations.

PARALLEL PLANNING

4-14. Commanders ensure that plans are sent to subordinates in time to allow them to adequately plan and prepare their own operations. To accomplish this, echelons plan in parallel as much as possible. Parallel planning is two or more echelons planning for the same operation nearly simultaneously. It is facilitated by continuous information sharing by the higher headquarters with subordinate units concerning future operations. Parallel planning requires significant interaction between echelons. With parallel planning, subordinate units do not wait for their higher headquarters to publish an OPORD or OPLAN to begin their own planning and orders development process.

4-15. Engineer commanders and the ENCOORD develop a parallel planning process between the supported unit and their task-organized engineer units as well. Although the senior engineer commander may in selected cases be dual hatted as commander and ENCOORD at lower echelons, this is no longer the preferred engineer staff relationship (see discussion in Chapter 3). At the brigade level and above, the senior staff engineer, the ENCOORD, should not be a supporting engineer unit commander. It is critical in either case that the ENCOORD conducts parallel planning with task-organized or subordinate engineer units to facilitate synchronized application of engineer operations. This parallel process feeds into the force commander's MDMP and provides input for an engineer unit OPLAN or OPORD or annex to be published nearly simultaneously and maximizing the time available for execution.

4-16. To facilitate effective parallel planning at the engineer unit level, engineer unit commanders and staff planners must—

- Understand the higher commander's intent and planning guidance.
- Analyze the terrain, OBSTINTEL, and threat capabilities.
- Know their engineer systems and capabilities to accomplish the identified tasks within the time allotted. Identify risks where engineer capabilities are limited or time is short and identify methods to mitigate the risks ensuring that all potential reachback capabilities have been leveraged.
- Consider the depth of the AO and the transitions that will occur among operational elements. This includes integration of environmental considerations.
- Plan for sustainment of the engineer operations. Engineers ensure that all logistical requirements are analyzed and accounted for to the end state of the operation and resourced to accomplish the mission and facilitate future operations.

STAFF PLANNING

4-17. Except in the smallest echelon of Army units, commanders will rely on assistance from a staff to conduct the planning processes which lead to the OPLAN or OPORD. FM 6-0 and FMI 5-0.1 describe the organization and responsibilities of the engineer staff. Engineer planners provide for the integration of engineer-focused considerations on the supported commander's staff at each echelon. Throughout the planning process, the engineer staff must advise supported commanders and their staffs about engineer capabilities, methods of employment, and the additional capabilities and depth of the Engineer Regiment. In the units without organic engineer staff support, including support-type organizations, it may be important for the supporting engineer organization to provide planning support. Liaison may need to be provided in certain situations to ensure that proper and complete staff planning is accomplished.

4-18. *Relevant information* (RI) is all information of importance to commanders and staffs in the exercise of C2. (FM 3-0) In the context of information management, the mission variables make up the major subject categories into which RI is grouped for military operations. See FM 6-0 for a complete discussion of METT-TC variables. The commander and staff consider RI for each variable in all military operations. The relative impact of each variable may vary, but the commander and C2 system consider them all.

4-19. Visualizing the desired outcome requires commanders to clearly understand the situation in the OE. What is the mission? What are the enemy's capabilities and likely actions? What are the characteristics of the AO? How much time is available? What sustainment factors are important? What role do civil considerations play? Analysis of the OE in terms of the operational variables begins as early as possible in the planning process. Analysis in terms of the mission variables begins during mission analysis. Staff sections analyze the situation and its effects on their areas of expertise in terms of METT-TC to maintain their running estimates. Staff running estimates provide the RI commanders need to understand the situation.

4-20. A running estimate is a staff section's continuous assessment of current and future operations to determine if the current operation is proceeding according to plan and if future operations are supportable. Staff sections maintain their running estimates continuously throughout planning, preparation, and execution. During planning, estimates initially focus on assessing which COA is most supportable from

each staff section's perspective. When the commander selects a COA, estimates focus on assessing the status of resources within the section's area of expertise.

SECTION II–PLANNING PROCESSES

4-21. Full spectrum operations demand a flexible approach to planning that adapts planning methods to each situation. An effective planning process structures the thinking of commanders and staffs while supporting their insight, creativity, and initiative. There are two Army doctrinal planning procedures defined in FM 5-0. In units with a formally organized staff, the MDMP helps commanders and staffs develop estimates, plans, and orders. It provides a logical sequence of decision and interaction between the commander and staff. The MDMP provides a common framework that supports the maximum use of parallel planning for all staffs. However, at the lowest tactical echelons, commanders do not have a staff. Consequently, they and subordinate leaders follow TLP. Both procedures hinge on the commander's ability to visualize and describe the mission or operation. Both are means to an end, and their value lies in the result, not the process. Each process can be performed in detail if time permits or in an abbreviated fashion in a time-constrained environment.

4-22. Although not fully developed planning procedures, there are a number of other processes and activities that assist commanders and staffs in planning for engineer operations. In addition to engineer operational considerations in the MDMP, this section describes some of those processes.

- The ENCOORD develops and maintains a running estimate as described in FM 5-0 and FMI 5-0.1, which links engineer input to the MDMP and coordination throughout planning and the other activities of the operations process.
- Plans and orders are the outcome of the planning process and provide direction for the application of engineer operations.
- Assured mobility provides a planning framework to guide the commander and staff in the proactive application of engineer and other combat power to assure the freedom of movement and maneuver.
- Essential tasks for M/CM/S provide the staff a framework for recommending prioritization of the critical enabling tasks.

Note. FMI 5-0.1 introduced the rapid decision-making and synchronization process (RDSP) for use when presented opportunities or threats during execution. Because the RDSP is an execution activity, it is discussed further in Chapter 5.

THE MILITARY DECISION-MAKING PROCESS

4-23. Planning is a form of decision making. *Decision making* is selecting a COA as the one most favorable to accomplish the mission. (FM 6-0) Not all decisions require the same level of planning. Commanders make hundreds of decisions during operations in an environment of great uncertainty, unpredictability, and constant change. The commander makes some decisions very quickly. Other decisions are deliberate, using the MDMP and a complete staff to create a fully developed and written order. The MDMP is defined in detail in FM 5-0 (see figure 4-3, page 4-8). JP 5-0 provides the planning construct in a joint environment in much the same manner.

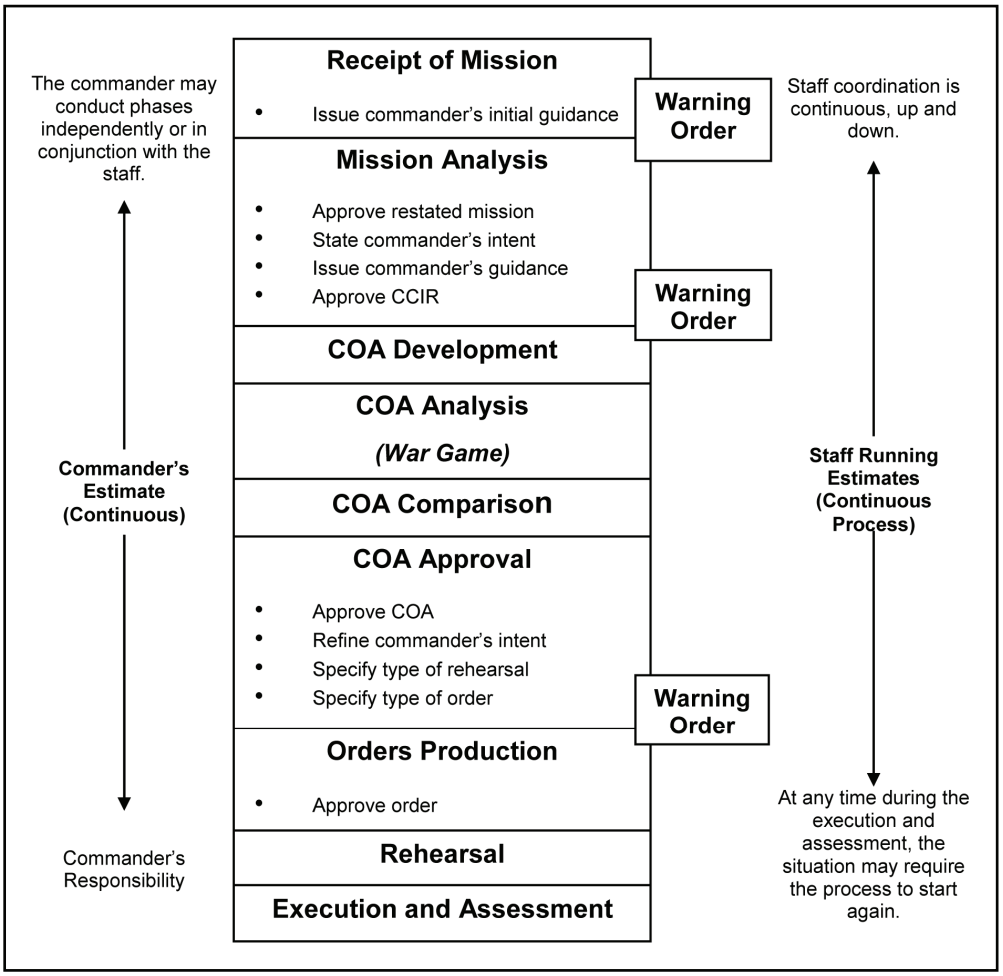


Figure 4-3. The military decision-making process

4-24. Engineer planning will include considerations unique to the particular situation and mission. Some considerations are more generic and can be summarized for broad reference in any application of the MDMP. Table 4-2 lists some of the generic engineer planning considerations as they pertain to each step of the MDMP, focused primarily at operational-level planning.

Table 4-2. Engineer considerations in the military decision-making process

Steps of the MDMP	*Engineer Considerations*
Receipt of the Mission	• Receive higher headquarters plans, orders, and construction directive(s). • Understand the commander's intent and time constraints. • Request geospatial information about the AO. Provide geospatial engineer products to the staff for use during the MDMP. • Establish and participate in engineer-related boards.
Mission Analysis	• Analyze available intelligence on existing obstacles. Evaluate terrain, weather, and threat capabilities to determine potential impact on M/CM/S. • Develop essential tasks for M/CM/S. • Identify available information on routes and key facilities. Evaluate LOCs, APOD, and SPOD requirements. • Determine availability of construction and other engineering materials. • Review availability of engineer capabilities to include Army, joint, multinational, HN, and contract. • Determine beddown requirements for supported force. Review theater construction standards and base camp master planning documentation. Review unified facilities criteria as required. • Review existing geospatial data on potential sites; conduct site reconnaissance (if possible); and determine the threat (to include environmental and EH). • Obtain necessary geologic, hydrologic, and climatic data. • Determine the level of interagency cooperation required. • Determine funding sources as required. • Determine terrain and mobility restraints, OBSTINTEL, threat engineer capabilities, and critical infrastructure. Recommend CCIR. • Integrate reconnaissance effort.
COA Development	• Identify priority engineer requirements, including essential tasks for M/CM/S developed during mission analysis. • Integrate engineer operations into COA development. • Recommend an appropriate level of survivability effort for each COA based on the expected threat. • Produce construction designs that meet the commander's intent (use the Theater Construction Management System [TCMS] if a project is sufficient size and scope). • Determine alternate construction location, methods, means, materials, and timelines to give the commander options. • Determine real property and real estate requirements.
COA Analysis	• War-game and refine the engineer plan. • Use the critical path method (CPM) to determine length of different COAs and the ability to accelerate the project.
COA Comparison	• Determine the most feasible, acceptable, and suitable methods of completing the engineering effort. • Determine and compare the risks of each engineering COA.
COA Approval	• Gain approval of the essential tasks for M/CM/S, construction management plan, safety plan, security plan, logistics plan, and environmental plan as required.
Orders Production	• Produce construction directives as required. • Provide input to the appropriate plans and orders. • Ensure that all resources are properly allocated.
Rehearsal	• Coordinate combined arms rehearsals as appropriate. • Conduct construction prebriefings, preinspections, and construction meetings. • Synchronize construction plans with local and adjacent units.

Table 4-2. Engineer considerations in the military decision-making process

Steps of the MDMP	*Engineer Considerations*
Execution and Assessment	• Implement survivability construction standards, including requirements for security fencing, lighting, barriers, and guard posts. • Conduct quality assurance and midproject inspections. • Participate in engineer-related boards. • Maintain "as built" and "red line" drawings. • Project turnover activities.

STAFF RUNNING ESTIMATE

4-25. The ENCOORD uses the running estimate as a logical thought process and extension of the MDMP. It is conducted by the ENCOORD concurrently with the planning process of the supported force commander and is continually refined. This estimate allows for early integration and synchronization of engineer considerations into combined arms planning processes. In their running estimates, staff sections continuously consider the effect of new information and update: assumptions, friendly force status, effects of enemy activity, civil considerations, and conclusions and recommendations. A section's running estimate assesses the following:

- Friendly force capabilities with respect to ongoing and planned operations.
- Enemy capabilities as they affect the section's area of expertise for both current operations and future plans.
- Civil considerations as they affect the section's area of expertise for both current operations and future plans.
- OE's effect on current and future operations from the section's perspective.

4-26. The development and continuous maintenance of the running estimate drives the coordination between the staff engineer, supporting engineers, the supported commander, and other staff officers in the development of plans, orders, and the supporting annexes. Additionally, the allocation of engineer assets and resources assists in determining command and support relationships that will be used. Table 4-3 shows the relationship between the MDMP and the engineer staff running estimate.

Table 4-3. The military decision-making process and the engineer estimate

Military Decision-Making Process	*Engineer Staff Running Estimate*
Mission Analysis: • Analyze higher headquarters order. • Conduct IPB. • Determine specified, implied, and essential tasks. • Review available assets. • Determine constraints. • Identify critical facts and assumptions. • Conduct risk assessment. • Determine CCIR. • Develop ISR plan. • Plan use of available time. • Write restated mission. • Conduct mission-analysis briefing. • Approve restated mission. • Develop commander's intent. • Issue commander's guidance. • Issue warning order. • Review facts and assumptions.	Mission Analysis: • Analyze higher headquarters orders, including— ▪ Commander's intent. ▪ Mission. ▪ Concept of operation. ▪ Timeline. ▪ AO. • Conduct IPB and develop engineer staff running estimate, including— ▪ Terrain and weather analysis. ▪ Enemy mission and M/CM/S capabilities. ▪ Friendly mission and M/CM/S capabilities. • Analyze the engineer mission, including— ▪ Specified M/CM/S tasks. ▪ Implied M/CM/S tasks. ▪ Assets available. ▪ Limitations. ▪ Risk as applied to engineer capabilities. ▪ Time analysis. ▪ Identify essential tasks for M/CM/S. ▪ Restated mission. • Conduct risk assessment. ▪ Safety. ▪ Environment. • Determine terrain and mobility restraints, OBSTINTEL, threat engineer capabilities, and critical infrastructure. Recommend CCIR. • Integrate engineer reconnaissance effort.
COA Development	Develop scheme of engineer operations. • Analyze relative combat power. • Refine essential tasks for M/CM/S. • Identify engineer missions and allocation of forces and assets. • Determine engineer priority of effort and support. • Refine commander's guidance for M/CM/S operations. • Apply engineer employment considerations. • Integrate engineer operations into the maneuver COA.
COA Analysis	War-game and refine the engineer plan.
COA Comparison	Recommend a COA.
COA Approval	Finalize the engineer plan.
Order Production	• Input the following into a basic OPORD: ▪ Scheme of engineer operations. ▪ Essential tasks for M/CM/S. ▪ Subunit instructions. ▪ Coordinating instructions. • Prepare engineer annex and appendixes.

PLANS AND ORDERS

4-27. The staff prepares the order or plan by turning the selected COA into a clear, concise concept of operations and required supporting information. The concept of operations for the approved COA becomes the concept of operations for the plan. The COA sketch becomes the basis for the operation overlay. Orders and plans provide all information subordinates need for execution. Mission orders avoid unnecessary constraints that inhibit subordinate initiative. The staff assists subordinate unit staffs with their planning and coordination.

4-28. The engineer staff planner provides input for the appropriate paragraphs in the base plan, as well as annexes and appendixes of the plan as found in FM 5-0. Chairman, Joint Chiefs of Staff Manual [CJCSM] 3122.03B, Volume II, is used for joint planning and resulting joint plans and orders. In addition to developing input for the functionally specific paragraphs in the base plan, annexes, and appendixes of the plan, engineer planners must review other sections. Engineers ensure the integration of geospatial support in appropriate sections and annexes. Engineers review the task organization to ensure sufficient capability to meet identified requirements. The engineer planner recommends appropriate command or support relationships. Additionally, planners provide input to the flow of the engineer force as detailed on the time-phased force and deployment data (TPFDD). Engineers review operations sections, annexes, and overlays to ensure the inclusion of obstacle effects or other graphics and assist in conveying engineer operations. In the fires sections, engineers work with the fire support coordinator and other members of the staff to integrate obstacles with fire, including SCATMINEs and confirming that all obstacles are covered by fire.

4-29. An engineer annex is the principal means through which the engineer defines engineer support to the maneuver commander's intent, essential tasks for M/CM/S, and coordinating instructions to subordinate commanders. It is not intended to function as the internal order for an engineer organization, where the engineer commander will articulate intent; concept of operations; and coordinating instructions to subordinate, supporting, and supported commanders. The preparation of the annex seeks to clarify engineer support to the OPLAN or OPORD and includes the—

- ENCOORDs overall description of the concept for engineer operations, including approved essential tasks for M/CM/S.
- Priorities of work to shape the theater or AO (not in a tactical-level engineer annex).
- Operational project planning, preparation, and execution responsibilities (not in a tactical-level engineer annex).
- Engineer organization for combat.
- Essential tasks for M/CM/S for subordinate units.
- Allocations of Class IV (construction and barrier materials) and Class V (munitions and demolitions).

Note. Guidance to maneuver units on obstacle responsibilities should be listed in the body of the basic order, not in the annex.

4-30. The ENCOORD may produce an engineer overlay in conjunction with the operations overlay to highlight obstacle information or breaching operations. A gap crossing operation may require a separate annex as part of an order.

4-31. The ENCOORD performs as the staff integrator and advisor to the commander for environmental considerations. An environmental considerations appendix parallels guidance from the joint OPLAN, OPORD, or concept plan (CONPLAN). See FM 3-100.4 for an example of this appendix. When specific command procedures dictate, other staff officers include some environmental considerations in logistics and medical annexes. Unit planning at the regiment or brigade level and below will normally include only those elements required by higher headquarters orders or plans that are not already included in a unit SOP. If this appendix is not written, appropriate material will be placed in the coordinating instructions of the basic order.

ASSURED MOBILITY

4-32. Planners employ the fundamentals of assured mobility as a planning process to assure the ability of the joint force to deploy and maneuver where and when desired, without interruption or delay, to achieve the mission. This construct is one means of enabling a joint force to achieve the commander's intent. Assured mobility emphasizes proactive mobility and countermobility (and supporting survivability) actions and integrates all of the engineer functions in accomplishing this. The fundamentals of assured mobility may also be, in certain circumstances, employed during the integrated application of the broader array of maneuver support capabilities.

4-33. Assured mobility can be applied at the strategic level (ports, rail, and roads), at the operational level (sustainment routes and airfields), and at the tactical level (the commander's freedom to maneuver). While the engineer has the primary staff role in assured mobility, other staff members support its integration and have critical roles to play. Ultimately, assured mobility is the commander's responsibility. The fundamentals of assured mobility are predict, detect, prevent, avoid, neutralize, and protect. These fundamentals support the implementation of the assured mobility framework.

- Predict. Engineers and other planners must accurately predict potential enemy impediments to joint force mobility by analyzing the enemy's TTP, capability, and evolution. Prediction requires a constantly updated understanding of the OE.
- Detect. Using ISR assets, engineers and other planners identify the location of natural and man-made obstacles, preparations to create and emplace obstacles, and potential means for obstacle creation. They identify both actual and potential obstacles and propose solutions and alternate COAs to minimize or eliminate their potential impact.
- Prevent. Engineers and other planners apply this fundamental by denying the enemy's ability to influence mobility. This is accomplished by forces acting proactively before the obstacles are emplaced or activated. This may include aggressive action to destroy enemy assets and capabilities before they can be used to create obstacles.
- Avoid. If prevention fails, the commander will maneuver forces to avoid impediments to mobility, if this is viable within the scheme of maneuver.
- Neutralize. Engineers and other planners plan to neutralize, reduce, or overcome obstacles and impediments as soon as possible to allow unrestricted movement of forces. The breaching tenets and fundamentals apply to the fundamental of "neutralize."
- Protect. Engineers and other elements plan and implement survivability and other protection measures that will deny the enemy the ability to inflict damage as joint forces maneuver. This may include countermobility missions to deny the enemy maneuver and provide protection to friendly maneuvering forces.

ESSENTIAL TASKS FOR MOBILITY, COUNTERMOBILITY, AND SURVIVABILITY

4-34. Increased engineer requirements in the OE may limit engineer resources immediately available to support mobility operations. Combat and general engineering requirements are often in competition for the same engineer assets. The maneuver commander sets the priorities to allow the force to perform the most critical tasks. The ENCOORD and other staff members assist the maneuver commander in his decision by identifying essential tasks for M/CM/S.

4-35. An essential task for M/CM/S is a specified or implied M/CM/S task that is critical to combined arms mission success. Like other essential tasks, these tasks are identified from the specified and implied tasks listed during mission analysis. Although ultimately executed by a combined arms element, the staff

(typically elements such as engineer, CBRN, MP, or EOD) identifies and recommends the essential tasks for M/CM/S to the commander. A fully developed essential task for M/CM/S includes the task and purpose.

- Task. A task is one or more clearly defined and measurable activities accomplished by individuals and organizations required to achieve the desired effects (see FM 7-0). These are the most important M/CM/S tasks that must be accomplished. Often the entire operation is dependent on completing these tasks, and without their successful completion, the operation is at risk.
- Purpose. The purpose is the desired or intended result of the task, stated in terms relating to the purpose of the supported unit. This portion of the essential task for M/CM/S explains why it must be accomplished. It also provides intent to the engineer commander so he can be reactive as the situation changes.

4-36. The maneuver commander uses essential tasks for M/CM/S to communicate to subordinate maneuver units what he wants accomplished with available assets to perform M/CM/S tasks. This provides the maneuver unit with clear priorities and unity of purpose in planning, preparation, and execution. Essential tasks for M/CM/S also provide CBRN, MP, PSYOPs, CA, and other nonengineer elements clearly articulated tasks related to M/CM/S. Sample engineer related essential tasks for M/CM/S might include—

- Essential task for M/CM/S #1 (see FM 3-34.170).
  - Task: Conduct engineer reconnaissance of MSR Tigers from CP 1 to CP 2.
  - Purpose: Classify the route, identify impediments to maneuver, and facilitate planning of route clearance operations.
- Essential task for M/CM/S #2 (see FM 3-34.170 and FM 3-90.12).
  - Task: Conduct engineer reconnaissance of Crossing Area White.
  - Purpose: Collect and confirm crossing site data, and locate key BCT river crossing locations.
- Essential task for M/CM/S #3 (see FM 3-34.170).
  - Task: Conduct an infrastructure reconnaissance of the power station at grid ST231546.
  - Purpose: Assess the status of the power station to enhance the SU of critical infrastructure throughout the AO.
- Essential task for M/CM/S #4 (see FM 3-34.170).
  - Task: Conduct engineer reconnaissance of buildings at grid ST234544.
  - Purpose: Determine if the buildings are adequate to house a BCT headquarters from a protection standpoint.
- Essential task for M/CM/S #5 (see FM 3-34.2).
  - Task: Conduct a deliberate breach at point of penetration 1 and 2.
  - Purpose: To facilitate the passage of BCT maneuver forces through obstacles and continue the attack to BCT Objectives Red and Green.
- Essential task for M/CM/S #6 (see FM 3-34.2).
  - Task: Conduct a route clearance of Route Dolphin.
  - Purpose: To clear the route of all obstacles and EH, in order to facilitate the uninterrupted movement of critical sustainment elements and allow resupply of BCT elements.
- Essential task for M/CM/S #7 (see FM 5-103).
  - Task: Employ sensored, scaleable obstacles as part of base camp security.
  - Purpose: Provide early warning and a combination of nonlethal and lethal means of defeating intruders.
- Essential task for M/CM/S #8 (see FM 5-103).
  - Task: Support hardening of FOB Bears.
  - Purpose: Construct revetments and berms to protect key assets at the FOB.

4-37. Essential tasks for M/CM/S development begins during the mission analysis phase of the MDMP. During this phase, planners identify specified and implied tasks and associated purpose. From these tasks, combined with the maneuver commander's guidance, the ENCOORD and other staff representatives recommend essential tasks for M/CM/S to maneuver commanders during the mission analysis brief. After essential tasks for M/CM/S are approved, the ENCOORD and other planners integrate them into COA development.

SECTION III–JOINT AND OTHER PROCESSES

JOINT ENGINEER PLANNING

4-38. Joint planning is focused at the strategic and operational levels of war. While corps and below Army units normally conduct Army tactical planning, Army forces frequently participate in or conduct joint operations planning. For example, ASCCs routinely participate in joint operation planning, to include developing plans as the joint force land component. Corps and divisions perform joint operations planning when serving as a JTF or Army forces headquarters. Corps, divisions, and brigades directly subordinate to a JTF participate in joint operations planning and receive joint formatted orders. It is important that Army leaders serving in headquarters above battalion understand the joint planning process and are familiar with the joint format for plans and orders.

4-39. The primary joint doctrinal publication for planning engineer operations is JP 3-34. Army planners should understand that the Air Force and Navy have a narrower focus for the engineering mission and consider (general) engineering to be primarily a logistic function that is executed to sustain their forces in a contingency operation. Their activities tend to focus on missions (such as base camp and life support development and construction and repair of SPODs, APODs, and other facilities and sites) and not focus on operational support to ground maneuver forces. The NCF's DS bridging mission in support of maneuver forces is an exception to this broad generalization of the Navy focus areas.

4-40. Joint engineer activities and considerations are similar during both the contingency and crisis action planning processes. For additional information about the deliberate planning and crisis action planning processes, see CJCSM 3122.01A, Volume I, and JP 5-0. The ESP (Appendix 6, Annex D, of a joint OPLAN) is produced by a joint engineer staff for input to a joint OPLAN as part of the planning process. It ensures that essential engineering capabilities are identified and will be provided at the required locations and times. It is the most critical appendix for engineering in a joint OPLAN. Other critical portions of a joint OPLAN for engineer planning include—

- Appendix 8, Annex C: Air Base Operability.
- Appendix 15, Annex C: Force Protection.
- Appendix 16, Annex C: Critical Infrastructure Protection.
- Appendix 5, Annex D: Mobility and Transportation.
- Annex G: Civil-Military Operations.
- Annex L: Environmental Considerations.
- Annex M: Geospatial Information and Services.

4-41. The engineer prepares several annexes and appendixes, provides significant input to others, and must review still others due to their possible significant impact on engineer operations (see table 4-4, page 4-16).

Table 4-4. Operation plan annexes

Subject	*Annex*	*Subject*	*Annex*
Task Organization	**A**	Communications System	K
Intelligence	B	Environmental Considerations	L
Operations Appendix A, Special Operations Appendix 6, Rules of Engagement Appendix 7, Reconnaissance **Appendix 8, Air Base Operability** **Appendix 12, Counterattack** Appendix 13, Explosive Ordnance Disposal **Appendix 14, Amphibious Operations** **Appendix 15, Force Protection** **Appendix 16, Critical Infrastructure Protection**	**C**	**Geospatial Information and Services**	**M**
Logistics **Appendix 5, Mobility and Transportation** Appendix 6, Engineer Support Plan	**D**	Space Operations	N
Personnel	E	Host-Nation Support	P
Public Affairs	F	Medical Services	Q
Civil-Military Operations	**G**	Special Technical Operations	S
Meteorological	H	Execution Checklist	X
Command Relationships	J	Distribution	Z
The joint force engineer— ● Prepares italicized *annexes and appendixes*. ● Provides significant input for the development of bolded **annexes and appendixes**. ● Reviews all other annexes and appendixes due to their possible significant impact on engineer operations and provides input as appropriate.			

4-42. The Joint Engineer Planning and Execution System (JEPES) is a tool used to support quantitative aspects of engineering support planning and execution. It provides the general requirements for the ESP and provides a common automated system for the joint force engineer planners to determine the appropriate amount of engineer assets and capabilities to support the selected COA. JEPES is the engineer component of the Global Combat Support System, a web-based application residing on the SIPRNET. JEPES assists engineer planners in determining the correct engineer capability for the proper location, timed correctly to support the concept of operations. JEPES includes a TCMS module to assist with facilities planning and links into construction resource and materials planning. It also includes an environmental module. JEPES is used to—

- Generate time-phased facility requirements based on the OPLAN.
- Analyze and assess engineering support by comparing facility requirements to in-theater facility assets and HN, contract, and troop engineering capability.
- Provide facility feasibility assessment, manpower, material, and nonunit cargo requirements for other processes.
- Provide infrastructure data to assist in mission analysis and COA development.
- Provide real time monitoring capability needed to track plan execution.

FORCE PROJECTION

4-43. *Force projection* is the ability to project the military instrument of national power from the U.S. or another theater in response to requirements for military operations. (JP 5-0) Force projection operations extend from mobilization and deployment of forces to redeployment to CONUS or home theater.

4-44. The most important characteristic of force projection is synchronizing assets at all levels of war and projecting forces rapidly in response to a crisis or other military requirement. Force projection operations may begin as contingency operations, involving imminent or actual involvement during war, or as conflict on a regional scale involving stability or support missions. Force projection also applies to rapidly deploying forces to respond to a Homeland Security requirement or national emergency or disaster. In combat operations, theater aims may be achieved faster by committing a smaller forward presence force than by waiting for a larger, but less timely, response option. In this case, U.S. forces could be opposed; however, force projection may occur unopposed. Unopposed operations could afford forces time to continue to build combat power, train, and acclimate after they arrive in-theater. The engineer will conduct force projection as part of the overall joint and, possibly, multinational force operation. Engineer support efforts require close coordination with joint and coalition military engineer forces and other agencies to meet force projection requirements. Operational requirements for force projection enablers may require creating or upgrading an intermediate staging base, a rapid port enhancement, or a similar support. These missions would require extensive use of engineer support in the earliest stages of force projection.

4-45. Force projection encompasses five processes—mobilization, deployment, employment, sustainment, and redeployment—that normally occur in a continuous, overlapping, and iterative sequence for the duration of the mission (see figure 4-4, page 4-18).

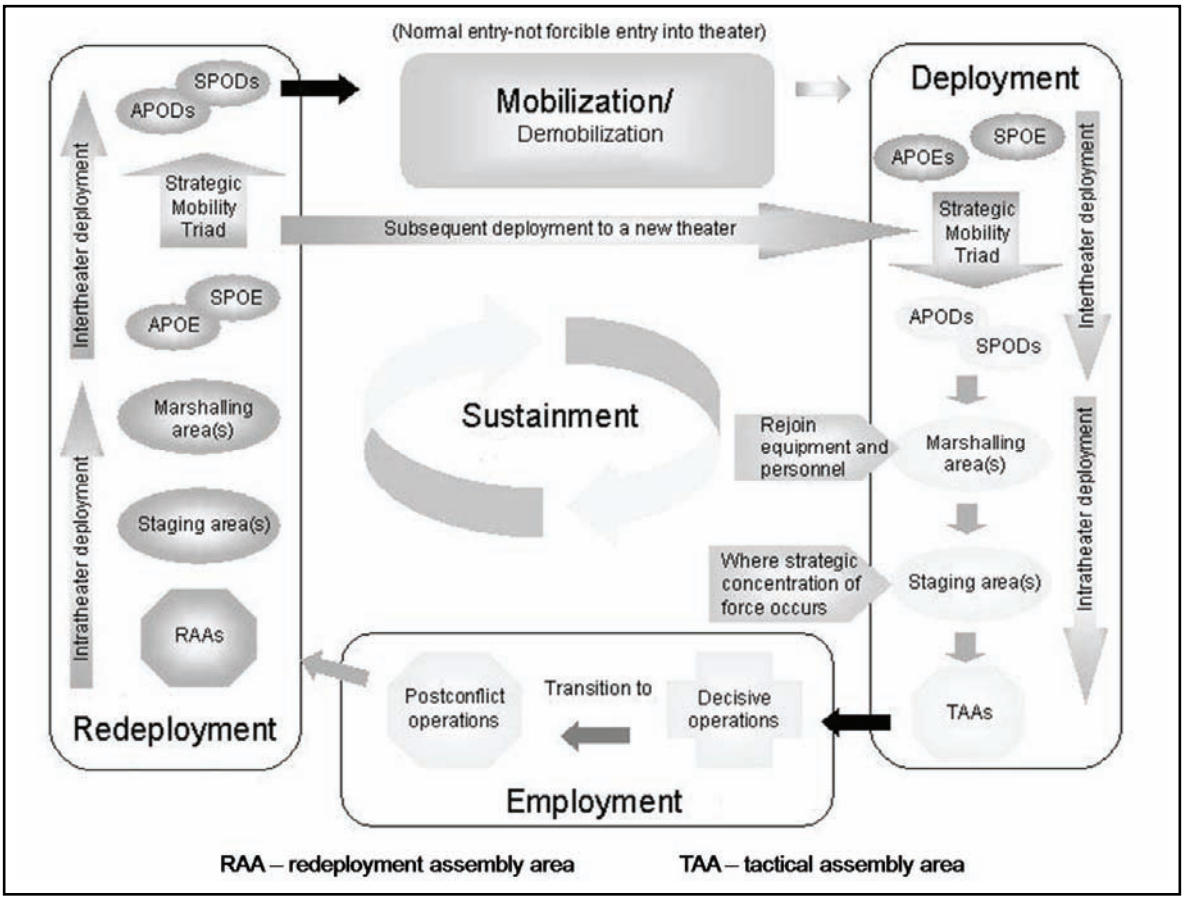


Figure 4-4. Force projection process

4-46. Deployment activities, for example, might be so closely followed by decisive operations that they are indistinct from one another. Decisive operations may begin well before the entire force has completely deployed. At a minimum, commanders and staffs must consider the—

- Coordination of sequencing and phasing of forces (maneuver, operational support, operational protection, SOF, and C2/intelligence and surveillance [IS]/ISR).
- Requirement and time frame to establish and build up the theater infrastructure.
- Environmental issues and the need to reduce the risk of negative impacts on HSS.
- Protection of forces, to include security operations, TCF, and ADC.
- Preparation time for deployment and operational readiness (types of units and their readiness).
- CCDR's critical items list in the TPFDD flow.
- Requirement and level of in-theater stocks.
- HN capability and availability.

4-47. Any particular force projection operation may not include all of the processes. For example, a force projection operation may be the first phase of an evolving major operation. Redeployment of all forces may not begin until the end of the subsequent phases of the major operation, of which the force projection was a single phase.

FACILITIES AND CONSTRUCTION PLANNING

4-48. Engineers must plan for the acquisition of uncontaminated land and facilities and their management and ultimate disposal to support operations, including—

- Operational facilities (such as CPs, airfields, and ports).

- Logistic facilities (such as maintenance facilities, supply points, warehouses, ammunition supply points (ASPs), and APOD or SPOD for sustainment).
- Force beddown facilities (such as dining halls, billeting, religious support facilities, clinics, and hygiene facilities).
- Common-use facilities (such as roads and joint RSOI facilities).
- Protection facilities (such as site selection, proximity to potential threat areas, and sniper screening).

4-49. The commander determines what facilities are needed to satisfy operational requirements. Facilities are grouped into six broad categories that emphasize the use of existing assets over new construction. To the maximum extent possible, facilities or real estate requirements should be met from these categories in the following priority order:

- U.S.-owned, occupied, or leased facilities (including captured facilities).
- U.S.-owned facility substitutes pre-positioned in-theater.
- HN or multinational support where an agreement exists for the HN or multinational element to provide specific types and quantities of facilities at specified times in designated locations.
- Facilities available from commercial sources.
- U.S.-owned facility substitutes stored in the United States.
- Construction of facilities that are considered shortfall after an assessment of the availability of existing assets.

4-50. The engineer staff should plan expeditious construction of facility requirements that are considered shortfalls (such as those facilities that cannot be sourced from existing assets). In these circumstances, the appropriate Service, HN, alliance, or coalition should—to the extent possible—perform construction during peacetime. Contracting support should be used to augment military capabilities. If time constraints risk new construction not being finished in time to meet mission requirements, the engineer should seek alternative solutions to new construction. Expedient construction (rapid construction techniques such as prefabricated buildings and clamshell structures) should also be considered, because these methods can be selectively employed with minimum time, cost, and risk.

4-51. Adequate funding (see Appendix G) must be available to undertake early engineer reconnaissance and acquisition of facilities to meet requirements, whether by construction or leasing. Funding constraints are a planning consideration. The commander articulates funding requirements for construction and leasing of facilities by considering the missions supported and the amount of funds required. Funding requirements include facility construction, associated contract administration services, and real estate acquisition and disposal services. Facility construction planning must be routinely and repetitively accomplished to ensure that mission-essential facilities are identified well in advance of the need and, wherever possible, on-the-shelf designs are completed to expedite facility construction in time of need.

4-52. The CCDR, in coordination with Service components and the Services, specifies the construction standards for facilities in the theater to optimize the engineer effort expended on any given facility while assuring that the facilities are adequate for health, safety, and mission accomplishment. Figure 4-5, page 4-20, shows the beddown and basing continuum and highlights the need for early master planning efforts to help facilitate transition to more permanent facilities as an operation develops. While the timelines provide a standard framework, the situation may warrant deviations from them. In addition to using these guidelines when establishing initial construction standards, the JFUB should be used to periodically revalidate construction standards based on current operational issues and provide recommendations to the commander on potential changes. Ultimately, it is the CCDR who determines the exact construction type based on location, materials available, and other factors. Construction standards are guidelines and the engineer must consider other factors in their planning (see FM 3-34.400 and JP 3-34 for additional discussion of construction standards).

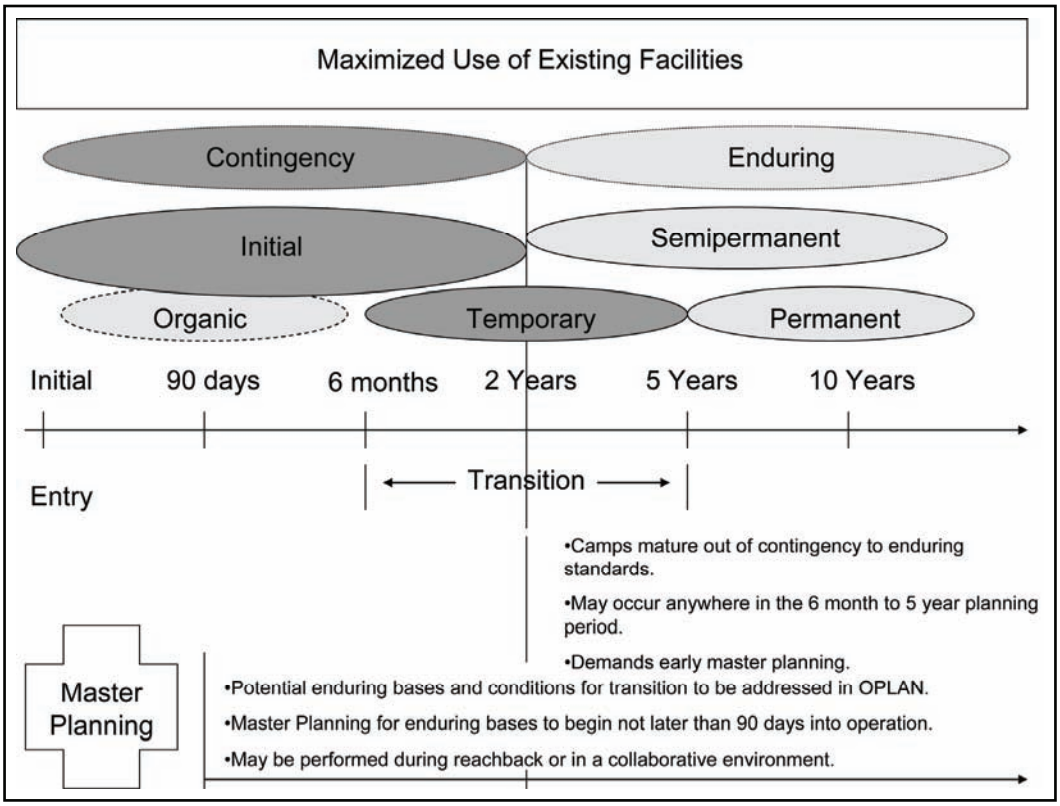


Figure 4-5. Force beddown and base development

4-53. Unified facilities criteria (UFC) provide facility planning, design, construction, operations, and maintenance criteria for all DOD components. Individual UFC are developed by a single-disciplined working group and published after careful coordination. They are jointly developed and managed by USACE, NAVFAC, and the Air Force Civil Engineer Support Agency (AFCESA). Although UFC are written with long-term standards in mind, planners who are executing under contingency and enduring standards for general engineering tasks will find them useful. Topics include pavement design, water supply systems, military airfields, concrete design and repair, plumbing, electrical systems, and many more.

4-54. UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. UFC are effective upon issuance and are distributed only in electronic media from the following sources:

- UFC index at <http://65.204.17.188//report/doc_ufc.html>.
- USACE Technical Information at <http://www.hnd.usace.army.mil/techinfo>.
- NAVFAC Engineering Innovation and Criteria Office at <http://www.wbdg.org/references/pa_dod.php>.
- Construction Criteria Base System maintained by the National Institute of Building Sciences at <http://www.wbdg.org/ccb>.

4-55. General engineer planners must consider any and all construction standards established by CCDRs and ASCCs for their AOR. Specific examples of these are the "Red Book" in the United States European Command (USEUCOM) AOR and "Sand Book" in United States Central Command (USCENTCOM). These constantly evolving guidebooks specifically establish base camp standards that consider regional requirements for troop living conditions and therefore have a major impact on projects such as base camps and utilities. Because availability of construction materials may vary greatly in various AORs, standards of construction may differ greatly between them. CCDRs often establish standards for construction in OPORDs and FRAGOs that may take precedence over guidebooks. Planners must understand the expected

life cycle of a general engineering project to apply these standards. Often the standards will be markedly different, depending on whether the construction is contingency or is intended to have an enduring presence.

PROJECT MANAGEMENT

4-56. Planners use the project management system described in FM 5-412 as a tool for the process of coordinating the skill and labor of personnel using machines and materials to form the materials into a desired structure. Figure 4-6 shows the project management process that divides the effort into the preliminary planning, detailed planning, and project execution. Today, when engineer planners are focused on general engineering tasks, they rely extensively on the TCMS to produce the products required by the project management system. These products include the design, activities list, logic network, CPM or Gantt Chart, bill of materials, and other products. Effective products produced during the planning phases also greatly assist during the construction phase. In addition to TCMS, the engineer has various other reachback tools or organizations that can exploit resources, capabilities, and expertise that is not organic to the unit that requires them. These tools and organizations include, but are not limited to, USAES, USACE Engineering Infrastructure and Intelligence Reachback Center and ERDC Tele-Engineering Operations Center, the 412th and 416th TECs, AFCESA, and NAVFAC. See Appendix H for additional information on how to access reachback support.

4-57. The project management process normally begins at the unit level with the construction directive. This gives who, what, when, where, and why of a particular project and is similar to an OPORD in its scope and purpose. Critical to the construction directive are plans, specifications, and all items essential for success of the project. Units may also receive general engineering missions as part of an OPORD, FRAGO, warning order, or verbal order/instruction. When a leader analyzes a construction directive, he may need to treat it as a FRAGO in that much of the information required for a thorough mission analysis may exist in an OPORD issued for a specific contingency operation.

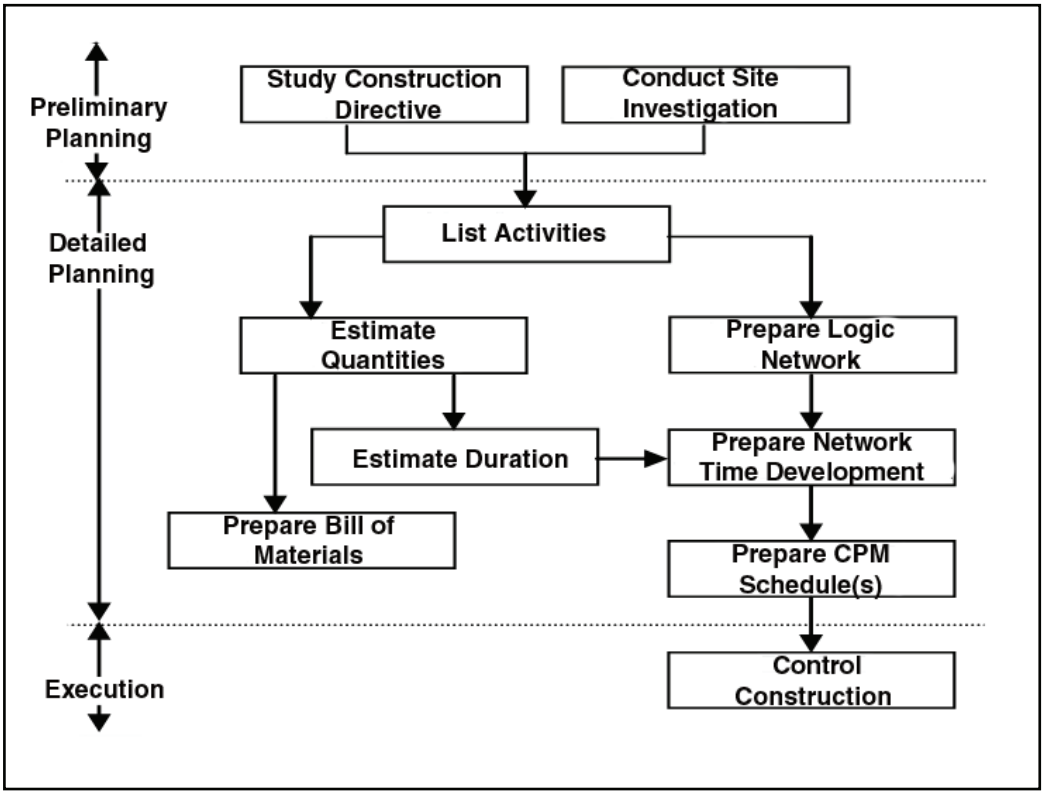


Figure 4-6. Project management process

This page intentionally left blank.

Chapter 5

Preparing, Executing, and Assessing Engineer Operations

Prepare for the unknown by studying how others in the past have coped with the unforeseeable and the unpredictable.

General George S. Patton

Full spectrum operations conducted overseas simultaneously combine: offensive, defensive, and stability operations. Within the United States and its territories, operations simultaneously combine offensive, defensive, and civil support operations. Army forces adapt to the requirements of the OE and conduct operations within it. Army forces operate through ever-changing combinations of full spectrum operations using synchronized action, joint interdependent capabilities, and mission command. They defeat enemies on land using offensive and defensive operations and engage the populace and civil authorities in the AO using stability or civil support operations. The effort accorded to each component is proportional to the mission and varies with the situation. Each element of full spectrum operations—offense, defense, and stability or civil support—is necessary in any campaign or joint operation. Synchronized through the warfighting functions, engineer operations contribute significant combat power, both lethal and nonlethal in nature, to all of the elements of full spectrum operations. The operations process is the context within which engineer capabilities are integrated into combined arms application. Chapter 4 entered the operations process by discussing various planning activities required for effective engineer operations. This chapter continues in that context by discussing preparation, execution, and continuous assessment of the entire spectrum of engineer operations.

SIMULTANEOUS COMBINATIONS

5-1. Full spectrum operations require simultaneous combinations of up to three elements—offense, defense, and stability or civil support. Figure 5-1, page 5-2, lists the elements of full spectrum operations, the primary tasks associated with them, and the purposes of each element. Each primary task has numerous associated subordinate tasks.

5-2. Engineer operations describe the synchronized application of engineer combat power capabilities in support of full spectrum operations. Engineer capabilities are organized by the engineer functions and synchronized in their application through the warfighting functions. As described in Chapter 3, the operations process activities provide the context in which both the synchronization and application are integrated into the combined arms operation. Chapter 4 described integration of engineer operations through the planning activities. This chapter will discuss integration through the preparation, execution, and continuous assessment activities of the process.

