FM 3-34

ENGINEER OPERATIONS

August 2011

HEADQUARTERS, DEPARTMENT OF THE ARMY

Field Manual
No. 3-34

Headquarters
Department of the Army
Washington, D.C., 4 August 2011

Engineer Operations

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***This publication supersedes FM 3-34, 2 April 2009.**

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Preface

Field Manual (FM) 3-34 is the Army's keystone doctrinal publication for the Engineer Regiment. It presents overarching doctrinal guidance and direction for conducting engineer activities and shows how they contribute to full spectrum operations. It provides a common framework and language for engineer support to operations and constitutes the doctrinal foundation for developing the other fundamentals and tactics, techniques, and procedures (TTP) detailed in subordinate doctrinal manuals in the FM 3-34 series. This manual is a key integrating publication that links the doctrine for the Engineer Regiment with Army capstone doctrine and joint doctrine. It focuses on synchronizing and coordinating the diverse range of capabilities in the Engineer Regiment to successfully support the Army and its mission. FM 3-34 provides operational guidance for engineer commanders and trainers at all echelons and forms the foundation for Army Engineer School curricula.

To comprehend the doctrine contained in FM 3-34, readers must first understand the elements of full spectrum operations, operational design, and the elements of combat power as described in FM 3-0 and addressed in FM 2-0, FM 3-13, FM 3-37, FM 4-0, FM 6-0, and FM 6-22. In addition, readers must be familiar with FM 3-07, FM 3-28, and FM 3-90. They must understand how offensive, defensive, and stability or civil support operations complement each other. Readers must also understand the operations process described in FM 5-0, and the terms and symbols in FM 1-02/MCRP5-12A.

This edition of FM 3-34 provides keystone doctrine on engineer support to operations with a chapter for each of the three major sections of the engineer framework and chapters on mission command considerations, engineers in the operations process, and sustainment considerations.

Chapter 1 draws from the right side of the engineer framework in figure 1, page vii, examining the context within which engineer support to operations occurs, focusing on those aspects that are most significant to engineers. It provides an engineer view of the following: the operational environment (OE), the operational and mission variables used to describe the OE, unified action, the continuum of operations, the levels of war, and the Army's operational concept—full spectrum operations. The chapter highlights the requirement to simultaneously support offensive, defensive, and stability or civil support operations.

Chapter 2 addresses the left side of the engineer framework, providing an overview of the Engineer Regiment, its organizational modularity, and its capabilities. It defines and discusses the engineer disciplines (combat, general, and geospatial engineering), highlighting their interdependence.

Chapter 3 addresses the middle portion of the engineer framework, defining the four lines of engineer support and describing their relationships to the engineer disciplines, full spectrum operations, and the warfighting functions. It describes engineer contributions to combat power linked through the lines of engineer support, the capabilities inherent in the engineer disciplines, and the warfighting functions.

Chapter 4 provides mission command considerations for engineer support, to include the use of various functional and multifunctional headquarters, describing how the Engineer Regiment "organizes for combat," and synchronizes engineer support to operations with those of other forces. It discusses engineer force tailoring, task organizing, and mission command of engineer forces.

Chapter 5 describes how engineer support is integrated into the supported commander's overall operation throughout the operations process. It describes engineer planning activities and considerations for preparing, executing, and continuously assessing engineer support.

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

Appendix A expands on the discussion of the engineer view of unified action in chapter 1. It describes engineer considerations for multinational and interagency operations and for working with nongovernmental organizations (NGO) and in host nations (HNs).

Appendix B supplements the information about operational force engineers in chapter 2. It provides information in a quick reference format about each type of engineer unit, including the unit symbol, mission, typical allocation and other information.

This manual applies to all Army engineer forces. The principal audience for this manual is engineer commanders and staff officers, but all Army leaders will benefit from reading it. Trainers and educators throughout the Army also use this manual, as do combat developers.

Terms that have joint or Army definitions are identified in both the glossary and the text. *Glossary references*: The glossary lists most terms used in FM 3-34 that have joint or Army definitions. Terms for which FM 3-34 is the proponent field manual (the authority) are indicated with an asterisk in the glossary. *Text references*: Definitions for which FM 3-34 is the proponent field manual are printed in boldface in the text. 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.

FM 3-34 applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States, and the United States Army Reserve (USAR) unless otherwise stated.