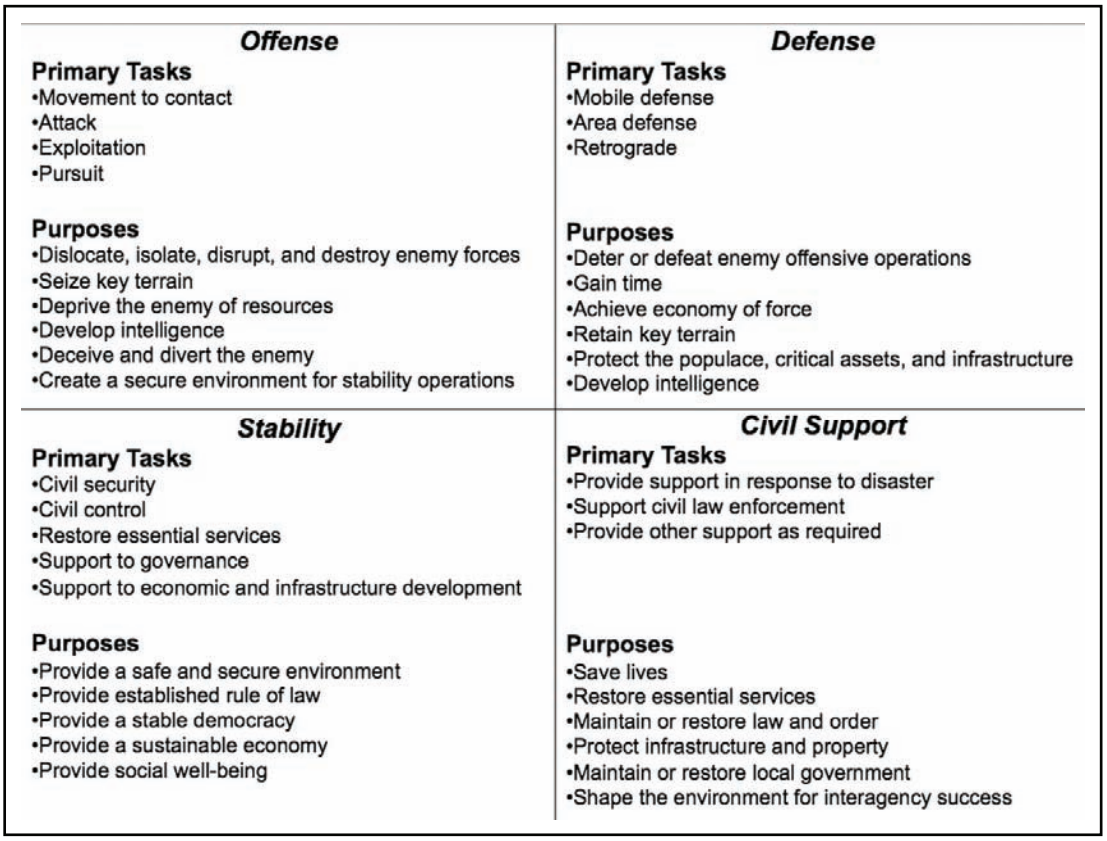


Figure 5-1. Elements of full spectrum operations

OPERATIONS PROCESS ACTIVITIES

5-3. Preparation consists of activities performed by the unit before execution to improve its ability to conduct the operation. Preparation requires staff, unit, and Soldier actions. Mission success depends as much on preparation as planning. Rehearsals help staffs, units, and individuals to better understand their specific role in upcoming operations, practice complicated tasks before execution, and ensure equipment and weapons function properly. Key preparation activities include—

- Revision and refinement of the plan.
- Rehearsals.
- Tailoring and task-organizing.
- Surveillance and reconnaissance.
- Training.
- Troop movements.
- Preparations checks and inspections.
- Sustainment preparations.
- Integrating new Soldiers and units.
- Subordinate confirmation back briefs.

5-4. In many cases, engineer units conduct these preparation activities integrated within the combined arms task organizations required by the operation. Combined arms rehearsals are critical to the success of a breaching, clearing, or gap crossing operation. Similarly, ERTs can be employed as integrated elements in a combined arms reconnaissance formation. In every case, engineer reconnaissance efforts must be integrated within the ISR plan. As required, engineer forces will conduct additional construction or other

technical preparation activities focused on the specific mission. Construction and technical preparation activities include—

- Complete and review the design. In a design-build process, the design will typically only be completed at a 10 to 30 percent resolution prior to execution.
- Conduct any necessary preconstruction studies or surveys.
- Identify additional technical support required.
- Complete any detailed planning activities not yet completed from the project management process, such as estimates, bill of materials, and schedules.
- Prepare the construction site as required; for example, stage equipment, stockpile materials, and complete temporary construction.

5-5. Execution is putting a plan into action by applying combat power to accomplish the mission and using SU to assess progress and make execution and adjustment decisions. It focuses on concerted action to seize, retain, and exploit the initiative. The Army's operational concept emphasizes executing operations at a tempo enemies cannot match by acting or reacting faster than they can adapt. To achieve this type of flexibility, commanders use mission command to focus subordinate commanders' initiative. Subordinates exercising initiative within the commander's intent can significantly increase tempo; however, they also may desynchronize the unit's warfighting functions. This may reduce commanders' ability to mass the effects of combat power. Even relatively minor, planned actions by CP cells affect other cells' areas of expertise, affecting the operation's overall synchronization.

5-6. Collaborative synchronization enabled and expected by mission command uses subordinates' initiative to achieve resynchronization continuously. Subordinates' successes may offer opportunities within the concept or develop advantages that make a new concept practical. In either case, the commander's intent keeps the force acceptably focused and synchronized. Subordinates need not wait for top-down synchronization. Mission command is especially appropriate for operations in which stability operations predominate. It allows subordinates to exploit information about enemies, adversaries, events, and trends without direction from higher echelons.

5-7. During execution, the current operations cell strives to keep the warfighting functions synchronized and balanced between subordinates' initiative and synchronized activities as the situation changes. The current operations cell follows and provides its own level of collaborative synchronization. To assist commanders in massing the effects of combat power at decisive times and places, the current operations cell considers the following outcomes when making synchronization decisions or allowing others' collaborative synchronization to proceed:

- Combined arms integration.
- Responsiveness (proactive and reactive).
- Timeliness.

5-8. Execution involves monitoring the situation, assessing the operation, and adjusting the order as needed. Throughout execution, commanders continuously assess the operation's progress based on information from the COP, running estimates, and assessments from subordinate commanders. When the situation varies from the assumptions the order was based on, commanders direct adjustments to exploit opportunities and counter threats.

5-9. The staff, both the engineer unit commander's staff and the combined arms commander's engineer staff, assists the commander in execution through the integrating processes and continuing activities during execution (see FM 3-0). In addition, commanders, assisted by the staff, perform the following activities specific to execution:

- Focus assets on the decisive operation.
- Adjust CCIR based on the situation.
- Adjust control measures.
- Manage movement and positioning of supporting units.
- Adjust unit missions and tasks as necessary.
- Modify the concept of operations as required.

- Position or relocate committed, supporting, and reserve units.

5-10. As with preparation, engineer forces will conduct additional construction or other technically related activities during execution of the specific mission. Construction and technically related execution activities include the following:

- Implementation and maintenance of a construction safety program.
- Implementation and enforcement of quality controls.
- Periodic design and construction reviews.
- Preparation of as-built drawings.
- Response to construction contingencies.

5-11. Commanders and staffs also use the RDSP described in FMI 5-0.1 to make decisions and rapidly resynchronize forces and warfighting functions when presented opportunities or threats during execution. The RDSP includes five steps. Leaders perform them as shown in FMI 5-0.1. The first two steps may be performed in any order, including concurrently. The last three steps are performed interactively until an acceptable COA is found (see figure 5-2).

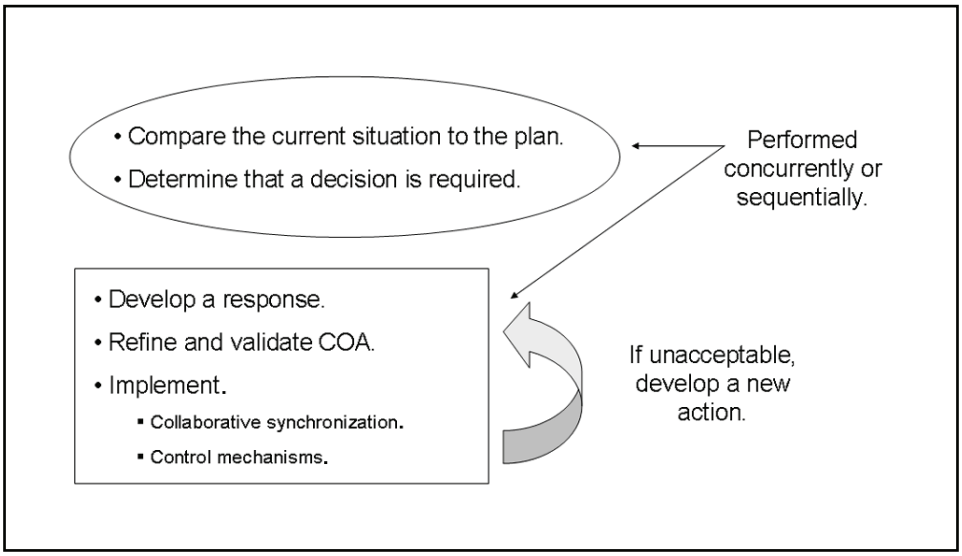


Figure 5-2. Rapid decision-making and synchronization process

5-12. Assessment is the continuous monitoring and evaluation of the current situation and progress of an operation. Commanders, assisted by the staff, continuously assess the current situation and the progress of the operation and compare it with the commander's vision throughout the entire operations process. Based on their assessment, commanders make decisions to direct adjustments, ensuring that the operation remains aligned with the mission and commander's intent. Subordinates assess their unit's progress by comparing it with their mission and commander's intent (one and two echelons up) and adjust their actions to accomplish the mission and achieve the desired end state.

5-13. Assessment precedes and guides every activity in the operations process and concludes each operation or phase of an operation. It involves a comparison of forecasted outcomes to actual events, using measures of performance (MOPs) and measures of effectiveness (MOEs) to judge progress toward success. It entails two distinct tasks: continuously monitoring the situation and progress of the operation toward the commander's desired end state and evaluating the operation against measures of effectiveness and performance.

- A *measure of performance* is a criterion used to assess friendly actions that is tied to measuring task accomplishment. (JP 3-0) MOPs answer the question: "Was the task or action performed as the commander intended?" MOPs confirm or deny that we have done things right.
- A *measure of effectiveness* is a criterion used to assess changes in system behavior, capability, or OE that is tied to measuring the attainment of an end state, achievement of an objective, or

creation of an effect. (JP 3-0) MOEs focus on the results or consequences of friendly actions taken. They answer the question, "Are we doing the right things or are additional or alternative actions required?"

5-14. Engineer capabilities may be applied to add technical detail to the commander's assessment. Engineer assessment and survey teams gather technically focused information on the physical environment, infrastructure, or other physical aspects of the AO. Relevant information gathered adds to the depth of the commander's understanding and can provide a technical basis for MOPs or MOEs.

5-15. Commanders monitor the current situation for unexpected success, failure, or enemy action that can prevent the operation from progressing toward the desired end state. As commanders assess progress, they look for opportunities, threats, or acceptable progress according to the plan. They embrace risk, seize opportunities, mitigate threats, and adjust the plan as necessary.

5-16. Staffs analyze the situation in terms of mission and/or operational variables to understand the mission and prepare their staff running estimates. They continuously assess the effects of new information on the conduct of the operation; they update their staff running estimates and determine if adjustment decisions are required. Commanders empower their staffs to make adjustments within their areas of expertise. This requires staffs to understand those aspects of operations that require the commander's attention as opposed to those that are delegated to their control.

5-17. Commanders avoid excessive analysis when assessing operations. The assessment process must be tailored to meet the needs of the commander. It must provide useful feedback on the progress of the operation that allows the commander to provide guidance and recommendations to the planning staff on potential course corrections. The focus should be on providing information in a means useful to the commander. Staffs should avoid developing systems that become all-consuming of resources and staff effort. Generally, the echelon at which a specific operation, task, or action is conducted should be the echelon at which the activity is assessed. This focuses assessment at each echelon and enhances the efficiency of the overall operations process.

SIMULTANEOUS APPLICATION

5-18. Not every echelon or unit will conduct simultaneous full spectrum combinations. Divisions and higher echelons normally conduct full spectrum operations simultaneously, based on METT-TC. BCTs may focus exclusively on offensive or defensive operations in a major combat operation, but typically shift to simultaneous execution of offensive, defensive, and stability operations in irregular warfare or peace operations. Battalion and smaller units often conduct the elements sequentially, based on their capabilities and the situation.

5-19. Engineer operations occur throughout the depth of the AO and simultaneously involve applications in support of any combination of the elements. Simultaneously, throughout the AO combat engineers prepare, execute, and assess close support of maneuver forces while general engineers support with a focus on operational mobility, sustainment, and protection. Geospatial support is provided for intelligence and C2. Integration through the operations process enables synchronization of the various and simultaneous applications through warfighting functions. At division and higher echelons, the ENCOORD will simultaneously coordinate the application of capabilities from all three engineer functions. Brigade and task force engineers may focus coordination activities on one or two of the engineer functions for a particular operation, but must be able to quickly shift to the integration of other applications as the situation changes.

OFFENSIVE OPERATIONS

5-20. Seizing, retaining, and exploiting the initiative is the essence of the offense. Offensive operations seek to throw enemy forces off balance, overwhelm their capabilities, disrupt their defenses, and ensure their defeat or destruction by maneuver. An offensive ends when the force achieves the operation's purpose, reaches a limit of advance, or approaches culmination. Army forces conclude an offensive by consolidating gains through stability operations, resuming the attack, shifting over to the defense, or preparing for future operations.

5-21. Army forces conduct four types of offensive operations: movement to contact, attack, exploitation, and pursuit. FM 3-90 provides details on the conduct of types of offensive operations.

5-22. Engineer operations supporting the offense include simultaneous application of combat, general, and geospatial engineer capabilities through synchronizing warfighting functions and throughout the depth of the AO. Combat engineer operations in close support of maneuver forces are the primary focus in offensive operations; however, all three functions are applied simultaneously to some degree. The primary focus will be support that enables movement and maneuver. Figure 5-3 shows a notional application of engineer capabilities supporting offensive operations.

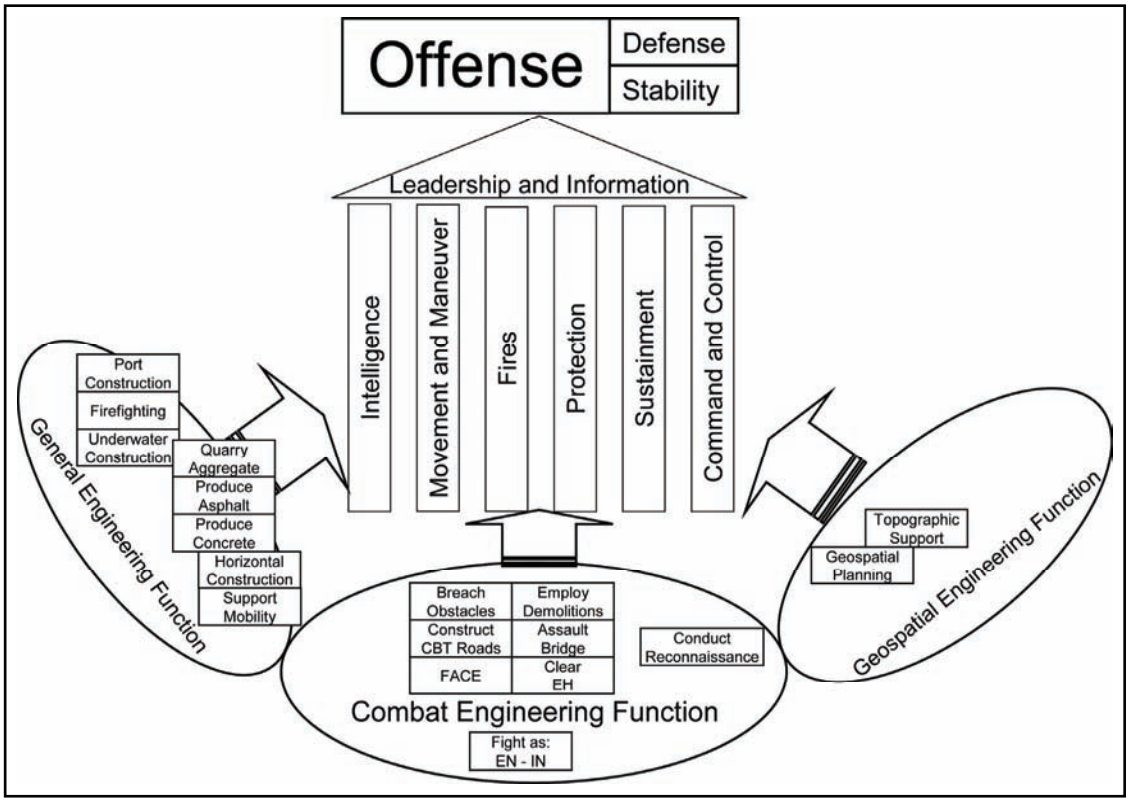


Figure 5-3. Notional engineer operations in the offense

5-23. Combat engineers use preparation activities to posture engineer assets with their task-organized gaining or supported headquarters. Engineer units establish early linkups with the maneuver units they will support. As combat engineer units prepare for offensive operations, they focus on inspections and combined arms rehearsals. Combined arms breaching and gap-crossing forces are organized and conduct rehearsals for the breach, assault, and support forces. The ENCOORD at the appropriate echelon coordinates engineer reconnaissance focused to support the collection of the appropriate OBSTINTEL. Assault and tactical bridging is moved into staging areas and crossing site reconnaissance is conducted when possible. Preparation may include creating combat trails or forward LZs. If route clearance operations are anticipated, clearance teams are organized and focus on inspections and combined arms rehearsals. Combat engineer preparation activities occur in close proximity and are closely aligned and integrated with maneuver force preparations.

5-24. ENCOORDs at every echelon coordinate the movement and positioning of general engineer assets task-organized to augment combat engineer capabilities. Although general engineer assets can be placed in command or support relationships with the maneuver force, these linkups are more effective directly between the combat engineer unit being augmented and the general engineer unit providing augmentation. General engineer assets will require added time for movement given the nature of the heavy and wheeled equipment employed. For significant construction, preparation activities may require a more technical engineer reconnaissance to enable adequate project planning and design, including the provision of

construction materials as required. Specialized engineer assets may also be necessary to accomplish certain missions. At the operational level, general engineer operations may not be conducted as part of a combined arms mission but must, nonetheless, be fully coordinated with the maneuver commander responsible for the AO. These general engineer operations are applied primarily to enable the sustainment warfighting function, but may be critical to the preparation for an offensive operation, to include support to operational mobility.

5-25. During offensive operations, fighting and protective position development is minimal for tactical vehicles and weapon systems. The emphasis lies on mobility of the force. Protective positions for artillery, AMD, and logistic positions may be required in the offense and defense, although more so in the defense. Stationary C2 facilities require protection to lessen their vulnerability. During halts in the advance, while the use of terrain will provide a measure of protection, units should develop as many protective positions as possible for key weapon systems, C2 nodes, and critical supplies based on the threat level and unit vulnerabilities. For example, expedient earth excavations or parapets are located to make the best use of existing terrain. During the early planning stages, terrain analysis teams can provide information on soil conditions, vegetative concealment, and terrain masking along march routes to facilitate survivability for the force. Each position design should consider camouflage from the start and the development of deception techniques as the situation and time permit.

5-26. When executing offensive operations, the maneuver force uses its COP to link detection efforts to maneuver to avoid encountering obstacles along the route of the attack. The maneuver force can actively avoid by interdicting threat countermobility before emplacement or passively avoid by identifying, marking, and bypassing. Assessment enables execution as decisions are made to breach or bypass obstacles. If the friendly force commander is compelled to neutralize obstacles, the force employs the breach tenets of intelligence, breach fundamentals, breach organization, mass, and synchronization. Bypasses are preferred whenever possible and may be handed off to follow-on engineer units for maintenance and improvement. Similarly, assault bridging must be replaced when feasible with appropriate tactical or LOC bridging to remain postured for future assault bridge missions. As soon as possible, more technical level assessments are made to determine feasible and suitable improvements to the LOCs.

DEFENSIVE OPERATIONS

5-27. Defending forces anticipate the enemy's attack and counter it. Waiting for the attack is not a passive activity. Commanders conduct aggressive ISR and security operations to seek out enemy forces and deny information to them. They engage them with Army and joint fires and maneuver to weaken them before close combat. Commanders use combined arms and joint capabilities to attack enemy vulnerabilities and seize the initiative. There are three types of tactical operations associated with defense. The three types of defensive operations are mobile defense, area defense, and retrograde. FM 3-90 provides detailed information on the conduct of types of offensive operations.

5-28. Engineer operations supporting the defense include simultaneous application of combat, general, and geospatial engineer capabilities through synchronizing warfighting functions and throughout the depth of the AO. Combat engineer operations in close support of maneuver forces are the primary focus in defensive operations; however, all three functions are applied simultaneously to some degree. Figure 5-4, page 5-8, shows a notional application of engineer capabilities supporting defensive operations.

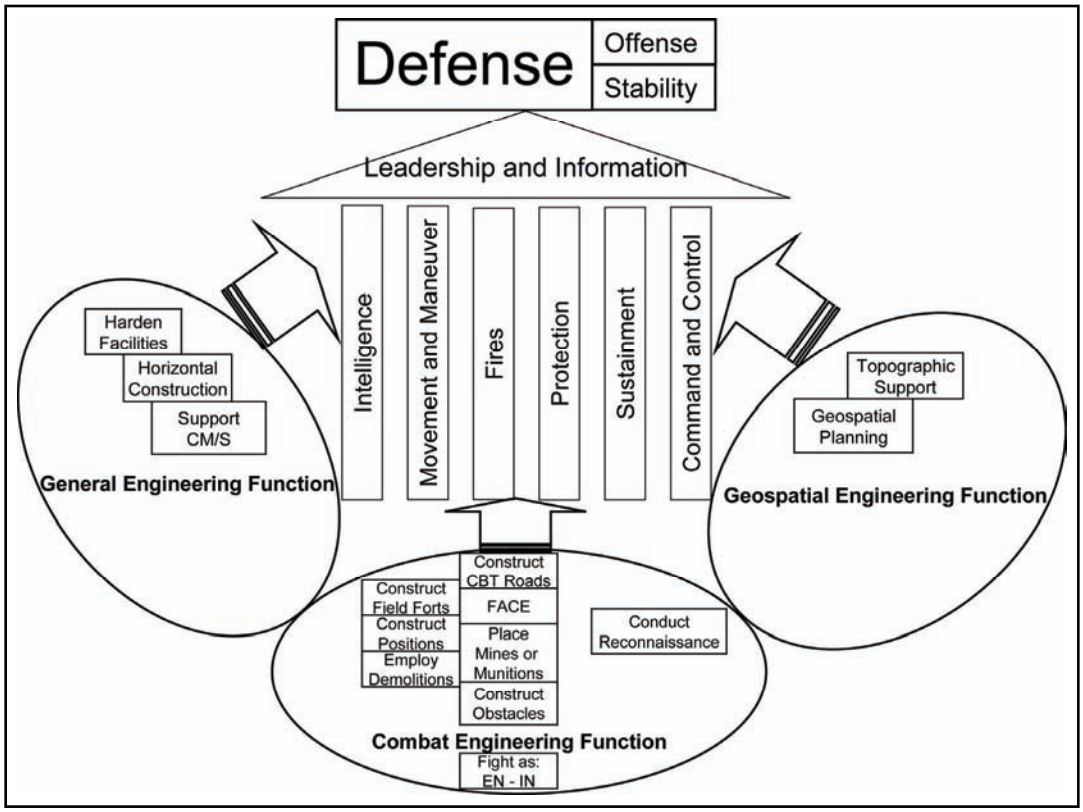


Figure 5-4. Notional engineer operations in the defense

5-29. In all three types of defensive operations (area defense, mobile defense, and retrograde), the primary focus for combat engineers is to enable combined arms obstacle integration (countermobility) and assure mobility to friendly repositioning or counterattacking forces. Defensive missions demand the greatest survivability effort. Activities in the defense include constructing survivability positions for C2, artillery, AMD, and critical equipment and supplies. They also include preparing individual and crew-served fighting positions and defilade fighting positions for combat vehicles. The use of engineer work timelines is essential and digging assets are intensively managed. During this period, countermobility efforts will compete with survivability resources and assets. Because of this, it is critical that maneuver commanders provide clear guidance on resources and priorities of effort. General engineer support accomplishes tasks exceeding the capability of the combat engineer force, as well as more extensive support to the mobility of repositioning counterattack forces. Examples of expected missions include—

- Construction and integration of obstacles and barriers.
- Preparation of fighting positions and survivability positions in-depth.
- Construction and repair of routes that facilitate the repositioning of forces throughout the AO.

5-30. During preparation, engineer assets are postured with their task-organized gaining or supported headquarters and initiate the engineer work effort. The equipment work effort is a balance between countermobility and survivability as determined by the commander. The effort continues throughout preparation activities until complete or until no longer feasible. Significant coordination is required to resource the materials required for constructing obstacles and fighting positions and to integrate the obstacles with friendly fire effects. Designated combat engineers link up and provide mobility support for the reserve or mobile strike force. The ENCOORD at the appropriate echelon coordinates for ISR assets to detect enemy engineer (primarily breaching, gap crossing, and countermobility assets) capabilities to nominate those in the targeting process and ensure their timely destruction.

5-31. At the operational level, general engineer operations will be conducted continuously to harden and prepare protective positions for facilities and installations. These general engineer operations are applied

primarily through the protection warfighting function. General engineer support to survivability and other protection tasks continues throughout operations as improvements are continuously reassessed and additional effort is made available. Operational-level barriers and obstacles may also be necessary as part of countermobility support (see JP 3-15 and the Joint Forward Operations Base [JFOB] Handbook). Other general engineer operations applied to enable the sustain warfighting function may also be critical to the preparation and conduct of defensive operation. Enabling mobility throughout the depth of the AO will remain an engineer mission.

STABILITY OPERATIONS

5-32. Stability operations involve both coercive and constructive military actions. They are designed to establish a safe and secure environment and facilitate reconciliation among local or regional adversaries. Stability operations establish political, legal, social, and economic institutions and support the transition to legitimate local governance. It is essential that stability operations maintain the initiative by pursuing objectives that resolve the causes of instability. The combination of tasks conducted during stability operations depends on the situation. Stability operations consist of five primary tasks: civil security, civil control, restore essential services, support to governance, and support to economic and infrastructure development. The primary tasks are discussed in detail in FM 3-07.

5-33. Engineer support for stability operations include simultaneous application of combat, general, and geospatial engineer capabilities through synchronizing warfighting functions and throughout the depth of the AO. General engineer operations supporting restoration of essential services and infrastructure development are the primary engineer focus in stability operations; however, all three functions are applied simultaneously to some degree. Figure 5-5, page 5-10, shows a notional application of engineer capabilities providing support to stability operations. The participation of engineer generating force elements (such as USACE) to stability operations will be significant and is typically realized as general or geospatial support. The TEC includes the capability to provide C2 of the USACE effort.

5-34. Often, stability operations are required to meet the critical needs of the populace. Engineer forces may be a critical enabler in the provision of essential services until the HN government or other agencies can do so. Engineering tasks primarily focus on reconstructing or establishing infrastructure to provide essential services that support the population. The effort is typically conducted in conjunction with civilian agencies and in addition to other engineer support of U.S. forces. Support for infrastructure development may be extended to assist the HN in developing capability and capacity. Essential services for engineer consideration include food and water, emergency shelter, and basic sanitation (sewage and garbage disposal). Likely engineer missions are similar to those required in civil support, except that they are conducted overseas. They include—

- Constructing and repairing rudimentary surface transportation systems, basic sanitation facilities, and rudimentary public facilities and utilities.
- Detecting and assessing water sources and drilling water wells.
- Constructing feeding centers.
- Providing environmental assessment and technical advice.
- Disposing of human and hazardous wastes.
- Constructing camps and providing power generation.
- Providing infrastructure reconnaissance, technical assistance, and damage assessment.
- Conducting emergency demolition.
- Conducting debris or route clearance operations.
- Support to HN capacity development.

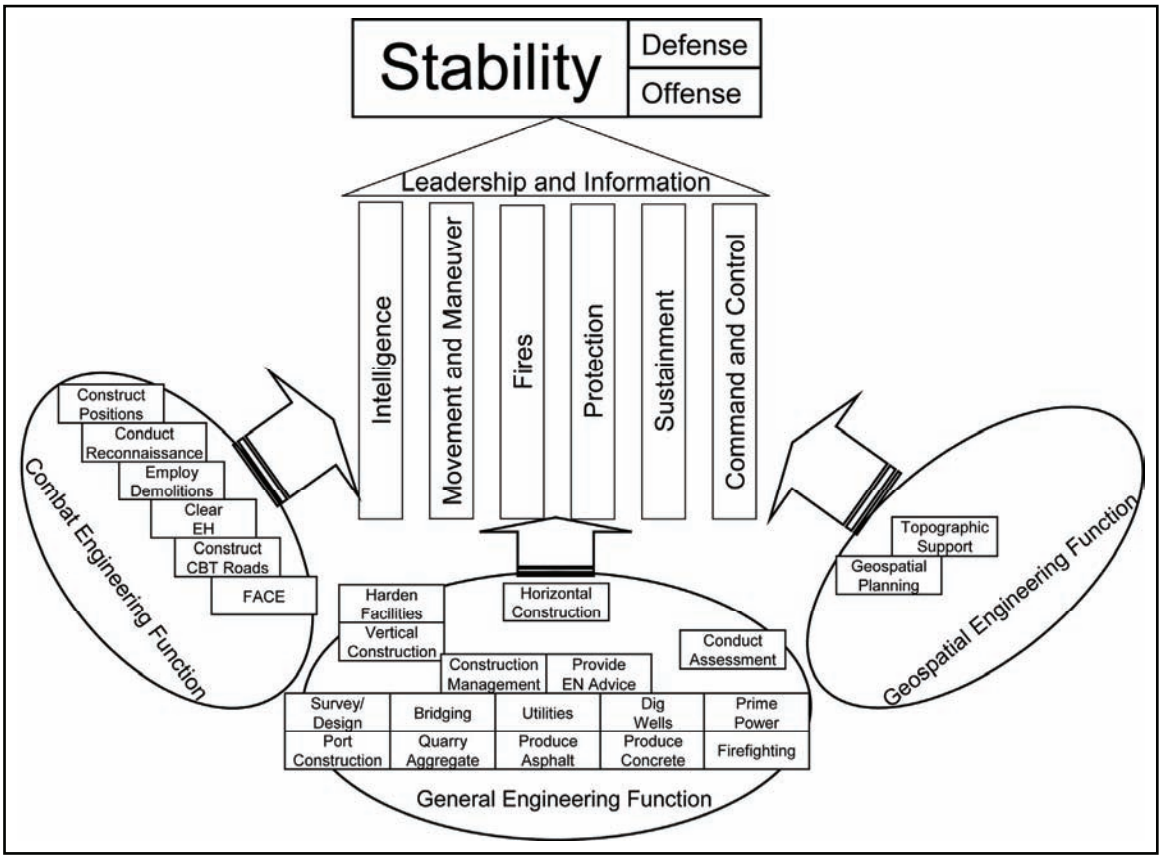


Figure 5-5. Notional engineer operations supporting stability

5-35. Engineer support to stability operations may include the typical integration with and support for combined arms forces in their missions. Combat engineer route clearance and other close support capabilities may be critical tasks applied through the movement and maneuver warfighting function. Geospatial engineer support continues to provide foundational information supporting the COP. General engineer support may be required for the sustainment and survivability requirements of the force. However, in stability operations, a focus of the engineer effort is likely to be the general engineering capabilities applied to restore essential services and support infrastructure development. Many of the technical capabilities only found in the generating force will be essential to providing appropriate engineer support as those elements of the Engineer Regiment are called upon (through reachback and FFE) for their specialized expertise and capabilities. Stability operations tend to be of a long duration compared to the other full spectrum operations. As such, the general engineering level of effort is very high at the onset and gradually decreases as the theater matures, although support will be required to some degree for the duration of the stability operation. Preparation activities include identification of significant infrastructure and base development construction projects and nomination of those projects for funding. The highest priority projects may be executed using military general engineer capabilities while others may compete for contingency funding and execution through a contract capability. As the AO matures, the general engineering effort in support of sustainment requirements may transfer to theater or external support contracts such as LOGCAP, AFCAP, or the Navy's global contingency construction contract.

5-36. CA operations are activities performed or supported by CA personnel that enhance the relationship between military forces and civil authorities in areas where military forces are present. They involve application of CA functional specialty skills in areas that are normally the responsibility of the civil government. These operations involve establishing, maintaining, influencing, or exploiting relations between military forces and all levels of HN government agencies. These activities are fundamental to

executing stability tasks. CA personnel, other Army forces, or a combination of the two perform the following tasks.

- CA personnel engage in a variety of CA operations in fulfillment of CA core tasks. CA elements can assess the needs of civil authorities, act as an interface between civil authorities and the military supporting agency, and act as a liaison to the civil populace. They can develop population and resource control measures and coordinate with international support agencies.
- CA personnel are regionally oriented and possess cultural and linguistic knowledge of countries in each region. Most CA personnel have had extensive experience in combat arms or combat support before assignment to CA units. With guidance from the commander on desired effects, CA personnel have a wide variety of resources at their disposal to influence the AO. CA is a combat multiplier in this sense. Additionally, the civilian skills that RC CA units possess enable them to assess and coordinate infrastructure activities (see FM 3-05.40 for more details).

5-37. CA operations may be critical in supporting engineer operations, which typically can include the engineer activities of nonmilitary organizations, as well as military forces. Similarly, engineer capabilities may be applied to provide specific construction and other technical support integrated within the CA plan. Integration occurs through the operations process activities and is facilitated by coordination among the ENCOORD and CA staff at the CMOC.

5-38. Preparing for stability operations may be more difficult than preparing for combat operations because of the technical nature of requirements and broad range of potential engineer missions associated with them. An early on-the-ground assessment can be critical to tailor the engineer force with required specialties and engineer resources. Results of this assessment are passed to planners to ensure that an adequate engineer force arrives in the AO in a timely manner. This early on-the-ground engineer reconnaissance and associated assessment or survey identifies the—

- Status of the infrastructure in the AO, to include airfields, roads, ports, logistic bases, and troop beddown facilities; real estate acquisition; environmental standards, conditions, and considerations; construction material supply; construction management; and line-haul requirements.
- Theater- and situation-specific survivability requirements.
- Existing geospatial product availability and requirements for new terrain visualization products.
- Specialized engineer requirements, such as prime power, well-drilling, and firefighting support.
- Specialized engineer requirements available only in the capabilities of generating force elements of the Engineer Regiment.
- C2 requirements, including headquarters staffing, communications, and information systems support.
- Engineer liaison requirements, including linguists and CA personnel.
- Potential for contract construction or other engineer capabilities.

CIVIL SUPPORT OPERATIONS

5-39. Civil support includes operations that address the consequences of natural or man-made disasters, accidents, and incidents within the United States and its territories. Army forces conduct civil support operations when the size and scope of events exceed the capabilities or capacities of domestic civilian agencies. The ARNG is often the first military force to respond on behalf of state authorities. In stability operations, multinational operations are typical; in civil support operations, they are the exception. Army civil support operations include three primary tasks: provide support in response to a disaster, support civil law enforcement, and provide other support as required. (When revised, FM 3-28 will discuss these tasks in detail.)

5-40. Engineer operations in civil support may include simultaneous application of combat, general, and geospatial engineer capabilities through synchronizing warfighting functions and throughout the depth of the AO. General engineer support for the restoration of essential services is the primary engineer focus in civil support. Engineer support may also be required for Army forces providing C2, protection, and sustainment to government agencies at all levels until they can function normally. Figure 5-6 shows a

notional application of engineer capabilities supporting civil support operations. The generating force elements of the Engineer Regiment (such as USACE) will play a critical and significant role in civil support operations. TECs, under their OPCON relationship with USACE, can provide C2 support. See Appendix F for a more detailed discussion of engineer applications in civil support operations.

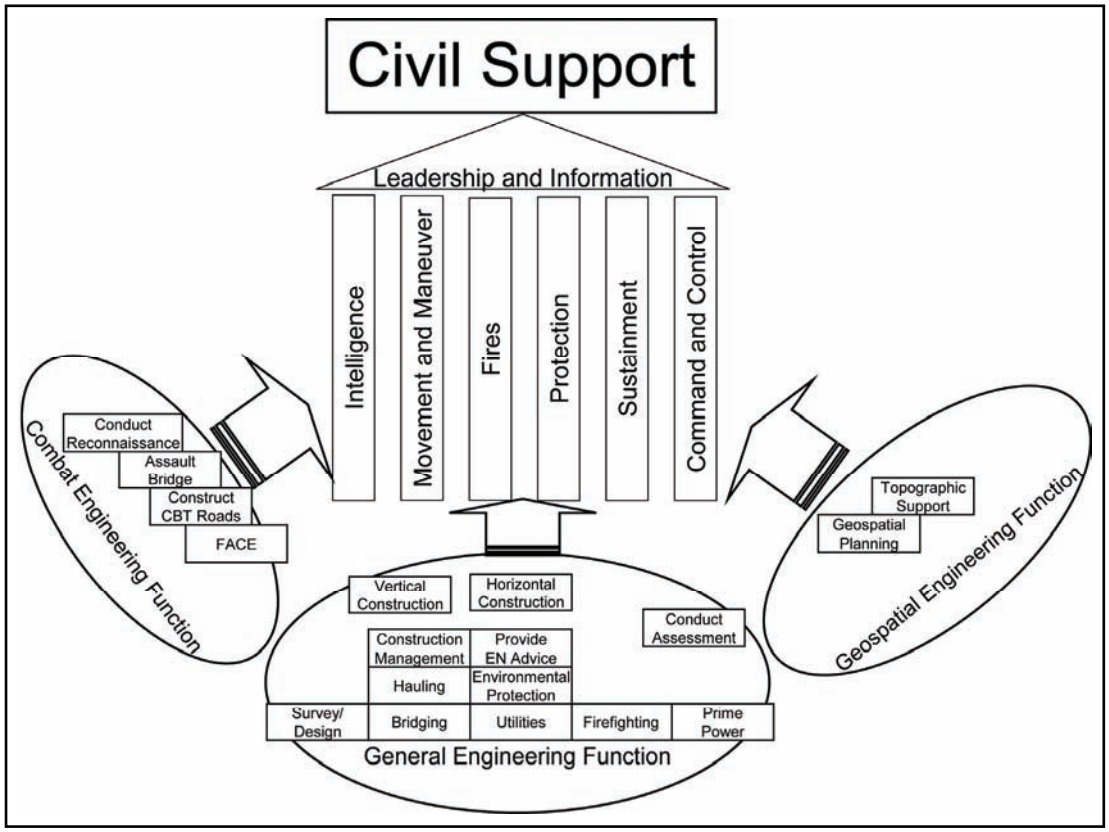


Figure 5-6. Notional engineer operations during civil support

5-41. There are few unique engineer missions performed in civil support that are not performed during other operations. The difference is the context in which they are performed. U.S. law carefully limits the actions that military forces, particularly regular Army units, can conduct within the U.S. and its territories. In addition to legal differences, civil support operations are always conducted in support of state and federal agencies. Army forces cooperate and synchronize their efforts closely with them. These agencies are trained, resourced, and equipped more extensively than similar agencies involved in stability operations overseas. Policies issued by the federal government govern the essential services Army forces provide in response to a disaster. Within this context, a focus for engineers during civil support operations will be the restoration of essential services. Essential services engineers are concerned with providing include the following:

- Rescue.
- Food and water.
- Emergency shelter.
- Basic sanitation (sewage and garbage disposal).
- Minimum essential access to affected areas.

5-42. Both combat and general engineer capabilities may be applied to restore essential services. Engineer equipment is well suited for removal of rubble and debris associated with rescue and access to affected areas. Other likely requirements include the construction of temporary shelters and provision of water and sanitation services. Likely missions include the following:

- Constructing and repairing rudimentary surface transportation systems, basic sanitation facilities, and rudimentary public facilities and utilities.
- Detecting and assessing water sources and drilling water wells.
- Constructing feeding centers.
- Providing environmental assessment and technical advice.
- Disposing of human and hazardous wastes.
- Constructing camps and providing power generation.
- Providing infrastructure reconnaissance, technical assistance, and damage assessment.
- Conducting emergency demolition.
- Conducting debris or route clearance operations.

5-43. Engineer operations in civil support may include the typical integration with and support for combined arms forces in their missions. Combat engineer route clearance and other close support capabilities may be critical tasks applied through the movement and maneuver warfighting function. Geospatial engineer support continues to provide foundational information supporting the COP. General engineer support may be required for the sustainment and survivability requirements of the force and may be extended to support other agencies. Likely missions include the following:

- Base camp construction and power generation.
- Debris or route clearance operations.
- Construction and repair of expedient (temporary) roads and trails.
- FACE (including the repair of paved, asphalt, and concrete runways and airfields).
- Installation of assets that prevent FOD to rotary-wing aircraft.
- Construction of temporary bridging.
- Construction and upgrade of ports, airfields, and RSOI facilities to ensure access to the region.

5-44. There is usually little time for preparation for civil support operations. Civil support operations may require an immediate response. Support to civilian law enforcement and community assistance allows greater leeway to plan and prepare. USACE maintains significant response capability and will normally be involved in civil support requiring engineer operations. USACE leverages capabilities and expertise developed through responsibility for military construction and civil works programs to prepare for assigned and anticipated civil support missions.

SPECIAL CONSIDERATIONS

5-45. Army commanders will likely determine that operations in an urban environment will be essential to mission accomplishment. They need to assess the relevance and impact of one or more urban areas as part of their mission. They will also need to determine whether urban operations may be the commander's sole focus or only one of several tasks nested in an even larger operation. Although urban operations can potentially be conducted as a single battle, engagement, or operation, they will more often be conducted as a major operation requiring joint resources. FM 3-06 provides a new framework—assess, shape, dominate, and transition—for urban operations. These are not phases or sequential operations, but rather a means to visualize the fight (or potentially the stability or civil support mission).

5-46. Engineers will provide critical support to any urban operation. FM 3-06 and FM 3-06.11 have more details, but commanders should understand that historically, large numbers of engineer units have been task-organized for urban operations. Engineers will provide unique geospatial products for the complex terrain of cities. Three-dimensional terrain visualization products are available and continue to be developed. Assured mobility will be an important framework for commanders to use as maneuver commanders think about how to shape and dominate within the urban terrain. General engineering tasks

will be prevalent throughout all operations, but will also be the major function during transition to stability or civil support operations. Engineers will have to work closely with all of the elements that enable M/CM/S. They must ensure close coordination with EOD (to reduce EH [improvised explosives and UXO] to minimize collateral damage), MPs (to enable the movement of civilians along routes), and CBRN elements (for potential agents along the routes and at other locations within the AO).

5-47. Full spectrum operations present a broad range of potential tasks to any engineer commander. It may appear daunting as METL is considered and training plans are established; however, it is up to the commander to understand these challenges and assess the priority missions that must be trained and prepared for. Projected support relationships allow discussion with higher headquarters and the units the engineer unit is likely to support and will assist the commander in narrowing the list of missions and, therefore, prioritizing their training. There is no substitute for having a unit that is trained and disciplined in its core tasks. When called on to respond to a mission, commanders can expect assistance from the remainder of the Regiment to facilitate the unit's preparation. It is up to the commander to be aware of the potential considerations and understand the right questions to ask and explore to develop the best training and preparation.

Chapter 6
Sustainment Support for Engineer Capabilities

Build no more fortresses, build railways.

Field Marshal Helmuth Von Moltke, The Elder

Army transformation into an expeditionary, campaign-quality force includes significant changes in the structure and systems providing logistics and other sustainment support. One key feature is a logistics system that relies on asset visibility and flexibility instead of mass. Within the transformed framework, distributed support and sustainment are keys to maintaining freedom of action with the smallest feasible deployed logistical footprint. Support planning and execution must be closely integrated into tactical and operational battle rhythms. Successful engineer operations include effective incorporation of sustainment support. Sustainment for the engineer company includes the functions of supply, field services, transportation, maintenance, EOD, HSS, human resources (HR) support, financial management support, legal support, religious support, and band support. Assignment of engineer companies to the BCTs includes responsibility for their sustainment support. Except for medics organic to each of the BCT engineer companies, all other sustainment support is provided by or coordinated through the BSTB for the engineer company of the HBCT and IBCT and through the BSB and the HHC of the SBCT for the organic engineer company of the SBCT. For units augmenting the BCT engineers and all other units operating at EAB, integration into an area or theater support structure will be required. This chapter focuses on sustainment support for engineer capabilities and highlights the sustainment considerations that will affect engineer operations.

ORGANIZATIONS AND FUNCTIONS

STRATEGIC-LEVEL SUPPORT

6-1. Within the transformed framework, distribution has transitioned to a single distribution manager who provides unity of control. The manager directs the flow throughout the entire network using asset visibility, capacity, and control information available from the COP while supported by a network-wide view of distribution operations. A single distribution manager will be used at each level of war within a distribution management center (DMC) and will interact as appropriate to provide sustainment support.

6-2. The strategic-level manager is concerned with centrally controlling the distribution network in support of the Secretary of Defense, the Joint Chiefs of Staff (JCS) and, when appropriate, Service components. The operational-level manager, working at the theater Army or JFLCC level, controls the flow of personnel, equipment, and materiel entering, leaving, or being distributed within the JOA. The tactical-level distribution managers, working in the modular force support battalion, manage according to the designated tactical commander's priorities.

Defense Logistics Agency

6-3. DLA is DOD's primary strategic-level logistics provider and is responsible for providing a variety of logistics support to the military Services. DLA has the capability of providing a forward presence in the

operational area via its DLA contingency support teams (DCSTs). DLA normally provides a DCST to each major joint operation. The team serves as the focal point for coordinating DLA activities within a specific AOR, theater of operation, or JOA. The DCSTs may either colocate with the JFC J-4, the TSC DMC, or the Army field support brigade (AFSB) when the Army is the lead Service for significant common-user logistics support. The in-theater DCST integrates strategic- to operational-level materiel management support of DLA common commodities (such as subsistence, clothing and other general supplies, Class IV construction and barrier materiel, package and bulk petroleum, and medical materiel).

6-4. DLA also provides in-theater defense reutilization and marketing services (DRMS). In coordination with the JFC J-4, DLA establishes theater-specific procedures for the reuse, demilitarization, or disposal of facilities, equipment, and supplies, to include hazardous material and waste. Initially, salvage and excess materiel destined for the DRMS is collected in the theater sustainment area or the BCT BSB areas as the situation permits. As the theater matures, DLA evacuates this materiel to collection points for inspection, classification, and disposal by DLA-directed activities. The TSC or sustainment brigade DMC coordinates DRMS operations for the Army forces to ensure that usable materiel is not disposed of or evacuated from the theater.

United States Army Materiel Command

6-5. Strategic logistics embraces national-level sustainment base capabilities. The TSC, expeditionary sustainment command (ESC), and sustainment brigades coordinate with elements of strategic-level organizations to ensure a smooth flow of support into and throughout the theater. In almost all operations, elements of the national strategic organizations deploy to the theater to enhance this coordination. Some of these elements, such as the United States Army Materiel Command (USAMC) and DLA work closely with, and in some cases, have a command or support relationship with the TSC or ESC and sustainment brigades as described below.

6-6. USAMC support to deployed Army forces is executed through the Army Sustainment Command's assigned AFSBs and contracting support brigades. These two separate O6-level commands are theater-committed headquarters which, upon deployment, are normally placed OPCON to the TSC. The AFSB is responsible for planning and controlling all Army acquisition, logistics, and technology (ALT) functions—less theater, contracting, and LOGCAP support—in the operational area. The AFSB is a small, highly modular TOE headquarters that leverages reach capabilities to provide ALT technical and call-forward support from the national sustainment base. In addition to the small TOE command and staff element, each AFSB has a tailored table of distribution and allowances (TDA) structure and can call forward significant USAMC and Assistant Secretary of the Army (ASA) (ALT) support capabilities necessary to meet specific mission requirements. Specific AFSB functions include, but are not limited to—

- Providing command, control, and management of the Logistics Assistance Program (LAP).
- Coordinating system contract support to new or partially fielded systems.
- Providing Army science and technology functions, as well as all materiel fielding organizations providing new equipment training.
- Coordinating Army pre-positioned stock support to include off-loading and property accountability.
- Providing C2 of sustainment maintenance organizations deployed to the theater.
- Maintaining accountability of all Army contractor personnel who deploy with the force.

6-7. AFSBs provide ALT support through two primary subordinate units: the logistics support element (LSE) and the brigade logistics support team (BLST). LSEs are small, tailorable, deployable, battalion-level TDA organizations of approximately 20 personnel, mostly Life Cycle Management Command logistics assistant representatives. BLSTs are similar to LSEs, but are smaller organizations that provide DS LAP support to a specific BCT or CAB. The LSE commander is primarily responsible for coordinating and controlling GS technical LAP support to the corps or division headquarters and Army units such as the MEB that do not have a DS BLST. Additional information on the AFSB can be found in FMI 4-93.41.

6-8. The contracting support brigades are new USAMC TOE commands that provide contracting support in-theater, normally on a GS basis, to deployed U.S. forces through its assigned or attached contingency

contracting battalions and contingency contracting teams. The contracting support brigade also provides common joint, multinational, and interagency support when directed by the JFC and ASCC. As theater-committed units, the contracting support brigades are aligned to theater Armies, but receive their contingency contracting authority through the United States Army Sustainment Command. More information on contracting support can be found later in this chapter.

OPERATIONAL-LEVEL SUPPORT

6-9. The JFC directs operations through Service component commanders or establishes functional commands. Such functional commands include a joint forces land component to provide centralized direction and control of all land operations (see JP 0-2, JP 3-31, and JP 4-07). For sustainment support, the JFC assigns a lead Service to provide common-user logistics wherever possible, to avoid redundancy and achieve greater efficiency.

6-10. The TSC is the senior Army logistics headquarters in a theater of operations and the single Army logistics headquarters for the theater-level numbered Army (such as USAREUR 7th Army, United States Army, United States Pacific Command (USPACOM) 8th Army, or JFC). The TSC consolidates most of the functions previously performed by corps support commands and TSCs into a single operational echelon and is responsible for C2 of logistics operations conducted in support of Army, joint, interagency, and multinational forces. The TSC is regionally focused and globally employable. Its modular design provides the TSC commander with the flexibility to adapt his C2 as requirements develop with ESC providing an additional measure of responsiveness, agility, and flexibility for employment or deterrence.

6-11. The TSC rapidly establishes C2 of operational-level logistics in a specified AO by employing one or more ESC. Each ESC provides a rapidly deployable, regionally focused, forward-based C2 capability that mirrors the organizational structure of the TSC. By design, the ESC executes logistics operations that are limited in scale and scope; employs reach capabilities to provide support to full spectrum operations; and conducts logistics operations according to TSC plans, policies, programs, and mission guidance. In some situations, the ASCC may choose to use a TEC or MEDCOM as senior headquarters for support if dictated by the mission circumstances.

TACTICAL-LEVEL SUPPORT

6-12. Engineers operating above the BCT level will work closely with the sustainment brigade. Sustainment brigades are one of the five types of support brigades and are subordinate commands of the TSC. They consolidate selected functions previously performed by corps and division support commands and area support groups into a single operational echelon. They provide C2 of the full range of logistics operations conducted at the operational (theater Army) or higher tactical (corps and division) levels. They perform theater opening, distribution, and sustainment functions. Each of these functions is interrelated, and throughout the course of an operation, a sustainment brigade will likely perform one or more of these functions simultaneously.

6-13. The sustainment brigade is a flexible, modular organization. Organic to the sustainment brigade are the brigade headquarters and an STB. All other assets are task-organized to the sustainment brigade to enable it to accomplish its role and mission (see FM 100-10-2 for more information on the organic and modular units within the sustainment brigade). Sustainment brigades are assigned to a TSC, but may be task-organized based on mission variables. The sustainment brigade may be assigned at either the operational level (tasked to provide operational sustainment, tasked to conduct theater opening operations, or tasked to provide theater distribution) or the tactical level (tasked to provide tactical logistics support to the division). Sustainment brigades, when assigned appropriate modular units, can provide logistics support for theater opening operations, theater distribution, operational and tactical logistics, and area support missions. Figure 6-1, page 6-4, depicts a notional sustainment brigade organization.

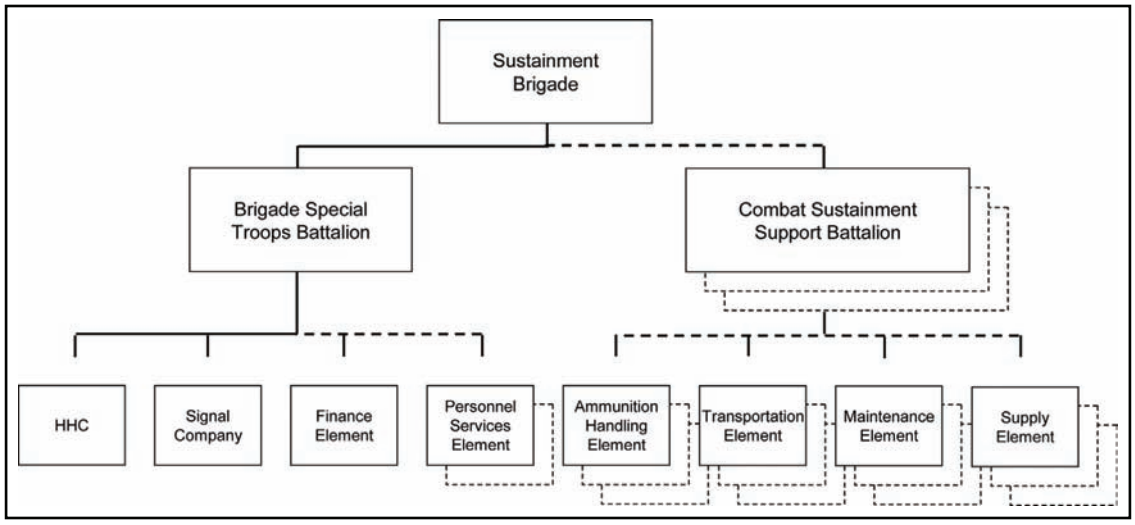


Figure 6-1. Notional sustainment brigade organization

6-14. Theater opening functions set the conditions for effective support and lay the groundwork for subsequent expansion of the theater distribution system. The critical tasks for theater opening include: C2, reach, and in-transit visibility; theater reception, staging, and onward movement; distribution and distribution management; life support; protection; contracting; and initial theater sustainment. Given the mission of theater opening, a sustainment brigade may have the following capabilities:

- Capable of receiving and providing C2 for theater opening, theater distribution, signal, financial management, ammunition, transportation, maintenance, supply and services, HR support, religious support, and other sustainment support.
- Capable of supporting early-entry operations until relieved by an operational-level sustainment brigade or ordered to continue that mission by the corps or TSC.
- Capable of establishing and managing initial theater opening operations to include reception, staging, and onward movement functions and establishing the theater base.
- Capable of establishing and managing initial theater distribution operations.

6-15. The sustainment brigade (theater distribution) operates the ground transportation assets, as well as the theater ground distribution network (nodes, rest halts, and distribution hubs) from the theater base distribution hub to the BCT BSBs. It is designed to provide C2 to assigned and attached units for the purpose of conducting distribution operations in the AO. Distribution operations include receive, store, issue, distribute, redistribute, transload, configure, reconfigure, classify, and collect stocks and unit equipment. It also includes the reception and transportation of units and replacement personnel. When task-organized to provide theater distribution, the sustainment brigade—

- Configures and reconfigures loads as required. Distributes to and retrogrades from maneuver BCTs; other support brigades; and joint, interagency, and multinational forces operating in the AO.
- Stores bulk supplies and authorized stockage list items for distribution and internal consumption.
- Directs the distribution of all supplies and services for which the sustainment brigade is responsible in coordination with the TSC. Plans and controls the use of surface transport for missions within the assigned AO. Organizes the movements of subordinate units within its AO. This function requires coordination with the supported elements concerning current and proposed locations and movement of units.
- Provides guidance and assistance to units in the AO on matters relating to airdrop.
- Provides staff supervision of technical training for personnel regarding the rigging and loading of supplies and equipment for airdrop and aerial resupply.

- Integrates joint, interagency, and multinational distribution capabilities.
- Supports SOF units.
- Delivers supplies, materiel, equipment, and personnel over the theater ground distribution network from theater bases to BCTs and forward distribution points, as required.
- Maintains surveillance over the theater ground distribution network.
- Operates forward distribution points to receive, store, issue, configure, and reconfigure materiel.
- Conducts retrograde, redirection, frustrated cargo, and redistribution operations.
- Establishes and maintains total asset visibility and in-transit visibility over commodities, equipment, personnel, units, and ground assets flowing in the distribution network.
- Executes the TSC's theater distribution plan.
- Operates regional distribution hubs.
- Synchronizes movements with the MEB along secured routes.
- Deploys an early-entry element to the theater just after or in conjunction with the sustainment brigade tasked to provide theater opening capabilities to establish robust distribution operations beyond the theater base, when required.

6-16. The sustainment brigade provides support within an AO. Each sustainment brigade is a multifunctional logistics organization providing support for multiple brigade-size units. It is tailored, task-organized, and uses modular subunits (battalions, companies, and platoons) to perform specific functions. At the tactical level, multifunctional sustainment brigades normally operate within the division AO. The sustainment brigade is primarily concerned with the continuous management and flow of stocks and allocation of reinforcing maintenance support in the AO to provide operational reach to maneuver commanders. When task-organized to provide sustainment support within an AO, the sustainment brigade capabilities include the following:

- Coordinating supply of arms, munitions, and equipment.
- Synchronizing supply and distribution of fuel and water.
- Maintaining equipment and stocks that support the supply system.
- Coordinating support of forces, including HR, field services, health, religious support, financial management, and legal services.
- Managing materiel, controlling movement, and managing distribution.
- Providing lead service common-user logistics to other services, multinational partners, and civilian agencies on order.
- Establishing, managing, and maintaining facilities, including storage areas and maintenance areas.
- Planning, coordinating, managing, and supervising the positioning and security of activities.

6-17. Engineers operating within the BCT will work closely with the BSB. The BSB is the organic sustainment unit of the BCT. The BSB commander is the BCT commander's single sustainment operator. The BSB support operations officer manages sustainment and HSS operations for the BSB commander. The support operations officer provides the technical supervision for the external sustainment mission of the BSB, is the key interface between the supported units and the BSB, plans and monitors sustainment operations and makes necessary adjustments to ensure that support requirements are met, and requests and coordinates augmentation with the higher echelon when requirements exceed capabilities. The BSB also has a sustainment automation management officer who assists with maintenance of logistics-related standard Army Management Information Systems (STAMIS) throughout the BCT.

6-18. The BSB has four forward support companies (FSCs) and three other companies in addition to its HHC (see figure 6-2, page 6-6). The BSB companies include a distribution company, a field maintenance company, and a medical company.

6-19. The distribution company provides all classes of supply (excluding medical) for BCT units. The field maintenance company provides common maintenance support for the BCT, excluding medical and automation support. It generally supports the BSTB (and HHC in the SBCT) and BSB since support for maneuver battalions comes from FSCs in the HBCT and IBCT. The medical company operates a Role 2

medical treatment facility and provides Role 2 HSS to all units on an area basis. The medical company is responsible for providing medical evacuation from supported units to its Role 2 medical treatment facility (MTF). It also provides Role 1 care to units without organic medical personnel and augments and reinforces maneuver battalion medical platoons/sections.

6-20. Each FSC commander is responsible for executing the sustainment plan according to the supported battalion commander's guidance. The BSB provides technical oversight to each FSC. The FSC has a distribution platoon providing transportation lift, along with food (Class I) and water, fuel (Class III), and ammunition (Class V) and a maintenance platoon that supports repair parts (Class IX), maintenance, and recovery.

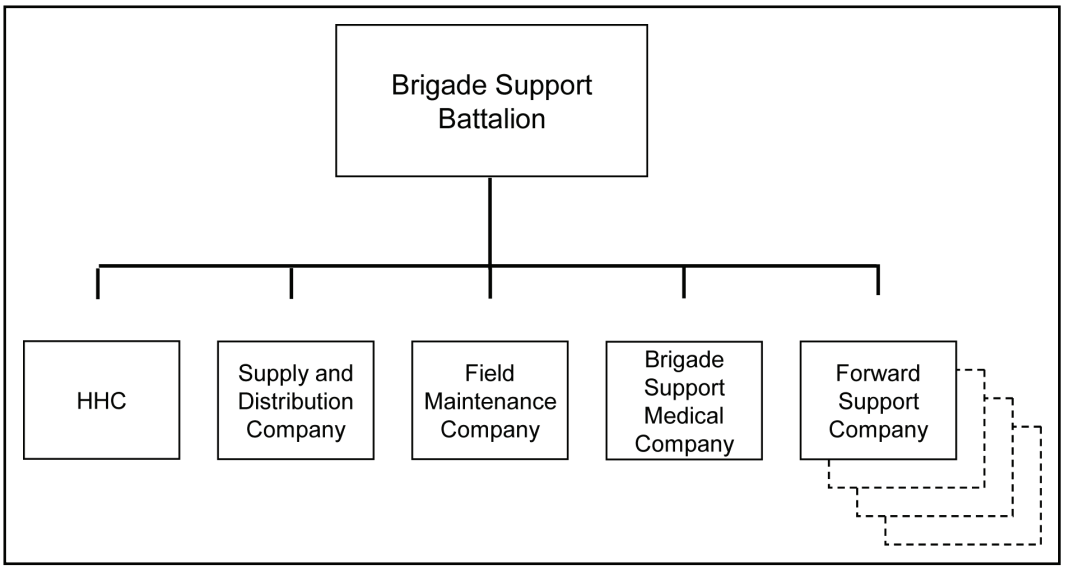


Figure 6-2. Brigade support battalion and subordinate unit organizations

6-21. The BSBs of the HBCT and IBCT each have FSCs to provide sustainment support to the maneuver, reconnaissance, and fires battalions. The BSB of the SBCT does not have FSCs authorized and creates improvised logistics teams to support SBCT units. FSCs are assigned to the BSB, but are generally task-organized to their supported battalions. The BCT commander must ensure that his staff and subordinate units understand the command and support relationships of FSCs. If an engineer battalion augments the BCT, it should be accompanied by its appropriate sustainment element that is task-organized to the battalion and augments the sustainment capabilities of the BSB.

6-22. Although not specifically a sustainment unit, the BSTB is included here because it provides sustainment for the colocated support elements assigned or attached to it from augmentation. The HBCT and IBCT each have a BSTB to provide C2 of selected support units as one of its primary functions. The SBCT and the ACR currently do not have a BSTB authorized. Augmenting units are task-organized to the BCT and much of their control comes from BCT staff officers. See FM 3-90.61 for additional information.

ENGINEER LEADER AND STAFF RESPONSIBILITIES SUSTAINMENT SUPPORT

6-23. Engineer staff and commanders are essential to the sustainment of engineer organizations and capabilities operating at every echelon. Sustainment for engineer units and capabilities organic, assigned, or attached directly to a supported unit is the responsibility of the leaders and staff of the unit they support, but the higher echelon ENCOORD will retain an interest in status of their support. The ENCOORD must also work closely with the supported unit logistics staff to assist in planning, preparing, executing, and assessing operations which will most likely require extensive engineer materials and resources. When engineer or multifunctional modular headquarters units are provided, the organic logistics staff within that

headquarters provides sustainment planning for the engineer force under its C2. Engineer battalions provide logistics support to subordinate units through organic FSCs.

6-24. At the engineer unit level, the basic sustainment responsibilities are to monitor, report, and request requirements through the correct channels and to ensure that sustainment requirements are met when sustainment is brought forward to the engineer unit. The engineer company executive officer (XO) and first sergeant (1SG) are normally in charge of these functions within the engineer companies and they receive guidance and oversight from the commander. They are also responsible for supporting any augmentation they may receive. Accurate and timely submission of personnel and logistics reports and other necessary information and requests is essential.

ENGINEER COORDINATOR

6-25. The ENCOORD at each echelon is responsible for engineer logistics estimates and plans and monitors engineer-related sustainment support for engineer capabilities operating at that echelon. When an engineer unit or capability is task-organized in support of the unit, the ENCOORD recommends the most effective command or support relationship, including considering the impact of inherent sustainment responsibilities. The ENCOORD—

- Writes the engineer annex and associated appendixes to the OPLAN or OPORD to support the commander's intent, including recommended distribution for any engineer-related command-regulated classes of supply and special equipment.
- Assists in planning the location(s) of the engineer forward supply point for the delivery of engineer configured loads of Class IV and Class V material. This site(s) is coordinated with the unit responsible for the terrain and the appropriate S-4 or assistant chief of staff, logistics (G-4).
- Assists in planning the location(s) of the engineer equipment parks for pre-positioning of critical equipment sets, such as tactical bridging. These sites are coordinated with the unit responsible for the terrain and the appropriate S-4 or G-4.
- Works closely with the sustainment staff to identify available haul assets (including HN) and recommends priorities to the sustainment planners.
- Identifies extraordinary medical evacuation requirements or coverage issues for engineer units and coordinates with sustainment planners to ensure that the supporting unit can accomplish these special workloads.
- Identifies critical engineer equipment and engineer mission logistics shortages.
- Provides the appropriate S-4 or G-4 with an initial estimate of required Class IV and Class V supplies for the countermobility and survivability efforts.
- Provides the appropriate S-4 or G-4 with an initial estimate of required Class IV supplies in support of construction. Monitors and advises, as required, implications of statutory, regulatory, and command policies for the procurement of construction materials. The critical issue for the ENCOORD is the timely delivery at required specifications whatever the source for construction materials.
- Tracks the flow of mission-critical Class IV and Class V supplies into support areas and forward to the supporting engineer units. Coordinates to provide engineer assistance as required to accept delivery of construction materials.
- Coordinates MSR clearing operations and tracks their status at the main CP.
- Coordinates for EOD support and integration as necessary.

ENGINEER UNIT COMMANDER

6-26. The unit commander ensures that sustainment operations maintain the mission capabilities of the unit and its ability to provide combat power. The unit commander provides critical insight during the supported unit planning process. The unit commander—

- Coordinates for sustainment support requirements external to the engineer unit.

- Anticipates problems, works to avoid delays in planning and transition, and conducts sustainment battle tracking.
- Communicates with subordinate leaders to identify the need for push packages, ensures their arrival, and tracks their expenditure.
- Determines the location of the unit resupply points and monitors the operation.
- Ensures that the unit is executing sustainment operations according to the supported unit SOP and OPORD.
- Monitors equipment locations and maintenance status.
- Updates the engineer-specific Class IV and Class V supply requirements based on reconnaissance of mission sites.
- Tracks engineer equipment use, maintenance deadlines, and fuel consumption.
- Receives, consolidates, and forwards all logistical, administrative, personnel, and casualty reports to the parent or supported unit.
- Directs and supervises the medical support within the unit, coordinating for additional support as required.
- Supervises and monitors the evacuation of casualties, detainees, and damaged equipment.
- Orients personnel replacements and assigns personnel to subordinate units.
- Conducts sustainment rehearsals at the unit level.
- Maintains and provides supplies for unit field sanitation activities.
- Integrates EOD support as necessary.

PRINCIPLES OF LOGISTICS

6-27. During the operations process cycle, the ENCOORD and the engineer unit commander(s) must plan, prepare, execute, and continuously assess sustainment support for engineer capabilities. Concurrent with other operational planning, the unit develops a sustainment plan during the mission analysis and refines it in the wargaming portion of the MDMP. Sustainment rehearsals are normally conducted at brigade, battalion, and company levels to ensure a smooth, continuous flow of materiel and services.

6-28. Successful sustainment involves balancing effectiveness with efficiency. Sustainment operations are characterized by being able to anticipate requirements, integrate joint and multinational sustainment, improvise solutions, and be responsive and continuous. The logistics principles—responsiveness, simplicity, flexibility, attainability, sustainability, survivability, economy, and integration—defined in FM 4-0 facilitate effective, efficient sustainment and act as a guide for planners and operators to synchronize logistics in support of operations. The following paragraphs describe these eight principles along with the engineer considerations for each.

6-29. "Responsiveness" is the key logistics principle. It means providing the right support in the right place at the right time. Responsiveness includes the ability to anticipate operational requirements and is the keystone of all the logistic principles. Engineers ensure that they identify all sustainment requirements in advance—taking into consideration support relationships of subordinate units. This information must be passed into sustainment channels and tracked through delivery. It involves identifying, accumulating, and maintaining the minimum assets, capabilities, and information necessary to meet support requirements. On the other hand, the force that accumulates enough material and personnel reserves to address every possible contingency usually cedes the initiative to the enemy. The sustainment system must keep pace with rapid decision cycles and mission execution to react quickly to crises or opportunities. It must continually respond to a changing situation and the shifting of engineer unit locations. Interim contingency sustainment support must be planned until the task organization is modified or changed. When possible, the plan should include aerial resupply.

6-30. Personnel losses and unit capabilities must also be anticipated to plan for continuous operations and future missions. Forward engineer units depend on the sustainment system of their parent unit or of the unit they are supporting and may require significant support to accomplish their engineer tasks. The brigade (and battalion) engineer must anticipate likely task organization changes that will affect the flow of

sustainment to engineer organizations. Additional missions will be created by the sustainment support plan (for example, clearing an LZ for aerial resupply). These missions and tasks must be anticipated and planned for during the mission analysis.

6-31. Versatile sustainment systems enhance the engineer unit's responsiveness and adapt engineer change requirements without interrupting the flow of support.

6-32. In this respect, responsiveness is closely tied with improvisation. Theater sustainment planners structure the logistics force to be versatile enough to complement engineer plans and operations yet be robust enough to ensure that engineer services are not interrupted. The structure must be responsive enough to allow the engineer commander to seize and maintain the initiative.

6-33. Engineers plan to meet the changing requirements of the operation on short notice. The engineer sustainment system should be versatile enough to keep pace with rapid decision cycles and mission execution and react rapidly to crises or opportunities. Engineer planners are sensitive to engineer task organization changes. Engineer units can normally respond to a change in task organization much quicker than theater sustainment packages can. Because of this, contingency engineer sustainment plans are normally developed.

6-34. The planner who anticipates—before, during, and after operations—is proactive, not reactive. The ability of the force to seize and maintain the initiative, synchronize activities along the entire depth of the AO, and exploit success depends on the commanders', logisticians', and engineers' ability to anticipate requirements. Engineers consider joint, multinational, contract civilian, and interagency assets when planning support for engineer operations. They—

- Use all available resources to the fullest, especially HN assets.
- Prioritize critical engineer activities based on the concept of operations.
- Anticipate engineer requirements based on wargaming and rock drills, incorporating experience and historical knowledge.
- Do not think linearly or sequentially; organize and resource for simultaneous and noncontiguous operations.
- Participate in and evaluate the engineer significance of each phase of the operation during the entire command estimate process, to include mission analysis and COA development, analysis and wargaming, recommendation, and execution.

6-35. The ENCOORD and the engineer unit commander forecast future requirements and accumulate assets needed to accommodate likely contingencies. Engineer operations frequently require—

- High fuel consumption rates (higher than most equipment found in a light brigade).
- Engineer-specific Class IX repair parts which often necessitates extraordinary coordination to obtain.
- Large amounts of Class IV (construction and barrier materials) and Class V (munitions and demolitions).
- Demolitions for offensive and defensive operations.
- A large commitment of maintenance and transportation support.
- Financial management support to procurement and contracting of locally available commercial services and materials.

6-36. "Simplicity" is avoiding complexity and often fosters efficiency in planning and executing logistics operations. Mission-type orders and standardized procedures contribute to simplicity. Engineer commanders and staffs establish priorities and allocate classes of supply and services to simplify sustainment operations. Engineers use preconfigured loads of specialized classes of supply to simplify transport.

6-37. "Flexibility" is the ability to adapt sustainment availability based on changing situations, missions, and concepts of operation. Due to the inherently changing world environment, engineer missions will change. Engineers require flexibility and coordination with higher staffs to provide sustainment and

logistical support. As ENCOORDs work future branch or sequel plans, they ensure that sustainment and logistical support is planned and resourced.

6-38. Sustainment plans and operations must be flexible enough to achieve responsiveness and economy. Flexibility may include improvisation, which is the ability to make, invent, or arrange what is needed from what is on hand. Improvised methods and support sources can maintain sustainment continuity when the preferred method is undefined or not usable to complete the mission.

6-39. Extraordinary methods may be necessary to ensure success during operations. Sustainment planners attempt to push support to engineer units forward to ensure smooth combat operations. Sometimes this is not feasible or supportable. In such cases, engineers improvise by making, inventing, devising, or fabricating what is needed. One example is creating a demolition cratering charge using common fertilizer and diesel fuel.

6-40. Commanders must be aware of the environmental impacts of their actions. They must weigh the implications of holding out for logistical support against environmental collateral damage that they will cause. They must ensure that a proper environmental risk-assessment is done before beginning any action.

6-41. Specific damage assessment and repair procedures have been developed based on the need to improvise during the operation. Improvisation is not a substitute for good planning; requirements must be anticipated. However, improvisation can be a great strength; engineer personnel must recognize it as an advantage in meeting emergencies.

6-42. "Attainability" involves generating the minimum essential supplies and services necessary to begin operations. Commanders determine the minimum levels of support acceptable to initiate operations. The engineer, in conjunction with the logistician, completes the sustainment estimate and initiates resource identification based on the supported commander's requirements and priorities. An operation should not begin until minimum essential levels of support are on hand.

6-43. For engineers, attainability is at the very core of decisions that are made. Trade-offs may be necessary to attain a given goal or level and quality of product. Since engineer materials must meet specific technical requirements, engineers work closely with the logistics staff to help them understand these requirements and obtain acceptable and suitable alternatives when trade-off decisions are required.

6-44. "Sustainability" ensures the longevity of logistics support to engineers throughout the AO for the duration of the operation. Sustainability focuses on the engineer commander's attention for long-term objectives and capabilities of the engineer forces. Long-term support is a challenge for the engineer staff, which must not only attain the minimum essential materiel levels to initiate operations but must also sustain those operations through the end state. The ENCOORD must ensure that logistical requirements are known and are flowing based on available transportation assets.

6-45. Engineers are either committed to the current operation or preparing for the next one. The tempo of operations requires a constant vigilance by the logistician and engineer commander to ensure a constant flow of support. Supplies are pushed (unit distribution method) forward whenever logistically feasible. Maneuver units rely on lulls in the tempo of an operation to conduct sustainment operations, while engineers may not. Engineers usually do not have this opportunity since many of their missions occur during a lull in operations and this may deny them the opportunity to use the supply point method. This increases the need for engineers to plan for continuous, routine, and emergency logistics support.

6-46. General engineering involves constructing, repairing, operating, and maintaining infrastructure and facilities to enhance provision of sustainment and services (see FM 3-34.400). Contracting support obtains and provides supplies, services, and construction labor and materiel—often providing a responsive option or enhancement to support the force (see FM 100-10-2 and FMI 4-93.41). General engineers will often be required to provide subject matter expertise for the supervision of contracted materials and services.

6-47. The logistics principle of "survivability" is related to but not exactly the same as the discussion of survivability operations in FM 5-103. It is based on being able to protect support functions from destruction or degradation. Engineers contribute to ensuring that sustainment means are survivable by constructing sustainment bases and clearing LOCs. They may also construct ammunition holding areas and provide revetments and other hardening for POL products.

6-48. "Economy" is the provision of support at the least cost. At some level and to some degree, resources are always limited. When prioritizing and allocating resources, the engineer commander and staff may not be able to provide a robust support package. Priority of effort will be established while balancing mitigation of risk to the operation. Engineer commanders may have to improvise to meet the higher intent and mitigate the risks. Commanders consider economy in prioritizing and allocating resources. Economy reflects the reality of resource shortfalls, while recognizing the inevitable friction and uncertainty of military operations.

6-49. "Integration" consists of synchronizing sustainment operations with all aspects of Army and joint, interagency, and multinational operations. The concept of operations achieves integration through a thorough understanding of the commander's intent and synchronization of the sustainment plan. Integration includes coordination with and mutual support among Army and joint, interagency, and multinational sustainment organizations.

6-50. Operational and tactical plans integrate all sustainment support to create a synergy with the concept of operations. Engineer planners participate in and evaluate the sustainment significance of each phase of the operation during the entire command estimate process. They create a clear and concise concept of support that integrates the commander's intent and concept of operations. This includes analyzing the mission; developing, analyzing, wargaming, and recommending a COA; and executing the plan.

SUSTAINMENT PLANNING

6-51. The efforts of engineer leaders and staff to plan and coordinate engineer sustainment are essential to the full integration of engineer operations. The ENCOORD, the engineer unit commander, the supported unit S-4 or G-4, and the sustainment support unit work closely to synchronize sustainment for engineer capabilities.

6-52. When the supported unit receives a warning order (directly or implied) as part of the MDMP, the ENCOORD initiates the engineer portion of the logistics estimate process. The ENCOORD focuses the logistics estimate on the requirements for the upcoming mission and the sustainment of all subordinate engineer units that are organic and task-organized in support of the unit. Class I, III, IV, and V supplies and personnel losses are the essential elements in the estimate process. Close integration with the sustainment support unit can simplify and accelerate this process through the use of the automated systems logistics status report to ensure that the sustainment support unit is able to maintain an up-to-date picture of the engineer unit sustainment requirements. During continuous operations, the estimate process supporting the RDSP may need to be abbreviated because of time constraints.

6-53. After conducting the estimate process to determine the requirements for unit and mission sustainment, the ENCOORD, with the respective S-4 or G-4, compares the requirements with the reported status of subordinate units to determine the specific amount of supplies needed to support the operation. These requirements are then coordinated with the sustainment support unit or forward support element to ensure that the needed supplies are identified and resourced higher echelon stocks.

6-54. The ENCOORD then translates the estimate into specific plans that are used to determine the supportability of supported unit COAs. After a COA is selected, the specific sustainment input to the supported unit base OPORD and paragraph 4 of the engineer annex is developed and incorporated.

6-55. In each of the different types of BCTs, the ENCOORD, working with the appropriate sustainment planner and executor, tracks essential sustainment tasks involving all engineer units supporting the brigade. Accurate and timely status reporting assists the ENCOORD in providing the overall engineer status to the brigade commander and allows the ENCOORD to intercede in critical sustainment problems when necessary. The ENCOORD also ensures that supplies needed by augmenting EAB engineer units to execute missions for the brigade are integrated into the brigade sustainment plans. For the ENCOORD to execute these missions properly, accurate and timely reporting and close coordination between the ENCOORD, sustainment planners and providers, task force engineers (or in some cases the engineer unit commander in the SBCT), and supporting EAB engineers are essential. Supporting EAB engineer units must effect linkup with the existing engineer sustainment to ensure their synchronization of effort.

SUSTAINMENT SUPPORT FUNCTIONS

6-56. Sustainment support can be broadly categorized and discussed within subordinate functions. The functions assist planners and leaders in coordinating for sustainment support. The functions include tasks associated with maintenance, ammunition support, supply and field services, transportation, HSS, transportation, HR support, and financial management.

MAINTENANCE

6-57. The Army has transitioned to two levels of maintenance: field and sustainment. Field maintenance is on-system maintenance and is mainly preventive maintenance and the replacement of defective parts. Field maintenance returns repaired equipment to the Soldier. It covers tasks previously assigned to operator and crew, organization and unit, and DS maintenance levels. It includes some "off-system maintenance" critical to mission readiness. Sustainment maintenance consists of repairing components of the user's system. It is generally a merging of the previous GS and depot levels of maintenance. Sustainment maintenance actions typically involve repair of repairable Class IX components (off-system) for return to the supply system. Sustainment-level maintenance is typically by an element of the sustainment brigade or higher echelon. The ENCOORD ensures that field level maintenance is identified for each supporting engineer unit.

6-58. Unit commanders ensure that vehicle crews and equipment operators perform preventive maintenance checks and services. To provide quick turnaround of maintenance problems, each engineer unit should coordinate for a field maintenance team (FMT) from their supporting maintenance company. These FMTs have contact maintenance trucks and mechanics trained to repair the unit's equipment.

SUPPLY AND FIELD SERVICES

6-59. Providing the force with general supplies and services is the mission of the attached or assigned elements of the sustainment brigade and functional battalions. Supply and service elements generally provide the subsistence, general supplies, bulk fuel, heavy materiel, repair parts, laundry and shower services, mortuary services, and water. Personal demand items (Class VI) and medical supplies are not typically provided by units under the C2 of the sustainment brigade, but must be considered during the planning process.

6-60. Class I consists of subsistence and gratuitous health and welfare items. They are automatically requested based on daily strength reports. BCT units deploy with three days of operational rations (meal, ready to eat [MRE]). MREs are distributed in case lots at the distribution point and picked up by the appropriate supply section. Unitized group rations and A-rations are broken down into lots at the distribution point and picked up by the appropriate field feeding section for incorporation into the LOGPAC.

6-61. Water is provided to Soldiers in two forms: bulk and bottled (packaged). Water support is provided through organic water purification and distribution capability when feasible. Either a distribution company or sustainment battalion provides external water support if required. Bulk potable water is used as needed for individual Soldiers. Bottled water may be provided on a limited basis, usually during the deployment phase of operations. Bottled water containers are issued based upon the same unit daily strength reports used for rations and field feeding. Engineers may be required to support with well drilling and other general and geospatial engineering expertise to provide adequate water for the force.

6-62. Class II consists of such items as clothing, individual equipment, tentage, hand tools, administrative and housekeeping supplies, and CBRN defense and decontamination items. Class III (P) consists of packaged POL. Usually, the unit deploys with 30 day's worth of common consumable supplies. These supplies are provided by the supporting supply unit and are maintained as part of the unit's authorized stockage list. Replenishment and other necessary supplies are ordered by unit supply sergeants. Supplies are provided at distribution points to the supporting supply unit. They are carried forward with the next LOGPAC, or immediately, if needed. Religious supplies and maps are considered Class II items. Unit ministry teams order consumable chaplain supplies as necessary. Maps are ordered through the S-2 or S-3 staff section or through the unit-level supply room if they are not classified.

6-63. Class III (B) consists of bulk POL. Quartermaster petroleum units provide fuel support for all U.S. (and potentially coalition) land-based forces. The POL group will be involved in the distribution from the refinery or terminal to the BSB's distribution company. The POL group may be task-organized with a quartermaster pipeline and terminal operating battalion. In a developed theater, the fuel distribution system includes: the offshore petroleum discharge system (OPDS), inland tank farms, tactical petroleum terminals, and pipeline systems. With a theater structure in place, operational petroleum pipeline and terminal operating companies in the POL group establish the theater petroleum support base for products received from ocean tankers at marine petroleum terminals. The petroleum support base serves as a hub for receiving, temporarily storing, and moving fuels to petroleum support companies in the sustainment brigades at division level. Petroleum support battalions in the POL group provide theater stocks and deliver fuel forward to the division-level sustainment brigade's petroleum support companies in the combat sustainment support battalion. Petroleum support companies support the distribution mission and POL truck companies deliver fuel to the BSB in the BCTs.

6-64. Pipelines and hoselines will be used to deliver fuel products as much as possible during initial operations. Large-scale combat operations may justify construction of coupled pipelines and hoselines using the inland petroleum distribution system or rapidly installed pipeline or hoseline systems to move bulk petroleum from the theater sustainment area storage locations forward. Air bases and tactical airfields are serviced by pipeline when feasible. When available, pipeline distribution is supplemented by tank-type vehicles, railcars, and barges.

6-65. Units usually deploy with half-full vehicle fuel tanks, purged fuelers, and empty fuel cans. Fuel is issued on the unit's arrival in the theater. Units forecast requirements based on the current or upcoming mission. The forecast is SOP-dependent, but usually is for the 72-hour period beyond the next day or out to 96 hours.

6-66. Class IV consists of construction materials, including all fortification and barrier materials. These are items for which allowances are not prescribed. The management of Class IV supplies for survivability and countermobility is most efficient when there is a shared interest between the maneuver and engineer logisticians. Units deploy with a limited amount of Class IV barrier material, primarily for protection of unit perimeters and key positions. This material is considered the unit's basic load and usually is carried on tactical vehicles. Replenishment is ordered by company supply sergeants. Supplies are provided from the distribution point and are carried forward by sustainment elements with the next LOGPAC, or immediately, if needed. Barrier material may also be requested as expeditionary support packages. See FM 3-90.6 for additional information on expeditionary support packages.

6-67. The ENCOORD must coordinate closely with the logistics staff to assist in management of required construction materials. Engineer operations may require large quantities and specified qualities of these materials. Statutory, regulatory, and command policies may dictate the source, requiring the maximum use of local procurement for example. The ENCOORD assists the logistics staff in adequately forecasting the requirements and ensuring a quality control process is in place for receipt of the materials.

6-68. Class V consists of all types of ammunition, including chemical, radiological, and special weapons; bombs; explosives; mines; fuses; detonators; pyrotechnics; missiles; rockets; propellants; and other associated items. Class V supplies are based on a required supply rate (RSR) and controlled supply rate (CSR). RSR is the amount of ammunition (usually expressed in rounds per weapon per day) estimated to be required to sustain operations without restriction for a specific period. CSR is the rate of ammunition consumption that can be supported (considering availability, facilities, and transportation) for a given period. The CSR may be less than the RSR. If the RSR exceeds the CSR, the commander determines who receives the ammunition. The ENCOORD coordinates supporting engineer unit ammunition requirements, including demolition munitions and mines, with the S-4 or G-4.

6-69. A combat load is the unit commander's designated quantity of munitions and items authorized to be carried by unit personnel and combat vehicles (turret-load). Troop-carried munitions to accompany troops are those issued before departure from the aerial port of embarkation (APOE). Turret-load and combat load munitions are those authorized for transportation in thick-skinned vehicles for deployment purposes. Generally, BCTs try to keep three combat loads of critical munitions on hand. Most units do not deploy

with their authorized basic load of ammunition. Instead, they are issued their combat load upon arrival in the theater. There are, however, times when selected units deploy with a full combat load of ammunition.

6-70. Ammunition support activities like the theater storage area (TSA), ASPs, and ammunition transfer and holding points (ATHPs) provide the capability to receive, store, issue, inspect, and perform field-level munitions maintenance support. The sustainment brigade gains such capability when it is assigned one or more ammunition ordnance company. The TSA encompasses the storage facilities located at the operational level. This is where the bulk of the theater reserve ammunition stocks are located. The primary mission of the TSA is to receive munitions from the national level, conduct the bulk of operational-level reconfiguration, and distribute munitions to forward ASP locations and BCT ATHPs. The TSA will build those configured loads that cannot be shipped into theater due to explosive compatibility conflicts for international shipment. Engineer units may provide general engineer support to the ammunition support activities.

6-71. Class VI consists of all personal-demand items, such as candy, cigarettes, soap, and cameras (nonmilitary sale items). Soldiers usually carry 30 days of personal comfort items with them when deploying. Health and comfort packs are also Class VI items. Class VI support is obtained through supply channels when a post exchange is not available. Resupply flow is the same as for Class I. Delivery of health and comfort packs is based on headcounts provided for field feeding.

6-72. Class VII consists of major end items, such as launchers, tanks, mobile machine shops, vehicles, and organizational tool sets. Units deploy with all required equipment based on the appropriate MTOE. Additional equipment may be issued to the unit in the theater of operations based on mission requirements. Class VII replacement is based on losses reported through command channels. Reporting loss of major end items permits the commander to remain apprised of the operational status of subordinate commands and to direct the distribution of items to the units having the most critical need.

6-73. Class VIII consists of medical material, including repair parts peculiar to medical equipment. Usually, medical units deploy with a 3- to 5-day supply of consumable medical supplies, and all companies deploy with complete combat lifesaver bags. Initial sustainment supplies are pushed to the medical company based on theater casualty estimates. Individual Soldiers deploy with a 180-day supply of their prescribed medications. Soldier must advise their supporting medical unit of their specific needs.

6-74. Resupply of medical supplies is through medical channels. The medical company and maneuver platoon medical personnel are responsible for maintaining the medical sets, kits, and outfits. Combat lifesavers and company and platoon medics receive replenishment for their aid bags from their unit medical platoon.

6-75. Class IX consists of repair parts and components, including kits, assemblies, and subassemblies (repairable and unrepairable) that are required for maintenance support of all equipment. Each unit stocks and deploys with combinations of repair parts: shop stock, bench stock, combat repair team stocks, and combat spares. Stocks are based on demand history and usually maintained at a 15-day supply quantity. Maintenance personnel replenish their combat spares and order other parts as needed through the supporting sustainment brigade, sustainment battalion, or BSB. Class IX repair part requisitions are prioritized based on the commander's priority of maintenance and need.

6-76. Class X consists of materials to support nonmilitary programs, such as agriculture and economic development. Class X items are requested based on requirements from the CA or operations channels. Materiel for nonmilitary support usually is provided by the HN, NGOs (such as Red Cross), or the DOS. Humanitarian assistance is governed by Title 10, U.S.C. Section 401, which specifies that humanitarian assistance—

- Must be carried out according to HN military or civilian personnel.
- Shall complement and may not duplicate any other form of social or economic assistance that may be provided to the HN by any other department or agency of the United States government.
- May not be provided directly or indirectly to any individual, group, or organization engaged in military or paramilitary activities.
- May not be provided unless the DOS specifically approves such assistance.

Note. Before providing civil-military support or humanitarian assistance, commanders should seek legal review from their servicing Judge Advocate.

6-77. The recovery and identification of deceased personnel is the responsibility of each unit. Units supervise the preparation of incident statements on DD Form 565, *Statements of Recognition of Deceased*. These documents accompany the remains during transport to a remains collection point. Usually, remains collection points are in the vicinity of the combat trains, but not near the medical support section. Once the necessary reports are complete, the remains are evacuated to the supporting collection point. From there remains are evacuated to a mortuary collection point established by the TSC. If remains have been contaminated by CBRN agents or toxic industrial materials, the S-4, in coordination with the CBRN officer, should provide guidance to units before they handle or evacuate the remains.

6-78. Shower, laundry, and clothing renovation capabilities resident within the quartermaster field services company are provided from the sustainment brigades with projection as far forward as possible. The mission is to provide Soldiers a minimum of a weekly shower and up to 15 pounds of laundered clothing each week (comprising two uniform sets, undergarments, socks, and two towels). Small unit showers are authorized according to common table of allowances 50-909. One shower unit consists of one heater, one shelter, and two water bags. Showers may be provided to the BCT by sustainment brigade units during mission staging operations.

TRANSPORTATION

6-79. Transportation assets of the sustainment brigade and functional transportation battalions provide distribution from the sustainment brigades forward and retrograde of damaged or surplus items. The mobility branch of the TSC support operations officer provides staff supervision of all transportation and coordinates directly with the movement control battalion (MCB). The MCB and its movement control teams coordinate all movement in the JOA or AO, to include in, out, and through all divisional areas. Sustainment brigades with lift assets physically located adjacent to divisional units may or may not provide transportation support to move materiel when requests from tactical units are processed by the TSC DMC.

6-80. Recent history has shown that intermodal operations are critically affected by the manner in which container management policies are enforced and container management is subsequently executed. Industry partners will continue to use this method of packaging and distribution within the global environment for the foreseeable future; therefore, it is vital to maintain the control and flow of containers. Modular force operations must fully integrate container management into the distribution system. Flat racks and containers offer tactical efficiencies that serve to increase the pace of sustainment operations. The key to these efficiencies and maintaining this pace is congruent flat rack and container management procedures at each stage or level of support (FSC, BSB, sustainment brigade, ESC, and TSC). An increased operational depth and the reduction of redundant logistics force structure challenge flat rack and container management and, ultimately, the sustainment of combat power. Flat rack and container employment, management, and retrograde operations are the responsibility of distribution managers. In the sustainment brigade, the support operations officer must track flat racks and containers dispersed throughout the distribution system and, if applicable, to the consignee in the division or corps AO.

6-81. Movement control teams process movement requests and arrange transport for moving personnel, equipment, and sustainment supplies. They process convoy clearance requests and special hauling permits. Movement control teams coordinate for the optimal mode (air, rail, inland waterway, or highway) for unprogrammed moves, and commit the mode operators from the sustainment brigade, LOGCAP, multinational elements, and the HN. They also assist in carrying out the movement program (for more information, refer to FM 4-01.30.)

HEALTH SERVICE SUPPORT

6-82. The first medical care a Soldier receives is provided at Role 1 of the Army health system. This care includes immediate lifesaving measures, emergency medical treatment, advanced trauma management, disease prevention, stress prevention, casualty collection, and evacuation from the supported unit to a

supporting MTF. These elements include the trauma specialist assisted by first aid (self-aid and buddy aid), advanced first aid (combat lifesaver), and the Role 1 MTF (battalion aid station). When a Role 1 medical capability is not present in a unit, this support is provided on an area support basis to that unit by the supporting Role 2 medical unit. See FM 4-02 for an overarching discussion of HSS.

6-83. Combat lifesavers and buddy aid are crucial to sustaining HSS. The combat lifesaver is almost always the first person on the scene to begin the process of providing enhanced first aid to wounded and injured personnel. The combat lifesaver is a nonmedical Soldier trained to provide enhanced first aid and lifesaving procedures beyond the level of self aid or buddy aid. The combat lifesaver is not intended to take the place of medical personnel but to slow deterioration of a wounded Soldier's condition until medical personnel arrive. Each squad, crew, or equivalent-size deployable unit will have at least one Soldier trained and certified as a combat lifesaver. The senior medic advises the company commander on the status of combat lifesavers for the company. The company commander coordinates with the supporting medical element for combat lifesaver training and Class VIII resupply.

6-84. Vehicle commanders are responsible for ensuring that injured crewmen receive immediate first aid and for reporting casualties. Vehicle commanders coordinate with the 1SG and senior medic for ground evacuation. Evacuation of injured Soldiers is categorized into two types:

- Medical evacuation is the use of ground or air ambulances to evacuate from the point of injury to a MTF while providing en route care.
- Casualty evacuation (CASEVAC) is the use of nonmedical vehicles or other means for patient movement without providing en route care.

6-85. Medical evacuation elements use the most expedient means available for medical evacuation of sick or wounded Soldiers. The use of air ambulance is METT-TC-dependent since they may not always be available. The CAB GS aviation battalion will determine where to position the forward support medical teams. The number of HH-60 Blackhawk aircraft in support of a BCT will be based on mission requirements. The forward support medical team will either provide DS or GS to the BCTs. The brigade aviation element and BCT surgeon coordinate the use and positioning of the forward support medical team. They integrate air ambulance support, to include coordination of Army airspace C2 requirements, establishing clear lines of authority to launch a medical evacuation and identification of pickup zones and LZs. Planners must anticipate potential high casualty rates and long evacuation distances while retaining the flexibility to shift nonstandard evacuation assets to support mass casualty or CASEVAC, as required.

6-86. Capabilities at the medical company duplicate those found at Role 1 and expand available medical services by adding operational dental, laboratory, X-ray, patient holding, mental health, and preventive medicine capabilities. Emergency medical treatment and advanced trauma management is continued. If necessary, additional emergency measures are instituted; however, these measures do not exceed those dictated by immediate needs. The forward surgical team from the corps may colocate with the medical company and provide emergency resuscitative surgical capability. The combined medical company and forward surgical team are generally considered to be Role 2+. The medical company examines and evaluates a casualty's wounds and general physical condition to determine treatment and evacuation priorities. The medical company provides sick call services, area medical support, and ground ambulance medical evacuation support for the engineer company.

HUMAN RESOURCES SUPPORT

6-87. The unit HR staff officer (S-1) is the principal coordinating staff responsible for the planning, integration, coordination, and delivery of HR support. The S-1 is responsible for the execution of the HR core competencies and capabilities listed in paragraph 6-91, and military pay input and inquiries. The S-1 also serves as the point of contact for command interest programs, such as voting assistance, Army Emergency Relief, equal opportunity, and retention. External HR support is coordinated through the HR Operations Cell of the sustainment brigade supporting the unit. The S-1 relies on the availability of both secure and nonsecure data and voice systems and its location in the AO must allow for full connectivity with SIPRNET and Nonsecure Internet Protocol Router Network (NIPRNET). Brigade-level S-1 sections provide staff control of subordinate S-1 sections.

6-88. HR support encompasses ten core competencies. These core competencies are—

- Personnel readiness management.
- Personnel accountability and strength reporting.
- Personnel information management.
- Reception, replacement, redeployment, rest and recuperation, and return-to-duty.
- Casualty operations.
- Essential personnel services.
- HR planning and operations.
- Postal operations.
- Morale, welfare, and recreation.
- Band operations.

OTHER SUSTAINMENT SUPPORT

6-89. In addition to the support provided by U.S. military organizations, sustainment support may incorporate support provided by contractors and host nation support (HNS) into plans and operations. These sources of support offer greater economy and may reduce demands on strategic lift. However, their use must be balanced with the greater burden of protection that they also bring.

CONTRACTED SUPPORT

6-90. Contracting is a key source of support for deployed forces conducting full spectrum operations. Because of the importance and unique challenges of contracted support, engineer commanders and staff need to fully understand their role in planning for and managing contracted support. Key to understanding contracting and contractor management is being familiar with the doctrine laid out in FM 100-10-2, FMI 4-93.41, and FM 3-100.21. These FMs describe three broad types of contracted support: theater support, external support, and systems support.

- Theater support contractors support deployed operational forces under prearranged contracts or contracts awarded from the mission area by contracting officers under the OPCON of the contracting support brigade or joint contracting command (if established). Theater-support contractors provide goods, services, and minor construction, usually from the local commercial sources, to meet the immediate needs of operational commanders. Theater support contracts are the type of contract typically associated with contingency contracting.
- External support contractors provide a variety of sustainment support to deployed forces. External support contracts may be prearranged contracts or contracts awarded during the contingency itself to support the mission and may include a mix of U.S. citizens, third-country nationals, and local national subcontractor employees. The largest and most commonly used external support contract is LOGCAP. This Army program is commonly used to provide life support, transportation support, and many other support functions to deployed Army forces and other elements of the joint force as well.
- System support contracts are prearranged contracts by the ASA (ALT) program executive officer (PEO) and program management offices. Supported systems include, but are not limited to, newly fielded weapon systems, aircraft, C2 infrastructure (such as the Army Battle Command System [ABCS] and standard STAMIS), and communications equipment. System support contractors, made up mostly of U.S. citizens, often provide support in garrison and may deploy with the force to both training and real-world operations. They may provide either temporary support during the initial fielding of a system (called interim contracted support) or long-term support for selected materiel systems (often referred to as contractor logistic support).

6-91. For engineer units, the major challenge is ensuring that the engineer-related requirements are properly identified in the ESP and that all requirements that cannot be met via military or HNS means are identified. It is imperative that the staff engineer work closely with the TSC or ESC support operations officer, the Army forces G-4, and the supporting contracting support brigade to ensure that engineer

requirements are properly integrated and captured in the contracting support plan and/or specifically addressed in the ESP. It is also important to understand that most engineer units (less FEST-As) do not have any dedicated contingency contracting teams and that this support will be provided on a GS basis from the supporting contracting support brigade (or joint command if established).

6-92. It is also imperative that the engineer commanders and staff fully understand the key differences between contracted and military support. These differences include—

- Contractor personnel authorized to accompany the force are neither combatants nor noncombatants, they are civilians "authorized" to accompany the force in the field.
- Contractors are not in the chain of command. They are managed through their contracts and the contract management system, which should always include a unit contracting officer's representative.
- Contractors perform only tasks specified in contracts. "Other duties as assigned" does not apply.

GENERATING FORCE SUSTAINMENT OF FORCES AND OPERATIONS

6-93. The increasingly interconnected global environment allows the generating force to apply its sustainment capabilities directly within the theater of operations. These capabilities include contingency and sustainment contracting; the maintenance and repair of equipment; acquisition, logistics, and technology functions; HSS; and force health protection. The generating force supports deployed operating forces employing a combination of forward presence, call-forward support, and technical reach. The Army field support brigade coordinates generating force sustainment support of operations in the theater of operations.

6-94. The ASC, through its deployable AFSBs, is the primary generating force integrator of ALT support. The AFSB, normally OPCON to the TSC, is responsible for integrating, coordinating, and, when appropriate, commanding Army ALT support organizations in support of deployed Army forces. Using reach and call-forward methodologies, the AFSB leverages national sustainment-level generating force capabilities. Specific AFSB generating force-related capabilities include, but are not limited to—

- Calling forward TDA or contracted-forward repair activities.
- Coordinating technical advice from various ALT organizations.
- Coordinating PEO and program manager system fielding and modification efforts.
- Integrating and assisting in the management of systems support contracts.

6-95. The MEDCOM provides enterprise-level HSS to the joint force that provides continuity of care from the theater of operations through the generating force. MEDCOM integrates the capabilities of its subordinate operational Army units with generating force assets like military treatment facilities and research, development, and acquisition capabilities. MEDCOM's generating force capabilities not only augment those of operating forces but also provide significant assistance in coping with unanticipated health threats.

HOST NATION SUPPORT

6-96. The TSC will coordinate for HNS (negotiated by the U.S. DOS) as required in support of its mission.