The proponent for this publication is the United States Army Training and Doctrine Command. 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-CDC, 320 MANSCEN Loop, Suite 270, 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.cdidcodddengdoc@conus.army.mil>.

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

Introduction

The Engineer Regiment exists to provide freedom of action to ground forces and to loosen these forces from the grips of the enemy and all aspects of the terrain. This was true in 16 June 1775, when the Continental Congress organized an Army with a chief engineer and two assistants, and it remains true today, 235 years later in this 22nd edition of this keystone document. This manual provides a body of thought that explains *how* (not what) *to think* about how to use the capabilities of the Engineer Regiment to provide freedom of action and shape civil conditions in support of the Army and its missions.

This version of FM 3-34 introduces an updated doctrinal framework (see figure 1) that provides the intellectual underpinnings for the Engineer Regiment and better articulates its purpose and activities. It describes how engineers combine the skills and organizations of the three interrelated engineer disciplines (combat, general, and geospatial engineering) to provide support that helps ground force commanders assure mobility of the force, enhance protection of the force, enable logistics, and develop infrastructure among afflicted populations and nations.

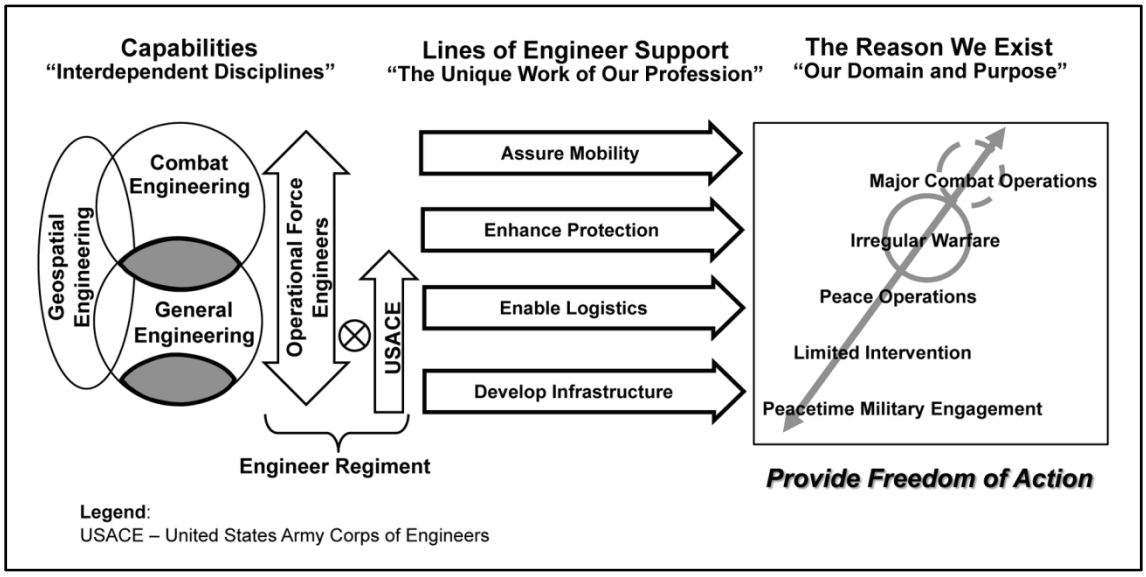

Figure 1. Engineer framework

The development of this framework was driven by several factors, including the—

- Addition of stability operations as a core mission for the United States (U.S.) military. Throughout much of the Army's history in the 20th century, its focus has often been on major combat operations. Today, however, the focus has shifted toward irregular warfare with an increased emphasis on shaping civil conditions. As a result, the Engineer Regiment finds itself supporting simultaneous combinations of offensive, defensive, and stability or civil support operations.
- Recognition that it is no longer sufficient to describe engineer operations only in terms of mobility, countermobility, and survivability. Such a construct, by itself, is inadequate for describing how engineers combine their diverse capabilities to help solve the problems faced by commanders and staffs in full spectrum operations. To address this shortcoming, this framework introduces four lines of engineer support to further align tasks according to their purpose for a specific operation.
- Need for the various disciplines (formerly known as functions) of the Engineer Regiment to be more interdependent and the recognition that these disciplines are areas of broad expertise within

military engineering. They drive training, leader development, personnel management and organizational design.

- Recognition that improving the interdependence between operational force engineers and the U.S. Army Corps of Engineers (USACE) provides greater synergy within the Engineer Regiment and enhanced support to the Army, joint forces, and governmental agencies.
- Imperative to foster adaptive leaders with the cognitive skills to make transitions and who can think in "combinations." The engineer leaders of today must be comfortable clearing improvised explosive devices (IEDs), fighting to gain and maintain a stronghold within an urban center, and then immediately integrating the full range of general engineering capabilities to establish a combat outpost using existing structures and set about the work of improving essential services to the surrounding populace to build trust and squash local support for insurgent combatants. Today's commander requires an engineer who is better equipped mentally to handle a broader array of engineering challenges, both simultaneously and sequentially.

The doctrinal engineer foundations 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 or how 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 and civilians 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.

In addition, this manual has been affected by recent changes in FM 3-0 and by maturation of the terms "field force engineering" and "assured mobility." It also includes the addition, modification, and rescission of several Army terms. (See table 1 which list changes to terms for which FM 3-34 is the proponent FM.)

Table 1. FM 3-34 term changes

New Army Terms		
combat engineering[1]	general engineering[1]	lines of engineer support
engineer disciplines[2]		
[1] Adds a second definition (Army only) to an existing joint term.	[2] Replaces engineer functions in Army doctrine.	
Modified Army Definitions		
assured mobility[1]	geospatial engineering	survivability operations
countermobility operations	geospatial information[2]	terrain reinforcement
field force engineering	mobility operations[1]	
[1] FM 3-90.4/MCWP 3-17.8 is now the proponent.	[2] ATTP 3-34.80 is now the proponent.	
Rescinded Army Definitions		
engineer coordinator	Engineer Regiment	tele-engineering
engineer functions[1]	terrain reinforcement	
[1] Replaced by engineer disciplines. Army doctrine will not use this term; joint doctrine will continue to use this term.		
Legend: ATTP – Army Tactics, Techniques, and Procedures FM – field manual MCWP – Marine Corps warfighting publication		

Chapter 1
The Operational Context

Understanding the operational context is essential if engineers are to achieve their purpose—providing freedom of action. Engineers must understand the OE because it fundamentally affects their activities and outcomes. The recent shift in focus from major combat operations to irregular warfare highlights the importance of understanding the entire continuum of operations (see figure 1, page viii). Understanding the Army's operational concept—full spectrum operations—is critical to effective engineer support to those operations. This chapter examines the context within which engineer support to operations occurs, focusing on those aspects that are most significant to engineers.

THE OPERATIONAL ENVIRONMENT

1-1. As discussed in FM 3-0, a complex framework of environmental factors shape the nature of military operations and affect their outcomes. This requires a broad understanding of the strategic and operational environment and their relevance to each mission. Army forces use operational variables to understand and analyze the broad environment in which they are conducting operations. They use mission variables to focus analysis on specific elements of the environment that apply to their mission. This is true not only for Army operations in general, but also for engineer support to operations. An understanding of the OE underpins the commander's ability to make decisions.

UNDERSTANDING THE OPERATIONAL ENVIRONMENT

1-2. Joint doctrine defines the *operational environment* as a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander (Joint Publication [JP] 3-0). 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.

1-3. Understanding the OE is essential to the successful execution of operations and is one of the fundamentals of the design methodology described in FM 5-0. To gain this understanding, 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.

1-4. 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, page 1-2). 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.

OPERATIONAL AND MISSION VARIABLES

1-5. Army doctrine describes an OE in terms of the following 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 or 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 may be impacted by the effect of laws, agreements, or positions of multinational partners such as restrictions on shipment of hazardous materials across borders or a host of similar political considerations that can 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 (EHs) 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 and engineer capabilities are discussed 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 the 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. Engineers assist the commander in using information engagement to shape the operational environment through their capability to improve infrastructure and services for the population. The engineer must consider how construction projects, especially in stability operations, will support informational themes consistent with friendly military goals and actions. The engineer view might also add challenges associated with deficiencies in the supporting architecture or nodes. Information flow may be affected by the available infrastructure to include power considerations.
- **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 3-34.170/MCRP 3-17.4 and FM 3-34.400. **Physical environment**. The defining factors are urban settings (supersurface, surface, and subsurface features), and other types of complex terrain, weather, topography, hydrology, and environmental conditions. An enemy may try to counteract U.S. military advantages by operating in urban or other complex terrain requiring greater engineer effort to provide freedom of action. The engineer view might add challenges associated with natural and man-made obstacles. Insights into environmental considerations are also a concern (see FM 3-34.5/MCRP 4-11B). Opportunities in the form of existing routes, installations, and resources might be added. The **e**ngineer view supports a broad understanding of the physical environment through geospatial engineering, which is discussed in detail in chapter 2 of this FM, Army Tactics, Techniques, and Procedures (ATTP) 3-34.80, 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 duration of an operation may influence engineer operations in terms of whether to pursue temporary or enduring solutions for facilities

and infrastructure. The methods and standards engineers use will often be markedly different, depending on whether the construction is contingent or is intended to have an enduring presence. The engineer view might add challenges associated with completing required construction projects on time and opportunities to accelerate priority projects.