6-97. HNS and local procurement may provide a full range of logistics, operational, and tactical support. HNS agreements fulfilling the command requirements for support need to be prenegotiated. Such support arrangements must be integrated into the distribution plan and coordinated with other Services, allies, and coalition partners to prevent competition for resources and ensure that high-priority requirements are met. HNS may include functional or area support and use of HN facilities, government agencies, civilians, or military units. Pre-established arrangements for HNS can reduce the requirement for early deployment of U.S. assets and can offset requirements for early strategic lift by reducing requirements for moving resources to the theater.

MULTINATIONAL SUPPORT

6-98. Multinational support may consist of common-user logistics support provided from one multinational partner to another. One or more of the following organizational and management options facilitates multinational support:

- National support elements provide national support.
- Individual acquisition and cross-servicing agreements provide limited support.
- A lead nation provides specific support to other contributing nation military forces.
- A role-specialist nation provides a specific common supply item or service.
- A multinational integrated logistics unit provides limited common supply and service support.
- A multinational joint logistics center manages common-user logistics support.

6-99. In all cases, the multinational force commander directs specific multinational common-user logistics support within the applicable laws and regulations of the HN. When operating within a formal alliance, the TSC commander and staff execute common-user logistics support according to applicable standardization agreements or international standardization agreements. FM 100-8, FM 4-0, JP 4-07, and JP 4-08 discuss multinational logistics support.

This page intentionally left blank.

Appendix A

Engineer Field Manuals and Related Joint Publications

A-1. Table A-1 provides a summary of engineer FMs and related JPs other than FM 3-34. These Army engineer publications are in some cases dual-Service manuals or multi-Service publications. Each one of these is linked through the engineer keystone manual of FM 3-34 or directly to the three engineer JPs—

- JP 2-03.
- JP 3-15.
- JP 3-34.

A-2. The Army and joint engineer publications are also linked with allied engineer doctrine whenever required or possible. Key allied publications include—

- Allied administrative publication (AAP) 19.
- AJP-3.12.
- ATP-52(B).

Table A-1. Other Army engineer publications

Current Number	*Planned Revision Number*	*Current Document Title*	*Current Version Available*
FM 3-34.2	FM 3-90.11	*Combined Arms Breaching Operations*	With change 1-3, 11 Oct 02
FM 5-102	FM 3-90.13	*Countermobility*	14 Mar 85
FM 5-103	FM 3-34.300	*Survivability*	10 Jun 85
FM 3-90.12		*Combined Arms Gap-Crossing Operations*	1 Jul 08
FM 90-7	FM 3-90.13	*Combined Arms Obstacle Integration*	With change 1, 10 Apr 03
FM 3-90.119		*Combined Arms Improvised Explosive Device Defeat Operations*	21 Sep 07
FM 3-34.170		*Engineer Reconnaissance*	25 Mar 08
FM 3-34.280		*Engineer Diving Operations*	20 Dec 04
FM 20-11	FM 3-34.281	*Military Diving*	With change 1, 14 Apr 00
FM 3-34.210		*Explosive Hazards Operations*	27 Mar 07
FM 3-34.214		*Explosives and Demolitions*	11 July 2007
FM 20-3	FM 3-34.305	*Camouflage, Concealment, and Decoys*	30 Aug 99
FM 5-34	FM 3-34.310	*Engineer Field Data*	19 Jul 05
FM 3-34.400		*General Engineering*	9 Dec 08
FM 5-430-00-1	FM 3-34.410	*Planning and Design of Roads, Airports, and Heliports in the Theater of Operations - Road Design*	26 Aug 94
FM 5-430-00-2	FM 3-34.411	*Planning and Design of Roads, Airports, and Heliports in the Theater of Operations - Airfield and Heliport Design*	29 Sep 94
FM 5-434	FM 3-34.420	*Earthmoving Operations*	15 Jun 00
FM 5-436	FM 3-34.421	*Paving and Surfacing Operations*	28 Apr 00

Table A-1. Other Army engineer publications

Current Number	*Planned Revision Number*	*Current Document Title*	*Current Version Available*
FM 5-428	FM 3-34.425	*Concrete and Masonry*	18 Jun 98
FM 3-34.471	FM 3-34.426	*Plumbing, Pipefitting and Sewerage*	31 Aug 01
FM 5-424	FM 3-34.428	*Theater of Operations Electrical Systems*	25 Jun 97
FM 5-426	FM 3-34.427	*Carpentry*	3 Oct 95
FM 5-212	FM 3-34.473	*Medium Girder Bridge*	7 Feb 89
FM 5-277	FM 3-34.474	*Bailey Bridge*	With change 1, 15 Aug 91
FM 3-34.343	FM 3-34.475	*Military Nonstandard Fixed Bridging*	12 Feb 02
FM 5-482	FM 3-34.476	*Military Petroleum Pipeline Systems*	26 Aug 94
FM 5-412	FM 3-34.464	*Project Management*	13 Jun 94
FM 5-553	FM 3-34.430	*General Drafting*	6 Jan 84*
TM 5-581B	FM 3-34.431	*Construction Drafting*	8 Dec 72*
TM 5-704	TM 3-34.432	*Construction Print Reading in the Field*	2 Jan 69*
FM 5-233	FM 3-34.433	*Construction Surveying*	4 Jan 85
FM 5-410	FM 3-34.450	*Military Soils Engineering*	With change 1, 4 Jun 97
FM 5-472	FM 3-34.451	*Materials Testing*	With change 2, 1 Jun 01
FM 5-125	FM 3-34.494	*Rigging Techniques, Procedures, and Applications*	With change 1, 3 Oct 95
FM 5-480	FM 3-34.470	*Port Construction and Repair*	12 Dec 90
FM 5-134	FM 3-34.471	*Pile Construction*	18 Apr 85
TM 5-349	FM 3-34.472	*Arctic Construction*	1 Feb -62
FM 3-34.468		*Seabee Quarry Blasting Operations and Safety Manual*	19 Dec 03
FM 5-484	*FM 3-34.469*	*Multi-Service Well-Drilling Operations*	8 Mar 94
FM 3-34.480	*None*	*Engineer Prime Power Operations*	4 Apr 07
FM 5-415	*FM 3-34.485*	*Firefighting Operations*	9 Feb 99
FM 5-499	*FM 3-34.495*	*Hydraulics*	1 Aug 97
TM 5-323	*FM 3-34.496*	*Military Standardization Handbook: Generators*	30 Aug 62*
FM 3-100.4	*FM 3-34.500*	*Environmental Considerations in Military Operations*	With change 1, 11 May 01
FM 3-34.230	*FM 3-34.600*	*Topographic Operations*	3 Aug 00
FM 5-33	*FM 3-34.610*	*Terrain Analysis*	With change 1, 8 Sep 92
FM 3-34.331	*FM 3-34.620*	*Topographic Surveying*	16 Jan 01
TM 5-235	*FM 3-34.625*	*Special Surveys*	18 Sep 64*
FM 5-10	*FM 3-34.21*	*Combat Engineer Platoon*	With change 1, 1 Apr 05
FM 5-116	*FM 3-34.23*	*Engineer Operations: Echelons Above Corps*	9 Feb 99
FM 5-100-15	*FM 3-34.23*	*Corps Engineer Operations*	6 Jun 95
FM 5-71-100	*FM 3-34.23*	*Division Engineer Combat Operations*	22 Apr 93
Note: * Not available on AKO; available by request through the Engineer Doctrine Section.			

Appendix B

Army Engineer Organizations and Capabilities

The modular construct of the Army engineer operational force is a complementary and interdependent relationship between four major categories of units (and includes USACE-provided technical engineering and contract support as already discussed). The four categories include organic engineers (and staff elements) and three categories in an engineer force pool (all operational force engineer units not organic to a BCT, organic to the ACR, or in a headquarters staff). The assets in the force pool exist to augment organic BCT engineers and provide echelons above the BCT with necessary engineer capabilities. The force pool is organized into engineer headquarters units, baseline units, and specialized engineer units.

ORGANIC ENGINEER UNITS

B-1. Table B-1 provides a quick reference index for the organic engineer units described in this appendix.

Table B-1. Organic engineer units

Unit	*Figure Number and Page*
HBCT Engineer Company	B-1, B-3
IBCT Engineer Company	B-2, B-4
SBCT Engineer Company	B-3, B-5
ACR Engineer Company	B-4, B-6

ENGINEER HEADQUARTERS UNITS

B-2. Table B-2 provides a quick reference index for the C2 units described in this appendix.

Table B-2. Headquarters units

Unit	*Figure Number and Page*
Theater Engineer Command	B-5, B-7
Engineer Brigade	B-6, B-8
Engineer Battalion	B-7, B-9

BASELINE ENGINEER UNITS

B-3. Table B-3, page B-2, provides a quick reference index for the baseline engineer units described in this appendix.

Table B-3. Baseline engineer units

Unit	*Figure Number and Page*
Sapper Company	B-8, B-10
Sapper Company (Wheeled)	B-9, B-11
Sapper Company (Airborne)	B-10, B-12
Mobility Augmentation Company	B-11, B-13
Multirole Bridge Company	B-12, B-14
Clearance Company	B-13, B-15
Horizontal Construction Company	B-14, B-16
Vertical Construction Company	B-15, B-17
Engineer Support Company	B-16, B-18
Engineer Support Company (Airborne)	B-17, B-19

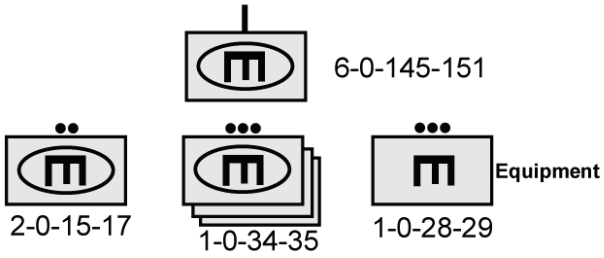
SPECIALIZED ENGINEER UNITS

B-4. Table B-4 provides a quick reference index for the specialized engineer units described in this appendix.

Table B-4. Specialized engineer units

Unit	*Figure Number and Page*
Pipeline Construction Company	B-18, B-20
Prime Power Company	B-19, B-21
Topographic Engineer Company	B-20, B-22
Equipment Support Platoon	B-21, B-23
Quarry Platoon	B-22, B-24
Facility Engineer Detachment	B-23, B-25
Construction Management Team	B-24, B-26
Survey and Design Team	B-25, B-27
Concrete Section	B-26, B-28
Forward Engineer Support Team–Main	B-27, B-29
Forward Engineer Support Team–Advance	B-28, B-30
Firefighting Headquarters	B-29, B-31
Firefighting Team	B-30, B-32
Asphalt Team	B-31, B-33
Dive Team	B-32, B-34
Real Estate Team	B-33, B-35
Well-Drilling Headquarters	B-34, B-36
Well-Drilling Team	B-35, B-37
Engineer Detachment Headquarters (Canine)	B-36, B-38
Engineer Squad (Canine)	B-37, B-39
Explosive Hazards Team	B-38, B-40
Explosive Hazards Coordination Cell	B-39, B-41
Geospatial Planning Cell	B-40, B-42

ENGINEER COMPANY, HBCT
05303G200



MISSION

To increase the combat effectiveness of the BCT by accomplishing mobility, countermobility, survivability, and limited general engineering tasks, or to perform combat tasks when required.

CAPABILITIES

- Provides advice to maneuver element commanders and staffs on engineer capabilities and engineering impacts on plans and operations.
- Prepares and maintains essential combat trails in forward area.
- Conducts expedient repair of essential bridges, fords and roads
- Conducts engineer reconnaissance and provides obstacle intelligence for the BCT.
- Provides engineer support for the conduct of mobility and countermobility operations.
- Provides field engineering advice, assistance, and equipment to maneuver elements in the construction of fighting positions for individuals and weapon systems.
- Prepares and conducts demolition targets such as bridge destruction, road and runway craters, abatis or other road blocks and tunnel and road destruction.
- Emplaces and provides technical assistance in the emplacement of mines and networked munitions.
- Performs limited sustainment engineering tasks such as construction, repair, and maintenance of command post, combat trails, site drainage, chemical decon sites and logistics field sites.
- When required, fights as Infantry.

DEPENDENCIES

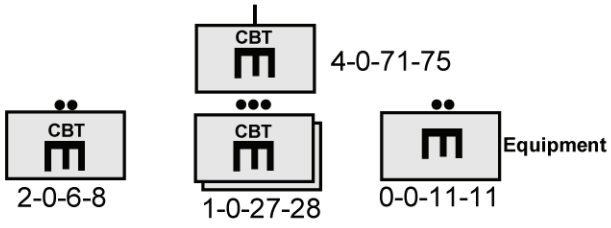
- Appropriate elements of the BSTB or BCT for unit level maintenance, direct support maintenance, religious, legal, health service support, finance, and personnel and administrative services.
- HHC, BSTB for religious, legal, health service support, field feeding support, finance, personnel and administrative service support.
- Forward Support Company for unit and direct support maintenance except communications-electronic equipment and communications-security equipment.
- Engineer Battalion, TOE 05436G00 for sufficient command and control assets to support entire Brigade.
- Engineer Company, Multi-Role Bridge, TOE 05473L000 for additional personnel and equipment in support of assault gap crossing missions.
- Engineer Support Company, TOE 05419G000, for additional equipment in support of obstacle emplacement, construction of defensive positions, and sustainment engineering missions.

TYPICAL ALLOCATION

One per HBCT.

Figure B-1. HBCT engineer company

ENGINEER COMPANY, IBCT
05453G000



MISSION

To increase the combat effectiveness of the BCT by accomplishing mobility, countermobility, survivability, and limited general engineering tasks, or to perform combat tasks when required.

CAPABILITIES

- Provides advice to maneuver element commanders and staffs on engineer capabilities and engineering impacts on plans and operations.
- Prepares and maintains essential combat trails in forward area.
- Conducts expedient repair of essential bridges, fords and roads.
- Conducts engineer reconnaissance and provides obstacle intelligence for the BCT.
- Provides engineer support for the conduct of mobility and countermobility operations.
- Provides field engineering advice, assistance, and equipment to maneuver elements in the construction of fighting positions for individuals and weapon systems.
- Prepares and conducts demolition targets such as bridge destruction, road and runway craters, abatis or other road blocks and tunnel and road destruction.
- Emplaces and provides technical assistance in the emplacement of mines and networked munitions.
- Performs limited sustainment engineering tasks such as construction, repair, and maintenance of command post, combat trails, site drainage, chemical decon sites and logistics field sites.
- When required, fights as Infantry.

DEPENDENCIES

- Appropriate elements of the BSTB or BCT for unit level maintenance, direct support maintenance, religious, legal, health service support, finance, and personnel and administrative services.
- HHC, BSTB for religious, legal, health service support, field feeding support, finance, personnel and administrative service support.
- Forward Support Company for unit and direct support maintenance except communications-electronic equipment and communications-security equipment.

Engineer Battalion, TOE 05436G00 for sufficient command and control assets to support entire Brigade.

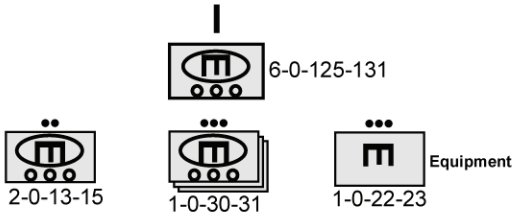
- Engineer Company, Multi-Role Bridge, TOE 05473L000 for additional personnel and equipment in support of assault gap crossing missions.
- Engineer Support Company, TOE 05419G000, for additional equipment in support of obstacle emplacement, construction of defensive positions, and sustainment engineering missions.

TYPICAL ALLOCATION

One per IBCT.

Figure B-2. IBCT engineer company

ENGINEER COMPANY, SBCT
05063F300



MISSION

To increase the combat effectiveness of the BCT by accomplishing mobility, countermobility, survivability, and limited general engineering tasks, or to perform combat tasks when required.

CAPABILITIES

- Provides advice to maneuver element commanders and staffs on engineer capabilities and engineering impacts on plans and operations.
- Prepares and maintains essential combat trails in forward area.
- Conducts expedient repair of essential bridges, fords and roads.
- Conducts engineer reconnaissance and provides obstacle intelligence for the BCT.
- Provides engineer support for the conduct of mobility and countermobility operations.
- Provides field engineering advice, assistance, and equipment to maneuver elements in the construction of fighting positions for individuals and weapon systems.
- Prepares and conducts demolition targets such as bridge destruction, road and runway craters, abatis or other road blocks and tunnel and road destruction.
- Emplaces and provides technical assistance in the emplacement of mines and networked munitions.
- Performs limited sustainment engineering tasks such as construction, repair, and maintenance of command post, combat trails, site drainage, chemical decon sites and logistics field sites.
- Provides medium weight bridging assets for limited wet and dry gap crossing.
- When required, fights as Infantry.

DEPENDENCIES

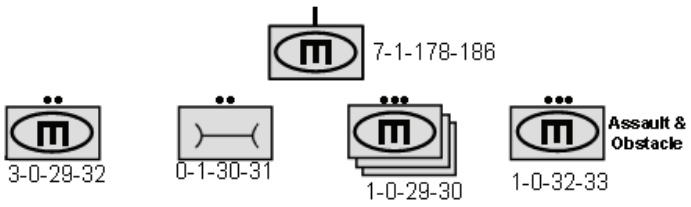
- Appropriate elements of the BCT for unit level maintenance, direct support maintenance, religious, legal, health service support, finance, and personnel and administrative services.
- HHC, for religious, legal, health service support, field feeding support, finance, personnel and administrative service support.
- Forward Support Company for unit and direct support maintenance except communications-electronic equipment and communications-security equipment.
- Engineer Battalion, TOE 05436G00 for sufficient command and control assets to support entire Brigade.
- Engineer Company, Multi-Role Bridge, TOE 05473L000 for additional personnel and equipment in support of assault gap crossing missions.
- Engineer Support Company, TOE 05419G000, for additional equipment in support of obstacle emplacement, construction of defensive positions, and sustainment engineering missions.

TYPICAL ALLOCATION

One per SBCT.

Figure B-3. SBCT engineer company

ENGINEER COMPANY, ACR
05113L000



MISSION

To increase the combat effectiveness of the Armored Cavalry Regiment by accomplishing mobility, countermobility, survivability, and limited general engineering missions. Perform infantry combat missions when required.

CAPABILITIES

- Provides advice to maneuver element commanders and staffs on engineer capabilities and engineering impacts on plans and operations.
- Prepares and maintains essential combat trails in forward area.
- Conducts expedient repair of essential bridges, fords and roads
- Provides, emplaces and maintains assault bridges to span six 60-foot gaps simultaneously.
- Conducts engineer reconnaissance and provides obstacle intelligence for the regiment.
- Provides engineer support for the conduct of mobility and countermobility operations.
- Provides field engineering advice, assistance, and equipment to maneuver elements in the construction of fighting positions for individuals and weapon systems.
- Prepares and conducts demolition targets such as bridge destruction, road and runway craters, abatis or other road blocks and tunnel and road destruction.
- Emplaces and provides technical assistance in the emplacement of mines and networked munitions.
- Performs limited sustainment engineering tasks such as construction, repair, and maintenance of command post, combat trails, site drainage, chemical decon sites and logistics field sites.
- Provides nine assault boats to transport up to 108 personnel in a single crossing.

DEPENDENCIES

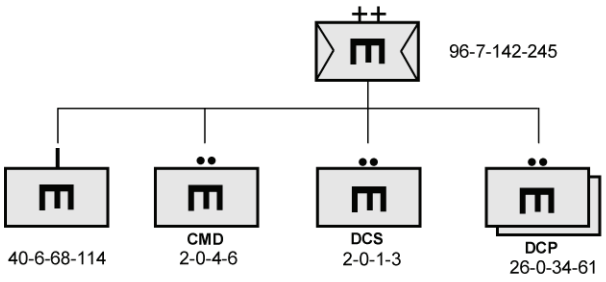
- HHT, ACR, TOE 17442L000, for religious, legal, health service support, personnel and administrative service support.
- ORD Maintenance Troop, Support Squadron, ACR, TOE 43187L000, for unit level maintenance for COMSEC equipment and DS Maintenance on all equipment.
- Multi-Role Bridge Company, TOE 05473L000 for river crossing operations.
- Engineer Support Company, TOE 05419G000, for additional equipment support of obstacle emplacement, construction of defensive positions and sustainment engineering missions.

RULE OF ALLOCATION

One per ACR.

Figure B-4. ACR engineer company

THEATER ENGINEER COMMAND
05800G000



MISSION

To provide a senior engineer headquarters for command and control of engineer operations in a theater of operations.

CAPABILITIES

Provides command and control for theater engineer operations including combat, general, and geospatial engineering missions. The TEC is organized in three modules. This design allows the TEC to be deployed in its entirety or in mission tailored modules. The modules are:

(1) Early Entry Module. Responsible for pre-operations engineer planning and early deployment requirements as outlined in the strategic theater Universal Joint Task List. The ENCOM Deputy Commander controls and deploys with elements from the intelligence, plans and operations, engineer, facility engineer, information, and material sections.

(2) Functional Module. As the engineer mission expands beyond the capability of the EEM, the ENCOM Commander deploys with enough personnel to perform the increased engineer functions.

(3) Command and Control Module. As the ASCC increases mission functionality and requirements the C2 module will deploy with the remaining TEC personnel from the intelligence, information management, public affairs, inspector general, staff judge advocate, materiel section, comptroller, internal review, and the company headquarters.

DEPENDENCIES

Transportation Command, for supplemental transportation. Signal Company (Command Operations) (Theater), for supplemental signal support. Legal support organization, for supervision of the administration of military justice and other legal matters in the command. Theater Aviation Brigade, for aviation support.

SUPPORTS

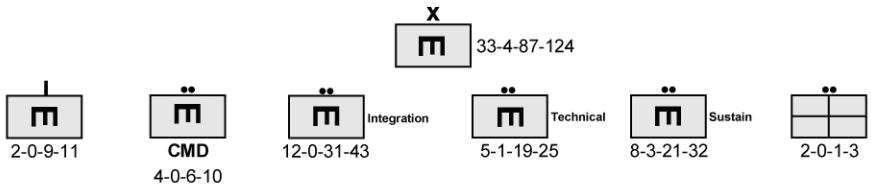
Mission tailored to conduct theater Army or corps echelon engineer operations.

TYPICAL ALLOCATION

One TEC per MCO. Mission tailored TEC modules as required for contingency operations.

Figure B-5. Theater engineer command

ENGINEER BRIGADE
05402G000



MISSION

To provide an engineer headquarters for command and control of engineer operations throughout the AO.

CAPABILITIES

- Conducts engineer missions with 2-5 task-organized engineer battalions and other force pool units.
- Provides command and control for engineer operations including combat, general, and geospatial engineering missions.
- Provides supervision for contract construction.
- Provides two scalable, deployable command posts as required.

DEPENDENCIES

- Appropriate elements of corps or division for religious, legal, health service support, finance, personnel and administrative, and logistical services.
- This unit requires TOE 63357G000, FSC EN BN, to perform field support maintenance on organic engineer construction equipment, and other organic equipment, except COMSEC and medical equipment.

SUPPORTS

- The brigade headquarters provides C2 for engineer operations supporting a division or corps.
- The brigade provides an intermediate headquarters for C2 of assigned engineer operations when task-organized to a TEC.
- The brigade headquarters provides C2 for joint or multinational engineer operations with augmentation.

TYPICAL ALLOCATION

One engineer brigade headquarters per 2-5 engineer battalions.

Figure B-6. Engineer brigade

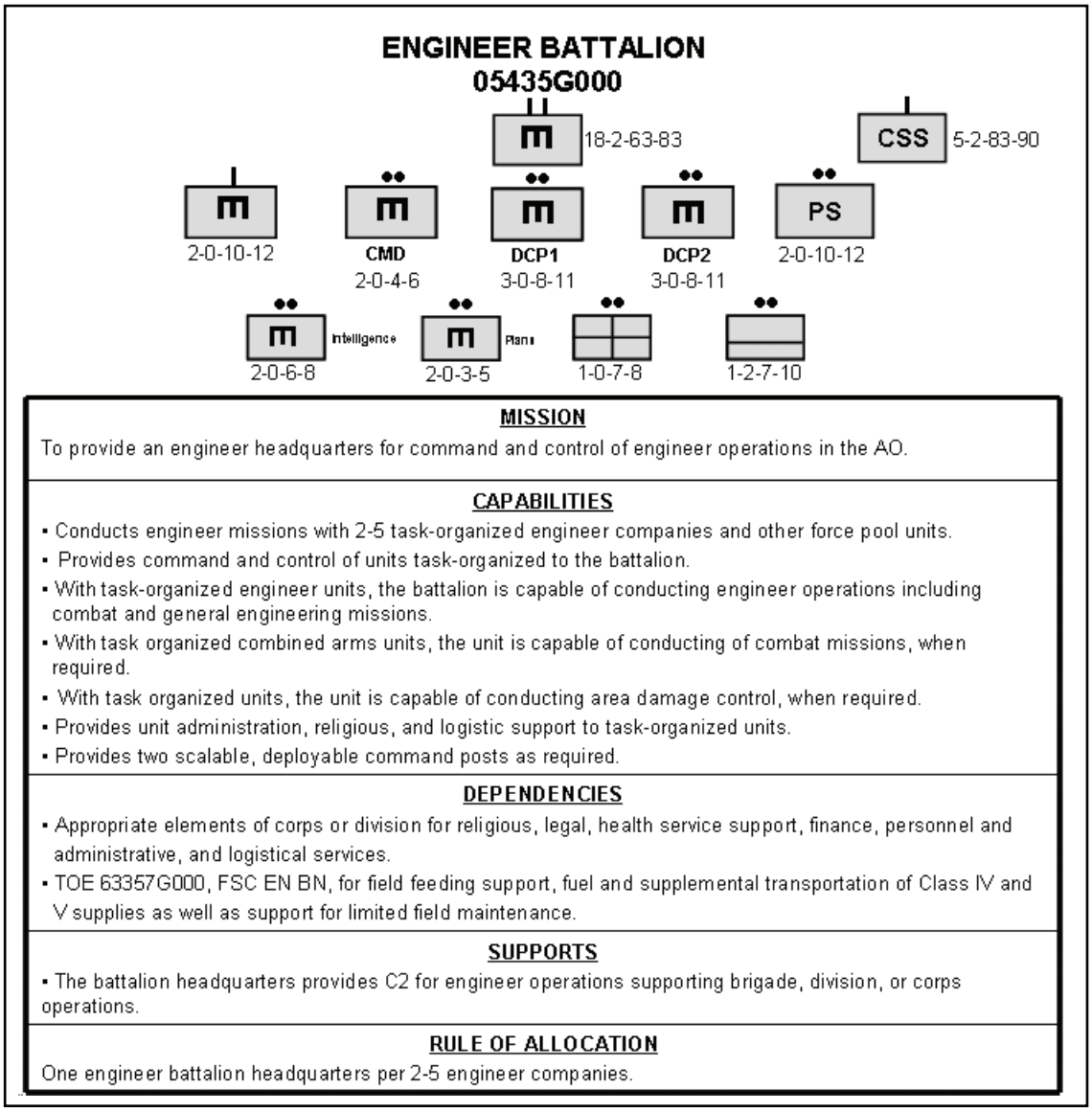
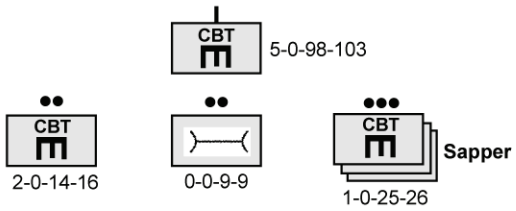


Figure B-7. Engineer battalion

SAPPER COMPANY
05439G000



MISSION

To conduct mobility, countermobility, and survivability tasks, and provide support for general engineering missions as part of a tailored force package or task-organized to the BCT.

CAPABILITIES

- Command and control of two-five sapper, assault, obstacle, clearance or tactical bridge platoons operating as an engineer team in the execution of mobility, countermobility, and survivability missions.
- Conducts 120 km (75 miles) of hasty route clearance per day.
- Conducts six dismounted and three mounted or urban breach lanes.
- Receive and analyze Ground/Airborne Standoff Minefield Detection data from other units.
- Provide 660 man-hours per day for general construction labor tasks to vertical/horizontal, or BCT companies during general engineering missions.
- Improve lanes and marking in the BCT AO.
- Provide engineer reconnaissance.
- Fights as infantry when required.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

SUPPORTS

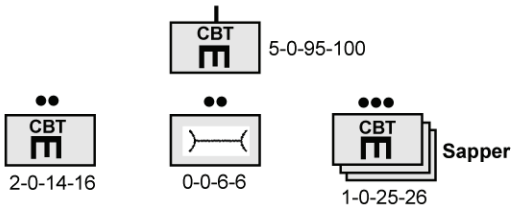
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a BSTB, CAB or other battalion conducting combined arms operations.

TYPICAL ALLOCATION

- 1 Sapper Company per clearance company conducting clearance operations.
- 1 Sapper Company per BCT conducting combat operations.
- 1.5 Sapper Companies per general construction workload.

Figure B-8. Sapper company

SAPPER COMPANY (WHEELED)
05330G200



MISSION

To conduct mobility, countermobility, and survivability tasks, and provide support for general engineering missions as part of a tailored force package or task-organized to the BCT.

CAPABILITIES

- Command and control of two-five sapper, assault, obstacle, clearance or tactical bridge platoons operating as an engineer team in the execution of mobility, counter mobility, and survivability missions.
- Conducts 120 km (75 miles) of hasty route clearance per day.
- Conducts six dismounted and three mounted or urban breach lanes.
- Receive and analyze Ground/Airborne Standoff Minefield Detection data from other units.
- Provides 660 man-hours per day for general construction labor tasks to vertical/horizontal, or BCT companies during general engineering missions.
- Improves lanes and marking in the BCT AO.
- Provides engineer reconnaissance.
- Fights as infantry when required.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

SUPPORTS

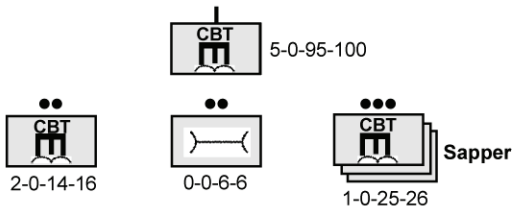
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a BSTB, CAB or other battalion conducting combined arms operations.

TYPICAL ALLOCATION

- 1 Sapper Company per clearance company conducting clearance operations.
- 1 Sapper Company per BCT conducting combat operations.
- 1.5 Sapper Companies per general construction workload.

Figure B-9. Sapper company (wheeled)

SAPPER COMPANY (AIRBORNE)
05330G100



MISSION

To conduct mobility, countermobility, and survivability tasks, and provide support for general engineering missions as part of a tailored force package or task-organized to the BCT.

CAPABILITIES

- Command and control of two-five sapper, assault, obstacle, clearance or tactical bridge platoons operating as an engineer team in the execution of mobility, counter mobility, and survivability missions.
- Can be parachute or air-delivered to work sites.
- Conducts 120 km (75 miles) of hasty route clearance per day.
- Conducts six dismounted and three mounted or urban breach lanes.
- Receive and analyze Ground/Airborne Standoff Minefield Detection data from other units.
- Provides advice on the employment of scatterable mines and networked munitions.
- Provides 660 man-hours per day for general construction labor tasks to vertical/horizontal, or BCT companies during general engineering missions.
- Improve lanes and marking in the BCT AO.
- Provides engineer reconnaissance.
- Fights as infantry when required.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

SUPPORTS

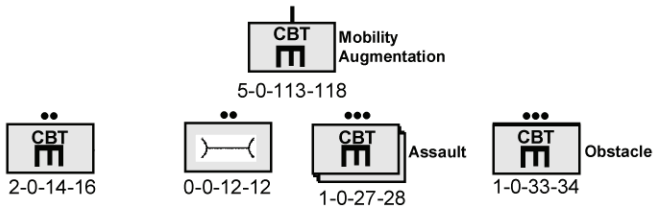
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a BSTB, CAB or other battalion conducting combined arms operations.

TYPICAL ALLOCATION

- 1 Sapper Company per clearance company conducting clearance operations.
- 1 Sapper Company per BCT conducting combat operations.
- 1.5 Sapper Companies per general construction workload.

Figure B-10. Sapper company (airborne)

MOBILITY AUGMENTATION COMPANY
05438G000



MISSION

To conduct assault gap crossings, mounted and dismounted breaches, and obstacle emplacement as part of a tailored force package or task-organized to the BCT.

CAPABILITIES

- Command and control two-five assault, obstacle, or Sapper platoons operating as an engineer team in the execution of mobility and countermobility missions.
- Provides up to four assault gap crossings to a BCT.
- Conducts up to four mounted breaches to an infantry or Stryker BCT.
- Conducts up to two mounted breaches to a heavy BCT.
- Conducts up to four additional dismounted breaches to a BCT.
- Emplacement of 4,432 linear meters of fix or disrupt tactical obstacle frontage without reload.
- Provides engineer reconnaissance.
- Provides advice on the employment of scatterable mines and networked munitions.
- Fights as infantry when required.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

SUPPORTS

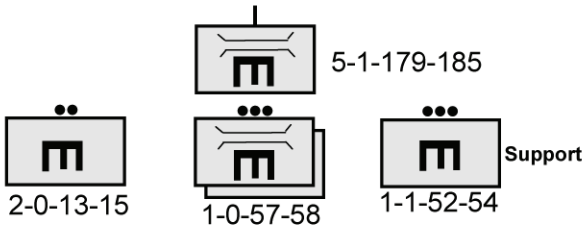
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a BSTB, CAB or other battalion conducting combined arms operations.

TYPICAL ALLOCATION

- One per infantry or Stryker BCT conducting combat operations.
- Two per heavy BCT or ACR conducting combat operations.

Figure B-11. Mobility augmentation company

MULTI-ROLE BRIDGE COMPANY
05473L000



MISSION

To provide personnel and equipment to transport, assemble, disassemble, retrieve and maintain all standard U.S. Army bridging systems, and to provide transportation of Palletized Loading System configured cargo.

CAPABILITIES

- When the unit performs fixed bridging it provides four heavy dry support sets with sufficient components for the assembly of various spans and load classes of single and double story bridges. Under normal conditions, the sets provide four, 40 - 48 meter, class 80 bridges.
- When unit performs float bridging it provides ribbon bridge of approximately 213 meters of class 75 (track) and class 96 (wheel) float bridge, or 6 rafts of class 75 (track) and class 96 (wheel) based on 0-3 feet per second stream velocity.
- Provides technical advice and assistance to other organizations in the construction of standard U.S. Army bridging systems.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, supplemental personnel and administrative services, and power generation equipment maintenance.

SUPPORTS

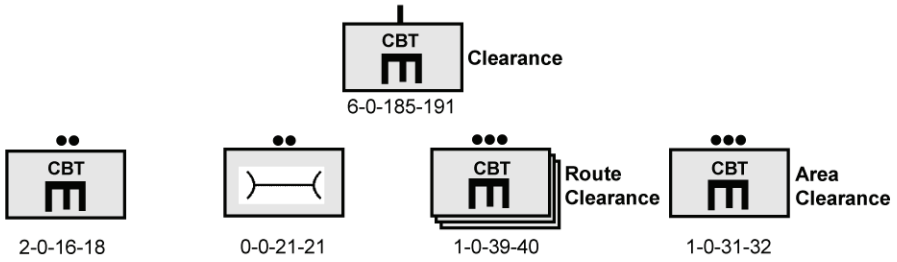
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to an engineer brigade conducting gap crossing operations.

TYPICAL ALLOCATION

- One per two BCTs.

Figure B-12. Multirole bridge company

CLEARANCE COMPANY
05437G000



MISSION

To detect and neutralize explosive hazards along routes and within designated areas as part of a tailored force package or task-organized to the BCT.

CAPABILITIES

- Provides command and control for 3-5 route, area, or sapper platoons operating as an engineer or combined arms clearance team.
- Clears a total of 255 km of two-way routes per day.
- Clears an area of 8000 square meters per day.

DEPENDENCIES

- Appropriate support elements for religious, legal, health service support, finance, supplemental personnel and administrative services, and power generation equipment maintenance.
- EHT for EH data and analysis as well as technical training and advice on EH threats.
- Engineer squad (canine) for specific detection capabilities.
- Sapper platoon and combined arms assets as required by METT-TC for combined arms clearance missions.
- Lift capability to load/unload mine rollers.
- Reachback capability to technical expertise.

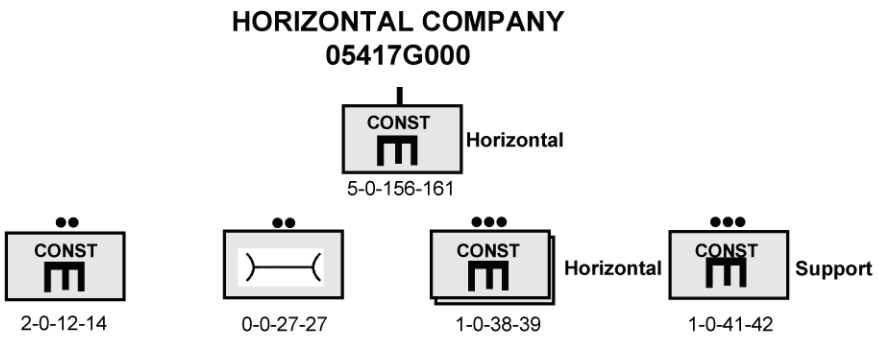
SUPPORTS

- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a BSTB, CAB or other battalion conducting combined arms operations.

TYPICAL ALLOCATION

One per 4 BCTs or per requirement for 255 km (156 miles) of two-way route clearance per day.

Figure B-13. Clearance company



MISSION

To repair, maintain, or construct roads and airfields; emplace culverts; haul construction materials; conduct clearing and grubbing; and provide other horizontal construction.

CAPABILITIES

- Provides command and control for two to five construction platoons.
- Provides personnel and equipment to perform tasks such as clearing and grubbing operations; haul, grade, shape, compact, cut and fill material; emplace culverts; remove snow/ice; construct drainage structures; conduct burrow pit operations; provide dust control operations; construct base camps, airlanding platforms, FARPS, supply routes, roads, control points, fire bases, tank ditches, ASPs, and field hospital platforms; prepare river crossing sites; and support port repair.
- Provides personnel and equipment for lift and load support in order to remove stockpiles; haul material; remove rubble; or raze and remove structures. Conducts convoy operations and burrow pit operations (light).

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

SUPPORTS

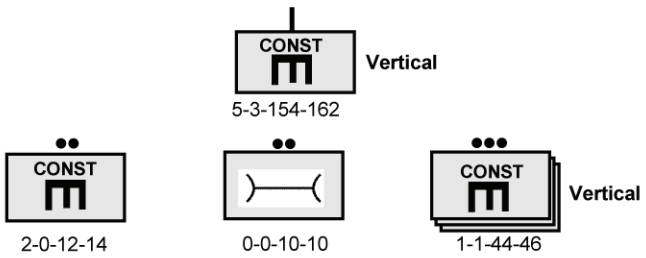
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to an engineer brigade conducting horizontal construction operations.

TYPICAL ALLOCATION

- One per division. One per BCT during defensive operations.

Figure B-14. Horizontal construction company

VERTICAL COMPANY
05418G000



MISSION

To provide vertical construction required in the development of base camps and to construct, repair, and maintain other facilities and infrastructure as required.

CAPABILITIES

- Command and control of three to five construction platoons.
- Construct, repair, maintain woodframe, steelframe, concrete and pre-engineered structures.
- Construct, repair, maintain interior plumbing, water distribution, sewage distribution systems.
- Construct culvert, abatements and retaining walls.
- Scrape .62cy of material per lift with Skid Steer Loader.
- Emplace interior electrical or sewer systems.
- Scoop .23 to .26cy of material per lift with backhoe.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, and logistical services. Dive team for port repair operations.

SUPPORTS

- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to an engineer brigade conducting vertical construction operations.

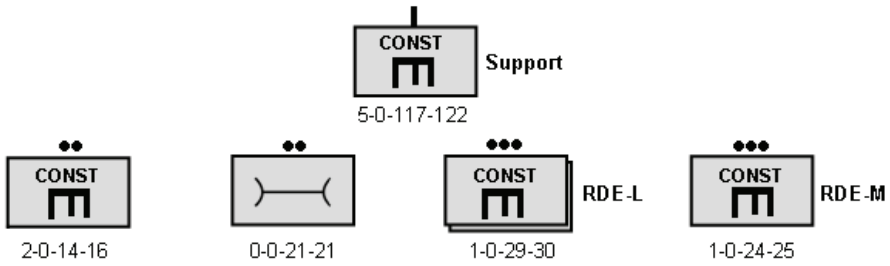
TYPICAL ALLOCATION

- One per vertical construction workload of 1,000 MH per day.

Figure B-15. Vertical construction company

ENGINEER SUPPORT COMPANY

05419G000



MISSION

To provide construction support for base camp development, road maintenance and repair, runway repair and airfields, and non-explosive obstacle clearance.

CAPABILITIES

- Provides command and control for 3-5 construction platoons.
- Provides two rapidly deployable equipment - light (RDE-L) and one rapidly deployable equipment – medium (RDE-M) platoons as required.
- Constructs 18 two-man fighting positions or 12 crew-served fighting positions per hour.
- Constructs 200 meters of protective berm per hour.
- Repairs/maintains 8-12 km of MSR per day.
- Provides horizontal construction for runway repair and for establishing airfields FARPs, HLZs, and UAS LZs.
- Prepares ingress/egress for float bridge operations.
- Self mobile to 130km.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.
Combines with horizontal company assets for additional construction capabilities.

SUPPORTS

- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to an engineer brigade conducting vertical construction operations.

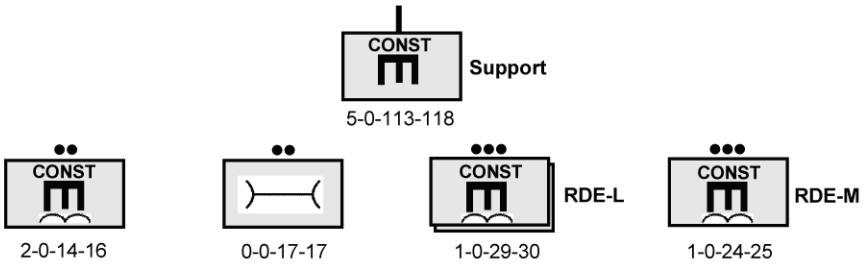
RULE OF ALLOCATION

- One per horizontal construction workload of 1000 MH per day.

Figure B-16. Engineer support company

ENGINEER SUPPORT COMPANY (AIRBORNE)

05419G100



MISSION

To provide construction support for base camp development, road maintenance and repair, runway repair and airfields, and non-explosive obstacle clearance.

CAPABILITIES

- Provides command and control for 3-5 construction platoons.
- Provides two rapidly deployable equipment - light (RDE-L) and one rapidly deployable equipment – medium (RDE-M) platoons as required.
- Can be parachute or air-delivered to work sites.
- Constructs 18 two-man fighting positions or 12 crew-served fighting positions per hour.
- Constructs 200 meters of protective berm per hour.
- Repairs/maintains 8-12 km of MSR per day.
- Provides horizontal construction for runway repair and for establishing airfields FARPs, HLZs, and UAS LZs.
- Prepares ingress/egress for float bridge operations.
- Self mobile to 130km.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.
Combines with horizontal company assets for additional construction capabilities.

SUPPORTS

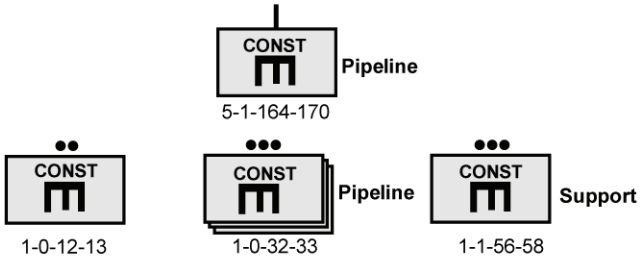
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to an engineer brigade conducting vertical construction operations.

TYPICAL ALLOCATION

- One per horizontal construction workload of 1,000 MH per day.

Figure B-17. Engineer support company (airborne)

PIPELINE CONSTRUCTION COMPANY
05434L000



MISSION

To provide technical assistance in constructing, rehabilitating, and maintaining pipeline systems.

CAPABILITIES

- Provides advisory personnel to support up to three engineer companies engaged in pipeline construction, pipe couplings, stringings, storage tank erection, and pump station and dispensing facility construction.
- Provides specialized tools, equipment, and personnel to operate on a 24 hour basis except for the equipment section, which operates on a two-shift basis.
- Provides transportation of up to 21,000 linear feet of six inch pipe, 16,200 linear feet of eight inch pipe, or 9,000 linear feet of twelve inch pipe over unimproved roads in two lifts.
- Provides construction and rehabilitation of pipeline systems, to include erecting storage tanks when construction units are available.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative services and maintenance on equipment.

The Petroleum Pipeline and Terminal Operating Company, TOE 10417L000, for location and maintenance of pumping and flowing regulation stations and overall pipeline layout.

The Engineer Support Company, TOE 05419G000 or other construction unit for the construction of bulk petroleum distribution systems.

SUPPORTS

Force tailored with an engineer company to perform pipeline construction operations. This unit normally does not perform pipeline construction independently.

TYPICAL ALLOCATION

One company per 3 miles of pipe laid per day.

Figure B-18. Pipeline construction company

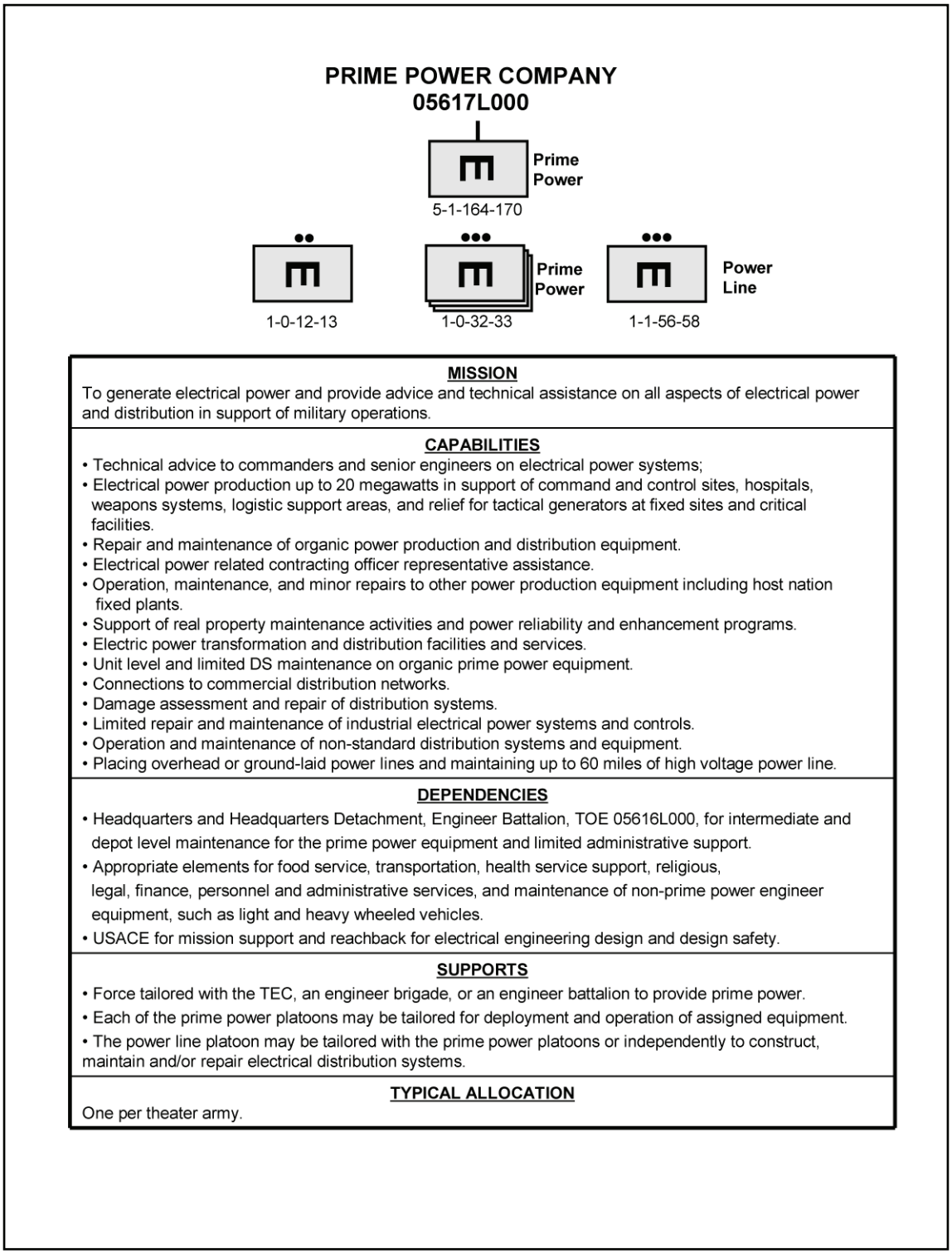
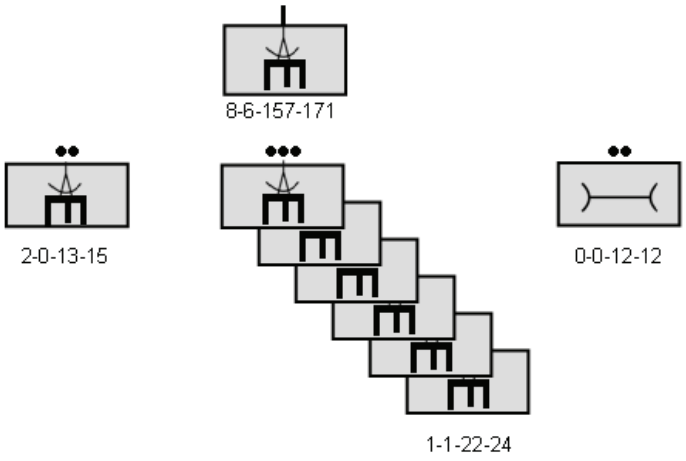


Figure B-19. Prime power company

TOPOGRAPHIC ENGINEER COMPANY
05610G000



MISSION

To provide generation, collection, analysis, and management of geospatial data and finishing, printing, and distribution of geospatial products for division, corps, or theater Army echelon operations.