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 lines of engineer support and linked to the common overall understanding through the warfighting functions. (See chapter 3 for discussion about lines of engineer support.)

1-7. The engineer view of the OE is synchronized to support combined arms using the warfighting functions to create combat power as described in FM 3-0. Chapter 3 provides a more detailed discussion of the application of engineer capabilities through the warfighting functions to synchronize support to combined arms operations.

MISSION VARIABLES

1-8. While an analysis of the OE using the operational variables (PMESII-PT) improves situational understanding (SU) at all levels, 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 the categories of relevant information used for mission analysis. Similar to the analysis of the OE using the operational variables, the engineer uses the mission variables to seek the shared common understanding from an engineer perspective.

1-9. The following are some examples of the engineer perspective for each of the mission variables:

- **Mission**. Commanders analyze a mission in terms of specified tasks, implied tasks, and the commander's intent (two echelons up) to determine their essential tasks. Engineers conduct the same analysis, with added focus on the engineer requirements, to determine the essential tasks for engineers. Early identification of the essential tasks for engineer support enables the maneuver commander to request engineer augmentation early on in the planning process.
- **Enemy**. The engineer view of the enemy concentrates on enemy tactics, equipment, and capabilities that could threaten friendly operations. This may include an analysis of other factors within the AO or area of interest (AI) that could have an impact on mission success.
- **Terrain and weather**. As the terrain visualization experts, engineers analyze terrain (man-made and natural) to determine the effects on friendly and enemy operations. Engineers analyze terrain using the five military aspects of terrain (observation and fields of fire, avenues of approach, key terrain, obstacles, and cover and concealment [OAKOC]). Engineers integrate geospatial products to help commanders and staffs visualize aspects of the terrain to support decisionmaking.
- **Troops and support available**. Engineers consider the number, type, capabilities, and condition of available engineer troops and support (joint, multinational, and interagency forces). Chapter 2 provides a more complete discussion of engineer capabilities.
- **Time available**. Engineers must understand the time required in planning engineer operations and the importance of collaborative and parallel planning. Engineers realize the time needed for positioning critical assets and the time associated with performing engineering tasks or projects.
- **Civil considerations**. The influence of man-made infrastructure; civilian institutions; and attitudes and activities of the civilian leaders, populations, and organization within the AO impact the conduct of military operations. At the tactical level, they directly relate to key civilian areas, structures, capabilities, organizations, people, and events (ASCOPE). This engineer view provides a detailed understanding of the basic infrastructure needed for a community or society. The engineer view might identify challenges associated with specific deficiencies in the basic infrastructure and opportunities for improvement or development of the infrastructure.

UNIFIED ACTION

1-10. *Unified action* is the synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort (JP 1-02). Engineer capabilities are a significant force multiplier in joint operations and unified action, facilitating the freedom of action necessary for the joint force commander (JFC) to meet mission objectives. This section provides an overview of non-Army engineer capabilities typically available within a multinational and interagency environment and of the integration of those capabilities. See appendix A for multinational, interagency, and HN considerations.

JOINT/INTERAGENCY/MULTINATIONAL CAPABILITIES

1-11. In full spectrum operations, Army engineers operate as part of a joint force and often within a multinational and interagency environment. Army engineers should be familiar with the core engineering units in each Service to include their combat, general, and geospatial engineering capabilities and limitations. It is also important to understand multinational, interagency, NGO, and intergovernmental organization engineer capabilities. The engineering capabilities of each Service component may provide engineering support to the other components to meet joint force requirements. See North Atlantic Treaty Organization (NATO) Military Committee Policy 0560; JP 3-08*;* JP 3-34; Allied Joint Publication (AJP) 3.12; and Standardization Agreement 2394/Allied Tactical Publication (ATP) 52(B) for further discussion of engineer participation in joint, interagency, and multinational operations. JP 3-34 provides information on other Service engineer capabilities, and discusses other engineering capabilities such as multinational military units, HN capabilities, and civil augmentation programs. Army engineers should be aware that some capabilities that reside in other (nonengineer) branches of the Army are categorized as engineering by other Services. Explosive ordnance disposal (EOD) and chemical, biological, radiological, and nuclear (CBRN) capabilities are two examples.

INTEGRATION OF CAPABILITIES

1-12. 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 mission command structure and processes in place to employ the engineer capabilities in unified action. It also requires an understanding of the chain of command, interagency coordination, and multinational operations.

Chain of Command

1-13. As described in JP 1, the President and the Secretary of Defense exercise authority and control of the Armed Forces through two distinct branches of the chain of command—one branch for the conduct of operations and support and the other branch to carry out the military service departments' Title 10 responsibilities of recruiting, manning, equipping, training, and providing service forces to the combatant commanders (CCDRs). Although the service branch of the chain of command is separate and distinct from the operating branch, the Army Service component commander (ASCC) and the Army forces operate within the CCDR's chain of command in the theater.

1-14. At the theater level, when Army forces operate outside the United States, they are assigned to an ASCC under a JFC (see JP 1 and JP 3-0). The ASCC provides administrative and logistic services to assigned Army forces and the ARFORs of subordinate JFCs. (An *ARFOR* is the Army Service component headquarters for a joint task force or a joint and multinational force [FM 3-0]. See ARFOR under terms). 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 theater engineer command (TEC) or the United States Army Medical Command, when the focus of support suggests this as the best solution. The USACE is often involved with supporting the ASCC as well and will generally operate through the TEC, if one is present. Chapter 4 provides additional discussion of joint mission command considerations and options.

Interagency Coordination

1-15. Because Army engineers will often be required to coordinate with government agencies to accomplish their mission, they 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, Department of Defense (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.

1-16. Because engineers are likely to operate with other agencies, foreign governments, NGOs, and intergovernmental organizations in a variety of circumstances, their participation in the JFC's interagency coordination is critical. Two methods for facilitating such coordination are the civil-military operations center (CMOC) and the joint interagency coordination group. Additional information on the CMOC and the joint interagency coordination group is provided in JP 3-0, JP 3-34, and JP 5-0.

Multinational Operations

1-17. During multinational operations, U.S. forces establish liaison with multinational forces early. Army forces exchange specialized liaison personnel in fields such as aviation, fire support, engineer, intelligence, military police, 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, special operations forces, and organic sustainment capabilities. Effective operational-level engineer planning requires an engineer staff to support the multinational commander, providing advice on all engineer aspects of the operation. 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.

1-18. Commanders should give special consideration to "niche" capabilities, such as mine clearance that may exceed U.S. capabilities. Multinational engineer forces may possess additional engineering specialties that exceed or enhance U.S. capabilities. See FM 3-17 for additional discussion of the employment of multinational forces.

SPECTRUM OF CONFLICT

1-19. Engineers provide support throughout the continuum of operations and across all levels of war. Their support is critical for full spectrum operations at all points along the spectrum of conflict and in all operational themes.

ENGINEER SUPPORT WITHIN THE CONTINUUM OF OPERATIONS

1-20. While the magnitude of violence varies over the spectrum of conflict, the magnitude of requirements for engineers may remain consistently high from stable peace through general war. This magnitude provides a menu of actions available to support military operations.

1-21. Engineer requirements at the end of the spectrum characterized as stable peace 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.

1-22. Engineer activities at the far end of the spectrum, characterized as general war, require support for ground combat (or the possibility of ground combat). This requires 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. It also involves significant challenges associated with sustaining the operation.

1-23. Between these two ends of the spectrum—stable peace and general war—engineers are often required to improve stability through projects to develop infrastructure, efforts to create or improve HN technological capacity, or other engineering projects (see chapter 3). There may also be requirements to provide specialized engineer support to other agencies. Engineers involved in unconventional warfare (which includes counterinsurgency and support to insurgencies) help overcome challenges to the commander's ability to move and maneuver freely, protect the forces employed, and sustain the operation. Other requirements include directly impacting the adversaries' freedom of action and improving stability.

1-24. 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 sometimes unique understanding at each level of war.