CAPABILITIES

- Provides command and control for three topographic platoons in support geospatial engineering missions.
- Generates, manages, and distributes topographic data.
- Prepares decision graphics, image maps, 3D terrain perspective views, press ready color separates for map substitutes, map updates, tactical decision aids, and intelligence preparation of the battlefield overlays.
- Provides personnel and equipment to develop photolithographic plates; print topographic products; size, collate, or stock within a controlled environment.
- Provides personnel and equipment for unit level maintenance of presses.
- Provides personnel and equipment (minus Topographic Support System and database) to Army, corps, division or other headquarters, as directed, in support of terrain analysis/intelligence producing missions.

DEPENDENCIES

- Appropriate elements for food service, transportation, health service support, religious, legal, finance, personnel and administrative services, and maintenance of equipment such as light and heavy wheeled vehicles.
- NGA or other NSGI topographic data. (i.e. GBS link).
- Reachback capability to technical expertise.

SUPPORTS

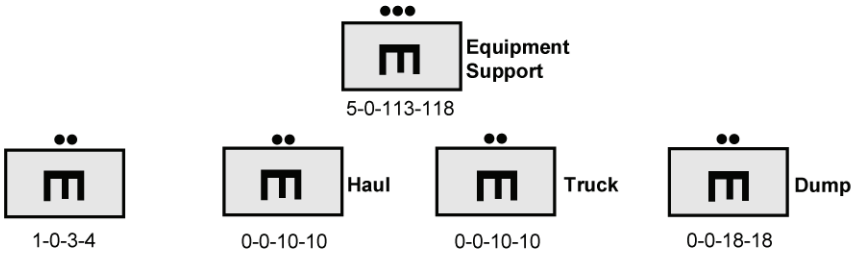
- Force tailored with the TEC, an engineer brigade, or an engineer battalion to provide geospatial engineering.

RULE OF ALLOCATION

One per theater army.

Figure B-20. Topographic engineer company

EQUIPMENT SUPPORT PLATOON
05520GF00



MISSION

To conduct borrow pit operations (light) and provide lift and load support in order to remove stockpiles; haul material; remove rubble; or raze and remove structures in support of construction missions.

CAPABILITIES

- Capable of hauling 96 - 112 cy of material per trip (20 ton dump).
- Capable of lifting 10 cy of material per lift.
- Capable of providing long haul lift operations to 2 Horizontal platoons.
- Fully self-mobile utilizing organic assets only.
- Capable of 24 hour operations.
- Total of 180 (12 major pieces of equip) equip hours per platoon.
- Total of 360 horizontal hours per platoon.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative services and maintenance on equipment.

SUPPORTS

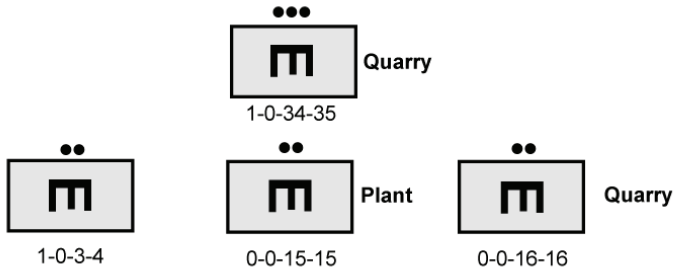
- Force tailored with the horizontal company, support company, or engineer battalion.
- May task-organized to support other engineer construction elements.

TYPICAL ALLOCATION

.25 per horizontal company.

Figure B-21. Equipment support platoon

QUARRY PLATOON
05520GC00



MISSION

Conduct rock-crushing operations to increase the capabilities of the supported construction unit in major horizontal construction projects such as roads, storage facilities, and airfields.

CAPABILITIES

- Supports construction projects that require crushed rock, sand, or washed construction materials.
- Prepares 100-150 tons of rock, sand and gravel per hour.
- Hauls 96-112 cubic yards of material per trip.
- Hauls 2500 gallons of water per trip.
- Excavates 169 cubic yards (banked) or 211 cubic yards (loose) of material per hour.
- Supervises contract labor or other personnel and assists in the supervision of contract construction.

DEPENDENCIES

Engineer battalion, TOE 05436G000, for unit level administration, religious, legal, health service support, and consolidated property book.
FSC En Bn, TOE 63357G000 to perform field maintenance, vehicle recovery, field feeding support, fuel, and supplemental transportation of Class IV and V supplies as well as support for sustainment maintenance.
Equipment support platoon, TOE 05520GF00 to provide transportation assets needed to relocate equipment and materials.
Engineer brigade, TOE 05402G000 for technical specialist when requiring analysis.
Construction & Geodetic Survey Design and Material Analysis, TOE 05402GL00, to develop the critical path and design plans for all structural developments.

SUPPORTS

- Force tailored with the horizontal company, support company, or engineer battalion.
- May task-organized to support other engineer construction elements.

TYPICAL ALLOCATION

.125 per horizontal company.

Figure B-22. Quarry platoon

FACILITY ENGINEER DETACHMENT
05530L100

10-0-5-15

MISSION

To provide facilities engineering and management to support base development.

CAPABILITIES

- Design of small scale construction projects.
- Project documentation preparation.
- Environmental assessments and reporting.
- Facilities operations and maintenance training.
- Energy conservation surveys.
- Utilization studies.
- Writing of service contracts.
- Short and long range facility work plans.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel, administrative services, transportation, food service, and logistical support.

SUPPORTS

- Force tailored with the TEC, engineer brigade, or deploying TEC or brigade module
- May be task-organized to support the ARFOR.

TYPICAL ALLOCATION

One per Theater Support Command.
One per Theater Opening Group.

Figure B-23. Facility engineer detachment

CONSTRUCTION MANAGEMENT TEAM
05601GT00

MISSION

To provide construction management, facilities engineering, and design capabilities as augmentation to an engineer headquarters.

CAPABILITIES

- Recommendations on construction priorities and allocation of resources.
- Monitoring of the execution of construction missions and design modifications.
- Engineering expertise and supervisory personnel for limited quality assurance and quality control.
- Advice and technical guidance on Host Nation Support and contract support requirements.
- Design review for construction missions.
- Technical advice to contract officers representative on aspects of construction scopes and schedules.
- Maintenance of project designs and final construction data.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel, administrative, and logistical services.

Survey/Design Teams, TOE 05402GL00, for initial drawings, plans and project reports.

SUPPORTS

- Force tailored with the TEC, engineer brigade, or deploying TEC or brigade module
- May be task-organized to support the ARFOR.

TYPICAL ALLOCATION

One per 5 Survey/Design Teams.

Figure B-24. Construction management team

SURVEY AND DESIGN TEAM
05402GL00

0-1-13-14

MISSION

To provide planning studies, tests, and reports; platting, legal descriptions, certifications and surveys (boundary, construction, etc); and estimates of project costs for construction projects.

CAPABILITIES

- Plans, supervises, and coordinates for construction, facility rehabilitation, resource allocation and management.
- Supervises contract construction, labor, and indigenous personnel.
- Conducts construction and geodetic survey.
- Prepares detailed construction plan drawings and "as built" drawings.
- Conducts material testing and analysis to support design, quality assurance and quality control for construction.
- Establishes third order geodetic control in underdeveloped theaters.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

Engineer headquarters or construction management team for specific project guidance.

SUPPORTS

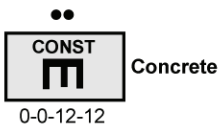
- Force tailored with the TEC, engineer brigade, or engineer battalion.

TYPICAL ALLOCATION

One per engineer battalion consisting of any combination of 3 horizontal companies, vertical companies, or engineer support companies.

Figure B-25. Survey and design team

CONCRETE SECTION
05520GB00



MISSION

To provide construction support for concrete mixing/pouring as part of major horizontal and vertical construction projects such as highways, storage facilities, airfields, and base camp construction.

CAPABILITIES

- Supports construction projects that require concrete construction.
- Produces up to 30 cubic yards per hour per mixer on a one-shift operation.
- Transports, mixes and pours concrete at construction location sites under any climatic and terrain condition.
- Transports cement, sand, aggregate, additives, and water.
- Can support selected construction on a two-shift operation.
- Supervises contract labor, indigenous personnel and assists in the supervision of contract construction.
- Total of 110 man hours.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, logistical services.

HHC, Engineer Battalion, TOE 05436G000, for unit level administration, religious, legal, force health protection, and consolidated property book.

This unit requires FSC En Bn, TOE 63357G000 to perform field maintenance, vehicle recovery, field feeding support, fuel, and supplemental transportation of Class IV and V supplies as well as support for sustainment maintenance.

Vertical platoon, TOE 05417GB00 to emplace construction forms.

Quarry platoon, TOE 05520GC00 to provide rock of specific size and gradation as needed.

Equipment support platoon, TOE 05520GF00 to provide transportation assets needed to relocate equipment and materials.

This unit requires support from engineer brigade, TOE 05402G000 for technical engineering specialist when required for concrete and soil analysis.

This unit requires Construction & Geodetic Survey Design, and Material Analysis, TOE 05402GL00, to develop the critical path and design plans for all structural developments.

SUPPORTS

- Force tailored with a construction company or engineer battalion.
- May task-organized to support other engineer construction elements.

TYPICAL ALLOCATION

.6 per vertical company.

Figure B-26. Concrete section

FORWARD ENGINEER SUPPORT TEAM - MAIN
05567GA00

MISSION

To provide deployed USACE capability in the AO with tele-engineering enabled access to reachback support from full USACE capabilities for technical expertise, contract and construction management, and other specialties as required.

CAPABILITIES

- Provides command and control for USACE teams in the AO
- Infrastructure engineering planning and design
- Technical engineering expertise
- Contract construction
- Real estate acquisition and disposal
- Environmental engineering
- Geospatial engineering support
- Provides LNOs and USACE planning modules to supported units

DEPENDENCIES

Supported organizations must provide basic life support and security.

SUPPORTS

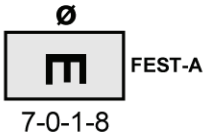
- Force tailored with a theater Army, corps, or division headquarters.
- May be tailored with support elements to form a provisional headquarters.
- May be task-organized to the TEC or engineer brigade.

TYPICAL ALLOCATION

One per theater Army.

Figure B-27. Forward engineer support team–main

FORWARD ENGINEER SUPPORT TEAM - ADVANCE
05567GB00



MISSION

To provide deployed USACE capability in the AO with tele-engineering enabled access to reachback support from full USACE capabilities for technical expertise, contract and construction management, and other specialties as required.

CAPABILITIES

- Provides command and control for USACE teams in the AO.
- Infrastructure engineering planning and design.
- Technical engineering expertise.
- Contract construction.
- Real estate acquisition and disposal.
- Environmental engineering.
- Geospatial engineering support.
- Provides LNOs and USACE planning modules to supported units.

DEPENDENCIES

Supported organizations must provide basic life support and security.

SUPPORTS

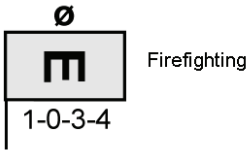
- Force tailored with a corps, division, or brigade headquarters.
- May be task-organized to the TEC or engineer brigade.

TYPICAL ALLOCATION

One per BCT.

Figure B-28. Forward engineer support team–advance

FIREFIGHTING **HEADQUARTERS**
05510AA00



MISSION

To provide command and control for rescue and firefighting operations for aircraft crash incidents, vehicle emergencies, natural cover fires, and emergency response to hazardous material incidents. .

CAPABILITIES

- Command and control for three to eight engineer firefighting teams.
- Conduct training of firefighting programs.
- Conduct training for prevention programs for fires, hazardous materiel emergencies, and initial fire-ground investigations.
- Resupply coordination of firefighting assets, agents, self-contained breathing apparatus, air, and fuel.
- Mutual aid coordination with other services and host nation fire protection assets.
- Maintenance support coordination for technical firefighting equipment.

DEPENDENCIES

This unit is dependent upon the gaining unit for equipment maintenance, supply, field feeding, health service support, religious, finance, legal, personnel and administrative services, and logistical support.

SUPPORTS

- Force tailored with a corps, division, brigade, or battalion headquarters element.

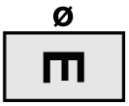
TYPICAL ALLOCATION

One per three to eight engineer firefighting teams,

Figure B-29. Firefighting headquarters

FIREFIGHTING TEAM

05510AB00



0-0-7-7

MISSION

To provide firefighting service in a theater of operations including fire protection of aviation and major facilities.

CAPABILITIES

- Firefighting prevention programs, and crash extrications.
- First aid.
- A fire protection program for logistics support area, intermediate staging base, forward operating base, and major facilities, to include, but not limited to, petroleum tank farms, petroleum distribution sites, open and closed warehouse facilities or general warehouses, detainee facilities, and civilian resettlement sites.
- Aviation fire fighting and extrication of personnel and equipment from crashed aircraft.
- Firefighting protection against grass or brush fires within assigned area when augmented with combat or construction engineer Soldiers/units.
- 6,000 gal of water per trip to support the fire truck when fighting fires.

DEPENDENCIES

This unit is dependent upon a gaining unit for equipment unit maintenance, supply, field feeding, combat health support, religious, finance, legal, personnel and administrative services, and logistical support.

The unit is dependent on an engineer firefighting team headquarters for C2 of firefighting operations.

SUPPORTS

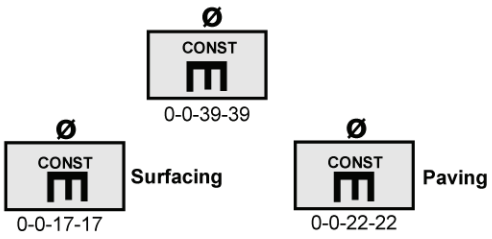
- Force tailored with an engineer firefighting headquarters.

TYPICAL ALLOCATION

- One per Air Traffic Service Company.
- One per Corps Support Group.
- One per Petroleum Supply Company.
- One per Petroleum Pipeline and Terminal Operating Company.

Figure B-30. Firefighting team

ASPHALT TEAM
05520GA00



MISSION

To provide bituminous mixing and paving in support of major horizontal construction projects such as highways, storage facilities and airfields.

CAPABILITIES

- Supports construction projects that require asphalt paving.
- Prepares 100-150 tons per hour of bituminous mixes on a one-shift operation.
- Paves 3 to 4 miles, single lane, of roadway/airfields surfaced per shift per day.
- Conducts dust suppression/stabilization missions.
- Provides equipment and operators to support construction on a two-shift operation.
- Supervises contract labor, indigenous personnel and assists in the supervision of contract construction.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

HHC, Engineer Battalion, TOE 05436G000, for unit level administration, religious, legal, force health protection, and consolidated property book.

FSC Engineer Battalion, TOE 63357G000 to perform field maintenance, vehicle recovery, field feeding support, fuel, and supplemental transportation of Class IV and V supplies as well as support for sustainment maintenance.

Concrete Section, TOE 05520GB00 to provide high type concrete mixes, cold mixes and some stabilized base mixture requirements.

Quarry Platoon, TOE 05520GC00 to provide rock of specific size and gradation as needed.

Equipment Support Platoon, TOE 05520GF00 to provide transportation assets needed to relocate equipment and materials.

Engineer Brigade, TOE 05402G000 for technical engineering specialist when required for asphalt and soil analysis.

Construction & Geodetic Survey Design, and Material Analysis, TOE 05402GL00, to develop the critical path and design plans for all structural developments.

SUPPORTS

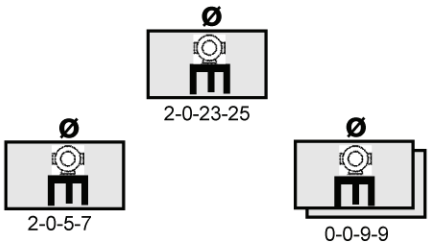
- Force tailored with the horizontal or engineer support company.
- May be task-organized to support other construction units.

TYPICAL ALLOCATION

.125 per Horizontal Company.

Figure B-31. Asphalt team

DIVING TEAM
05530LA00



MISSION

To provide heavy diving support in the areas of ports, harbors, and coastal zones.

CAPABILITIES

- Performs scuba and surface supplied diving to a maximum depth of 190 feet.
- Assists in constructing port facilities, Logistics Over the Shore structures, and floating barriers.
- Repairs damaged piers, docks, wharves, seawalls, and breakwaters.
- Clears underwater obstructions and marks navigational waterways.
- Reduces and emplaces underwater obstacles and mines.
- Reduces structures with underwater demolitions.
- Recovers sunken material and vessels.
- Installs and maintains vessel moorings.
- Repairs Army lighters and vessels.
- Collects underwater terrain data for Logistics Over the Shore operations.
- Installs and maintains the underwater portion of offshore petroleum and water-distribution systems.
- Protects vessels and underwater structures from underwater threats, reducing the probability of underwater structural damage.
- Conducts surface supplied air diving operations at depths of 170 ft and scuba diving operations at normal operating depths of 60 ft.
- Provides hyperbaric chamber operations, emergency diving medical treatment, intermediate maintenance on diving life-support equipment, and maintains repair parts for diving equipment.

DEPENDENCIES

Appropriate support elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.
Appropriate medical element to provide a physician with diving medicine training to support diving missions.
Engineer Support Company for support in performing salvage and construction missions.
The gaining unit for unit maintenance on organic equipment (except diving life-support equipment).

SUPPORTS

- Force tailored with a corps, division, brigade, or battalion headquarters element.

TYPICAL ALLOCATION

1 per 2 major ports.

Figure B-32. Dive team

REAL ESTATE TEAM
05530LF00

MISSION

To provide perform functions related to the acquisition, utilization, and disposal of real property for military purposes.

CAPABILITIES

- Acquires, uses, and disposes of real property for military purposes.
- Inventories and records installed and personnel property located on installations.

DEPENDENCIES

Dependent upon the gaining unit for religious, legal, health service support, finance, personnel, administrative services, transportation, food service, and logistical support.

SUPPORTS

- Force tailored with a corps, division, brigade, or battalion headquarters element.

TYPICAL ALLOCATION

One per Army Service Component Command.

Figure B-33. Real estate team

WELL-DRILLING HEADQUARTERS
05520LD00

MISSION

To provide command and control for water resource development and well-drilling.

CAPABILITIES

- Provides command and control for up to 5 Well-Drilling Teams, TOE 05520LE00.
- Conducts well drilling training and operations.
- Assist teams in requisitioning unique repair parts for well drilling rigs.
- Assists in obtaining materials and unique supplies required in well drilling operations.
- Assist teams in coordinating construction support for site preparation.
- Assist teams in coordinating for the hand off to quartermaster water units.

DEPENDENCIES

Dependent on gaining unit for religious, legal, health service support, finance, personnel and administrative services, supply and field feeding support, and unit level and direct support maintenance on organic equipment.

SUPPORTS

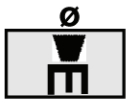
- Force tailored with a corps, division, brigade, or battalion headquarters element.

RULE OF ALLOCATION

.167 per Well-Drilling Team.

Figure B-34. Well-drilling headquarters

WELL DRILLING TEAM
05520LE00



1-0-2-3

MISSION

To provide drilling for development of water wells.

CAPABILITIES

- The capability of drilling and casting two complete water well holes of 5 7/8 inches in diameter.
- Truck mounted rigs can reach depths of 600 feet and semi trailer mounted drilling rigs are capable of reaching depths of 1,500 feet.
- Installs casings, screens, and pumps and develops wells to provide water at the well head.
- Personnel and equipment to sustain two-shift operations.

DEPENDENCIES

Dependent on gaining unit for religious, legal, health service support, finance, field feeding support, and personnel and administrative services.

Requires construction unit support for site preparation, electrical connections,

Concrete casings, and transportation of casing and supplies beyond organic capabilities.

Procurement and transportation of drilling water (as much as 2000 gallons per day may be required).

Gaining unit quartermaster assets for fuel to site and a water purification team to check water purity and for sanitary testing.

Dependent on well drilling headquarters for C2 of water resource development and well drilling operations.

SUPPORTS

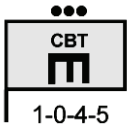
- Force tailored with a corps, division, brigade, or battalion headquarters element.

TYPICAL ALLOCATION

One well drilling team per 1,000 short tons (240,964 gallons) consumption of water per day.

Figure B-35. Well-drilling team

ENGINEER DETACHMENT HEADQUARTERS (CANINE)
05550LA00

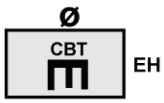


Canine

MISSION
To provide command and control of engineer canine clearance and specialized search operations.
CAPABILITIES
• Command and control of five Engineer Squads (Canine), TOE 05550LB00. • Management of specialized care, treatment, and sanitary conditions of the mine detecting and specialized search dogs in the engineer squads (canine). • Mass movement of dog kennels and dogs as required.
DEPENDENCIES
Appropriate elements for unit maintenance, field feeding, health service support, religious, and logistical support. Medical Detachment, Veterinary Services, TOE 08413L000, for veterinarian support.
SUPPORTS
• Force tailored with the Engineer Battalion or Clearance Company. • May task-organized to a BCT, support brigade or other headquarters conducting clearing operations.
TYPICAL ALLOCATION
One per HHC, theater engineer command.

Figure B-36. Engineer detachment headquarters (canine)

EXPLOSIVE HAZARDS TEAM
05601GI00



1-0-5-6

MISSION

To provide staff element for collection, analysis, and dissemination of explosive hazards information.

CAPABILITIES

- Gather/Track explosive hazards incidents.
- Maintain mine strike database.
- Provide pattern analysis of explosive hazard incidents.
- Provide technical advice on explosive hazards.
- Provide explosive hazards situational awareness within theater or JOA.
- Provide prediction of mobility impediments.

DEPENDENCIES

Appropriate elements for unit maintenance, field feeding, health service support, religious, and supplemental logistical support.

Topographic Analysis Unit.

Reachback capability to technical expertise at CBRNE Defense Cells.

Criminal Investigator for forensics investigation provided by MP/CID organization responsible for Area Coverage.

SUPPORTS

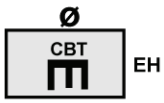
- Force tailored to the corps, division, or brigade headquarters.

TYPICAL ALLOCATION

One per theater or JOA

Figure B-37. Engineer squad (canine)

EXPLOSIVE HAZARDS TEAM
05601GI00



1-0-5-6

MISSION

To provide staff element for collection, analysis, and dissemination of explosive hazards information.

CAPABILITIES

- Gather/Track explosive hazards incidents.
- Maintain mine strike database.
- Provide pattern analysis of explosive hazard incidents.
- Provide technical advice on explosive hazards.
- Provide explosive hazards situational awareness within theater or JOA.
- Provide prediction of mobility impediments.

DEPENDENCIES

Appropriate elements for unit maintenance, field feeding, health service support, religious, and supplemental logistical support.

Topographic Analysis Unit.

Reachback capability to technical expertise at CBRNE Defense Cells.

Criminal Investigator for forensics investigation provided by MP/CID organization responsible for Area Coverage.

SUPPORTS

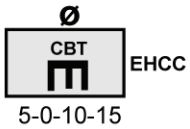
- Force tailored to the corps, division, or brigade headquarters.

TYPICAL ALLOCATION

One per theater or JOA

Figure B-38. Explosive hazards team

EXPLOSIVE HAZARDS COORDINATION CELL
05601GH00



MISSION

To provide staff element for collection, analysis, and dissemination of explosive hazards information.

CAPABILITIES

- Gather/Track explosive hazards incidents.
- Maintain mine strike database.
- Provide pattern analysis of explosive hazard incidents.
- Provide technical advice on explosive hazards.
- Provide explosive hazards situational awareness within theater or JOA.
- Provide prediction of mobility impediments.

DEPENDENCIES

Appropriate elements for unit maintenance, field feeding, health service support, religious, and supplemental logistical support.

Topographic Analysis Unit.

Reachback capability to technical expertise at CBRNE Defense Cells.

Criminal Investigator for forensics investigation provided by MP/CID organization responsible for Area Coverage.

SUPPORTS

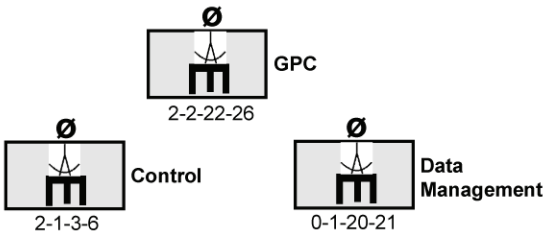
- Force tailored to the corps, division, or brigade headquarters.

TYPICAL ALLOCATION

One per theater or JOA

Figure B-39. Explosive hazards coordination cell

GEOSPATIAL PLANNING CELL
05543GH00



MISSION

To conduct topographic operations to support geospatial engineering requirements for a theater or JOA.

CAPABILITIES

- Capabilities to generate and analyze terrain data; prepare decision graphics, image maps, 3D terrain perspective views, digital color separations for map substitutes, map updates, and tactical decision aids; and assist in intelligence preparation of the battlefield overlays.
- Maintains the theater geospatial digital database for all units operating in the team's area of responsibility.
- Coordinates with national and multinational agencies.
- Team can operate on a 24-hour basis.

DEPENDENCIES

Appropriate elements for religious, legal, health service support, finance, personnel and administrative, and logistical services.

FSC EN BN , TOE 63357G000, for field feeding support, fuel and supplemental transportation of Class IV and V supplies as well as support for field maintenance.

National Geospatial Agency and or National System for Geospatial Intelligence (U.S. NIMA) for Global Broadcast Satellite linkage for reachback capability for technical expertise and data base accesses.

SUPPORTS

- Assigned to a corps or theater army headquarters.

TYPICAL ALLOCATION

One per ASCC.

Figure B-40. Geospatial planning cell

Appendix C

Joint Engineer Organizations and Capabilities

Each Service has core engineering units and capabilities that stem from their traditional roles and associations to meet specific operational needs and to support accomplishing a variety of mission requirements in any OE. An understanding of the Services' combat, general, and geospatial engineering capabilities allows the JFC and the joint force engineer to tailor the engineer force to effectively and efficiently accomplish the mission. The JFC should understand multinational, interagency, NGO, and IGO engineer capabilities to better coordinate coherent activity, develop viable COAs, and, when appropriate, to properly integrate them into the joint operation (see Appendix D). The joint force engineer is responsible for providing comprehensive recommendations to the JFC on the effective employment of all engineer capabilities in support of joint operations. The JFC, with the assistance of the joint force engineer, analyzes mission requirements to tailor optimal engineer force packages. The engineering capabilities of each Service component may provide engineering support to the other components to meet joint force requirements. For additional information see JP 3-34.

NAVY ENGINEER ORGANIZATIONS AND CAPABILITIES

C-1. Naval civil engineering forces are organized and equipped within the Department of the Navy to meet the requirements of expeditionary operations. The term naval civil engineering forces is an overarching reference to all naval civil engineers including officers, enlisted personnel, civilians, and units. It combines the complementary but distinct capabilities of the engineering operating forces of 1NCD, the ACBs organized under the Atlantic and Pacific NBGs, and the business enterprise of Naval NAVFAC. 1NCD, its subordinate units, and the ACBs make up the NCF also referred to as Seabees.

C-2. The NCF is a general engineering and construction force. The units of the NCF construct, repair, maintain, and operate shore, inshore, and deep ocean facilities for the Navy and Marine Corps, other Services, and JTFs as tasked by the CCDRs through the Navy component commander or an assigned JFLCC or joint force maritime component command. They are responsive, versatile, flexible, task-tailorable, expandable, rapidly deployable, sustainable, and are able to reconstitute for expeditionary operations. The NCF's mission is to conduct contingency engineering and expeditionary construction operations to support amphibious landing, construction diving, humanitarian aid, and disaster recovery operations across the range of military operations.

C-3. Navy Seabees deploy around the world to provide construction support for U.S. forces, as well as the FHA. Naval mobile construction battalion (NMCB) resources are continually forward-deployed to provide quick response to any location where a contingency may occur and to support combatant command OPLANs. NMCB equipment is forward-deployed to Okinawa, Japan; Guam; and Rota, Spain. NMCB and naval construction regiment (NCR) equipment is also deployed aboard all three squadrons of the maritime pre-positioning force. The forward-deployed presence of Seabee resources minimizes strategic lift requirements and ensures prompt engineering support to the JFC or MAGTF commander.

C-4. The NCF is organized, trained, and equipped to construct, maintain, operate, and repair advanced bases and their associated logistic pipelines. The force also provides disaster recovery and relief assistance and performs civic action projects to complement military and other national programs. NCF units are organized for quick and effective response as required by planning assumptions and guidance. Seabee units

are trained in survivability operations and in limited defensive combat. The common thread that is woven throughout all Seabee units is responsiveness and flexibility.

C-5. During normal homeport operations, NCF units are under the OPCON of the Navy component commander of their assigned CCDR. When deployed during peacetime, NCF units are normally transferred to the supported theater Navy component commander under the geographic CCDR. During contingencies when NCF units deploy in support of a MAGTF, NCF units are generally transferred to the theater Marine Corps forces component commander. When not directly supporting Navy or Marine Corps forces, Seabee units may be assigned as part of a JTF, or assigned to operate with other Service engineers under a special engineering task force.

FIRST NAVAL CONSTRUCTION DIVISION ORGANIZATION

C-6. 1NCD is an active and reserve integrated staff commanded by a Navy Civil Engineer Corps (CEC) rear admiral (upper half). It is headquartered at Naval Amphibious Base Little Creek, Virginia Beach, Virginia. Commander, 1NCD, who has concurrent duties as Commander, Naval Construction Forces Command, reports to Commander, U.S. Fleet Forces Command through Commander, U.S. Second Fleet operationally, and Commander, Navy Expeditionary Combat Command administratively. Commander, 1NCD, is assigned additional duty to Commander, U.S. Pacific Fleet; Commander, U.S. Naval Forces Europe; Commander, U.S. Naval Forces Central Command; and Commander, U.S. Naval Forces Southern Command as the subject matter expert and principal advisor for NCF matters. Figure C-1 illustrates the command relationships of 1NCD and its subordinate units.

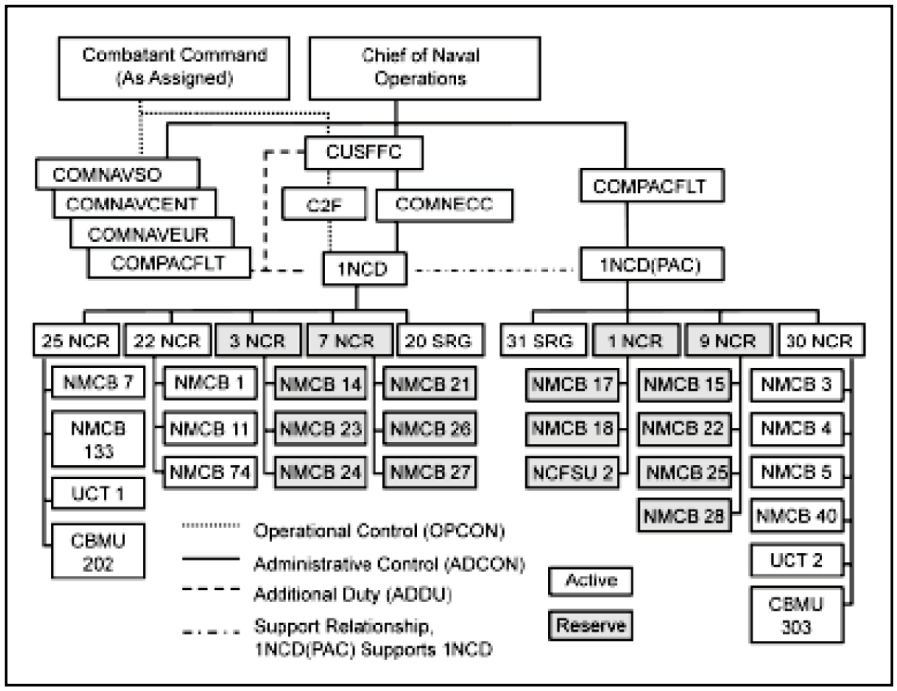


Figure C-1. 1NCD command relationships

C-7. The 1NCD exercises ADCON and OPCON over NCRs and Seabee readiness groups (SRGs), which encompass about 16,000 active duty and reserve Navy Seabees. These commands are responsible for C2 over NMCBs, underwater construction teams (UCTs), construction battalion maintenance units (CBMUs), and a naval construction force support unit (NCFSU). As a force provider, 1NCD provides ready combat construction forces to fulfill operational and forward engagement requirements of CCDRs and their component commanders for expeditionary construction, contributory support to Naval Shore Activities and Marine Corps bases and camps, and FHA and disaster recovery operations. 1NCD also provides contingency and deliberate engineer planning in support of CCDR planning efforts.

C-8. The 1NCD commander exercises C2 over the NCRs and SRGs; normally deploying only in support of two or more deployed NCRs during exercises, contingencies, or major combat operations. When deployed, it relies on subordinate units for tactical and logistic support.

NAVAL CONSTRUCTION REGIMENT

C-9. NCRs report directly to 1NCD. There are three active and four reserve NCRs commanded by a Navy CEC captain. Two active NCRs are located at Construction Battalion Center, Gulfport, Mississippi; and one active NCR is located at Naval Base Ventura County, Port Hueneme, California. There are four reserve NCRs with readiness support sites spread across CONUS.

C-10. NCRs exercise ADCON and OPCON of all NCF units assigned to them and will generally deploy to exercise C2 over two or more NCF units operating in a specific geographic area or in support of a specific military operation. In addition, NCRs are responsible for ensuring that subordinate units assigned to them achieve maximum operational readiness before the unit's deployment to a contingency or forward-deployment site.

SEABEE READINESS GROUPS

C-11. SRGs report directly to 1NCD. There are two active and reserve integrated SRGs commanded by a Navy CEC captain. There is one SRG located at Construction Battalion Center, Gulfport, Mississippi, and one at Naval Base Ventura County, Port Hueneme, California.

C-12. SRGs provide military training for active and reserve NCF units during their homeport training cycles. SRGs also ensure that units achieve maximum effectiveness and operational readiness by facilitating individual and unit training, and assist NCRs in evaluating unit readiness to deploy, equip unit personnel, and assist NCRs in the marshalling and embarkation of units or detachments. Additionally, SRGs are tasked with processing, equipping, and training reserve units during recalls or mobilizations. The SRGs do not deploy.

NAVAL MOBILE CONSTRUCTION BATTALIONS

C-13. NMCBs report to their respective NCR. There are 9 active and 12 reserve battalions commanded by Navy CEC commanders. Five active NMCBs are homeported at Construction Battalion Center, Gulfport, Mississippi, and four are homeported at Naval Base Ventura County, Port Hueneme, California. There are 12 reserve NMCBs with readiness support sites spread across CONUS.

C-14. NMCBs provide responsive military engineering and construction support to Navy, Marine Corps, and other forces in military operations. NMCBs have extensive heavy horizontal and vertical construction capabilities. NMCBs construct and maintain roads and bridging for supply routes; build expeditionary airfields and advanced bases; construct or extend airfield pavements; establish ASPs; install, repackage, and redeploy support and LOC bridging; construct base facilities and force beddown facilities; and conduct defensive combat operations. Additional functions include repair, maintenance, and construction of shore facilities and LOCs during contingency, emergency, or disaster recovery operations. NMCBs also perform specialized construction such as water well drilling, quarry and rock crusher operations, asphalt and concrete placement, and battle damage repair (for example, airfield damage repair). They are able to work and defend themselves, including self-decontamination of organic equipment and personnel at construction sites outside of their base camp and execution of tactical convoys.

C-15. NMCBs deploy on a rotational basis according to the 1NCD approved deployment schedule. NMCBs are operationally self-sustainable for up to 60 days, requiring only replenishment of consumables. In times of emergency or disaster, NMCBs conduct disaster recovery and humanitarian assistance operations. NMCBs are capable of limited operations in a CBRN environment. They are outfitted with individual personal protective gear, limited chemical and radiological detection equipment, and decontamination apparatus capable of decontamination of personnel, facilities, and equipment organic to the unit. Other configurations of the NMCB's manpower and equipment, such as those pre-positioned on the maritime pre-positioning ships, have been tailored to meet various missions. An NMCB can task-

organize and deploy away from its main body a number of detachments, details, and teams, depending on the operational tasking and theater requirements.

C-16. NMCBs have standing 89-person air detachments capable of deploying anywhere in the world within 48 hours of notification via tactical or strategic airlift, such as C-130 or C-17 (not organic assets). The NCMB air detachment can be augmented with an organic security element or a special engineering capability, such as a well-drilling team.

UNDERWATER CONSTRUCTION TEAMS

C-17. UCTs report to their respective NCR. There are two active and reserve integrated teams commanded by Navy CEC lieutenant commanders. There is one UCT located at the Naval Amphibious Base Little Creek, Virginia Beach, Virginia, and one at Naval Base Ventura County, Port Hueneme, California.

C-18. UCTs are specially trained and equipped units that perform underwater engineering, construction, repair, and inspection. UCTs facilitate port-opening operations with underwater surveys, damage repair, and obstacle removal through the use of precision demolitions, as well as detailed beach and port hydrographic and side-scan surveys for maritime pre-positioning force or amphibious operations. UCTs conduct battle damage repair and assessments to ocean, waterfront, and port facilities and are capable of a light salvage capability.

C-19. UCTs perform complex inshore and deep ocean underwater construction tasks in any climate, including extreme cold weather environments. They provide ocean bottom surveys for appropriate site selection of underwater facilities. UCTs are capable of diving and working at depths of 190 feet and rely on self-contained underwater breathing apparatus and surface-supplied air driving systems. Typical projects include underwater repair of wharves, piers, pipelines, moorings, boat ramps, and underwater utility systems. The unit also supports OPDS operations by sinking, installing, connecting, and maintaining the single anchor let moorings.

C-20. A UCT is divided into three air detachments and a platoon-size sea echelon, capable of deploying as one unit or separately. Each air detachment carries its own transportable recompression chamber to support diving operations anywhere in the world. The sea echelon is composed of additional and larger unit equipment for sustained operations. UCTs deploy only during exercises, contingencies, or major combat operations and do not conduct regular rotational deployments.

CONSTRUCTION BATTALION MAINTENANCE UNITS

C-21. CBMUs report to their respective NCR. There are two active and reserve integrated shore-based, surge capable units commanded by Navy CEC lieutenant commanders. There is one CBMU headquartered at Naval Amphibious Base Little Creek, Virginia Beach, Virginia, and one at Naval Base San Diego, California.

C-22. CBMUs provide initial construction and continuous public works support to the Navy's expeditionary medical facilities deployed in support of a contingency. The CBMU can provide follow-on public works operations to maintain and repair existing advanced base shore facilities or facilities constructed by NMCBs during contingency operations, to include base camps, power, sewage, POLs, and water systems. The unit is also capable of equipping, manning, and maintaining water production, as well as steam and electrical power generation and distribution systems (systems less than 600 volts) for advanced base facilities. CBMUs deploy only during exercises, contingencies, or major combat operations and do not conduct regular rotational deployments.

NAVAL CONSTRUCTION FORCE SUPPORT UNIT

C-23. The NCFSU reports to its respective NCR. The one reserve NCFSU is commanded by a Navy CEC commander and is headquartered at Naval Base Ventura County, Port Hueneme, California. The NCFSU is undergoing extensive transformation at the time of this publication. The following paragraphs represent the traditional mission of the NCFSU.

C-24. NCFSUs provide logistics-oriented and specialized construction support for the NCR and other NCF units in the following areas:

- Operation, maintenance, and repair of local and long-haul transportation equipment.
- Set up and support of quarry and rock crusher operations, asphalt and concrete production and placement, and soil analysis and stabilization equipment.
- The production and storage of potable water using reverse osmosis purification systems and storage units.
- Construction material management, including requisitioning, expediting, receiving, controlling, storing, issuing, and delivering.
- Support for deliberate bridging and heavy timber construction.
- Maintenance, custody, inventory control, and issuance of special Seabee support equipment.

C-25. The NCFSU deploys only during exercises, contingencies, or major combat operations and do not conduct regular rotational deployments.

AMPHIBIOUS CONSTRUCTION BATTALION

C-26. ACBs are organized under the Atlantic and Pacific NBGs. They are not subordinate to 1NCD. There are two active and reserve integrated units commanded by Navy CEC captains. There is one located at Naval Amphibious Base Little Creek, Virginia Beach, Virginia, and one at Naval Amphibious Base Coronado, San Diego, California.

C-27. NBGs provide an administrative and command element from which personnel and equipment are formed in tactical elements and made available to appropriate commanders to support beach and waterfront operations, especially amphibious and maritime pre-positioning force off-load operations. ACBs provide logistics over-the-shore movement (ship-to-shore or shore-to-shore) and construction support to amphibious forces. ACBs are part of the naval support element and report to the NBG, which is responsible for in-stream offload of maritime ships in support of amphibious operations or the pier-side offload of a maritime pre-positioning squadron in support of a more permissive operation. The primary tasking of ACBs is to provide ship-to-shore transportation of fuel, materials, and equipment in support of amphibious operations. Transport is accomplished primarily by means of assembling powered and nonpowered causeway sections into transfer barges and warping tugs. Additional tasks include operating pontoon causeways, installing and operating offshore petroleum discharge system and assault bulk liquid transfer systems, and meeting the salvage requirements of the NBG. ACBs construct elevated causeways and floating causeway piers, erect 1,300 man expeditionary camps, and provide camp public works support, perimeter defense, and other beach improvement construction support.

C-28. The ACBs deploy only during exercises, contingencies, or major combat operations and do not conduct regular rotational deployments.

GENERAL ENGINEERING SUPPORT TO THE MARINE CORPS

C-29. The NCF provides general engineering support to reinforce and augment the limited general engineering capability of the Marine Corps. The normal employment of the NCF is as a major subordinate element within the MAGTF to maximize engineering capabilities available to the MAGTF commander. Seabees are an essential support element to any size MAGTF and routinely deploy and exercise with Marine Corps units. The NCF constructs and maintains base facilities, repairs battle-damaged facilities, accomplishes disaster recovery efforts and FHA construction projects, and conducts limited defensive operations as required by the OE.

ENGINEERING TECHNICAL AND CONTRACT SUPPORT

C-30. NAVFAC is the Navy's global shore facilities manager and reports to the Chief of Naval Operations. NAVFAC is an active and reserve integrated organization commanded by a Navy CEC rear admiral (upper half). It is headquartered at the Washington Navy Yard, Washington, District of Columbia.

C-31. NAVFAC's component commands comprise two subordinate headquarters commands (NAVFAC Atlantic and NAVFAC Pacific) and facilities engineering commands located around the globe. Facilities engineering commands include an officer in charge of construction located in Department of Navy concentration areas that can be used to support contingency operations. NAVFAC has three specialty centers that provide significant support to the NCF: Naval Facilities Engineering Service Center, Naval Facilities Expeditionary Logistics Center, and the Navy Crane Center.

C-32. NAVFAC provides acquisition and technical support to include planning, design, project management, environmental engineering, and operations and maintenance for shore-based, ocean facilities, and the operating forces of the Navy, Marine Corps, and other services as required. NAVFAC does not regularly deploy, but can deploy contingency engineering response teams to assess damaged facilities and environmental disasters; environmental engineering support teams to conduct surveys, remediation, and disposal; and a contingency officer in charge of construction detail to provide theater or expeditionary contracting management and support to include real-estate transactions and the Global Contingency Construction and Contingency Service Contracts. NAVFAC also has mobile utilities support equipment teams, which provide temporary or short-term utility support. The mobile utilities support equipment program provides portable diesel engine driven generators, substations, switchgear, low-NOx boilers, and technical expertise to support worldwide DOD utility shortfalls and emergencies.

Note. For additional information on the NCF, see Office of the Chief of Naval Operations Instruction (OPNAVINST) 5450.46(series), NCF Policy.

AIR FORCE ENGINEER ORGANIZATIONS AND CAPABILITIES

C-33. Air Force engineer units, organized as Prime BEEF or RED HORSE units, are structured and equipped to provide the full range of support required to establish, operate, and maintain garrison and contingency air bases that support fixed-wing and rotary-wing aircraft. The units provide support ranging from expeditionary to general engineering across the spectrum of operations. The primary mission of Air Force engineers is to provide mission-ready base systems, to include force beddown and aircraft beddown, for the projection of air power for both in-garrison and deployed locations. Air Force engineers are focused on general engineering tasks, but have limited combat engineering capabilities centered on the defense of deployed forces, camouflage, survivability, and base denial.

AIR FORCE ENGINEER STRUCTURE

C-34. Air Force engineering units can deploy as part of an AETF, 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) and are tailorable to meet special deployment taskings. Beddown UTCs deploy with other modular teams as necessary for command, control, and communications to conduct construction, maintenance, repair, fire and emergency services, readiness, and EOD operations.

PRIME BASE ENGINEER EMERGENCY FORCE CAPABILITIES

C-35. Prime BEEF capabilities include site surveys, bare-base construction using mobility assets (such as Bear/Eagle), concrete and asphalt paving, and utility system installation and maintenance (such as water; waste water; electrical; heating, ventilation, and air conditioning; fire protection and crash rescue; and EOD operations and readiness). Projected mobility asset requirements are established using the base engineering survey toolkit. This geospatial component enables the warfighter to preplan beddown capabilities and limitations before actual deployment. Support UTCs augment beddown 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.

RAPID ENGINEER DEPLOYABLE HEAVY OPERATIONAL REPAIR SQUADRON ENGINEER CAPABILITIES

C-36. RED HORSE squadrons are organized and deployed for austere, independent operation to execute heavy horizontal and vertical construction projects; site development; construction and repair of runways, taxiways, aprons, roads, and revetments; heavy earthwork; and construction and repair of facilities and infrastructure. RED HORSE squadrons are organized to operate on a hub-and-spoke concept and, unlike Prime BEEF units, are a theater asset. The concept is to deploy the entire squadron, including augmenters, to a single AOR with the capability of the hub supporting multiple tailored spokes simultaneously. RED HORSE capabilities include all of the functions of Prime BEEF teams, but they are more focused on providing a heavy construction capability, to include water well drilling, quarry operations, small-scale explosive demolition, heavy horizontal and vertical construction, and water purification.

C-37. RED HORSE units are organized in a capabilities-based, building block structure capable of operating a hub-and-spoke concept. The concept is to deploy the entire squadron, including augmentees, to a single AOR. UTCs are structured to support hub-and-spoke operations. Each RED HORSE unit is a 404-person squadron composed of seven different types of personnel UTCs which include vertical construction teams (large and small), horizontal construction teams (large and small), additional construction support element, and beddown and C2 hubs (primary and secondary). In addition, these units have the following airborne capabilities: airborne and air insertable repair teams, airborne fire protection, EOD, and readiness teams.

C-38. RED HORSE units also have small, highly specialized airborne engineer teams (up to 35-person teams). These tailorable teams are trained and equipped to rapidly deploy into an austere location to assess airfield capabilities, prepare helicopter or aircraft landing areas, clear obstacles, make expedient airfield damage repairs, and provide initial assessment of required follow-on forces and material resources to establish airfield contingency operations. The airborne teams can be augmented to clear small areas of UXO and EH, assess potential CBRNE and toxic industrial material hazards, and provide limited crash rescue and medical services. Airborne RED HORSE teams do not capture airfields via forcible entry; rather, they operate on airfields controlled by other U.S. or coalition forces or open airfields not held by enemy forces. Airborne air assault RED HORSE personnel and equipment can be inserted into locations via airdrop, air-insertion, or air-delivery.

AIRFIELD OPERATIONS

C-39. A primary tasking for Air Force engineers is to enable rapid global mobility for airlift, bombers, fighters and to support other manned and unmanned aerial weapon systems. Air Force engineers are trained and equipped with organic capabilities to support all aspects of airfield operations where heavy strategic airlift, bombers, or fighters will operate on a daily or frequent basis. The Air Force has the capability to rapidly deploy general engineer units organized as part of an AETF to open, establish, and maintain air base power projection platforms. These same units can deploy as detached units operating in support of specific missions and operational taskings, such as airfield pavement evaluations; crash and fire rescue; EOD; emergency management response; airfield damage repair; facility construction and maintenance; and utility systems construction, maintenance, and operation. Other taskings include road construction; pavement construction and maintenance; aircraft arresting system installation and maintenance; and airfield lighting, marking, and installation of navigational aids.

C-40. Air Force engineers assess, establish, maintain, and operate air bases that support fixed-wing aircraft. Air Force engineer units have the specialized capabilities required to support all engineering 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.
- Generation of geospatial site information and analysis of operational locations using approved Headquarters Air Force Geo-Integration Office expeditionary site mapping agencies and established policies.
- Airfield pavement inspection and evaluation required to determine the feasibility of supporting and sustaining aircraft operations.
- Design and execution of expedient airfield damage repair.
- 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 and utilities.
- Automatic or ultimate building machine (K-span), pre-engineered building, tension fabric structure, and inflatable building construction.
- Power and water utility generation required to support deployed forces, to include reverse osmosis water purification.
- Aircraft crash fire rescue, structural fire, hazardous material response, and first responder medical support.
- CBRNE training, reconnaissance, operations, and initial weapons of mass destruction (WMD) response.
- EOD to support aircraft munitions, rendering safe and disposing of hazardous munitions, providing response to IEDs and WMD incidents, and conducting assessment support for the destruction of captured enemy munitions and caches and clearance of IEDs from MSRs (not just limited to airfields).

TECHNICAL AND CONTRACT SUPPORT

C-41. 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 AFCESA provides technical engineering support and training and administers the AFCAP. Additionally, AFCESA provides specialized teams to assess pavement and runway conditions along with teams to conduct in-field maintenance and repair specialized power generation equipment.