ENGINEER ACTIVITIES SPANNING THE LEVELS OF WAR

1-25. 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, described in FM 3-0 as 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 level may adversely impact the effectiveness of the operation. Engineer support to operations must be synchronized from strategic to the tactical level. Strategic engineer decisions affect tactical engineer support and tactical engineer support will affect strategic.

1-26. Engineer planning at each level of war is not limited or constrained to the development of engineer functional tasks. The warfighting functions and the parallel joint functions are used to synchronize engineer support 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, sustainment, and protection functions. At the operational to tactical level, planning support focuses primarily on the movement and maneuver, intelligence, mission command, 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 and the linkages to all of the warfighting functions. Chapter 4 discusses the engineer staff organization. The following paragraphs briefly describe some of the engineer considerations at each level of war, and more information is provided in ATTP 3-34.23 and FM 3-34.22.

Strategic Level

1-27. Engineer activities at the strategic level include force planning, engineer policy, and the support of campaigns and operations, focusing primarily on the means and capabilities to generate, deploy, employ, 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 sea ports 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, environmental considerations, engineer interoperability, input to the rules of engagement (ROE), rules for the use of force, and support to protection.

1-28. 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 joint task force (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.

Operational Level

1-29. Engineer activities at the operational level focus on the impact of geography and force-projection infrastructure on the 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.

1-30. 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. They provide master planning guidance that incorporates 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.

Tactical Level

1-31. Engineer activities at the tactical level focus on support to the ordered arrangement and maneuver of forces—in relationship to each other and to the enemy—that are required to achieve combat objectives. At the same time, engineer support is critical to achieving necessary stability tasks, involving activities such as those described in paragraph 1-28.

1-32. Tactical planning is conducted by each of the Services; in the context of engineer support to operations, this translates to a primary focus on combat engineering tasks and planning done within tactical organizations (see chapter 2 for a discussion of the engineer disciplines 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 (mobility and countermobility), survivability, and sustainment support that is not addressed by the higher-echelon commander. Construction planning at the tactical level will typically focus on survivability in support of the protection warfighting function and infrastructure development in support of primarily the 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 threat capabilities.

1-33. 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 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 EOD capabilities has become an increasing requirement.

ENGINEER SUPPORT TO FULL SPECTRUM OPERATIONS

1-34. The Army's operational concept is *full spectrum operations*: Army forces combine offensive, defensive, and stability or civil support operations simultaneously as part of an interdependent joint force to seize, retain, and exploit the initiative, accepting prudent risk to create opportunities to achieve decisive

results. They employ synchronized action—lethal and nonlethal—proportional to the mission and informed by a thorough understanding of all variables of the operational environment. Mission command that conveys intent and an appreciation of all aspects of the situation guides the adaptive use of Army forces (FM 3-0). Engineer support requires a thorough understanding of full spectrum operations as described in FM 3-0.

1-35. Engineer support contributes significant combat power, both lethal and nonlethal in nature, to the elements of full spectrum operations. Organic engineer capabilities in each of the brigade combat teams (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 combat engineer capabilities, as well as an engineer battalion headquarters to provide the necessary mission command 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 primarily the movement and maneuver, protection, and sustainment warfighting functions. These same capabilities may be employed at division, corps, and theater army 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 engineering capabilities, both organic and from the force pool, support all elements of full spectrum operations by adding to a clear understanding of the physical environment.

1-36. Engineer capabilities are a significant force multiplier in full spectrum operations, facilitating the freedom of action necessary to meet mission objectives. Full spectrum operations require simultaneous combinations of offensive, defensive, and stability or civil support operations. Higher-echelon engineer activities are intrinsically simultaneous—supporting combinations of operational components, occurring at every echelon, impacting each level of war, influencing the entire spectrum of conflict. Engineer activities modify, maintain, provide understanding of, and protect the physical environment. In doing so, they enable the mobility of friendly forces and alter the mobility of adversaries. This enhances survivability and enables the sustainment of friendly forces, contributes to a clear understanding of the physical environment, and provides support to noncombatants, other nations, and civilian authorities and agencies. Indeed, engineer activities may be so widespread and enveloping that they may be viewed as a standalone objective, but they are not standalone. Engineer applications are effective within the context of the supported objective. Military engineer support is focused on the combined arms objective. To identify and maintain that focus for the widespread application of engineer capabilities, engineer support is integrated within the combined arms operation. See chapter 5 for a further discussion on engineer planning considerations for full spectrum operations.

Chapter 2

The Engineer Regiment

Engineer Soldiers are the centerpiece of the Engineer Regiment. They are the foundation of engineer forces and the repository of both expertise and skills required to provide engineer support to the combined arms team. Regardless of the importance of equipment or the expansion of technological capabilities, engineer Soldiers, not equipment or technology, carry out engineer support. Engineer Soldiers, and the engineer organizations that are built around them, focus on three engineer disciplines (combat, general, and geospatial engineering).

THE MILITARY ENGINEER PROFESSION

2-1. Military Engineering is a sub-profession within the greater profession of arms. The Engineer Regiment is the manifestation of this profession within the Army. It is a body of people—not just equipment, organizations or technology—with a passion or calling to serve as a Warrior with unique technical skills. These technical skills set the Engineer Regiment apart, providing unique knowledge, services and capabilities that the Army needs to accomplish its missions.

2-2. The Army has a broad range of diverse engineer capabilities, requiring many different types of units, personnel, and equipment. These capabilities are grouped together into three engineer disciplines (see figure 2-1). ***Engineer disciplines*** **are the interdependent areas of expertise within the Engineer Regiment. The three engineer disciplines are combat, general, and geospatial engineering.** (Joint doctrine refers to these as engineer functions.) The engineer disciplines are interdependent, each one focused on capabilities that support, or are supported by, the other disciplines. The Army categorizes engineer units, personnel, and systems based on the engineer disciplines to provide focus to unit leaders and personnel in the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) functions (for example, organizational developers, training developers, and combat developers), Engineer reconnaissance, although not a separate engineer discipline, is a critical part of each one. See FM 3-34.170 for additional discussion of engineer reconnaissance.

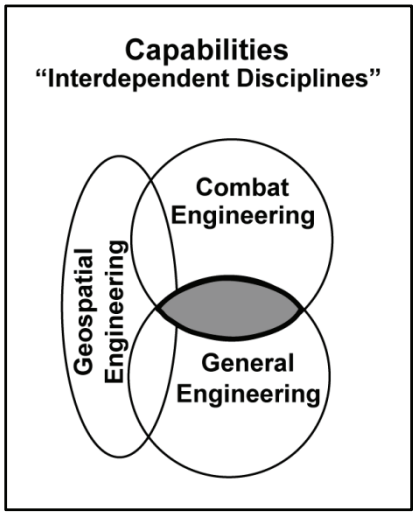

Figure 2-1. Engineer disciplines

COMBAT ENGINEERING

2-3. ***Combat engineering*** **is the engineer discipline that is focused on supporting the maneuver of land combat forces while in close support to those forces.** The characteristic that differentiates combat engineering from the other engineer disciplines is its focus on operating while in close support to maneuver forces that are in close combat.

2-4. In the past, combat engineer units have been much more likely than general engineer units to be faced with close combat. However, close combat is insufficient to distinguish combat engineering from general engineering, since all engineer units must be prepared to operate while in close combat. (See chapter 3 for more information about engineers in close combat.) The condition of operating in close support to maneuver forces that may be in close combat requires that combat engineer units be able to integrate and coordinate their actions with the fire, movement, or other actions of such forces. To do that, combat engineer units must be organized, manned, equipped, and trained differently than general engineer units, who are not designed to operate in such conditions. For example, combat engineer units are organized similarly to infantry squads and platoons, manned with additional medical personnel, equipped with different weapons and vehicles that general engineers don't need, and trained in a close habitual relationship with their supported close combat force. However, these requirements also limit the ability of combat engineer units to perform many tasks to the same standards as general engineering units. This can be overcome, in some cases, with additional equipment and training, along with augmenting technical expertise.

2-5. Combat engineering is integral to the ability of combined arms units to maneuver. 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 as well as physically and psychologically degrading his will to fight.

2-6. Many engineering tasks associated with mobility, countermobility, and survivability operations are more frequently performed under combat engineering conditions (that is, while in close support to maneuver forces that are in close combat) than are other engineering tasks, especially when performed in offensive and defensive operations in support of the tactical level of war. See chapter 3 for more discussion about mobility, countermobility, and survivability operations and their relation to the tactical, operational, and strategic levels of war.

GENERAL ENGINEERING

2-7. ***General engineering*** **is the engineer discipline that is focused on affecting terrain while not in close support to maneuver forces.** General engineering is distinguished from geospatial engineering by its focus on affecting terrain (rather than improving understanding about terrain). General engineering is distinguished from combat engineering by its focus on conditions other than close support to maneuver forces. Tasks that are most frequently performed under general engineering conditions include the construction, repair, maintenance, and operation of infrastructure, facilities, LOCs, and bases; protection of natural and cultural resources; terrain modification and repair; selected EH activities; and environmental activities. These are the primary focus for general engineer units.