C-42. The civil engineer maintenance, inspection, and repair team provides intermediate and depot-level repair support on power generation, electrical distribution, and aircraft arresting systems. They also provide technical support for heating, ventilation, and cooling systems. These teams provide commanders with power production and electrical expertise during wartime, contingency operations, and humanitarian and natural disaster recovery actions. In addition, the Air Force Center for Environmental Excellence provides a full range of environmental program support, base planning, construction, and contract services. Headquarters, Air Force, Geo-Integration Office expeditionary site mapping agencies provide planners and warfighters high-quality, timely geospatial information. Expeditionary site mapping agencies fuse ISR with agile combat support in a horizontal and vertical integration strategy to provide the warfighter rapid situational awareness.

FIRE AND EMERGENCY SERVICES CAPABILITY

C-43. Fire and emergency services prevent fires and minimize losses to lives, property, and the environment occurring throughout the spectrum of operations. Included are both man-made and natural incidents; fire suppression or hazard mitigation; rescue; mitigation or containment of releases of hazardous materials resulting from industrial accidents, terrorism, or WMD; and emergency medical responses.

C-44. The capabilities within fire and emergency services are—

- Rescue trapped, sick, or injured personnel from aircraft, buildings, equipment, vehicles, water, confined spaces, or high angles.
- Suppress and minimize fires involving aircraft and other weapon systems, structures, equipment, vehicles, or natural cover.
- Provide emergency lifesaving care for victims of accident or sudden illness.
- Mitigate the impact of hazardous material releases, such as industrial materials; chemical, biological, or radiological materials; or detonation of explosives.
- Prevent fires by advising, enforcing standards, and educating personnel.

C-45. Fire and emergency services are a fundamental component of the Air Force civil engineer capability. Because fire and emergency services are "capabilities based," the capability changes little from one location to another. At home stations, military firefighters represent 50 percent of the Air Force's firefighting capability. By assisting civilian firefighters with home-station missions, they are able to acquire the experience and training needed to maintain the critical skills needed for wartime operations. Since missions at home station and deployed locations are similar, military firefighters are seamlessly postured in UTCs for rapid deployment. Military firefighters support both home station and deployed missions, but equipment and vehicles required to support war plans are set aside in UTCs. This enables firefighters to rapidly transition from peacetime to wartime operations with similar capability, with the same types of equipment and vehicles. Moreover, fire protection UTCs are packaged to support a variety of scenarios that may require a single firefighting crew, multiple firefighting crews, or a management and oversight capability.

C-46. Air Force fire and emergency services provide continuous "24/7" capability. The capability required is based on the specific mission at the deployed location, primarily the type and size of aircraft assigned. Other factors such as large tent cities and lack of an adequate water supply can also affect capability. Firefighters work 72 hours per week in 24-hour shifts at home station and 84 hours per week in 24-hour shifts during contingency operations.

EMERGENCY MANAGEMENT

C-47. Emergency management provides CBRNE defense expertise, to include CBRN and WMD defense supporting activities ranging from small-scale contingency operations to response to major accidents and natural disasters for an air base. Capabilities include preliminary risk and vulnerability assessments and threat analysis; planning, detection, identification, warning and reporting; and contamination control, decontamination, and disaster response equipment.

MARINE CORPS ENGINEER ORGANIZATIONS AND CAPABILITIES

C-48. The MAGTF is the Marine Corps's principal organization for all missions across the spectrum of operations. MAGTFs are balanced combined arms forces consisting of four organic elements: the command element (CE), aviation combat element (ACE), ground combat element (GCE), and a logistics combat element (LCE). MAGTFs range in size from an MEF, Marine expeditionary brigade, Marine expeditionary unit (MEU), to a special-purpose MAGTF. An MEF has a Marine division as the GCE, a Marine air wing as the ACE, and a Marine logistics group as the LCE. A Marine expeditionary brigade has a regiment as the GCE, a Marine air group as the ACE, and a brigade service support-group as the LCE. An MEU has a battalion as the GCE, a squadron as the ACE, and an MEU combat logistics group as the LCE. The element sizes that make up a special purpose MAGTF vary according to mission. Engineers are organic to each of the four elements of a MAGTF.

ENGINEERS IN THE COMBAT ELEMENT

C-49. Engineers within the CE provide advice and guidance to the MAGTF commander and coordinate the overall engineer efforts of the MAGTF. CE engineers work closely with other staff sections to integrate engineer considerations and requirements into all phases of planning and execution.

ENGINEERS IN THE AVIATION COMBAT ELEMENT

C-50. A Marine wing support group (MWSG) is organic to each Marine air wing. The MWSG is a headquarters element that has subordinate Marine wing support squadrons (MWSSs). The MWSS provides the following aviation ground support (AGS) functions: internal airfield communications, weather services, expeditionary airfield services, aircraft rescue and firefighting, EOD, essential engineer services, motor transport, field messing, medical, CBRN defense, security and law enforcement, and air base commandant functions (including air base ground defense). These functions allow the ACE to project its assets ashore and generate sorties at a rate beyond that capable from sea-based platforms.

C-51. AGS is compatible with Navy aircraft and can support and accommodate Army rotary-wing aircraft and most Air Force aircraft. The MWSS provides a full range of general engineering, utilities, material handling, and heavy equipment. Tasks include engineer reconnaissance and survey; construction and maintenance of base camps, including survivability, horizontal and vertical construction; K-span construction; airfield drainage; airfield damage repair; countermobility; mine detection; vertical or short takeoff and landing facilities; bulk fuel storage and distribution; forward arming and refueling point sites; water purification, storage, and distribution; laundry and shower services; mobile electric power; refrigeration; expedient road construction, repair, and maintenance in an ACE area; drafting and surveying; and material handling equipment. The MWSS can be reinforced by MAGTF engineer support battalions (ESBs) or Seabees as necessary to perform missions such as constructing airstrips in excess of 900 feet. Generally, four MWSSs compose the MWSG. The MWSS is composed of a headquarters company, airfield operations company, engineer company, motor transport company, and a maintenance company.

ENGINEERS IN THE GROUND COMBAT ELEMENT

C-52. A combat engineer battalion (CEB) is organic to the MEF. The CEB mission is to enhance the mobility, countermobility, and survivability of the division through combat and limited general engineering support. CEB tasks include engineer reconnaissance, emplacing obstacle systems, breaching operations, mine and countermine, demolitions, assault bridging, expedient bridge construction and repair, limited combat road and trail construction and maintenance, temporary vertical and horizontal construction, and provide provisional infantry. A CEB contains a headquarters and service company, engineer support company, and three or four combat engineer companies.

ENGINEERS IN THE LOGISTICS COMBAT ELEMENT

C-53. The ESB is organic to the LCE. The ESB mission is to provide combat engineering and limited general engineering, bulk liquid (fuel and water), and utility support to the MAGTF. ESB tasks include combat engineering support; standard and nonstandard bridging; EOD; handling, storing, and dispensing bulk fuel and water; water purification; engineer reconnaissance and survey; construction and maintenance of base camps, to include survivability; horizontal and vertical construction; laundry and shower services; mobile electric power; refrigeration; expedient road construction, repair, and maintenance; drafting and surveying; obstacle emplacement; breaching operations; and expeditionary airfield construction. The ESB can reinforce either the MWSS or CEB to support specific requirements that exceed organic ACE or GCE engineer capabilities. The ESB works in concert with the NCF to provide comprehensive engineer support to the MAGTF. The ESB is composed of a headquarters and service company, engineer support company, bridge company, bulk fuel company, and two or three combat engineer companies.

SEABEE SUPPORT TO THE MARINE AIR-GROUND TASK FORCE

C-54. The Navy typically provides an NCE to enhance the MAGTF through complementary, not duplicative engineering support. NCE tasks include construction or pre-engineered buildings, bunkers, towers, ASPs, and concrete and masonry buildings; surveying and drafting; materials testing; well-drilling operations; rapid runway repair; bulk liquid distribution and storage; forward arming and refueling point sites; water purification; horizontal construction such as paved and unpaved roads; MSR maintenance, expeditionary airfields, and asphalt and concrete runways; parking areas; beach improvements; and installation of both standard and nonstandard bridging.

COMMUNICATIONS SUPPORT FOR JOINT ENGINEER FORCES

C-55. Supporting engineer forces with an effective communications system for C2 is an essential consideration for the JFC and the joint force engineer. Engineer forces have organic communications capabilities within Service channels up to the component headquarters. When operating in a joint environment, engineer units retain organic communications capabilities, but may also require additional communications system support from the Service component, other Service components, or the joint force. Specific requirements will depend on the C2 arrangement of the engineer forces within the joint force, mission tasking, and geographic location in the JOA. The following description of capabilities may be helpful in developing the communications for engineer forces supporting the joint force.

ARMY

C-56. Army engineers use the Global Command and Control System (GCCS)-Army at corps level and above and the ABCS at corps level and below. The Maneuver Control System, a subfunction of the ABCS, is used down to the divisional battalion level to accomplish mission planning and C2. At the brigade level and below, Army engineers rely on organic communication assets that include encrypted frequency modulation, facsimile and telephone mobile subscriber equipment, and digitized tactical electronic mail. When operating in a joint force, Army engineers rely on organic communications capability. The GCCS-Army provides engineer access and interface to the JOPES and JEPES, which give Army engineers the capability to exchange engineer annexes with the JFC's headquarters and other elements of the joint force. A secure video teleconference (VTC) capability provided by the Tele-Engineering Kit allows an additional means to reach back to draw on the capabilities of the USACE and assets that they may bring to the fight.

NAVY

C-57. NCF units have sufficient capability to perform all internal communications operations and to communicate with subordinate, adjacent, and higher headquarters. NCRs can maintain voice communications with subordinate units and higher authority by telephone, very high frequency (VHF), high frequency (HF), and limited ultrahigh frequency (UHF). Units can transmit data and achieve limited NIPRNET and SIPRNET access via UHF or satellite phone. Battalion-level units have internal client 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

C-58. Marine Corps engineers have the minimum required capability to perform internal communications operations and to communicate with subordinate, adjacent, and higher headquarters at the division level and below when in a noncontingency status. Marine Corps engineer units may rely on higher headquarters capabilities or request additional C2 assets during operations, particularly when subordinate units support multiple task-organized units. With appropriate augmentation, Marine Corps engineer units can maintain voice communications with subordinate units and higher authority by secure telephone, VHF, HF, and limited UHF and transmit data and achieve limited NIPRNET and SIPRNET access via UHF satellite communications. When employed as part of an MEF or MEF-size MAGTF, engineer units have access to GCCS-Marine Corps combat logistics group headquarters. When operating in a joint force, Marine Corps engineers rely on organic communications capability, but also require additional support.

AIR FORCE

C-59. Air Force engineer forces' communications requirements beyond unit-level capability are provided by deployed installation communications elements. These communications elements are embedded in the base information infrastructure. Developed as part of the Air Force's expeditionary air and space expeditionary force concept, base information infrastructure packages are scalable, modular communications support packages that offer deployed personnel access to such standard services as secure

and unsecured telephones and facsimiles, NIPRNET, SIPRNET, and land mobile radio repeaters. When operating out of an Air Force, joint, or combined operations center, Air Force engineer forces can gain access to a wide range of mission support systems. These systems provide linkage to the GCCS, JOPES, JEPES, and other ISR systems necessary for mission planning.

Appendix D

Multinational, Interagency, and Host Nation Considerations

Military engineers may need to coordinate their activities with multinational, U.S. government agencies, NGOs, UN, and HN agencies according to the operational mandate or military objective. In all cases, authority must exist for direct coordination. Military engineers must establish interagency relationships through negotiation. The specific agency will vary, depending on who has federal or state proponency for the situation (for example, disaster relief versus a firefighting mission). Agreements should be written as memorandums of understanding or terms of reference to ensure understanding and avoid confusion. Most agreements are made at the unified command or JTF level and normally place serious legal restrictions on using military personnel and equipment. These agencies and organizations may have unique engineer capabilities that could be used as part of the overall operational effort. However, these agencies and organizations often request extensive engineer support of their activities and programs. It is critical that an effective engineer liaison is established with the force headquarters CMOC to coordinate and execute any engineer support exchange with these agencies.

SECTION I–MULTINATIONAL CONSIDERATIONS

UNITS AND ORGANIZATIONS

D-1. When military operations are considered, the U.S. seeks to develop coalitions rather than conduct unilateral operations. The United States may participate in a U.S.-led coalition, such as Operation Restore Hope (Somalia), or a non-U.S.-led coalition, such as Operation Able Sentry (former Yugoslav Republic of Macedonia). The agencies involved in each of these operations are both consumers and possible resources of engineer activity. Army engineer units may be subordinate to, colocated, and working alongside, or directing engineer activities and providing oversight or support for the missions assigned to these organizations. The engineer forces' effectiveness to operate within the varied framework surrounding a collective international enterprise can be greatly enhanced by respecting the multinational partners; their construction and engineering techniques; and their ideas, culture, religion, and customs. Equally important and parallel to operating within a U.S. unilateral joint environment is understanding multinational unit or organization capabilities and training. This understanding ensures the assignment of appropriate missions and avoids the risk of offending national honor or prestige by allocating unsuitable tasks to partners in the multinational endeavor.

MULTINATIONAL ENGINEERS

D-2. The engineer organizations available from deployed national armies are generally a mix of combat and construction engineers in company- and battalion-size units. The training and experience levels and equipment fielding varies among these units. National engineers from Britain, Canada, and Australia have been involved in numerous missions outside their territorial boundaries. The political impact of these missions is important to understand. When German engineers deployed into Somalia in 1992, it took a national legislative amendment to their constitution to allow them to participate in operations off German soil. This was their first experience in multinational efforts outside of NATO. Smaller countries have more regional restrictions on their involvement, and their experience is correspondingly narrow. However, they are also more likely to be attuned to the special circumstances that are relevant to the AO.

MULTINATIONAL ENGINEER CAPABILITIES

D-3. NATO and American, British, Canadian, and Australian New Zealand Armies Program engineer capabilities are well known, and data about them is readily available. Standardization agreements between national armies facilitate engineer interoperability and cooperation. The capabilities of other nation's engineers are normally available through intelligence channels or formal links with the nations concerned. Several nations have engineers that are experts in specific combat engineering tasks, such as mine detection and removal. Other national engineers are focused on specific missions, such as disaster relief. Engineers must have an appreciation for the engineer capabilities and limitations of other nations. AJP 3.12 and
ATP-52(B) provide a necessary starting point for working with allied engineers.

MULTINATIONAL ENGINEER COMMAND AND CONTROL

D-4. Depending on the multinational force arrangement in-theater, Army engineers may control or work closely with engineers from other nations. C2 relationships for multinational engineer forces are established to foster cooperation and share information. Critical to this process is providing adequate U.S. engineer LNO support, including linguist support, communications equipment, and transportation.

MULTINATIONAL ENGINEER CONSIDERATIONS

D-5. During force projection operations, the initial engineer capabilities in-theater will most likely be a mix of HN, contract, and multinational capabilities. As Army engineers deploy into a theater, they may be joined by multinational engineers. The Army engineer staff should consider including the following when coordinating multinational engineer plans and operations:

- Requesting the latest intelligence information concerning the HN, allied, and coalition engineers' structures and logistics requirements.
- Requesting the latest engineer intelligence data from the HN or deploying allied and coalition engineer elements to help identify force projection theater Army engineer requirements and enemy engineer capabilities. Requirements include threat mine and obstacle data, soils data, construction materials availability, and HN construction support.
- Establishing multinational engineer staff links between the Army, HN, allied, and coalition engineer force staff sections through the JTF or theater engineer staff and headquarters.
- Executing NATO multinational C2 with the NATO OPORD format and the NATO decision-making process.
- Providing necessary Army engineer liaison officer support.
- Developing the multinational task-organization relationships that enhance HN, allied, and coalition engineer capabilities following the deployment of Army engineers.
- Assessing the need for HN, allied, and coalition engineer support following the arrival of Army combat and construction units in-theater.
- Determining if multinational engineer units need augmentation from Army combat and construction units.
- Developing procedures for Army engineer units to support multinational engineers with additional Class IV construction materials and engineer equipment.

SECTION II–INTERAGENCY AND NONGOVERNMENTAL ORGANIZATION CONSIDERATIONS

INTERAGENCY OPERATIONS

D-6. Interagency operations expand the scope and capabilities of any given response because of the wide variety of expertise and funding resources potentially available. Not only do interagency operations increase the resources engaged in an operation, but they also increase and complicate the coordination necessary to conduct operations. Engineer operations may be significantly impacted by the participation of

interagency organizations. In civil support operations, Army forces provide C2, protection, and sustainment to government agencies at all levels until they can function normally. Engineer operations may be a key enabler to extending this support. In stability operations, interagency organizations will employ contract or other construction capabilities concurrently with ongoing military engineer operations. Coordination can identify and avoid conflicting issues and unify the effect of these efforts. The following are some of the interagency organizations that could be involved:

- FEMA.
- Environmental Protection Agency.
- Drug Enforcement Administration.
- National Oceanic and Atmospheric Administration.
- United States Geological Survey.
- Public Health Service.
- Civil Air Patrol.
- Department of Agriculture.
- DOS and the United States Agency for International Development.
- Office of Foreign Disaster Assistance.
- Department of the Interior, Fish, and Wildlife Agency.
- General Accounting Office.
- NGA.

D-7. USACE routinely operates with many of these organizations and may, through FFE, provide assistance in coordination. See Appendix A of JP 3-07 and JP 3-08 for an in-depth discussion of interagency coordination during joint operations.

NONGOVERNMENTAL ORGANIZATIONS

D-8. Relationships with international and domestic NGOs must be established through negotiation. Most agreements are made at the strategic level (unified command); however, the operational commander may have some latitude delegated to him. All agreements normally have serious legal restrictions on using military personnel and equipment. Some of these agencies may have unique and significant engineer capabilities that could be used as a part of the overall operational concept. These capabilities may be a useful source of Class IV material, not only for the agency's own projects, but also as a negotiated barter for services rendered in support of its mission. More often than not, however, these agencies and organizations may request extensive engineer support for their activities and programs. As these organizations play an important part in the CCDR's achievement of strategic objectives, their demands must be coordinated. Therefore, it is critical that an effective engineer liaison be established and maintained with the force headquarters CMOC.

D-9. The UN may designate a regional organization with a greater vested interest and appreciation for the forces at work in a given region as its operational agent to exercise control. Each of these organizations has different operational concepts and organizational procedures; U.S. forces are familiar with some of these concepts and procedures, such as those of NATO. However, there are others with which they are not familiar.

SECTION III–HOST NATION CONSIDERATIONS

HOST NATION INTERFACE

D-10. In a forward-deployed theater, the ASCC in conjunction with the other component commanders, the CCDR, the allies, and the HNs identifies wartime facility and construction requirements for the Army as part of the deliberate war planning effort. Doctrinal construction requirements for the ASCC may be identified using the planning module in the TCMS. Subsequent analyses further refine construction requirements and provide a basis for—

- Force structuring.
- Procurement.
- Leasing provisions and establishing HN agreements.

D-11. The product of these analyses is the ESP. The goal is to reach HN support agreements in peacetime to provide as many of the facilities as possible that are needed within the theater. Advanced planning and the commitment of resources by HNs reduce the early lift requirements needed to support the RSOI. Engineering support from the HN usually involves providing—

- Land.
- Facilities.
- Construction support.
- Manpower.
- Equipment.
- Materials.
- Services.
- Hazardous-waste disposal.

D-12. Written agreements with HNs regarding support items foster an understanding of the assistance levels and increase the likelihood of execution.

REAL ESTATE CONSIDERATIONS

D-13. Real estate operations involve acquiring, managing, and disposing of land and facilities to support joint operations. The JFC should establish real estate acquisition policies and programs in support of contingency operations. The JFC determines what real estate is needed to satisfy operational requirements. Acquiring land and facilities not owned by the United States government is accomplished through assignment, international agreements such as Status of Forces Agreements, memorandums of agreement, leases from the HN, or direct leases from the private sector. Within DOD, the secretaries of the military departments are authorized to lease structures and real property relating to structures that are needed for urgent military purposes in foreign countries (see Title 10 U.S. Code, initiated as contingency plans are developed to identify land and facility requirements for joint operations). Real estate acquisition requires special contracting procedures that are performed by USACE, NAVFAC, or a designated executive agent. Early deployment of real estate personnel is essential to acquire land and facilities in a timely manner.

D-14. Real estate authorities throughout the world have been assigned to components along similar lines corresponding to the designation of DOD construction agents (DOD Directive 4270.5). Within regions designated to the Army, USACE establishes policies for the acquisition, maintenance, and disposal of real estate, to include leased and rent-free facilities. Real estate teams may be assigned to each sustainment brigade or centrally controlled at the senior engineer headquarters. These teams coordinate with HN agencies and private owners to acquire and dispose of real estate and establish the terms of lease agreements. Real estate planning and surveys must be initiated as campaign plans are developed to provide timely and adequate facilities to sustain the combat force. Local HN officials can help identify available facilities or land that meets military requirements. Thorough documentation of lease agreements and property conditions at the time of the lease, to include environmental baseline survey data and expectations of property conditions at the termination of the lease, are crucial to expedite a fair and amiable conclusion of lease activities. CA and real estate personnel may be required to work through HN governments to settle agreements with property owners. Real estate acquisition is more difficult in contingency operations due to the lack of preparation to identify probable sources of and confirm legal ownership. Real estate is required for—

- Air bases.
- Base camps.
- Medical and logistics complexes.
- Ranges and training sites.
- Quarry and borrow sites.

- Trailer transfer points.
- Traffic control points.

D-15. Property is generally acquired by requisition, with all transactions documented thoroughly under the provisions of the CCDR's directives. Procedures are used that provide the property required for missions while protecting the property owner's legal rights. Using rent-free facilities provided by the host government or a host agency require the same legal responsibilities as using facilities leased from private owners. Real estate policies and procedures are discussed in more detail in FM 3-34.400.

HOST NATION SUPPORT

D-16. Wartime HN support agreements in forward-presence theaters (Europe and Korea) have been negotiated to provide HN construction support, such as facility modifications, LOC maintenance and repair, and utility services. In Southwest Asia, the agreements are less formal and lack the practiced application that accompanies the full-time presence of U.S. forces in Europe and Korea. However, these agreements are no less critical to mission success in the event of an operation in this region. Such HNS is used whenever possible to free U.S. engineer units for critical missions where HNS alternatives are not viable. Support agreements are negotiated in peacetime on an asset basis. Assets may be facilities, contracts, or equipment. Again, this support is particularly critical during the initial stages of a contingency when RSOI requirements are high and engineer assets are limited.

D-17. Pre-positioning equipment within the region reduces the United States response time into a particular theater by allowing military forces to deploy by air and fall in on war stocks within the region. These pre-positioning locations are a critical element of U.S. force projection national strategy and represent a significant contribution of HNS. The HN's commitment for space, facilities, services, and utility support for these complexes demonstrate the HN's interface with U.S. forces and the partnership of the United States and UN in the defense and stability within the region. Beyond direct HNS, multinational elements directly or indirectly involved in the crisis may provide other support. Other nations sympathetic to the cause may be limited in their direct participation because of constitutional restrictions or political sensitivities. However, these nations may provide nonlethal equipment or funding much like the Japanese provided during the Gulf War.

D-18. During a conflict, the HN may provide construction organizations to repair or construct facilities, usually within the sustainment area. Construction materials (such as cement, asphalt, aggregate, timber, and steel) and contract labor may also be available. HN assets may also be available for local security and for transporting construction materials and equipment. Third-country nationals may also be available by request through the HN or direct contact with nationals to support engineer activities within the sustainment areas. Engineer reconnaissance and assessment teams engaged in planning during peacetime or dispatched early in contingency operations are the key to identifying and accessing available HN assets.

This page intentionally left blank.

Appendix E

Engineer Staff Organization and Selected Cells, Workgroups, and Boards

This appendix describes engineer staff and geospatial engineering organizations at each echelon from BCT to theater Army. It also highlights many of the key cells, workgroups, and boards with which the engineer staff may interact.

ENGINEER STAFF ORGANIZATIONS IN BRIGADES

E-1. The BCT is the principal tactical unit and centerpiece of the Army's modular effort. It is the fundamental building block of combat power in the Army, made up of battalion-, company-, and platoon-size units that are discrete packages and rapidly deployable. The three types of BCTs are heavy, infantry, and Stryker. This section provides general information on the engineer staff organization within the BCT, including staff assigned to the CABs and BSTBs. Additional information on the structure of each of the BCTs can be found in FM 3-90.6.

BRIGADE COMBAT TEAM ENGINEER STAFF AND GEOSPATIAL SUPPORT

E-2. The organic engineer staff organizations within the three types of BCT and the ACR are shown in figure E-1. A discussion of the variations is provided below.

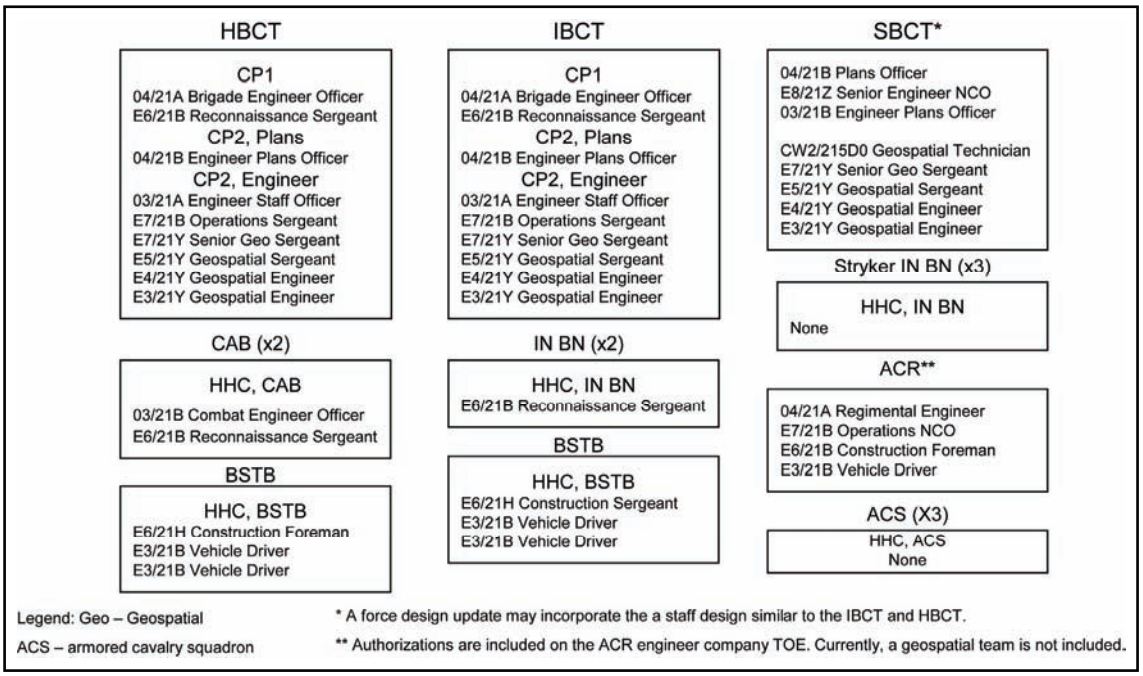


Figure E-1. Organic engineer staff in the brigade combat teams

E-3. All three types of BCTs have assigned engineer staff personnel in the BCT headquarters in addition to a supporting geospatial engineer section. The HBCT and IBCT both have five engineer personnel assigned, while the SBCT has only three additional engineer staff assigned. In all three, a major is assigned as the brigade engineer or ENCOORD and is the senior engineer in the BCT headquarters. The brigade

engineer is assisted by an engineer NCO (a senior engineer NCO in the SBCT) to provide 24-hour coverage. In the HBCT, an additional major is assigned to the BCT plans cell as the engineer planner. The engineer planner in the IBCT and the SBCT is a captain. Both the HBCT and IBCT are assigned an additional captain and engineer NCO to provide staff support.

E-4. The organic geospatial engineer team assigned to both the HBCT and IBCT headquarters consists of two geospatial engineer NCOs and two enlisted Soldiers. The organic geospatial engineer team assigned to the SBCT headquarters consists of one chief warrant officer 2 geospatial information technician, two geospatial engineer NCOs, and two enlisted Soldiers. The geospatial engineer section operates in the BCT main CP providing geospatial support for the BCT. The geospatial engineer section has the capability to—

- Generate and analyze terrain data.
- Prepare decision graphics.
- Produce image maps.
- Provide three-dimensional terrain perspective views.
- Manage the theater geospatial database.
- Update maps.
- Produce tactical decision aids.
- Produce IPB overlays.
- Operate on a 24-hour basis.

E-5. Equipment assigned to the geospatial engineer section includes—

- One each digital geospatial engineer support system (Digital Topographic Support System [DTSS]): AN/TYQ-67 (light).
- One each DTSS: AN/TYQ-71 (deployable minus) (SBCT only).
- One each truck cargo: 4 by 4 light medium tactical vehicle (LMTV) with towed generator.
- One each truck utility: 1 ¼-ton 4 by 4 (with equipment) high-mobility multipurpose wheeled vehicle (HMMWV).

E-6. In the HBCT, an engineer planning staff is assigned to each CAB headquarters. This engineer section includes an engineer captain as the CAB engineer or ENCOORD and a senior engineer NCO. They are responsible for engineer planning and coordination within the CAB. This staff section coordinates directly with the supporting engineer units and advises the CAB commander on engineer operations.

E-7. Each infantry battalion of the IBCT has an engineer staff of one engineer NCO to act as the battalion staff engineer or ENCOORD. This engineer NCO advises the commander on engineer operations in the battalion. Responsibilities include providing planning and coordination for engineer elements that augment the battalion and tracking engineer effort within the battalion. There are currently no engineers on the staff of the Stryker infantry battalion or in the ACR.

E-8. The BSTB of the HBCT is resourced with two engineer personnel, a construction foreman and a command section driver. The BSTB of the IBCT is resourced with two engineer personnel, the BSTB commander's driver and a construction NCO. The engineer NCO is assigned to the BSTB to coordinate engineer support to sustainment and facilitate additional engineer forces being attached to augment the HBCT. Engineer units from company size and below are intended to be attached to the BCT for C2 and logistics support. Neither the SBCT nor the ACR currently has an organic BSTB. If the decision is made to resource one, then it is expected that it will include the same basic engineer staff package as is present in the BSTB of the HBCT or the IBCT.

OTHER BRIGADES AND AUGMENTING ENGINEER ORGANIZATIONS

E-9. A mix of multifunctional brigade types is available to support theater Army, corps, and division commanders. These supporting brigade types include the BFSB, CAB, MEB, the fires brigade, and the sustainment brigade. These brigades are combined arms units designed to support BCTs and carry out specific tasks in support of echelons above BCT. The MEB was previously discussed in Chapter 2 and includes a robust engineer staff presence. Of the other four multifunctional brigades, only the sustainment

brigade includes an assigned engineer staff officer, a major in the plans and civil support operations staff. All five of the multifunctional brigades have a geospatial engineer cell assigned—or a working proposal to assign—that consists of two geospatial engineer NCOs and two geospatial engineer Soldiers.

E-10. A mix of functional supporting brigades and units will remain in the Army force structure for the foreseeable future. These functional brigades will normally be assigned to theater-level commands. Examples include, but are not limited to, MP, engineer, AMD, network, medical, CBRN defense, and CA. Of the functional brigades, only the engineer brigade has assigned engineer staff personnel.

E-11. The engineer battalion headquarters from the force pool possesses the capability to provide engineer staff planning for a variety of engineer-related missions. Based on the factors of METT-TC, the headquarters may be task-organized in support of a brigade or BCT, not only to provide C2 of other assigned or augmenting units, but also to provide engineer staff and planning support. Both the engineer brigade and the TEC may provide limited engineer staff augmentation to brigades or the BCT based on the factors of METT-TC.

ECHELONS ABOVE BRIGADE ENGINEER STAFF AND GEOSPATIAL ENGINEERING SUPPORT

E-12. The organic structure of the staff at each EAB will vary slightly from unit to unit. This is especially true at theater Army echelon. The basic structure is described as follows, but readers must investigate variations based on the specific division, corps, or theater Army headquarters in which they are interested.

Divison Engineer Staff

E-13. The organic engineer staff distribution within the division headquarters is shown in figure E-2, page E-4.

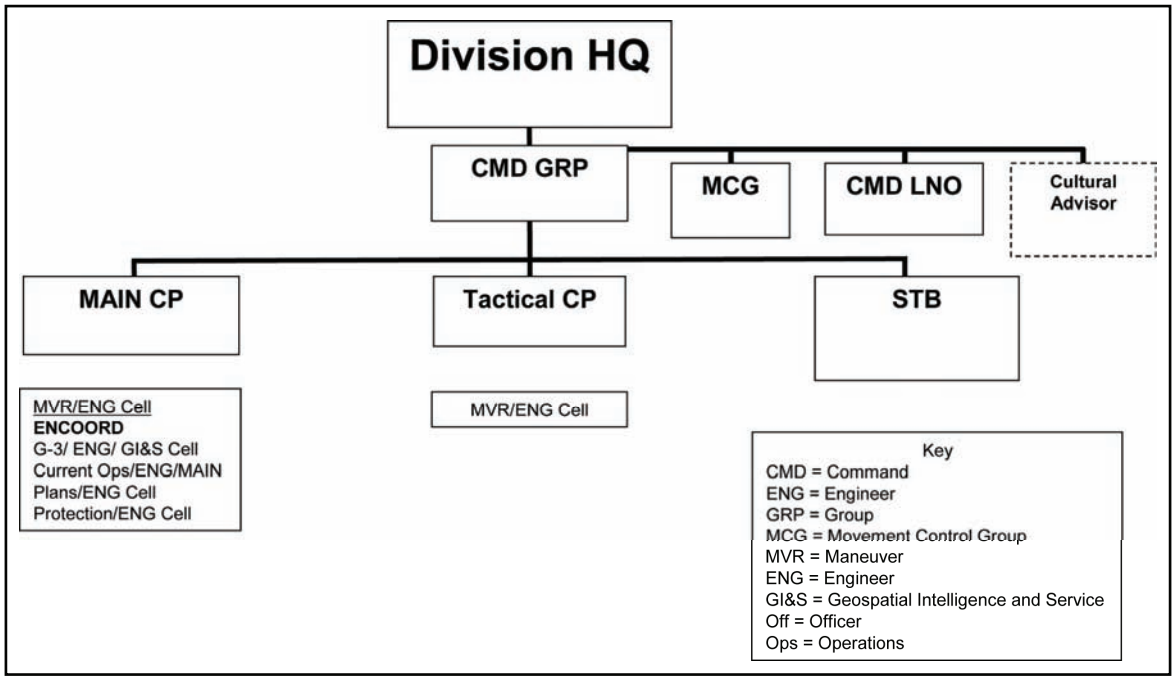


Figure E-2. Organic engineer staff in the division headquarters

E-14. The division engineer or ENCOORD is an engineer lieutenant colonel who is assisted by a senior engineer NCO and a chief warrant officer 2 utilities operations maintenance technician. In addition to the ENCOORD, the division headquarters is assigned engineer staff cells in both the main CP and tactical CP. An engineer major, captain, and NCO provide an engineer operations cell in both the main CP and tactical CP. An additional engineer major and NCO are assigned to the protection cell in the main CP, and an engineer major serves as engineer plans officer in the main CP.

E-15. The organic GI&S cell assigned to the division main CP is lead by a chief warrant officer 3 geospatial information technician and a senior geospatial engineer sergeant. In addition, the cell has two geospatial engineer NCOs and five geospatial engineer Soldiers. The geospatial engineer cell has the capability to—

- Generate and analyze terrain data.
- Prepare decision graphics.
- Produce image maps.
- Provide three-dimensional terrain perspective views.
- Manage the theater geospatial database.
- Update maps.
- Produce tactical decision aids.
- Produce IPB overlays.
- Operate on a 24-hour basis.

E-16. Equipment assigned to the geospatial engineer section includes—

- One each DTSS: AN/TYQ-67 (light).
- One each truck cargo: 4X4 LMTV with towed generator.
- One each truck utility: 1 1/4-ton 4 by 4 (with equipment) HMMWV.

Corps Engineer Staff

E-17. The organic engineer staff distribution within the corps headquarters is shown in figure E-3.

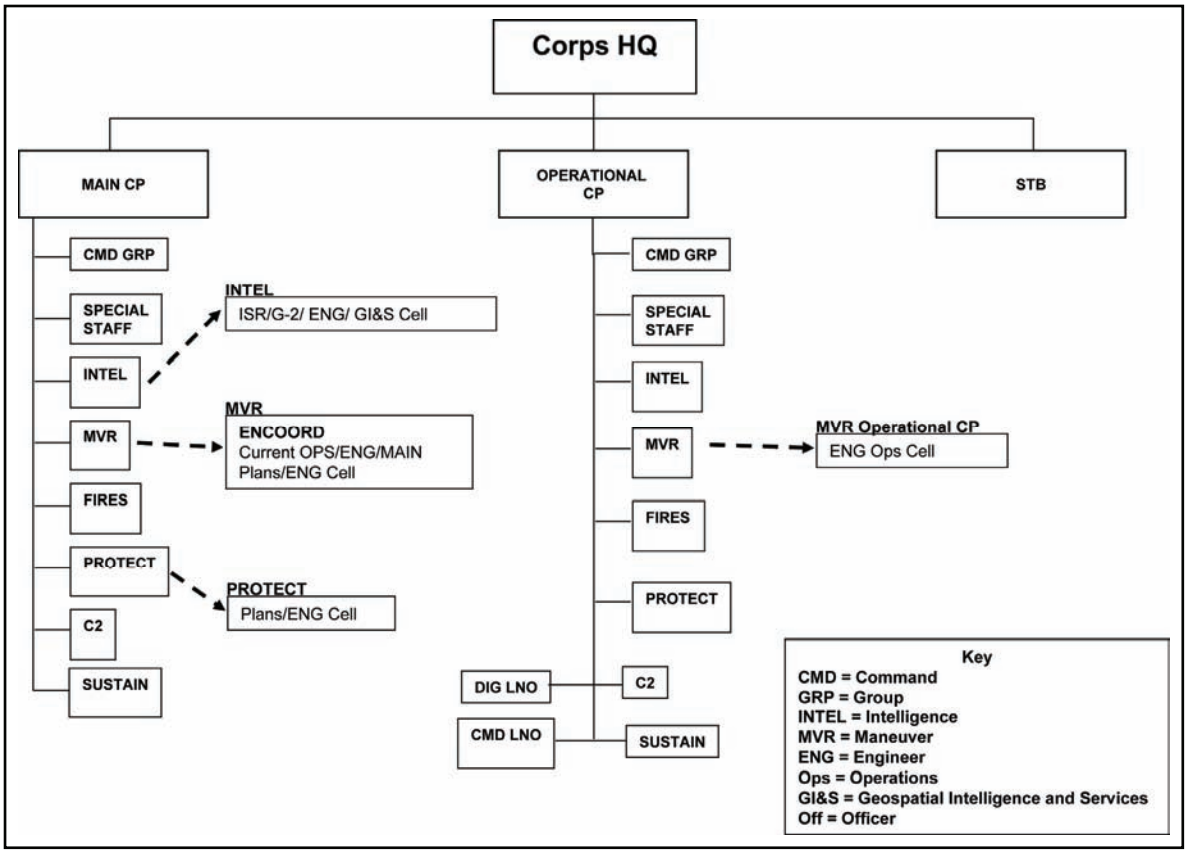


Figure E-3. Organic engineer staff in the corps headquarters

E-18. The corps engineer or ENCOORD is an engineer colonel who is assisted by an engineer sergeant major (SGM). In addition to the ENCOORD, the corps headquarters is assigned engineer staff cells in both the main CP and operational CP. An engineer major and captain provide an engineer operations cell in the main CP. The engineer operations cell in the operational CP consists of an engineer lieutenant colonel, two majors, an engineer NCO, and two combat engineer Soldiers. An additional engineer major serves as engineer plans officer in the main CP.

E-19. The organic GI&S cell assigned to the corps main CP is lead by a chief warrant officer geospatial information technician and a senior geospatial engineer sergeant. In addition, the cell has two geospatial engineer NCOs and seven geospatial engineer Soldiers. The geospatial engineer section has the capability to—

- Generate and analyze terrain data.
- Prepare decision graphics.
- Produce image maps.
- Provide three-dimensional terrain perspective views.
- Manage the theater geospatial database.
- Update maps.
- Produce tactical decision aids.
- Produce IPB overlays.
- Operate on a 24-hour basis.

E-20. Equipment assigned to the geospatial engineer section includes—

- One each DTSS: AN/TYQ-67 (light).
- One each truck cargo: 4X4 LMTV with towed generator.
- One each truck utility: 1 1/4-ton 4 by 4 (with equipment) HMMWV.

Theater Army Engineer Staff

E-21. The organic engineer staff distribution within the theater Army headquarters is shown in figure E-4.

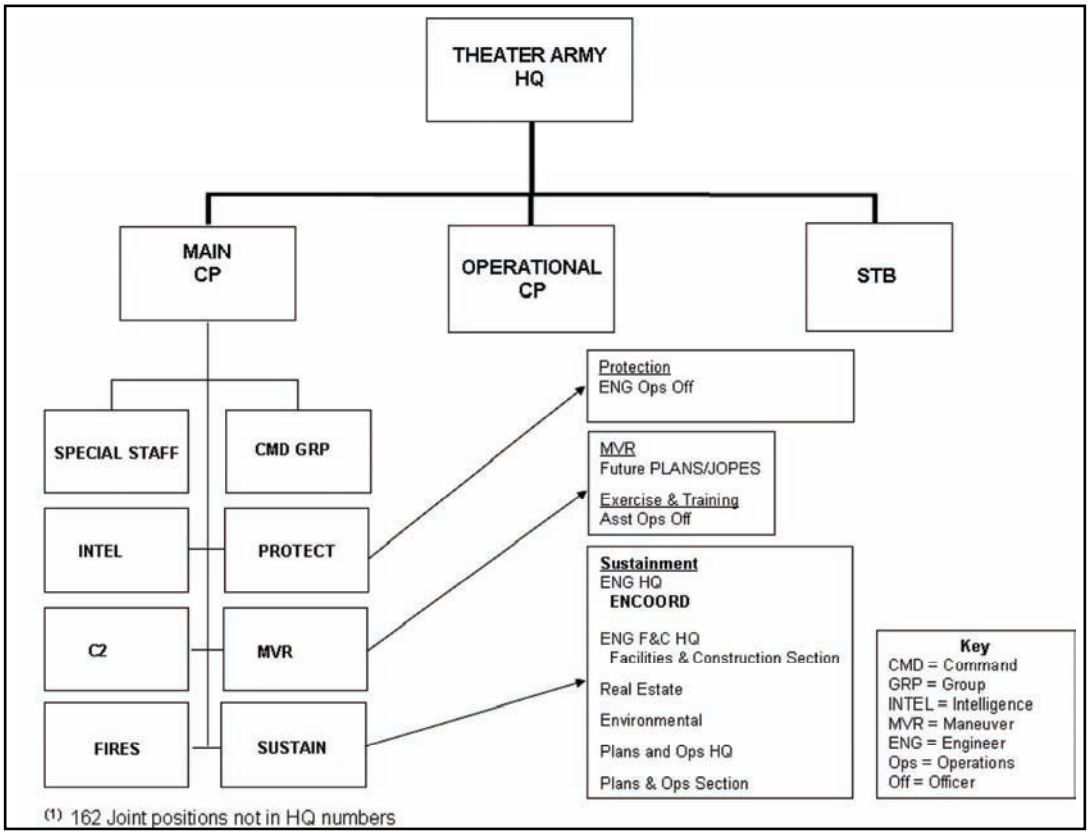


Figure E-4. Organic engineer staff in the Army headquarters

E-22. The theater Army engineer, ENCOORD, is an engineer colonel who is assisted by an engineer SGM. In addition to the ENCOORD, the theater Army headquarters is assigned engineer staff cells within the protection, maneuver, and sustainment sections of the main CP. Within the operational sustainment section, a total of seven engineer lieutenant colonels lead subordinate engineer staff cells with majors, captains, NCOs, and combat engineer Soldiers to assist as shown in figure E-4. An additional engineer lieutenant colonel and two majors serve within the operational maneuver section and an engineer major serves in the operational protection section.

E-23. The theater Army headquarters relies on a geospatial engineer company or geospatial planning cell task-organized to provide geospatial engineering support. See Appendix B for a description of these organizations.

JOINT FORCE ENGINEER STAFF AND GEOSPATIAL SUPPORT

E-24. Each JFC has a unique engineer staff structure. The specific joint manning document (JMD) describes the engineer staff organization and should reflect representation from each Service. Staff engineers should work closely with civilian and multinational partner organizations to develop operational organization augmentation manning. The JMD should be built based on analysis of the mission and the engineer staff capabilities required to support the operation.

E-25. The JFC will organize their staffs to carry out their respective assigned duties and responsibilities. Based on mission-specific requirements, the engineer staff may be placed within the J-3 or J-4 or be organized as a separate staff to the JFC. The JFC may choose to organize geospatial engineers or GI&S

officers within the J-2, J-3, or J-4 depending on the specific organizational structure of the unit. Considerations for each option include the following:

- Operations Directorate Staff. When the focus of engineer effort predominantly supports the operational movement and maneuver, fires, and protection warfighting functions, the JFC should consider placing the engineer staff as a cell within the J-3. This option will provide the fastest exchange of information during crisis action planning and optimize the use of supporting capabilities.
- Logistics Directorate Staff. When the engineer effort predominantly supports sustainment of the joint force, the JFC should consider placing the engineer staff as a cell within the J-4. This option facilitates planning and coordination among engineers and logisticians for the construction and repair of LOCs, MSRs, airfields, other logistic facilities, and infrastructure in general.
- Separate Engineer Staff. When the engineer effort is a significant focus or a key element of the joint operation equally divided between combat and general engineer functions, the JFC should consider establishing a separate engineer staff element that reports directly to the JFC. This option provides the greatest flexibility in orchestrating diverse engineer operations, and it provides the greatest visibility of engineer capabilities, requirements, and responsibilities throughout the staff. This is the preferred option.

CELLS, WORKGROUPS, AND BOARDS

COMMAND POST CELLS

E-26. In the context of CPs, a cell is a grouping of personnel and equipment by warfighting function or purpose to facilitate C2. There are two types of CP cells: functional and integrating (see figure E-5, page E-8). Functional cells group personnel and equipment by warfighting function. Integrating cells group personnel and equipment to integrate functional cell activities. Integrating cells normally focus on different time horizons. For example, the plans cell focuses on the long-range time horizon, while the current operations cell focuses on the short-range time horizons (FM 3-0 discusses time horizons). This is not to say that the functional cells do not integrate. The sustainment cell integrates numerous logistic areas and services; the fires cell integrates the contributions of all warfighting functions to targeting through the targeting working group. This integration, however, generally focuses on maximizing the effects of a single warfighting function. Integrating cells focus the efforts of functional cells on planning, preparing for, or executing the overall operation within a time horizon.

E-27. Functional cells and integrating cells are not single staff sections. In a sense, they are combined arms staff components. For example, in a corps main CP, G-2 section personnel often form elements of the intelligence, fires, current operations, and plans cells. They form elements of the intelligence, fires, current operations, and future operations cells in the tactical CP.

E-28. Not all cells depicted in figure E-5 are in every CP. A battalion or brigade tactical CP, for example, is usually not divided into cells; the entire tactical CP is the current operations cell. It comprises representatives from various staff sections. A corps tactical CP, in contrast, has all cells listed in paragraph E-27 except for plans.

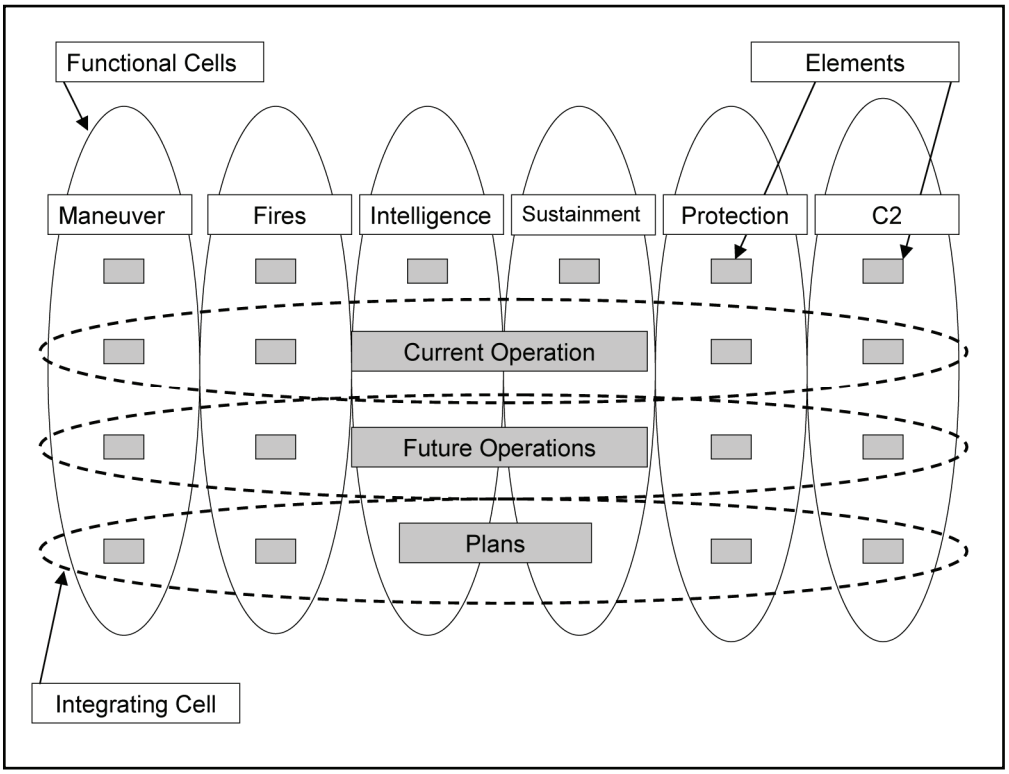


Figure E-5. Command post organization

MEETINGS, WORKGROUPS, AND BOARDS

E-29. Periodically or as required, ad hoc groupings form to solve problems and coordinate actions. These groups include representatives from within or outside a CP. Their composition depends on the issue. These groups are called meetings, working groups, and boards. Each is a control mechanism for regulating a specific action, process, or function. (See JP 5-00.2 for joint force headquarters design options. It addresses the boards, bureaus, and centers used by JFCs.)

E-30. "Meetings" (sometimes called huddles) are informal gatherings used to present and exchange information. Cell chiefs and staff section representatives hold meetings as needed to synchronize their activities.

E-31. A *working group* is a temporary grouping of predetermined staff representatives who meet to coordinate and provide recommendations for a particular purpose or function. (FMI 5-0.1) Some working groups may be thought of as ad hoc cells. Others are the forum used to synchronize the contributions of multiple cells to a process. For example, the targeting working group brings together representatives of all staff elements concerned with targeting. It synchronizes the contributions of all staff elements to the work of the fires cell. It also synchronizes fires with current or future operations. Working groups may be held at a central location, by teleconference, by VTC, or by a combination of all of these. They are formed as needed or when the commander directs. Typical working groups and the lead cell or staff section at division and corps headquarters include—

- Operations synchronization (current operations cell).
- Plans (plans cell).
- Targeting (fires cell).
- Information operations (Assistant Chief of Staff (ACOS), information operations [G-7] section).
- ISR (current operations cell).
- GEOINT (GEOINT cell)

- Intelligence synchronization (intelligence cell).
- Protection (protection cell).
- Logistics synchronization (sustainment cell).
- Movements (sustainment cell).
- Civil-military operations (assistant chief of staff, civil affairs [G-9] section).
- Information management (ACOS, command, control, communications, and computer operations [G-6] section).

E-32. The number of and subjects that working groups address will depend on the situation and echelon. For example, a corps CP may form working groups to address enemy IED tactics or refugee return and resettlement. Battalion and brigade headquarters normally have fewer working groups than higher echelons. Working groups there are often less formal. Groups may gather daily, weekly, or monthly depending on the subject, situation, and echelon.

E-33. Working groups form a major part of a CP's battle rhythm. The chief of staff or XO oversees the battle rhythm and scheduling of working groups. Each group should be logically sequenced so that one working group's outputs are available for the next working group's inputs when needed. Chiefs of staff or XOs balance the time required to plan, prepare for, and hold working groups with other staff duties and responsibilities. They also examine attendance requirements critically. Some staff sections and cells may not have enough personnel to attend all working groups. Chiefs of staff and cell leaders constantly look for ways to combine working groups and eliminate unproductive ones.

E-34. A *board* is a temporary grouping of selected staff representatives delegated decision authority for a particular purpose or function. (FMI 5-0.1) They are similar to working groups. When the process or activity being synchronized requires command approval, a board is the appropriate forum. The unit's SOP establishes each board's purpose, frequency, required inputs, expected outputs, attendees, and agenda.

ENGINEER BOARDS, CENTERS, AND CELLS

E-35. A JFC may establish engineer boards or cells to manage engineer-intensive activities and ensure that resources are used effectively to meet mission requirements. Engineer boards establish policies, procedures, priorities, and oversight to coordinate efficient use of engineer resources. Engineer boards serve as the forum to address issues outside of daily operations and to ensure coordination at the leadership level and across staff directorates. The joint force engineer and staff will carry out responsibilities of the engineer-specific boards until the boards are formed. An important distinction between a board and a working group is that a board is usually a decision-making body. Working groups conduct staff coordination at the action officer level and prepare materials for decisions to be made at a board. Cells within the JTF are a group of personnel with specific skills who are listed together on the headquarters joint manning document to accomplish key functions. It is important for the Services and components to be represented on the engineer boards to facilitate vertical and horizontal integration that will allow the joint force engineer to capitalize on the advantages of joint capabilities. Collaborative tools allow components to participate in boards without having to be physically present at the joint force headquarters. The joint force engineer is responsible for the boards described below.

E-36. The CCDR or subordinate JFC may establish a JCMEB to assist in managing civil-military construction, engineer projects, and resources. The JCMEB is a temporary board chaired by the CCDR or a designated representative (such as the combatant command J-4, combatant command engineer, subordinate joint force engineer, or CA officer). The joint force engineer provides the secretariat and manages the administrative details of the board. Key members on the board include the J-3 future plans officer, J-4, engineer, CA officer, staff judge advocate, and J-8. Other personnel from the staff, components, and DOD agencies or activities in support of the combatant command may also participate. According to the CCDR guidelines, the JCMEB establishes policies, procedures, priorities, and overall direction for general military construction and engineering requirements in-theater. Figure E-6, page E-10, depicts some typical inputs and outputs for the board, as well as primary membership and outside stakeholders. The board gauges mission impact from engineering activities and recommends actions as needed. A primary task of the board is to deconflict requirements between the military and civilian aspects of construction during a joint

operation. The board should also facilitate synchronization of the joint force engineer effort with similar efforts being undertaken at the strategic level. The JCMEB will coordinate its activities with the combatant command's engineering and CA staff. The JCMEB will elevate construction and engineering requirements it cannot satisfy from within joint force resources to the next appropriate level for support. The JCMEB may arbitrate issues referred to it by the JFUB. The JCMEB, in conjunction with the JFUB, provides guidance on developing the ESP to an OPLAN or OPORD and, if appropriate, assumes responsibility for preparation of the ESP.

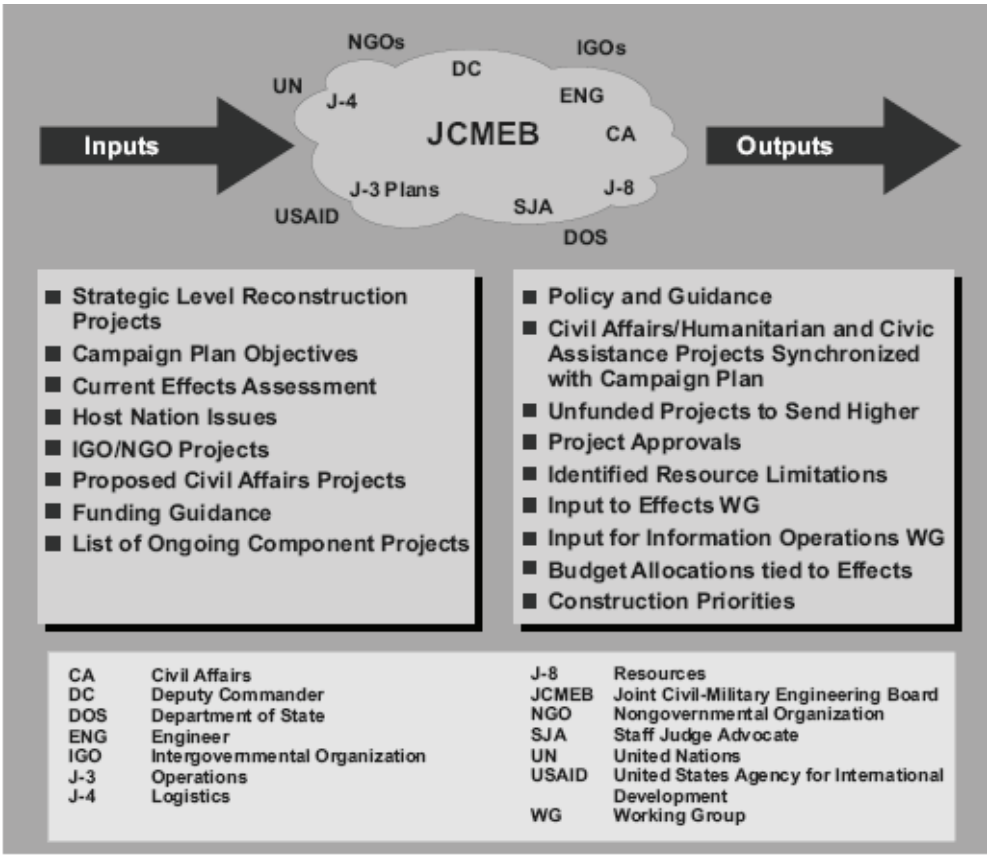


Figure E-6. Joint civil-military engineering board inputs and outputs

E-37. The JFC may establish a JFUB to assist in managing Service component use of real estate and existing facilities. The JFUB is a temporary board chaired by the combatant command or subordinate joint force engineer, with members from the joint force staff, components, and any other required special activities (such as legal, contracting, and CA). If the JFC decides that all engineer-related decisions will be made at the JCMEB, then the JFUB functions as a working group to forward recommendations for decision to the JCMEB. The JFUB evaluates and reconciles component requests for real estate, use of existing facilities, inter-Service support, and construction to ensure compliance with priorities established by the JFC. It serves as the primary coordination body within the JTF for approving construction projects within the wire to support troop beddown and mission requirements. For long-standing JTFs, the JFUB may issue master planning guidance and develop the JTF military construction program to support enduring base operations. The joint force engineer handles most of the JFUB's work with assistance from other selected board members. Unresolved issues may be forwarded to the JCMEB.

E-38. The 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 engineer, with members from the joint force staff, components, and any other required special activities (such as legal, medical, and CA). The board establishes policies, procedures, priorities, and the overall direction for environmental management requirements in a JOA. The JEMB will coordinate its activities with the combatant command

or subordinate joint force engineering staff. The JEMB also provides guidance on development of Annex L, "Environmental Considerations," of the ESP and, if appropriate, assumes responsibility for preparation and appropriate updates of this annex.

E-39. The JFC may establish the EHCC to predict, track, distribute information on, and mitigate EH within the theater that affect force application, focused logistics, survivability, and awareness of the OE. The EHCC should establish and maintain an EH database, conduct pattern analysis, investigate mine and IED strikes, and track UXO hazard areas. The cell provides technical advice on the mitigation of EH, including the development of TTP, and provides training updates to field units. The EHCC coordinates EHTs. Key capabilities of the EHCC include—

- Establishing, maintaining, and sharing the EH tracking database within the joint force.
- Ensuring accuracy of EH information.
- Coordinating site evaluations or strike incident investigations.
- Conducting unit EH training.
- Assisting ISR planners with EH pattern analysis and ISR synchronization.
- Providing updated TTP and guidance for route and area clearance operations.

E-40. Engineer participation in a number of other boards, centers, and cells is essential to joint mission accomplishment. Compared to the formal, nonstanding nature of boards, centers are standing organizations typically operating 24 hours, and cells are functionally oriented groups meeting on a regular basis. Engineer staff participation and support to these organizations will be significant, but the resultant exchange of relevant information is vital in maintaining situational awareness and facilitating the horizontal staff integration of the joint force engineer. Joint force engineer participation in boards, centers, and cells include the following:

- Joint Planning Group. Engineers are represented on the joint planning group to enhance the formulation of joint force plans. The engineer planner ensures that joint force plans are supportable from an engineer perspective. Support by the rest of the joint force engineer cell with products facilitates engineer input and impact into the planning cycle. The engineer planner should leverage the rest of the engineer staff to provide products throughout the planning process. The key for the engineer is to ensure representation and establish hand-off procedures for products developed within all three planning horizons within the joint force: future plans, future operations, and current operations.
- Joint Intelligence Support Element. Representation on the joint intelligence support element provides engineers with MI related to infrastructure, hydrography, and other geospatial engineering and GEOINT topics.
- Joint Operations Center. The joint operations center plans, monitors, and guides the execution of the JFC's decisions. The joint force engineer maintains a presence in or close contact with this center. This is the engineer's link to current operations and the engineer watch officer is responsible for keeping the rest of the engineer staff situationally aware.
- Joint Targeting Coordination Board. On the joint targeting coordination board, the joint force engineer contributes to the planning and integration of munitions fields into the barrier plan and participates in target coordination to ensure critical infrastructure preservation. Of particular engineer concern are remotely delivered mines scattered beyond the intended location and the related reporting, marking, and clearing of those mines. The joint force engineer should ensure that implications on stability operations are considered during the targeting process for decisive operations. Engineer expertise can enable the JFC to achieve desired effects with minimal long-term infrastructure damage and protection of significant cultural and natural resources in the operational area.
- Information Operations Cell. In the information operations cell, the joint force engineer coordinates with other staff elements on the preservation of critical adversary facilities and infrastructure. During stability operations, engineer reconstruction efforts focused on the HN can help support the commander's strategic communications plan.
- Civil-Military Operations Center. The CMOC provides the joint force engineer a meeting place to coordinate nonmilitary activities with other agencies, departments, organizations, and the HN.

If formed, the CMOC is the focal point where engineers coordinate any support to IGOs and NGOs. Outputs from the CMOC (such as lists of IGO and NGO projects) are useful input into the JCMEB and help facilitate unity of effort.

- Joint Logistics Operations Center. Engineers are represented at the joint logistics operations center to respond to information received from supporting command, Service components, and external sources for presentation to the CCDR.
- Force Protection Working Group. The force protection working group will often generate engineer requirements as they develop or modify JTF force protection policy and guidance. Examples include hardening of key facilities and modifications to entry control points.
- Special Purpose Boards, Centers, Working Groups, and Cells. Through necessity, new boards, centers, and cells may be formed and require engineer participation. For example, an IED working group may be required as a central clearinghouse for developing solutions to an IED problem within the JOA. The engineer should also have representation at the force protection and effects assessment working groups and boards, if established. Engineer construction efforts, whether inside or outside the wire, are closely tied to the issues addressed at these two working groups and boards.

Appendix F

Civil Support Considerations

Civil support refers to support provided by military forces, DOD civilians, contractor personnel, and DOD agencies and components in response to requests for assistance during domestic incidents, to include terrorist threats or attacks, major disasters, and other emergencies (see JP 3-27 and FM 3-28, when published). FM 3-0 and FM 3-28 provide Army doctrine for civil support. Engineer operations are a key enabler in the restoration of essential services in civil support.

CIVIL SUPPORT

F-1. In an emergency situation, such as managing the consequences of a terrorist attack or natural disaster, DOD may receive requests for assistance once local, state, and federal resources are overwhelmed. DOD has the capability to provide self-deploying, self-sustaining forces with a wide variety of skills and equipment, including engineer forces, which can play a major role in support of civil authorities.

F-2. Support of civil authorities usually consists of catastrophic emergencies (natural or man-made disasters). Emergency response is managed locally with response capability growing to include the state government, and if the disaster is large enough in scope to overwhelm local and state agencies, the federal government becomes involved. If federal support is required, it is managed under the authority of the Secretary of Homeland Security using the NRF. While the military can be called upon to provide support in any of the civil support categories, the most common situations that can potentially employ engineer forces include—

- Natural disasters. Natural disasters include, but are not limited to, severe weather, earthquakes, and wild land firefighting. Engineers can expect to respond with equipment assets to remove rubble and debris. Engineers may be tasked to maintain or restore essential services and activities, to mitigate damage, and to take actions to avoid hardship and human suffering. Engineers may be called on to provide manpower support or general engineering support (such as water purification operations). Other engineer contributions include technical advice and assessments, construction planning, management and inspection, emergency contracting, and emergency repair of wastewater and solid waste facilities.
- Man-made disasters. Examples of man-made disasters include oil spills, terrorist acts, or a CBRNE incident. These events can produce catastrophic loss of life, destruction of property, or irreparable damage to the environment. Support to domestic CBRNE consequence management is a major support requirement for military forces and may be an extensive civil support operation for military engineers. Engineers possess mobility and heavy equipment assets and may provide support similar to that provided in response to a natural disaster.

F-3. DOD engineer forces may serve in a supporting role to a primary agency in support of civil authorities. Deployed DOD forces remain under the C2 of the Secretary of Defense at all times. Engineer forces may operate under the scenarios described below.

F-4. Immediate response. Military installation commanders or responsible DOD officials may respond immediately to a request from local or state governments in an emergency that has imminent serious conditions that require immediate response to prevent loss of life, human suffering, or major property damage, but may not be a Presidential declared emergency. Engineer assets on military installations may be directed to respond in support of public fire, search and rescue services, and public works. DOD support for local environmental operations can begin immediately within the authority delegated to installation commanders. The commander's authority is generally limited to the initial 72 hours of an emergency.

F-5. Support to a Primary Agency or as Part of a Joint Task Force. Requests for assistance follow the NRF procedures. If the primary agency determines that existing resources are inadequate or not available, a request is initiated and passed to the defense coordinating officer on site with the primary agency. The primary agency validates the request and forwards it to the Joint Director of Military Support (JDOMS) and the geographic combatant command for approval. JDOMS coordinates, validates, and provides the Assistant Secretary of Defense (Homeland Defense) with recommendations and then passes it to the Secretary of Defense for approval. Once approved, JDOMS processes the request (in the form of deployment and execute orders) to the Commander, United States Joint Forces Command (USJFCOM), who will task the Services for the best-matched capability to meet the requested requirement. A JTF may be established with engineering support under a joint force engineer, or supporting engineer forces may be assigned to an existing JTF such as JTF-Civil Support, JTF-Alaska, JTF-National Capital Region, or JTF-North.

ENGINEER PLANNING CONSIDERATIONS

F-6. General engineering planning in support of civil authorities is focused on taking actions to save lives and property, assisting in stabilizing a disaster area, and assisting state or federal agencies where needed. Typical engineer units with capabilities required include the NMCBs, Air Force Prime BEEF and RED HORSE units, Army construction units, and task-organized Marine Corps units. Specialized units may include capabilities for bridging, water well drilling, power generation, and water purification.

F-7. A focus for engineers during civil support operations will be the restoration of essential services. Essential services of concern for engineers include providing the following:

- Rescue operations.
- Food and water.
- Emergency shelter.
- Basic sanitation (sewage and garbage disposal).
- Minimum essential access to affected areas.

F-8. Both combat and general engineer capabilities may be applied to restore essential services. Engineer equipment is well suited for removal of rubble and debris associated with rescue and access to affected areas. Other likely requirements include the construction of temporary shelters and provision of water and sanitation services. Likely missions include the following:

- Constructing and repairing rudimentary surface transportation systems, basic sanitation facilities, and rudimentary public facilities and utilities.
- Detecting and assessing water sources and drilling water wells.
- Constructing feeding centers.
- Providing environmental assessment and technical advice.
- Disposing of human and hazardous wastes.
- Providing camp construction and power generation.
- Providing infrastructure reconnaissance, technical assistance, and damage assessment.
- Providing emergency demolition.
- Providing debris or route clearing operations.

F-9. Engineer operations in civil support may include the typical integration with and support for combined arms forces in their missions. Combat engineer route clearance and other close support capabilities may be critical tasks applied through the movement and maneuver warfighting function. Geospatial engineer support continues to provide foundational information supporting the COP. General engineer support may be required for the sustainment and survivability requirements of the force and may be extended to support other agencies. Likely missions include the following:

- Base camp construction and power generation.
- Debris or route clearing operations.
- Construction and repair of expedient (temporary) roads and trails.
- FACE, to include the repair of paved, asphalt, and concrete runways and airfields.
- Installation of assets that prevent FOD to rotary-wing aircraft.
- Construction of temporary bridging.
- Ensuring access to the region through the construction and upgrade of ports, airfields, and RSOI facilities.

UNITED STATES ARMY CORPS OF ENGINEERS IN CIVIL SUPPORT OPERATIONS

F-10. In a typical year, USACE responds to more than 30 Presidential disaster declarations, plus numerous state and local emergencies. Emergency responses usually involve cooperation with other military elements and federal agencies in support of state and local efforts. USACE conducts its emergency response activities under two basic authorities: the Flood Control and Coastal Emergency Act (Public Law 84-99, as amended) and the Stafford Disaster and Emergency Assistance Act (Public Law 93-288, as amended).

F-11. Under the Flood Control and Coastal Emergency Act, USACE provides disaster preparedness services and advanced planning measures designed to reduce the amount of damage caused by an impending disaster. Under the Stafford Act, USACE supports the Department of Homeland Security and FEMA in carrying out the NRF, which calls on 30 federal departments and agencies to provide coordinated disaster relief and recovery operations.

F-12. The NRF is an all-discipline, all-hazards plan that establishes a single comprehensive framework for the management of domestic incidents. It provides the structure and mechanisms to coordinate federal support to state, local, and tribal incident managers and for exercising direct federal authorities and responsibilities. It assists in the important homeland security mission of preventing terrorist attacks within the United States, reducing the vulnerability to all natural and man-made hazards, minimizing the damage, and assisting in the recovery from any type of incident that occurs.

F-13. Within the plan, DOD has designated USACE as the primary agency for planning, preparedness, and response under the "ESF #3, Public Works and Engineering." The purpose of this ESF is to provide lifesaving or life protecting assistance to augment efforts of the affected state(s) and local response efforts following a major or catastrophic disaster.

F-14. Public works and engineering support includes technical advice and evaluations, engineering services, construction management and inspection, emergency contracting, provision of emergency power, emergency repair of wastewater and solid waste facilities, and real estate support. Some of the activities within the scope of ESF #3 include—

- Emergency clearance of debris for reconnaissance of the damaged areas and passage of emergency personnel and equipment.
- Temporary construction of emergency access routes which include damaged streets, roads, bridges, ports, waterways, airfields, and any other facilities necessary for passage of rescue personnel.
- Emergency restoration of critical public services and facilities, including supply of adequate amounts of potable water, temporary restoration of water supply systems, and the provision of water for firefighting.
- Emergency demolition or stabilization of damaged structures and facilities designated by state or local governments.
- Technical assistance and damaged assessment, including structural inspection of structures.

F-15. While the USACE is coordinating public works and engineering activities under the NRF, it may also be simultaneously providing direct assistance under its own Flood Control and Coastal Emergency authorities.

Appendix G

Contingency Authorities and Funding

It is especially important that engineers understand contingency authorities and the associated funding. These are the tools that set the conditions for success during contingency operations and provide the basis for legal spending to take care of DOD personnel and activities in support of contingency operations. Contingency operations comprise a large portion of the operations conducted by Army and joint forces. This appendix provides an introduction to contingency authorities and funding. However, the information in this appendix is subject to change due to changes in legislation, policy, or regulation. The reader should consult with legal and financial management personnel for the latest definitive guidance.

LEGAL PERSONNEL

G-1. Legal personnel can provide invaluable advice and guidance on authorities and sources of funding for civil engineering activities in a variety of situations. From the earliest stages of planning, execution, and redeployment, legal professionals play a vital role in preparing the JOA by identifying and assisting in the resolution of legal and political constraints, as well as providing relevant and responsive readiness programs to the individual civil engineering members.

TYPES OF AUTHORIZATIONS AND SOURCES OF FUNDING

G-2. Services are authorized to use annual operation and maintenance (O&M) funds for construction projects costing less than $750,000 on U.S. controlled or owned real property ($1.5 million to correct a life-threatening condition or for new construction and $3 million for maintenance and repair when the repair to replacement ratio is less than 50 percent). This is a peacetime provision, applicable during contingencies and emergencies; however, “life threatening” is generally considered a safety issue vice an emergency in the context of contingency operations. During combat or designated contingency operations, O&M funds may be used to fund construction projects exceeding these thresholds. The JFC must consult with their staff judge advocate before making a determination to use O&M funds in such a case.

G-3. Several broad authorities have been established under Title 10 U.S. Code that enable the JFC to carry out contingency construction, including procuring materials for construction by military forces and funding of civilian contracts in support of contingency operations. Figure G-1, page G-2, and figure G-2, page G-3, depict decision trees for the following contingency construction funding options:

- Section 2803, Emergency Construction, authorizes each service to use $45 million per year of nonobligated military construction funds for projects that cannot wait for the normal military construction submission procedures. Projects must comply with a 21-day congressional notice and wait period before proceeding. Generally, a previous congressionally approved project must be canceled to free the required funds.

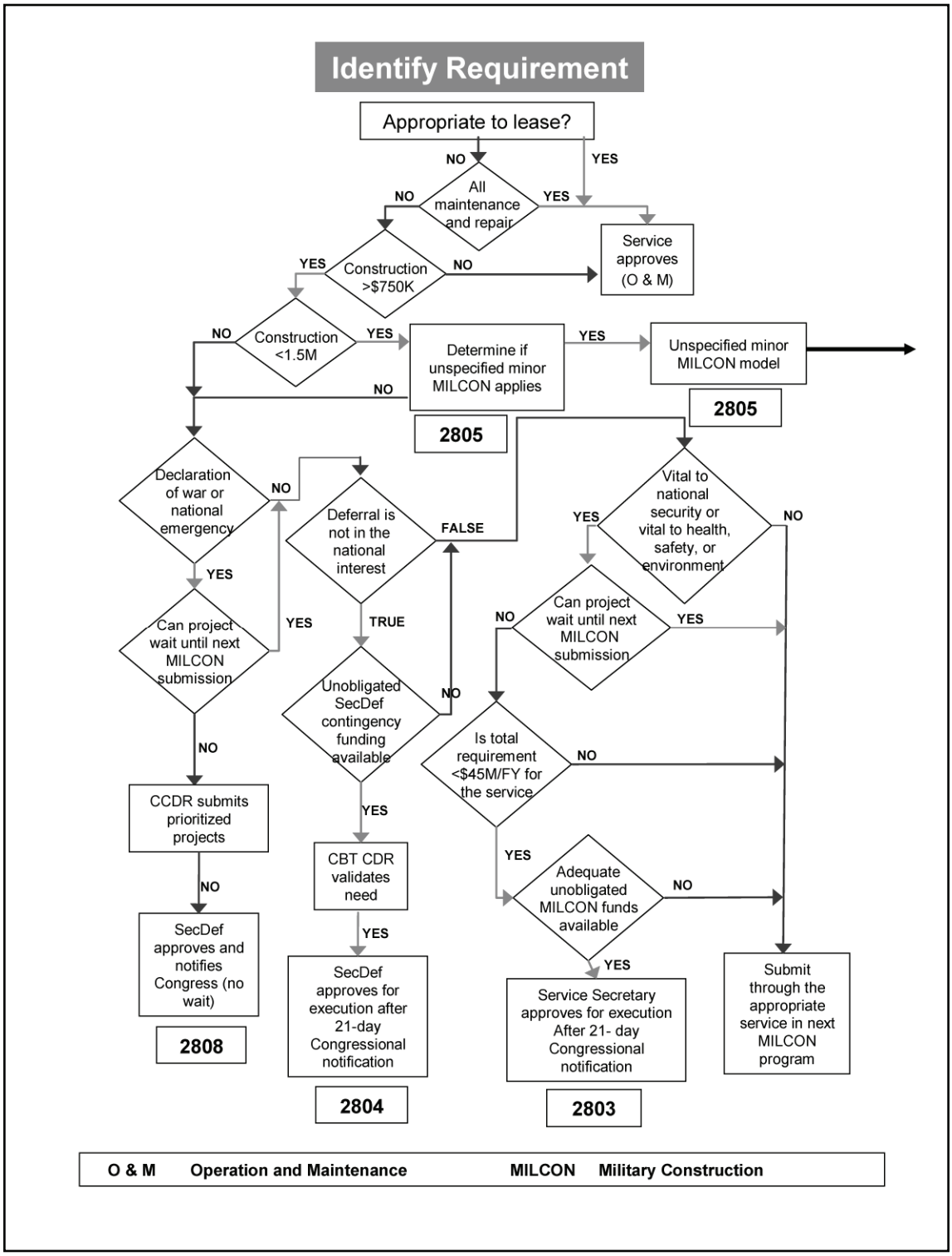


Figure G-1. Contingency construction funding model

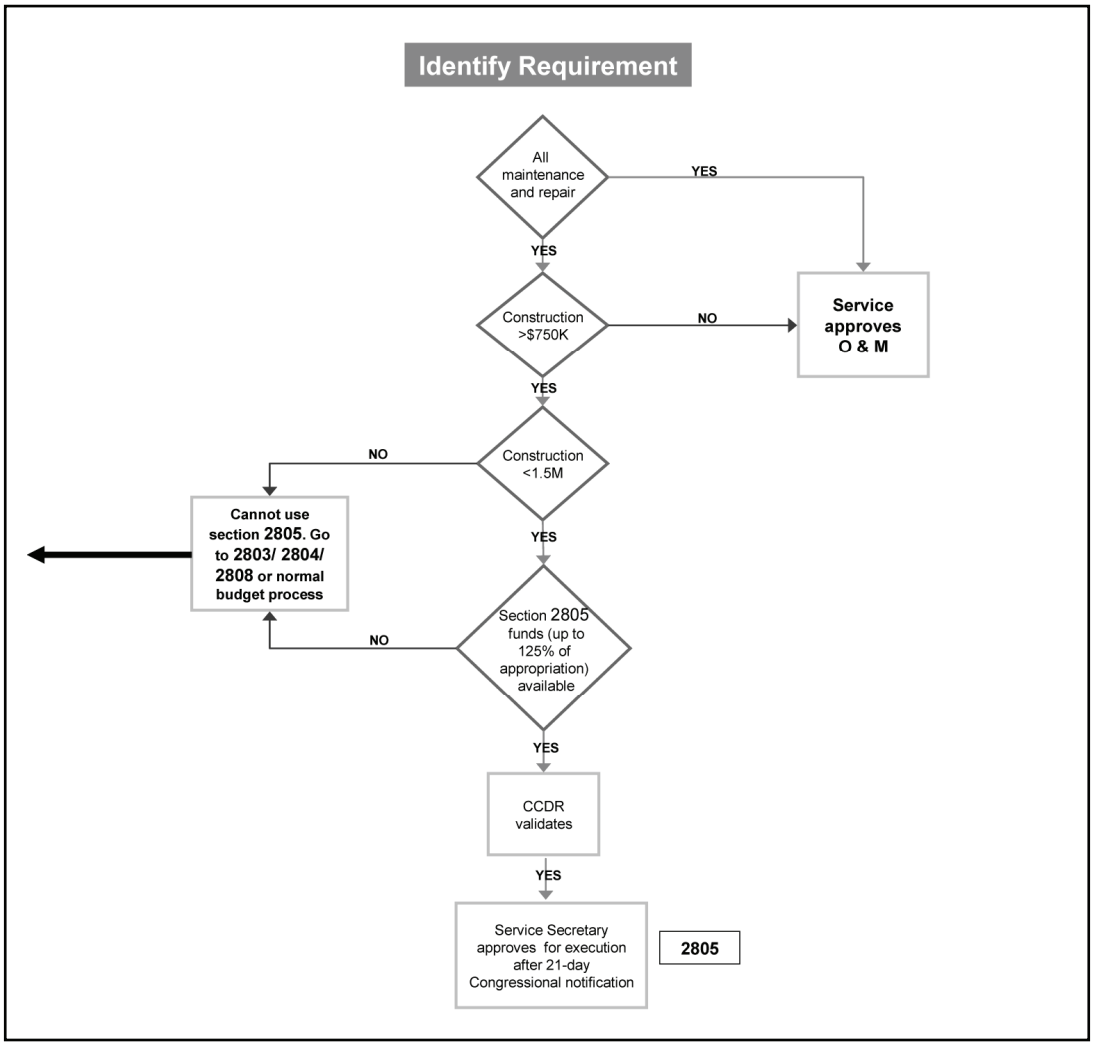


Figure G-2. Contingency construction funding model (unspecified minor, $750,000-$1.5 million)

- Section 2804, Contingency Construction, authorizes the Secretary of Defense a specific military construction line item amount for contingency construction projects that cannot wait for the normal military construction program submission process. A project must comply with a 21-day congressional notice and wait period before proceeding. Generally, funding for this section has been limited to less than $10 million per year.
- Section 2805, Unspecified Minor Construction, authorizes each Service a specific military construction line item amount that varies annually for unspecified minor construction. Projects must be less than $1.5 million each (or $3 million for life-, safety-, or heath-focused projects). Projects more than $750,000 require a 21-day congressional notice and wait period before proceeding.

- Section 2808, Construction Authority, requires a Presidential declaration of war or national emergency and authorizes the Secretary of Defense to carry out any military construction project for the war or national emergency within the total amount of unobligated military construction funds available. Congress must be notified of each project, but there is no wait requirement before the project may begin.
- Section 2811, Repair of Facilities, authorizes the Secretary of Defense to use funds available to carry out repair of facilities. Repair projects over $10 million must be submitted to Congress for approval.

G-4. CCDRs do not need specific authority to request projects under Sections 2803 and 2804. To gain approval for a project under either authority, it is necessary to provide the appropriate service secretary or Secretary of Defense with a justification of need, estimated costs, and source of funding.

OTHER AUTHORITIES AND SOURCES OF FUNDING

BURDEN SHARING (TITLE 10 UNITED STATES CODE 2350.J)

G-5. This portion of law authorizes the Secretary of Defense, after consultation with the Secretary of State, to accept burden sharing cash contributions from any country or regional organization designated for certain purposes (to include military construction projects) for DOD. Written approval from the Under Secretary of Defense (Comptroller) is required for the use of such contributions to carry out military construction projects. For additional information, see DOD 7000.14-R, "DOD Financial Management Regulation," Volume 12, Chapter 24.

SECTION 607A OF THE FOREIGN ASSISTANCE ACT OF 1961 (PUBLIC LAW 87-195, AS AMENDED)

G-6. This act provides restoration of HN civil infrastructure. This provision of law allows any U.S. government agency to provide goods and services to friendly countries and NGO agencies on an advance-of-funds or reimbursable basis.

ARMS EXPORT CONTROL ACT OF 1976 (PUBLIC LAW 90-629, AS AMENDED)

G-7. HN military facilities may be restored under the foreign military sales provisions of this authority.

ECONOMY IN GOVERNMENT ACT (TITLE 31 UNITED STATES CODE 1535)

G-8. This act allows U.S. government agencies to support each other, provided that the supported agency has the funds and authority to do the work requested.

HUMANITARIAN AND CIVIC ASSISTANCE PROJECTS PROVIDED IN CONJUNCTION WITH MILITARY OPERATIONS (TITLE 10 UNITED STATES CODE 401) PROJECTS

G-9. In humanitarian and civic assistance facilities projects, the JFC and joint force engineers may work with HN government agencies to repair or improve infrastructure and public facilities. These authorized and funded projects are designed to provide assistance to the HN populace in conjunction with a military operation or exercise. They are usually planned well in advance and are not usually planned in response to disasters, although humanitarian and civic assistance activities have been executed following disasters. Specific engineer activities for which humanitarian and civic assistance funds can be used include construction of rudimentary surface transportation systems, well drilling, construction of basic sanitation facilities, and rudimentary construction and repair of facilities.

FOREIGN HUMANITARIAN ASSISTANCE (TITLE 10 UNITED STATES CODE 2551)

G-10. In disaster operations, the UN, the DOS, and the Office of Foreign Disaster Assistance may generate funded requirements for DOD assistance. FHA programs focus on the use of DOD excess property,

emergency transportation support, disaster relief, or other support as necessary to alleviate urgent needs caused by some type of disaster or catastrophe in a host country. While other elements of the joint force are focused on immediate humanitarian assistance, civil engineering planning may focus on projects that provide immediate shelter for dislocated civilians. The joint force engineers must work in a close relationship with the representatives of the HN and U.S. country team.

DRAWDOWN OF DEPARTMENT OF DEFENSE ARTICLES AND SERVICES (TITLE 22, 2318)

G-11. Drawdown authority is a means to respond to unforeseen military emergencies or humanitarian relief situations. These recurring authorities have placed annual limitations on the value of articles and services that may be drawn down in any fiscal year.

DEPARTMENT OF DEFENSE DIRECTIVE 5100.46, FOREIGN DISASTER RELIEF

G-12. Normally, DOD components may participate in foreign disaster relief operations only after a determination is made by the DOS. This directive allows the military commander at the scene of a disaster to undertake disaster relief operations without prior approval from the ambassador or chief of the mission when the emergency is so acute that immediate action is required to save life and property.

This page intentionally left blank.

Appendix H

Contract Construction Agents

Use of construction contracting and engineering support can play an important role in support of joint operations. Civilian construction contractors and HN engineering support provide the JFC with a significant engineering capability that becomes a force multiplier when combined with joint force military engineering units. Construction agents provide the ability to harness and direct this means of support.

CONSTRUCTION CONTRACTING AND ENGINEERING SUPPORT

H-1. DOD construction agents are USACE, NAVFAC, or other approved DOD activities (see DOD Directive 4270.5). These organizations and their contractors are a powerful force multiplier, allowing military engineers to concentrate on engineering missions in high-threat areas. USACE and NAVFAC also provide the JFC with a significant engineering capability to be leveraged in joint operations. They are DOD's principal organizations to plan, design, construct, and acquire (lease or buy) facilities and real estate. Inherent in their mission support capabilities is a planning and engineering capability for theater advanced base and infrastructure development. These organizations also maintain in-depth engineering expertise in their operating field organizations and laboratories.

H-2. The responsibilities of DOD construction agents include designing, awarding, and managing the construction contracts for projects associated with the peacetime military construction program. When overseas, USACE, NAVFAC, and the Air Force are assigned specific geographical areas under DOD Directive 4270.5 (see figure H-1, page H-2). Related to these responsibilities is the leasing of real estate. The CCAs are fee for service organizations that require funding from JFC or other user in order to execute taskings.

H-3. The CCDR may also use USACE and NAVFAC as contingency CCAs for design, award, and management of construction contracts in support of military operations. For geographical areas where there is no designated DOD construction agent, the CCDR usually designates a CCA for support during a contingency. USACE and NAVFAC also provide facilities planning, contract administration, and technical engineering support to JFCs (such as advanced base master planning, geospatial engineering, facilities hardening, environmental engineering, and cold-weather mobility assessments). The Air Force also maintains a limited capability in contract construction in contingencies and facilities and real estate acquisition in England, Turkey, Spain, and Israel.

DEPARTMENT OF THE ARMY
Afghanistan
Canada, excluding Newfoundland
Central America
Europe, excluding Span, Portugal, Italy, Greece, and the British Isles
Northern Eurasia, which makes up Russia and the former Soviet Republics
Greenland
Iraq
Japan, including the Ryukya Island (Okinawa)
Korea
Marshall Islands
Mexico
Middle East, including the Saudi Arabian Peninsula
South America
Southern Asia, from Iran to Myanmar (Burma)
Sub-Sahara Africa, excluding Kenya and Somalia
Taiwán
Turkey

DEPARTMENT OF THE NAVY
Atlantic Ocean area
Australia and New Zealand
Caribbean Sea area
Greece
Iceland
Indian Ocean area
Italy
Newfoundland
North Africa, including Somalia and Kenya but excluding Egypt
Pacific Ocean area, including the Commonwealth of the Northern Marianas Islands, but excluding the Marshall Islands
Portugal, including the Azores
Republic of the Philippines
Southeast Asia, from Thailand to Vietnam
Span
DEPARTMENT OF THE AIR FORCE
British Isles

Figure H-1. Designated geographical areas of Department of Defense construction agents

UNITED STATES ARMY CORPS OF ENGINEERS

H-4. USACE is assigned responsibility to execute the following Army and DOD mission areas:

- Engineering and design for the Army and Air Force military construction programs.
- Contract construction.
- Real estate acquisition.
- Technical assistance.
- Geospatial engineering support.
- The Army's civil works program.

H-5. USACE's subordinate commands are organized geographically and functionally. There are three major organizational structures—

- The division is the major subordinate C2 organization for USACE. The division commander provides executive direction to and management of the subordinate district commands. The division's orientation is regional and provides broad interface with regional interests and management of division-wide programs (see figure H-2).
- The district command is the operating arm of the division. All USACE districts in the United States have civil works responsibilities. In the United States, their boundaries are delineated along major watershed basins, and their work lines are set on state boundaries (see figure H-3, page H-4). In addition, some of the districts have military execution responsibilities. The districts maintain in-house capabilities in planning, engineering, construction, operations, project management, and contract administration.

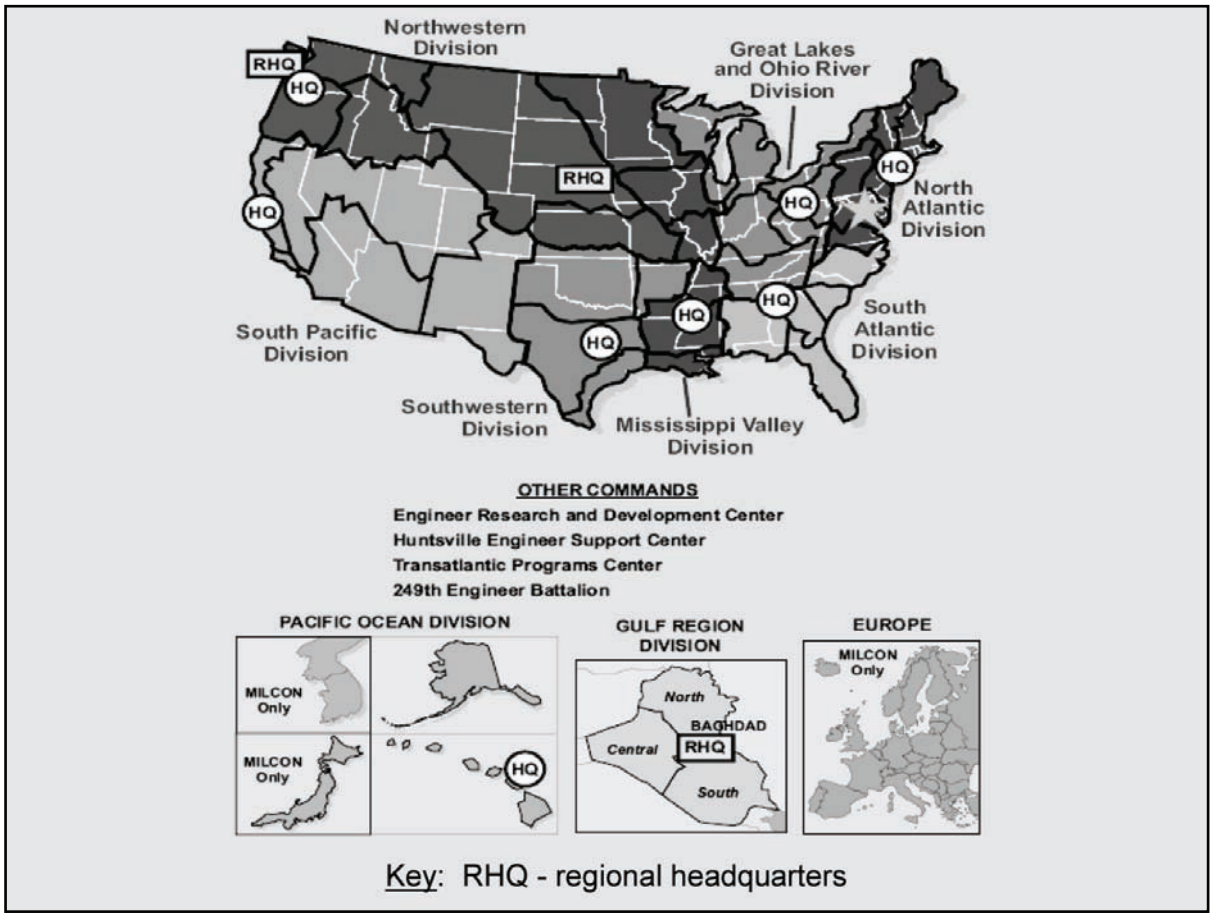


Figure H-2. USACE division organization

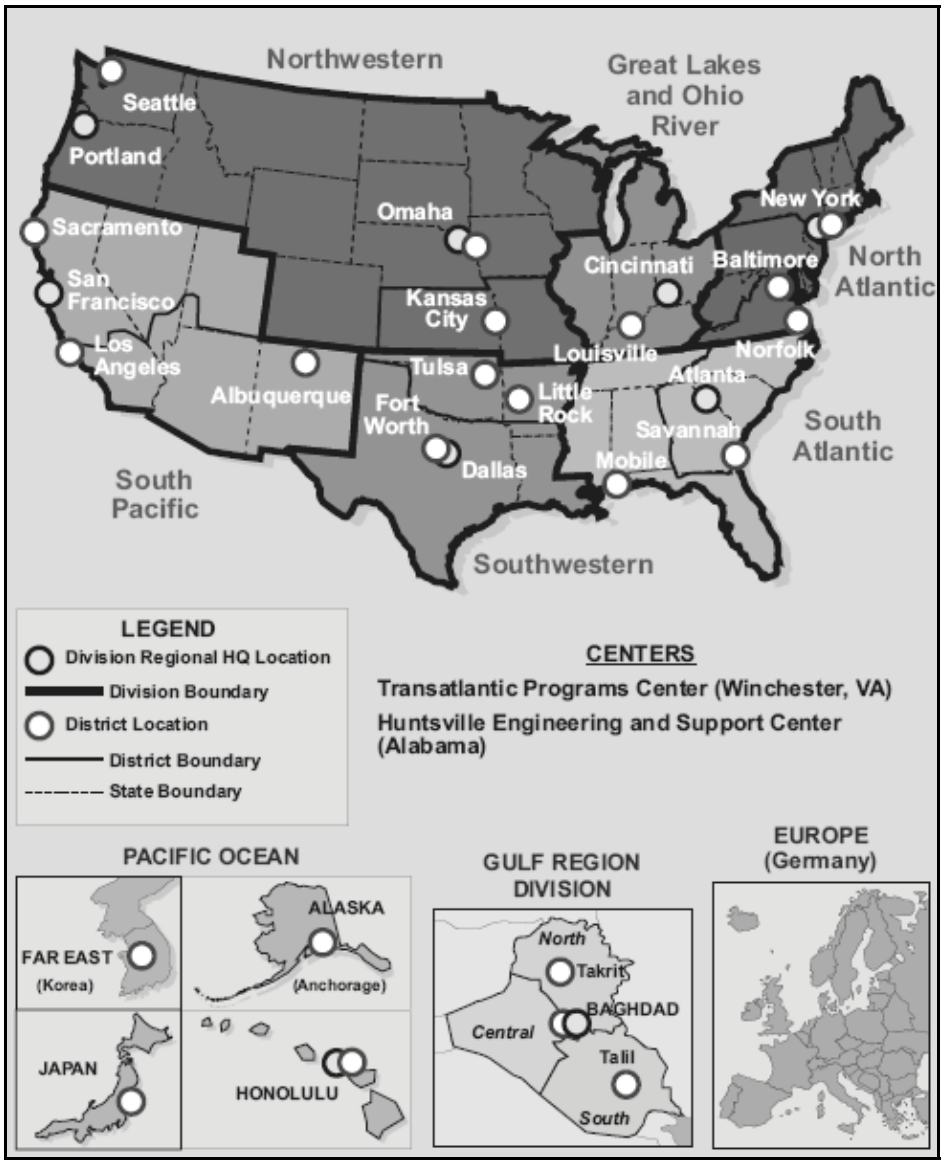


Figure H-3. USACE military works boundaries

- ERDC is USACE's distributed research and development command. Headquartered in Vicksburg, Mississippi, ERDC consists of seven unique laboratories that conduct research and development in support of the Army and the other Services. By virtue of their engineering expertise, laboratory personnel provide operational support to the rest of USACE and DOD through the aforementioned subordinate commands. In addition, USACE maintains several specialized centers of expertise at its districts that provide additional technical engineering services, to include—
  - Coastal and Hydraulics Laboratory, Vicksburg, Mississippi.
  - Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.
  - Construction Engineering Research Laboratory, Champaign, Illinois.
  - Environmental Laboratory, Vicksburg, Mississippi.
  - Geotechnical and Structures Laboratory, Vicksburg, Mississippi.
  - Information Technology Laboratory, Vicksburg, Mississippi.
  - Topographic Engineering Center, Alexandria, Virginia.

H-6. USACE designs and constructs military facilities and supports military installations worldwide. The military engineering expertise of USACE is focused on the engineering required to plan, design, and construct military facilities and the environmental engineering necessary to execute DOD installation environmental restoration projects. USACE maintains specialized expertise in its laboratories and centers for cold-weather engineering, remote sensing and imagery, force protection design, airfield design, weapons effects (for example, support for operational targeting—assess the target, recommend appropriate weapon systems, and attack profile), terrain analysis for mobility and countermobility, topographic engineering, security systems engineering, environmental management, and environmental engineering. Additionally, USACE's 249th Engineer Battalion (Prime Power) can conduct power assessments and install generators to provide emergency power.

H-7. USACE initially provides contingency operations support to CCDRs and subordinate JFCs through assigned LNOs who define requirements. A FEST or FESTs, each with a warranted contracting officer assigned, is deployed as required. Headquarters USACE will task support as necessary.

THE FIELD FORCE ENGINEERING REACHBACK PROCESS

H-8. FFE refers to linking well-trained and well-equipped military and civilian deployed forces with reachback teams for technical expertise. The objective of FFE is to effectively execute USACE roles—such as engineering expertise, contract construction, real estate acquisition and disposal, and environmental engineering—in the AO and to maximize the use of reachback to assist the CCDR. FFE reachback teams provide rapid, actionable engineering analyses across the full operational and natural disaster response spectrum in support of the armed forces and the nation. They provide support for technical engineering analyses, base camp planning, Geographic Information Systems, intelligence support, training, and equipment.

H-9. Accessing reachback support is simple. Deployed personnel from all military services or other U.S. government organizations can submit a request for information (RFI) via unclassified or classified websites, electronic mail, VTC, or telephone to the Engineering Infrastructure Intelligence Reachback Center (EI2RC) in Mobile, Alabama, or the Tele-Engineering Operations Center (TEOC) in Vicksburg, Mississippi. Once a request is submitted, it is routed to trained response teams, centers of expertise, or laboratories for solutions. The personnel working the RFI will provide the response to the requestor to solve the problem and the data will be archived in a repository. Army, Navy, Air Force, Marine Corps, the DOS, and FEMA, among others, can benefit from USACE expertise (see figure H-4).

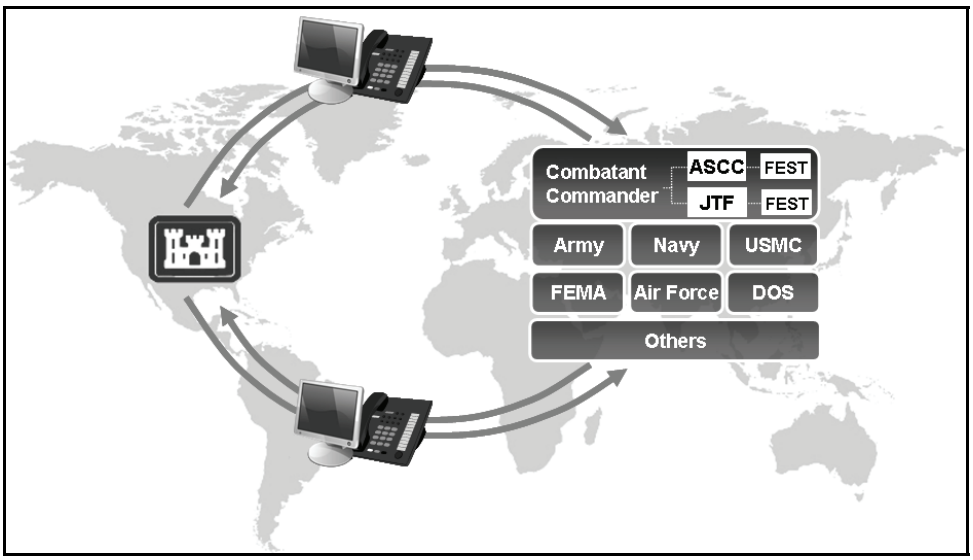


Figure H-4. Reachback process

H-10. The engineer providing support is the preferred access point to the USACE reachback capability. The engineer will determine if the required technical assistance is beyond available capabilities and can then develop an appropriate RFI for reachback support. Table H-1 provides general contact information for reachback support.

Table H-1. Reachback contact information

	Website	*Electronic-mail*	*Mail*	*Telephone*
Unclassified	https://ei2rc.usace.army.mil https://teleengineering.usace.army.mil	CEEI2RC@usace.army.mil TEOC@usace.army.mil TEOC-VTC@usace.army.mil	CESAM-EN (EI2RC) 109 Saint Joseph Street Mobile, Alabama 36602 CEERDC, TEOC Room 42, Building 3294 3909 Halls Ferry Road Vicksburg, Mississippi 39180-6199	Comm: 251-690-2039 601-634-2735 DSN: 312-446-2735 VTC: 601-634-3485
Classified	http://ei2rc.usace.army.smil.mil http://www.teleengineering.army.smil.mil	OrgMBoxCEEI2RC@usace.army.smil.mil TEOC@teleengineering.army.smil.mil		Comm: 601-634-4231 (STUIII)
Korea	http://ei2rc.korea.army.rmil.mil	ei2rc@korea.army.rmil.mil		DSN 312-457-2039 (STUIII)

NAVAL FACILITIES ENGINEERING COMMAND

NAVAL FACILITIES ENGINEERING COMMAND HEADQUARTERS

H-11. NAVFAC is the Navy's facilities engineering professionals. A global, interdependent organization, NAVFAC has a broad range and strong depth of expertise in facilities engineering and acquisition. NAVFAC headquarters is an Echelon II headquarters with programmatic responsibilities for the Military Construction Program, the Environmental Restoration Navy Program, and a variety of other programs related to Shore Installation Management. In partnership with the Commander, Navy Installations, and the Commander, Naval Supply Systems Command, NAVFAC supports the "shore domain" of the Navy. The NAVFAC headquarters contingency engineering officer provides the liaison to the JCS and the functional combatant commands.

ATLANTIC AND PACIFIC THEATERS

H-12. Two Echelon III commands under NAVFAC, NAVFAC Atlantic and Pacific (figure H-5), are aligned with the fleet commanders and provide leadership over NAVFAC Echelon IV activities within each fleet's operational area. In addition, they provide centralized production of specialized engineering services beyond the organic capability of the regional commands at the Echelon IV level. The contingency engineering officer at NAVFAC Pacific provides the liaison to USPACOM. The Contingency Engineering Officer at NAVFAC Atlantic provides the liaison to USEUCOM, United States Southern Command (USSOUTHCOM), and USCENTCOM.

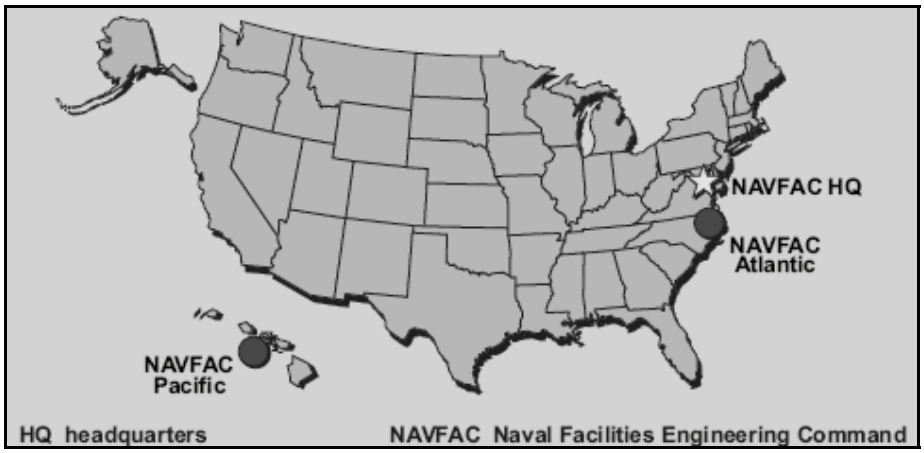


Figure H-5. Naval Facilities Engineering Command, C2

H-13. NAVFAC specialty centers shown in figure H-6 are described below.

Figure H-6. Naval Facilities Engineering Command, naval facilities engineering specialty centers

NAVAL FACILITIES ENGINEERING SERVICE CENTER

H-14. The Naval Facilities Engineering Service Center is located in Port Hueneme, California, with a detachment in Washington, District of Columbia. The center provides specialized engineering and technical expertise in contingency engineering, amphibious and expeditionary systems, logistics C2, explosive safety, blast mitigation, ordnance facilities, utilities and energy, environmental engineering, ocean engineering, shore facilities engineering, and antiterrorism or force protection services.

NAVAL FACILITIES EXPEDITIONARY LOGISTICS CENTER

H-15. The Naval Facilities Expeditionary Logistics Center is located in Port Hueneme, California, and is commanded by a Navy CEC captain. The center provides overarching asset management and expeditionary

logistics support and is responsible for lifecycle management of the equipment, materials, and training required to enable the readiness of the NCF and other expeditionary units. Specific support to the NCF includes the following:

- Management and maintenance of the Seabee table of allowance which is the primary allowance of equipment, supplies, and facilities for the NCF.
- Development of communication and information technology in support of the NCF and other expeditionary forces.
- Service as the training support agency for the NCF and sealift program.
- Development and maintenance of training curriculums and training publications to support military and construction skills for the NCF and NBG.
- Management of pre-positioned war reserve material and stock for the NCF, including maintenance and wartime mobilization of stock stored, received, or shipped at Port Hueneme, California, and Construction Battalion Center, Gulfport, Mississippi.
- Primary procurement of the Navy's inventory of automotive and construction equipment.
- Management of mobile utilities support equipment program.
- Development of sealift support products, including modular, floating, and elevated piers; wharves and docks; powered and nonpowered causeways; roll-on/roll-off floating platforms; and fabrication of special craft and bulk liquid transfer systems.

NAVY CRANE CENTER

H-16. The Navy Crane Center is located in Portsmouth, Virginia, at the Norfolk Naval Shipyard and led by a civilian director. It has five field offices located at the three other Navy shipyards (Pearl Harbor, Portsmouth, and Puget Sound), San Diego, California, and Silverdale, Washington. It leads the Navy's weight handling program by establishing policy and providing engineering, acquisition, technical support, training, and evaluation services to Navy shore activities worldwide. The Navy Crane Center's website <*https://portal.navfac.navy.mil/ncc*> is a valuable resource for Navy shore activities, providing requirement and policy documents, training information on courses (both instructor-led and web-based), safety videos, and other useful information to assist Navy shore activities in improving their weight handling programs and operations. Since cranes are an important NCF resource, the Navy Crane Center provides technical expertise and programmatic oversight for safe operation of NCF crane assets.

FACILITIES ENGINEERING COMMANDS

H-17. The majority of the products and services provided to bases and shore installations by NAVFAC are produced at Echelon IV commands aligned with Navy regions. Each activity is named "NAVFAC Region Name," such as NAVFAC Hawaii or NAVFAC Mid-Atlantic. These activities are staffed primarily by civilian employees and led by Navy Civil Engineer Corps officers. While each activity will vary in size and capability based on the regional requirements, each is capable of delivering the full range of NAVFAC products and services by leveraging other NAVFAC activities. NAVFAC supports Navy and Marine Corps operations, DOD missions, and joint force operations around the world in the following ways:

- The Navy accomplishes force projection worldwide by use of superior naval, air, and amphibious forces, equipment, tactics, and doctrine. This force projection requires shore logistic platforms, such as advanced logistic support sites and ports to receive supplies, equipment, and personnel to be deployed to ships and advanced bases. NAVFAC directly supports these activities by providing engineering, contract construction, and facilities management (including disposition of real estate) for these ports and bases.
- During normal operations, NAVFAC provides support to the NCF or Seabees; the fleet commanders; Commander, Naval Installations; the Marine Corps; and many other clients in planning, design, construction, maintenance, and environmental compliance for Navy shore facilities and other bases worldwide. NAVFAC elements directly support the Navy's shore establishment throughout the world with a wide variety of engineering services. These commands provide project management, planning, design engineering, construction, operations and maintenance, and real property disposal functions for shore facilities. Across the spectrum

of operations, NAVFAC, while not an operating command, can support the combatant or component commanders in three specific ways—

- Execution of contract construction funded from the military construction appropriation for all Services in DOD-designated NAVFAC geographic areas.
- Execution of contracts to accomplish architect-engineer services, construction, real estate, or base operating support and facilities support services.
- Provision of specific technical support across a broad spectrum of engineering and scientific disciplines to solve challenging engineering and infrastructure-related problems.

- Programs such as counterterrorism, antiterrorism, counterdrug, and health affairs are common areas where NAVFAC provides direct support to JFCs by carrying out engineer missions using in-house and contracted forces.
- NAVFAC has responsibility for disaster recovery and other contingency operations at Navy and Marine Corps installations in the United States. NAVFAC can quickly mobilize and provide significant assets for disaster recovery.

This page intentionally left blank.

Appendix I

Explosive Ordnance Disposal Organizations and Functions

The mission of EOD is to eliminate or reduce CBRNE hazards and to protect the commander's combat power. UXO limits mobility, denies the use of critical assets, and threatens to injure or kill Soldiers at levels unprecedented in past wars. UXO, to include improved conventional munitions and IEDs, have greater emphasis now and in the future because of the potential of significantly reducing the commander's combat power. The continuing development of foreign and U.S. smart and brilliant munitions that disperse hundreds of submunitions and area denial ordnance has lead to the proliferation of UXO. These munitions are available for a range of weapon systems, including artillery, ballistic and cruise missiles, rockets, and bombs.

INTRODUCTION TO EXPLOSIVE ORDNANCE DISPOSAL

I-1. The EOD force is prepared to deal with the increased quantity, quality, and lethality of UXO. Sophisticated fuzing and sensors systems developed for the 21st century have the capability to detect, identify, and select specific targets using infrared, proximity, magnetic influence, acoustic, and seismic technologies. Attempts to approach and perform a render-safe procedure on these munitions by the traditional 20th century methods will cause detonation of the devices. This is because of a wider kill radius (greater than 250 meters) added to the hazards of their antidisturbance, antiremoval, antilift, random-delay, and self-destruct features. UXO also presents access problems from—

- Toxic chemicals from rocket motors and guidance systems.
- Ordnance that is normally safe can be extremely dangerous after it has been in fire, especially newer ordnance made of lightweight metals and plastics.
- The nature of the location of most UXO—destroyed vehicles and aircraft—have unique dangers like depleted uranium and carbon fiber.
- Confined space, bunkers, caves, and tunnels.

I-2. EOD missions include—

- Responding to counterterrorism, WMD, and UXO incidents on the sea, in the air, and on land.
- Supporting the United States Secret Service, DOS, Department of Justice, Department of Energy, and FEMA.
- Advising and assisting civil authorities in the remediation of military ordnance that poses a threat to public safety.
- Providing education on the hazards of UXO.
- Examining, identifying, and reporting new and unusual explosive ordnance for technical intelligence purposes.
- Supporting nuclear and chemical weapons shipments.
- Conducting a range sweep by disposing of UXO on impact areas.
- Destroying ammunition and routine ammunition stocks and conducting emergency destruction of ammunition to prevent capture by the enemy (including sensitive site exploitation).
- Responding to increased lethality of UXO, IEDs, and WMD.
- Removing rounds stuck in artillery tubes and other large-caliber weapons.
- Advising and assisting in the instruction of UXO clearance for humanitarian demining missions.

- Clearing enemy UXO and booby traps from a captured ASP, airfield, AMD site, CP, or other key objectives.
- Clearing dropped UXO from enemy targets, such as an ASP, airfield, AMD site, CP, or other key objectives that have been captured by U.S. forces.
- Responding to an enemy Sapper attack clearing satchel charges from targets—aircraft, vehicles, stacks of ammunition, and dead Sappers or suicide bombers.
- Responding to terrorist attacks against U.S. facilities with car or truck bombs at U.S. embassies, consulates, and military barracks.
- Retrieving casualties from a minefield and evacuating survivors to medical facilities while assisting graves registration for fatalities.
- Clearing enemy aircraft, armor, artillery, and other materiel identified as having significant intelligence value of booby traps and hazardous ordnance.
- Collecting war souvenirs from departing U.S. forces.

EXPLOSIVE ORDNANCE DISPOSAL ORGANIZATION

GROUP HEADQUARTERS

I-3. The EOD group commander serves as the ASCC, G-3, and theater EOD special staff officer. The EOD group provides C2 of all Army EOD assets and operations in-theater. When directed by the JFC, the EOD group commander becomes the commander of the joint EOD task force and coordinates all EOD assets within theater.

I-4. The EOD group provides C2, mission tasking, theater EOD planning, technical intelligence acquisition and management, and limited administrative and logistics support for two to six EOD battalions. In operations without a fully deployed theater or EOD group, a headquarters element of an EOD group will deploy to provide C2 and staff planning for deployed EOD battalions.

BATTALION HEADQUARTERS

I-5. The EOD battalion exercises C2 for three to seven EOD companies in the AO. The commander of the EOD battalion is the EOD officer for the corps. He monitors operations and develops plans to meet the needs of the CCDR, providing an LNO team, as required.

I-6. The EOD battalion provides C2, mission tasking, EOD planning, and technical intelligence acquisition and management. The battalion also provides limited administrative and logistics support for up to seven EOD companies.

COMPANY

I-7. The EOD company exercises C2 for two EOD response sections. The primary function of the EOD company is to provide support as directed by the EOD battalion; it does this in a variety of ways. An EOD company provides GS to assigned AORs and all units within it. Dependent upon METT-TC considerations, this may require the company to perform split-based operations to fully support mission requirements. An EOD company is task-organized by the EOD battalion commander and is typically attached to a separate organization for administrative and logistical support. The EOD company commander may further task-organize EOD teams to division, BCT, or MEB areas to conduct EOD operations in support of maneuver elements. The commander of an EOD company exercises C2 of the company throughout his assigned AOR, to include split-based operations and fragmented team operations. He must also coordinate and conduct liaison with various supported and supporting units, to include civil or HN authorities and other agencies.

I-8. The EOD company provides the ability to eliminate or reduce the hazards of domestic or foreign conventional, nuclear, chemical, and biological munitions and IEDs that threaten personnel, military operations, facilities, and materiel. The EOD company exploits technical intelligence by submitting reports on first-seen ordnance. It provides support to the U.S. Secret Service to protect the President, Vice

President, and others, as directed. It also provides support to the Federal Bureau of Investigation and Department of Energy about counterterrorism with emphasis on IEDs.

ENGINEER AND EXPLOSIVE ORDNANCE DISPOSAL CONSIDERATIONS

I-9. Army engineer and EOD units have a unique relationship compared to other armies and services around the world. Several allied countries (United Kingdom, France, Canada, and Australia) teach EOD skills in addition to combat engineer training; the U.S. Army does not. Army engineers and ordnance are two distinct branches and organizations. The role of each is unique but similar, and this necessitates close coordination when operating in today's OE. Engineers are responsible for ensuring mobility of combat forces. The Army's combat engineers approach detection and neutralization of mines along three strategies—metal detection, explosive neutralization, and brute force neutralization. Detection technologies focus on identifying the metal content of mines. Explosive neutralization applies systems such as mine-clearing line charges to detonate the mines. The brute force neutralization applies plows and rollers to push the mines aside or detonate them by pressure. All these means require the use of intelligence sources and reconnaissance to detect mines and then use the appropriate combination of explosive or brute force means to neutralize and breach conventional minefields. Explosive and brute force neutralization strategies may not be appropriate in all operations, such as in urban areas. EOD personnel can task-organize directly to a maneuver unit to render safe or neutralize booby traps, UXO, and IEDs. (Booby traps have increased in sophistication in recent years and may include electronic circuitry, to include light sensors, motion sensors, and command detonation.)

I-10. The engineer commander or staff engineer should consider the following when working with EOD units:

- Ensure that you know the EOD LNO and work together in planning.
- Exchange information on the mines, booby traps, UXO, and IEDs.
- Work with the S-2 or G-2 to identify the types of booby traps expected.
- Include EOD in planning and request EOD intelligence of the region.
- Establish and operate a training scenario to teach awareness and the most current procedures.
- Use combat engineers to detect, mark, record, and report booby traps.
- Know that EOD is task-organized to evaluate and render safe booby traps, IED, and UXO.
- Know that combat engineers can remove standard structural demolitions that are not booby trapped.

I-11. EOCA personnel are Army combat engineers trained to perform limited battlefield destruction of UXO—as outlined in the EOCA identification guide and supplemental list of EOCA ordnance provided by the theater EOD commander (part of the ordnance order of battle)—during route reconnaissance or route clearance operations or other engineer missions. If the UXO is out of the scope of operations for the EOCA, EOD personnel must be called. EOCA personnel can assist EOD personnel in disposing of other EH as requested. Properly trained and certified EOCA personnel capabilities include the following:

- Unexploded ordnance reconnaissance. EOCA personnel are trained to perform detailed reconnaissance of a suspected UXO.
- Unexploded ordnance identification. EOCA personnel can perform limited identification of items listed in the EOCA identification guide and the supplemental EOCA ordnance list provided by the theater EOD commander (part of the ordnance order of battle). Items that the EOCA cannot positively identify must be reported to EOD personnel.
- Unexploded ordnance area marking. EOCA personnel mark the UXO area according to the standard UXO marking system.
- Protective works. EOCA personnel can provide protective works to isolate a blast and fragmentation danger area of identified UXO. EOCA personnel may provide an estimated blast and fragmentation danger area for items similar to, but not included in the EOCA identification guide and supplemental list of EOCA ordnance provided by the theater EOD commander (part of the ordnance order of battle). EOCAs will advise the on-scene commander about the

recommended personnel and equipment protective measures. When the commander determines that certain personnel or equipment cannot be removed from the hazard area, protective works must be established to protect those personnel and assets from the effects of the UXO. EOCAs will recommend and supervise the appropriate protective works to be completed.

- Unexploded ordnance disposal. EOCA personnel are authorized to destroy (by detonation) individual UXO identified in the EOCA identification guide and supplemental list of EOCA ordnance list provided by the theater EOD commander (part of the ordnance order of battle).
- Improvised explosive device disposal. EOCA personnel are authorized to blow in place single munitions-based IEDs that are positively identifiable in the EOCA identification guide and the supplemental EOCA ordnance provided by the theater EOD commander (part of the ordnance order of battle) and based upon theater policy.

I-12. The following are the EOCA's limitations (see FM 3-90.119 for the most detailed and current information):

- Not trained to move, combine, or destroy multiple UXO (such as cache or IED incorporating more than one munition).
- Not trained to perform reconnaissance or handling of IED or vehicle-borne IED incidents.
- Can only perform explosive remnants of war operations under the direct supervision of EOD personnel (includes EH teams).
- Are not to be used for EH response calls. However, if EOD is not readily available as determined by the maneuver commander, EOCA personnel can be used to conduct an initial reconnaissance of the UXO. If the UXO falls within their capability, then EOCA personnel may dispose of the UXO.

Note. The JFC will be advised by the senior EOD commander who creates and manages modifications to the JOA UXO supplemental list. Requests to modify the supplemental list will be coordinated through the local EOD unit or EH team for approval by the CBRNE cell or EOD group or battalion staff. Any modification to the JOA UXO supplemental list will be provided based upon positively identifiable munitions in the theaters ordnance order of battle.

Source Notes

These are the sources used, quoted, or paraphrased in this publication. They are listed by page number. Where material appears in a paragraph, both page and paragraph numbers are listed.

1-1 "A general in all his projects…": Frederick the Great, Instructions to his Generals, 1747.

3-1 "I would desire to have companies…": Louis Deportail, Chief of Engineers, Continental Army, January 1778.

4-1 "In preparing for battle…": Dwight D. Eisenhower, *The Military Quotation Book*, James Charlton, ed. (New York: St. Martin's Press, 2002), 5.

5-1 "Prepare for the unknown…": General George S. Patton, *The Military Quotation Book*, James Charlton, ed. (New York: St. Martin's Press, 2002), 5.

6-1 "Build no more fortresses…": Field Marshall Helmuth Von Moltke, The Elder, *The Military Quotation Book*, James Charlton, ed. (New York: St. Martin's Press, 2002), 86.

This page intentionally left blank.

Glossary

The glossary lists acronyms/abbreviations and terms with Army or joint definitions, and other selected terms. Where Army and joint definitions are different, (Army) follows the term. Terms or acronyms for which FM 3-34 is the proponent manual (the authority) are marked with an asterisk (*).

SECTION I–ACRONYMS AND ABBREVIATIONS

Acronym/Term	Definition
1NCD	First Naval Construction Division
1SG	first sergeant
A2C2	Army airspace command and control
AAP	allied administrative publication
ABCS	Army Battle Command System
AC	Active Component
ACB	amphibious construction battalion
ACE	aviation combat element
ACOS	Assistant Chief of Staff
ACR	armored cavalry regiment
ACS	armored cavalry squadron
ADC	area damage control
ADCON	administrative control
AETF	air and space expeditionary task force
AFCAP	Air Force Contract Augmentation Program
AFCESA	Air Force Civil Engineer Support Agency
AFSB	Army field service brigade
AG	Adjutant General
AGS	aviation ground support
AKO	Army Knowledge Online
AJP	allied joint publication
ALT	acquisition, logistics, and technology
AMD	air and missile defense
AO	area of operations
AOR	area of responsibility
APOD	aerial port of debarkation
APOE	aerial port of embarkation
AR	Army regulation
ARFORGEN	Army force generation
ARNG	Army National Guard
ARNGUS	Army National Guard of the United States
ASA	Assistant Secretary of the Army

Acronym/Term	Definition
ASCC	Army service component commander
ASP	ammunition supply point
ATHP	ammunition transfer and holding points
ATP	allied tactical publication
BCT	brigade combat team
BFSB	battlefield surveillance brigade
BLST	brigade logistics support team
BSB	brigade support battalion
BSTB	brigade special troops battalion
C2	command and control
CA	civil affairs
CAB	combat aviation brigade
CALL	Center for Army Lessons Learned
CASEVAC	casualty evacuation
CBMU	construction battalion maintenance unit
CBRN	chemical, biological, radiological, and nuclear
CBRNE	chemical, biological, radiological, nuclear, and high-yield explosives
CBT	combat
CCA	contract construction agent
CCDR	combatant commander
CCIR	commander's critical information requirements
CCMET	core capability mission essential task
CE	combat element
CEB	combat engineer battalion
CEC	Civil Engineer Corps
CEF	contingency expeditionary force
CJCSI	Chairman of the Joint Chiefs of Staff instruction
CJCSM	Chairman, Joint Chiefs of Staff Manual
CMO	civil-military operations
CMOC	civil-military operations center
CMT	collection management
COA	course of action
COCOM	combatant command (command authority)
COMM	commercial
CONPLAN	concept plan
CONUS	continental United States
COP	common operational picture
CP	command post
CPM	critical path method
CSA	Chief of Staff of the Army

Acronym/Term	Definition
CSR	controlled supply rate
CTOE	common topographic operating environment
DA	Department of the Army; deputy commander
DC	District of Columbia
DCO	defense coordinating officer
DCP	deployable command post
DCST	Defense Logistics Agency contingency support team
DEF	deployment expeditionary force
DIB	distributed integrated backbone
DLA	Defense Logistics Agency
DMC	distribution management center
DOD	Department of Defense
DOS	Department of State
DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel, and facilities
DRMS	Defense Reutilization and Marketing Service
DS	direct support
DSN	defense switched network
DTSS	Digital Topographic Support System
EAB	echelons above brigade
EFD	engineer facility detachment
EI2RC	Engineering Infrastructure Intelligence Reachback Center
EH	explosive hazards
EHCC	explosive hazards coordination cell
EHT	explosive hazards team
EN	engineer
ENCOM	engineer command
ENCOORD	engineer coordinator
ENFORCE	Engineer Force Conference
EOCA	explosive ordnance clearance agent
EOD	explosive ordnance disposal
ERDC	Engineer Research and Development Center
ERT	engineer reconnaissance team
ESB	engineer support battalion
ESC	expeditionary sustainment command
ESF	emergency support function
ESP	engineer support plan
EWL	engineer work line
FACE	forward aviation combat engineering
FARP	forward arming and resupply point

Acronym/Term	Definition
FEMA	Federal Emergency Management Agency
FEST	forward engineer support team
FEST-A	forward engineer support team – advance
FEST-M	forward engineer support team – main
FFE	field force engineering
FHA	foreign humanitarian assistance
FID	foreign internal defense
FM	field manual
FMI	field manual interim
FMT	field maintenance team
FOB	forward operating base
FOD	foreign object damage
FORSCOM	United States Army Forces Command
FPCON	force protection condition
FRAGO	fragmentary order
FSC	forward support company
G-1	Assistant Chief of Staff, Personnel
G-2	Assistant Chief of Staff, Intelligence
G-3	Assistant Chief of Staff, Operations
G-4	Assistant Chief of Staff, Logistics
G-5	Assistant Chief of Staff, Plans
G-6	Assistant Chief of Staff, Command, Control, Communications, and Computer Operations
G-7	Assistant Chief of Staff, Information Operations
G-8	Assistant Chief of Staff, Resource Management
G-9	Assistant Chief of Staff, Civil Affairs
GCC	geographic combatant commander
GCCS	Global Command and Control System
GCE	ground combat element
GEOINT	geospatial intelligence
GI&S	geospatial intelligence and services
GPC	geospatial planning cell
GS	general support
GSR	general support reinforcing
HBCT	heavy brigade combat team
HF	high frequency
HHC	headquarters and headquarters company
HLZ	hot landing zone
HMMWV	high-mobility multipurpose wheeled vehicle
HN	host nation

Acronym/Term	Definition
HNS	host nation support
HQ	headquarters
HR	human resources
HRC	Human Resources Command
HSS	health service support
IBCT	infantry brigade combat team
IDN	initial distribution number
IED	improvised explosive device
IGO	intergovernmental organization
IN	infantry
IPB	intelligence preparation of the battlefield
IPL	imagery product library
IS	intelligence and surveillance
ISR	intelligence, surveillance, and reconnaissance
J-2	intelligence directorate of a joint staff
J-3	operations directorate of a joint staff
J-4	logistics directorate of a joint staff
J-8	resource directorate of a joint staff
JCMEB	Joint Civil-Military Engineering Board
JCS	Joint Chiefs of Staff
JDOMS	Joint Director of Military Support
JEMB	Joint Environmental Management Board
JEPES	Joint Engineer Planning and Execution System
JFACC	joint force air component commander
JFMCC	joint force maritime component commander
JFSOC	joint force special operations component commander
JFC	joint force commander
JFLCC	joint force land component command
JFOB	joint forward operations base
JFUB	Joint Facilities Utilization Board
JIACG	joint interagency coordination group
JMD	joint manning document
JOA	joint operations area
JOPES	Joint Operation Planning and Execution System
JP	joint publication
JTF	joint task force
LAN	local area network
LAP	Logistic Assistance Program
LCE	logistics combat element
LMTV	light to medium tactical truck

Acronym/Term	Definition
LNO	liaison officer
LOC	line of communications
LOGCAP	logistics civil augmentation program
LSE	logistics support element
LZ	landing zone
M/CM/S	mobility/countermobility/survivability
MAGTF	Marine air-ground task force
MANSCEN	Maneuver Support Center
MCB	movement control battalion
MCP	main command post
MCRP	Marine Corps reference publication
MCWP	Marine Corps Warfighting Publication
MDMP	military decision-making process
MEB	maneuver enhancement brigade
MEDCOM	United States Army Medical Command
MEF	Marine expeditionary force
METL	mission essential task list
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, and civil considerations
MEU	Marine expeditionary unit
MI	military intelligence
MILCON	military construction
MOE	measure of effectiveness
MOP	measure of performance
MOS	military occupational specialty
MP	military police
MRE	meal, ready to eat
MSR	main supply route
MTF	medical treatment facility
MTI	moving target indicator
MTOE	modified table of organization and equipment
MWSG	Marine wing support group
MWSS	Marine wing support squadron
NATO	North Atlantic Treaty Organization
NAVFAC	Naval Facilities Engineering Command
NBG	Naval beach group
NCE	Naval construction element
NCF	Naval construction force
NCFSU	Naval construction force support unit
NCO	noncommissioned officer

Acronym/Term	Definition
NCR	Naval construction regiment
NGA	National Geospatial Intelligence Agency
NGO	nongovernmental organization
NIPRNET	Nonsecure Internet Protocol Router Network
NMCB	Naval mobile construction battalion
NRF	National Response Framework
NSC	network support company
NWP	Naval warfare pamphlet
O&M	operations and maintenance
OBSTINTEL	obstacle intelligence
OCE	Office of the Chief of Engineers
OCP	operational command post
OE	operational environment
OPCON	operational control
OPDS	offshore petroleum discharge system
OPLAN	operation plan
OPNAVINST	Office of the Chief of Naval Operations Instruction
OPORD	operation order
PEO	program executive officer
PMESII-PT	political, military, economic, social, information, infrastructure, physical environment, time
POL	petroleum, oil, and lubricants
Prime BEEF	prime base emergency engineer force
PSYOP	psychological operations
R	reinforcing
RAA	rear assembly area
RC	Reserve Component
RDE-L	rapidly deployable equipment-light
RDE-M	rapidly deployable equipment-medium
R-DAY	redeployment day
RDSP	rapid decision-making and synchronization process
RED HORSE	rapid engineer deployable heavy operational repair squadron, engineer
REF	ready expeditionary force
RFI	request for information
RHQ	regional headquarters
RI	relevant information
ROE	rules of engagement
RSO	reception, staging, and onward movement
RSOI	reception, staging, onward movement, and integration
RSR	required supply rate

Acronym/Term	Definition
S-1	human resources staff officer
S-2	intelligence staff officer
S-3	operations staff officer
S-4	logistics staff officer
SBCT	Stryker brigade combat team
SCATMINE	scatterable mine
SecDef	Secretary of Defense
SGM	sergeant major
SIPRNET	SECRET Internet Protocol Router Network
SJA	Staff Judge Advocate
SOF	special operations forces
SOP	standing operating procedure
SPOD	seaport of debarkation
SPOE	seaport of embarkation
SRG	Seabee readiness group
STAMIS	standard Army management information systems
STANAG	standardization agreement
STB	special troops battalion
STU	secure telephone unit
SU	situational understanding
TAA	tactical assembly area
TACON	tactical control
TC	training circular
TCF	tactical combat force
TCMS	Theater Construction Management System
TDA	table of distribution and allowances
TEC	theater engineer command
TEOC	Tele-Engineering Operations Center
TLP	Troop-leading procedures
TOE	table of organization and equipment
TPFDD	time-phased force and deployment data
TRADOC	United States Army Training and Doctrine Command
TRO	training and readiness oversight
TSA	theater storage area
TSC	theater support command
TTP	tactics, techniques, and procedures
UCT	underwater construction team
UFC	unified facilities criteria
UHF	ultra high frequency
UN	United Nations

Acronym/Term	Definition
UNAAF	Unified Action Armed Forces
U.S.	United States
USACE	United States Army Corps of Engineers
USAES	United States Army Engineer School
USAF	United States Air Force
USAFRICOM	United States Africa Command
USAID	United States Agency for International Development
USAMC	United States Army Materiel Command
USAR	United States Army Reserve
USARAF	United States Army Africa
USARCENT	United States Army Forces, Central Command
USAREUR	United States Army, European Command
USARNORTH	United States Army, Northern Command
USARPAC	United States Army, Pacific Command
USARSO	United States Army, Southern Command
USCENTCOM	United States Central Command
USEUCOM	United States European Command
USJFCOM	United States Joint Forces Command
USMC	United States Marine Corps
USN	United States Navy
USNORTHCOM	United States Northern Command
USPACOM	United States Pacific Command
USSOUTHCOM	United States Southern Command
UTC	unit type code
UXO	unexploded explosive ordnance
VHF	very high frequency
VTC	video teleconference
WG	working group
WMD	weapons of mass destruction
WS	workstation
XO	executive officer

SECTION II–TERMS

***assured mobility**

A framework of processes, actions, and capabilities that assures the ability of the joint force to deploy and maneuver where and when desired, without interruption or delay, to achieve the mission. The assured mobility fundamentals—predict, detect, prevent, neutralize, and protect—support the implementation of the assured mobility framework.

board

(DOD) An organized group of individuals within a joint force commander's headquarters, appointed by the commander or (other authority), that meets with the purpose of gaining guidance or decision. Its responsibilities and authority are governed by the authority which established the board. (JP 3-33) (Army) A temporary grouping of selected staff representatives delegated decision authority for a particular purpose or function. (FMI 5-0.1)

combat engineering

(joint) Those engineering capabilities and activities that support the maneuver of land combat forces and that require close support to those forces. Combat engineering consists of three types of capabilities and activities: mobility, countermobility, and survivability. (JP 3-34)

control

(Army) 1. Authority that may be less than full command exercised by a commander over part of the activities of subordinate or other organizations. (JP 1-02) See FM 3-0. 2. In mapping, charting, and photogrammetry, a collective term for a system of marks or objects on the Earth or on a map or a photograph, whose positions or elevations (or both) have been or will be determined. (JP 1-02) See FM 3-25.26. 3. Physical or psychological pressures exerted with the intent to assure that an agent or group will respond as directed. (JP 1-02) 4. An indicator governing the distribution and use of documents, information, or material. Such indicators are the subject of intelligence community agreement and are specially defined in appropriate regulations. [Note: see AAP-6.] (JP 1-02) See FM 2-0. (Army) 1. In the context of command and control, the regulation of forces and warfighting functions to accomplish the mission in accordance with the commander's intent. (FM 3-0) 2. A tactical mission task that requires the commander to maintain physical influence over a specified area to prevent its use by an enemy. (FM 3-90) 3. Action taken that eliminates a hazard or reduces the risk from that hazard. Part of the third step in risk management. (FM 5-19) 4. In the context of stability mechanisms, to impose civil order. (FM 3-0) See also **administrative control**; **commander**; **commander's intent**; **command relationships**; **common operational picture**; **hazard**; **operational control**; **operations process**; **relevant information**; **risk management**; **tactical control**; **tactical mission task**; **warfighting function**.

***countermobility operations**

(Army) Operations that deny the enemy freedom of maneuver through the employment of reinforcing obstacles.

decision making

Selecting a course of action as the one most favorable to accomplish the mission. See also **course of action.** (FM 6-0)

***directed target**

A target directed by the responsible commander to be prepared for demolition or destroyed to support his intent. See also **demolition; destroy.**

***engineer coordinator**

The special staff officer, usually the senior engineer officer on the staff, responsible for coordinating engineer assets and operations for the command.

***engineer functions**

Categories of related engineer capabilities and activities grouped together to help joint force commanders integrate, synchronize, and direct engineer operations. The three engineer functions are combat engineering, general engineering, and geospatial engineering.

***Engineer Regiment**

All Active Army, Army National Guard, and United States Army Reserve engineer organizations (as well as Department of Defense civilians and affiliated contractors and agencies within the civilian community) with a diverse range of capabilities that are all focused toward supporting the Army and its mission.

***engineer work line**

A coordinated boundary or phase line used to compartmentalize an area of operations (AO) to indicate where specific engineer units have primary responsibility for the engineer effort. It may be used at division level to discriminate between an AO supported by division engineer assets and an AO supported by direct support or general support corps engineer units. Also called **EWL**. See also **area of operations; boundary; direct support; general support; phase line**.

***field force engineering**

(Army) The application of the Engineer Regiment's capabilities from the three engineer functions (although primarily general engineering) to support full spectrum operations through both reachback and forward presence.

force projection

The ability to project the military instrument of national power from the United States or another theater in response to requirements for military operations. See also **deployment; mobilization, redeployment.**(JP 5-0) See FM 3-0

general engineering

(joint) Those engineering capabilities and activities, other than combat engineering, that modify, maintain, or protect the physical environment. Examples include: the construction, repair, maintenance, and operation of infrastructure, facilities, lines of communication and bases; terrain modification and repair; and selected explosive hazards activities. Also called **GE**. (JP 3-34)

general war

(Army) Armed conflict between major powers in which the total resources of the belligerents are employed, and the national survival of a major belligerent is in jeopardy. See also conflict. (JP 1-02) See FM 27-10

***geospatial engineering**

(Army) The art and science of applying geospatial information to enable understanding of the physical environment for military operations. The art is the ability to understand mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC) and the geospatial information available, including intent of use and limitations, in order to explain the military significance of the terrain to the commander and staff and create geospatial products for decision making; the science is the ability to exploit geospatial information, producing spatially accurate products for measurement, mapping, visualization, modeling, and all types of analysis of the terrain.

***geospatial information**

(Army) Foundation information upon which all other information about the physical environment is referenced to form the common operational picture (COP).

insurgency

(DOD, NATO) An organized movement aimed at the overthrow of a constituted government through the use of subversion and armed conflict. See also **counterinsurgency**. (JP 3-05) See FM 3-07.

intelligence warfighting function

See **warfighting function**.

maneuver

(DOD) 1. A movement to place ships, aircraft, or land forces in a position of advantage over the enemy. 2. A tactical exercise carried out at sea, in the air, on the ground, or on a map in imitation of war. 3. The operation of a ship, aircraft, or vehicle, to cause it to perform desired movements. 4. Employment of forces in the operational area through movement in combination with fires to achieve a position of advantage in respect to the enemy in order to accomplish the mission. (JP 3-0) [Note: see AAP-6.] (Army) See **principles of war**. See also **mission**; **operation**

maneuver support operations

Integrate the complementary and reinforcing capabilities of key protection, movement and maneuver, and sustainment functions, tasks, and systems to enhance freedom of action.

movement and maneuver warfighting function

See **warfighting function**.

measure of effectiveness

(Army) A criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect. (JP 3-0) See FM 3-0.

measure of performance

(Army) A criterion to assess friendly actions that is tied to measuring task accomplishment. (JP 3-0) See FM 3-0.

***mobility operations**

Obstacle reduction by maneuver and engineer units to reduce or negate the effects of existing or reinforcing obstacles. The objective is to maintain freedom of movement for maneuver units, weapon systems, and critical supplies.

obstacle

(joint) Any obstruction designed or employed to disrupt, fix, turn, or block the movement of an enemy force, and to impose additional losses in personnel, time, and equipment on the enemy. Obstacles can be natural, man-made, or a combination of both. (JP 3-15)

relevant information

All information of importance to commanders and staffs in the exercise of command control. See also **command and control.** (FM 3-0)

support area

Is a specific surface area designated by the echelon commander to facilitate the positioning, employment, and protection of resources required to sustain, enable, and control tactical operations. (FMI 3-0.1)

***survivability operations**

The development and construction of protective positions, such as earth berms, dug-in positions, overhead protection, and countersurveillance means, to reduce the effectiveness of enemy weapon systems. See also **survivability.**

sustainment warfighting function

See **warfighting function.**

synchronization

(joint) The arrangement of military activities in time, space, and purpose to mass maximum relative combat power at a decisive place and time. See FM 3-0.2. In the intelligence context, application of intelligence sources and methods in concert with the operation plan. (JP 2-0) See FM 34-2.

***tele-engineering**

Assisting engineers and the commanders they support in planning and executing their missions with capabilities inherent in field force engineering (FFE) through exploitation of the Army's command, control, and communications architectures to provide a linkage between engineers and the appropriate nondeployed subject matter experts for resolution of technical challenges. Tele-engineering is under the proponency of the United States Army Corps of Engineers.

***terrain reinforcement**

The development of terrain using obstacles to degrade enemy mobility or to enhance friendly survivability through the construction of fighting positions and cover. See also **countermboility operations; obstacle; survivability operations**.

warfighting function

A group of tasks and systems (people, organizations, information, and processes), united by a common purpose, that commanders use to accomplish missions and training objectives. The six warfighting functions are: a. **command and control** – the related tasks and systems that support commanders in exercising authority and direction; b. **fires** – the related tasks and systems that provide collective and coordinated Army indirect fires, joint fires, and command and control warfare, including nonlethal fires, through the targeting process; c. **intelligence** – the related tasks and systems that facilitate understanding of the operational environment, enemy, terrain, and civil considerations; d. **movement and maneuver** – the related tasks and systems that move forces to achieve a position of advantage in relation to the enemy. Direct fire is inherenet in maneuver, as is close combat; e. **protection** – the related tasks and systems that preserve the force so the commander can apply maximum combat power; f. **sustainment** – the related tasks and systems that provide support and services to ensure freedom of action, extend operational reach, and prolong endurance. (FM 3-0)

working group

(Army) An enduring or ad hoc organization within a joint force commander's headquarters formed around a specific function whose purpose is to provide analysis to users. The working group consists of a core functional group and other staff and component representatives. (JP 3-33) (Army) A temporary grouping of predetermined staff representatives who meet to coordinate and provide recommendations for a particular purpose or function. Also called **WG**. (FMI 5-0.1)

This page intentionally left blank.

References

SOURCES USED

The following sources are either quoted or paraphrased in this publication.

PUBLICATIONS

AR 27-1, *Legal Services, Judge Advocate Legal Services*, 30 September 1996

AR 350-1, *Army Training and Leader Development*, 3 August 2007

AR 715-9, *Contractors Accompanying the Force*, 29 October 1999

CJCSI 3121.01A, *Rules on the Use of Force by DOD Personnel Providing Support to Law Enforcement Agencies Conducting Counterdrug Operations in the United States*, 31 May 2000

DA Form 2028, *Recommended Changes to Publications and Blank Forms*

DD Form 565, *Statements of Recognition of Deceased*

DOD Directive 4270.5, *Military Construction*, 12 February 2005

DOD 7000.14-R, "Department of Defense Financial Management Regulations (FMRs)," Volume 12, *Special Accounts, Funds, and Programs*, January 2002

FM 1, *The Army*, 14 June 2005

FM 1-0, *Human Resources Support*, 21 February 2007

FM 2-0, *Intelligence*, 17 May 2004

FM 3-0, *Operations*, 27 February 2008

FM 3-05.40, *Civil Affairs Operations*, 29 September 2006

FM 3-05.301, *Psychological Operations Process Tactics, Techniques, and Procedures*, 30 August 2007

FM 3-06, *Urban Operations*, 26 October 2006

FM 3-06.11, *Combined Arms Operations in Urban Terrain*, 28 February 2002

FM 3-07, *Stability Operations*, 6 October 2008

FM 3-13, *Information Operations: Doctrine, Tactics, Techniques, and Procedures*, 28 November 2003

FM 3-19.1, *Military Police Operations*, 22 March 2001

FM 3-19.40, *Internment/Resettlement Operations*, 4 September 2007

FM 3-20.96, *Cavalry Squadron (RSTA)*, 20 September 2006

FM 3-34.2, *Combined-Arms Breaching Operations,* 31 August 2000

FM 3-34.22, *Engineer Operations – Brigade Combat Team and Below,* 11 February 2009

FM 3-34.210, *Explosive Hazards Operations*, 27 March 2007

FM 3-34.214, *Explosives and Demolitions*, 11 July 2007

FM 3-34.230, *Topographic Operations*, 3 August 2000

FM 3-34.400, *General Engineering*, 9 December 2008

FM 3-90, *Tactics*, 4 July 2001

FM 3-90.6, *The Brigade Combat Team,* 4 August 2006

FM 3-90.12, *Combined Arms Gap-Crossing Operations*, 1 July 2008

FM 3-90.31, *Maneuver Enhancement Brigade Operations*, 26 February 2009

FM 3-90.61, *The Brigade Special Troops Battalion*, 22 December 2006

FM 3-97.6, *Mountain Operations*, 28 November 2000

FM 3-100.21, *Contractors on the Battlefield*, 3 January 2003

FM 4-0, *Combat Service Support*, 29 August 2003

FM 4-01.30, *Movement Control*, 1 September 2003

FM 4-02, *Force Health Protection in a Global Environment*, 13 February 2003

FM 5-0, *Army Planning and Orders Production*, 20 January 2005

FM 5-102, *Countermobility,* 14 March 1985 (To be revised as FM 3-90.13.)

FM 5-103, *Survivability,* 10 June 1985 (To be revised as FM 3-34.300.)

FM 5-412, *Project Management*, 13 June 1994

FM 6-0, *Mission Command: Command and Control of Army Forces*, 11 August 2003

FM 6-99.2, *US Army Report and Message Formats*, 30 April 2007

FM 7-0, *Training for Full Spectrum Operations*, 12 December 2008

FM 7-15, *The Army Universal Task List*, 27 February 2009

FM 20-3, *Camouflage, Concealment, and Decoys*, 30 August 1999

FM 27-100, *Legal Support to Operations*, 1 March 2000

FM 90-3, *Desert Operations*, 24 August 1993

FM 90-5, *Jungle Operations*, 16 August 1982

FM 90-7, *Combined Arms Obstacle Integration*, 29 September 1994 (To be revised as FM 3-90.13.)

FM 100-8, *The Army in Multinational Operations*, 24 November 1997

FM 100-10-2, *Contracting Support on the Battlefield*, 4 August 1999 (To be revised as FM 4-10.12.)

FMI 3-0.1, *The Modular Force*, 28 January 2008

FMI 4-93.41, *Army Field Support Brigade Tactics, Techniques, and Procedures*, 22 February 2007

FMI 5-0.1, *The Operations Process*, 31 March 2006

TC 5-230, *Army Geospatial Guide for Commanders and Planners*, 28 November 2003

JOINT PUBLICATIONS

AJP-3.12, *Joint Engineering,* December 2003

CJCSM 3122.01A, *Joint Operation Planning and Execution System (JOPES) Volume I (Planning Policies and Procedures)*, 29 September 2006

CJCSM 3122.03C, *Joint Operation Planning and Execution System Volume II, Planning Formats and Guidance*, 17 August 2007

JP 1, *Doctrine for the Armed Forces of the United States*, 2 May 2007

JP 0-2, *Unified Action Armed Forces (UNAAF)*, 10 July 2001

JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001

JP 2-03, *Geospatial Intelligence Support to Joint Operations*, 22 March 2007

JP 3-0, *Joint Operations*, 17 September 2006

JP 3-07, *Joint Doctrine for Military Operations Other Than War*, 16 June 1995

JP 3-07.1, *Joint Tactics, Techniques, and Procedures for Foreign Internal Defense (FID)*, 30 April 2004

JP 3-07.3, *Peace Operations*, 17 October 2007

JP 3-08, *Interagency, Intergovernmental Organization, and Nongovernmental Organization Coordination During Joint Operations Volume I*, 17 March 2006

JP 3-15, *Barriers, Obstacles, and Mine Warfare for Joint Operations*, 27 April 2007

JP 3-27, *Homeland Defense*, 12 July 2007

JP 3-31, *Command and Control for Joint Land Operations,* 23 March 2004

JP 3-34, *Joint Engineer Operations,* 12 February 2007

JP 3-35, *Deployment and Redeployment Operations,* 7 May 2007

JP 4-07, *Joint Tactics, Techniques, and Procedures for Common-User Logistics During Joint Operations,* 11 June 2001

JP 4-08, *Joint Doctrine for Logistic Support of Multinational Operations,* 25 September 2002

JP 5-0, *Joint Operation Planning*, 26 December 2006

J*oint Forward Operations Base (JFOB) Handbook*, December 2006

MULTI-SERVICE PUBLICATIONS

FM 1-02/MCRP 5-12A, *Operational Terms and Graphics*, 21 September 2004

FM 3-34.170/MCWP 3-17.4, *Engineer Reconnaissance*, 25 March 2008

FM 3-90.119/MCIP 3-17.01, *Combined Arms Improvised Explosive Device Defeat Operations*, 21 September 2007

FM 3-100.4/MCRP 4-11B, *Environmental Considerations in Military Operations*, 15 June 2000 (To be revised as FM 3-34.500.)

FM 4-30.16/MCRP 3-17.2C/NTTP 3-02.5/AFTTP(I) 3-2.32, *Multi-Service Tactics, Techniques, and Procedures for Explosive Ordnance Disposal in a Joint Environment*, 27 October 2005

FM 4-30.51/MCRP 3-17.2A, *Unexploded Ordnance (UXO) Procedures*, 13 July 2006

FM 5-34/MCRP 3-17A, *Engineer Field Data*, 19 July 2005 (To be revised as FM 3-34.310.)

OTHER PUBLICATIONS

STANAG 2394/ATP-52(B), *Land Force Combat Engineer Doctrine,* October 2006

STANAG 2991, *NATO Combat Engineer Glossary* AAP 19(D)*,* 18 August 2004

NWP 4-04, *Naval Civil Engineering Operations*, December 2007

This page intentionally left blank.

Index

FM 3-34
2 April 2009

By order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0907102

DISTRIBUTION:

Active Army, Army National Guard, and U.S. Army Reserve: To be distributed in accordance with the initial distribution number (IDN) 110451, requirements for FM 3-34.