2-8. General engineer units can also conduct mobility, countermobility, and survivability operations, when not under combat engineering conditions. Although organized, manned, equipped, and trained to perform their tasks in combat, they are not organized, manned, equipped, and trained to do so while in close support to maneuver forces that are in close combat. General engineer units are not designed to perform as combat engineers without significant augmentation and training.

2-9. General engineering is the most diverse of the three engineer disciplines and is typically the largest percentage of all engineer support provided to an operation, except in offensive and defensive operations at the tactical level, when combat engineering will typically be predominant. It occurs throughout the AO, at all levels of war, during every type of military operation, and may include the employment of all military

occupational specialties within the Engineer Regiment. For more information on general engineering, see FM 3-34.400. General engineering—

- 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, waste management systems, 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 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.
- Incorporates field force engineering (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).
- Includes disaster preparedness planning, response, and support to consequence management.
- Includes the acquisition and disposal of real estate and real property.
- Includes those survivability planning and construction tasks that are not considered under combat engineering.
- May include camouflage, concealment, and deception tasks.
- Includes the performance of environmental support engineering missions.
- May include base or area denial missions.
- Usually requires large amounts of construction materials, which must be planned and provided for in a timely manner.
- May include the production of construction materials.
- Requires the integration of environmental considerations (see FM 3-34.5).

GEOSPATIAL ENGINEERING

2-10. ***Geospatial engineering*** **is the engineer discipline that is focused on applying geospatial information to improve understanding of terrain for military operations.** Geospatial engineering focuses on applying information to improve the understanding of terrain, while general engineering focuses on affecting terrain. 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, to be capable of explaining the military significance of the terrain to the commander and staff and creating geospatial products for decisionmaking. 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.

2-11. Geospatial engineers generate, manage, analyze, and disseminate positionally accurate terrain information that is tied to some portion of the earth's surface. This includes 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.

2-12. Geospatial engineers enable the commander and staff to visualize the OE discussed in chapter 1. They collect, create, and process geospatial information and imagery that support analysis of the OE, either by the operational or mission variables. Additionally, geospatial engineers provide 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.

2-13. 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.

2-14. 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. ATTP 3-34.80 and JP 2-03 are the primary references for geospatial engineering.

ENGINEER ORGANIZATIONS

2-15. The Army organizes Soldiers and equipment into a variety of organizations, each with particular capabilities. Engineer units are organized based on the engineer disciplines. Organizations that have engineer capabilities comprise the Engineer Regiment, which 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 USAR engineer organizations (as well as 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 Engineer Regiment's Active Army organizations include USACE and active duty Army military engineer units within the combatant commands and Army commands. Three-fourths of the Army's military engineer units are in the Reserve Component, which provides both TEC headquarters and includes a wide range of specialized capabilities in its ARNG and USAR components. In addition, certain types of engineer units are found only in the Reserve Component. The Regiment has joint integration capabilities and supports the planning, preparing, executing, and assessing of joint operations. The Regiment is experienced at interagency support and in leveraging nonmilitary and nongovernmental engineer assets to support mission accomplishment.

2-16. 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 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. The Engineer Branch and USACE are discussed later in this section. The Office of the Chief of Engineers is a staff element assigned to the Army Staff to assist the Chief of Engineers in advising the Chief of Staff of the Army and the Army Staff. Figure 2-2 shows how engineers are organized from the tactical to the operational level.

THE ENGINEER BRANCH

2-17. The Engineer Branch includes both the human resource managers in Human Resources Command and the Engineer Branch proponent under United States Army Training and Doctrine Command. Together these components generate and manage engineer Soldiers—the centerpiece of engineer forces. The Engineer Branch proponent is the United States Army Engineer School (USAES) which trains, educates, and manages engineer Soldiers in a variety of military occupational specialties.

2-18. In addition to providing core, tactical, technical, and leader education for engineer Soldiers of all ranks, USAES also provides specialized training. Of particular interest to units are courses such as the Joint Engineer Operations Course, the Explosive Ordnance Clearance Agent Course, the Search Advisor Course, and the Sapper Leader Course. Additional training is developed and provided as required.

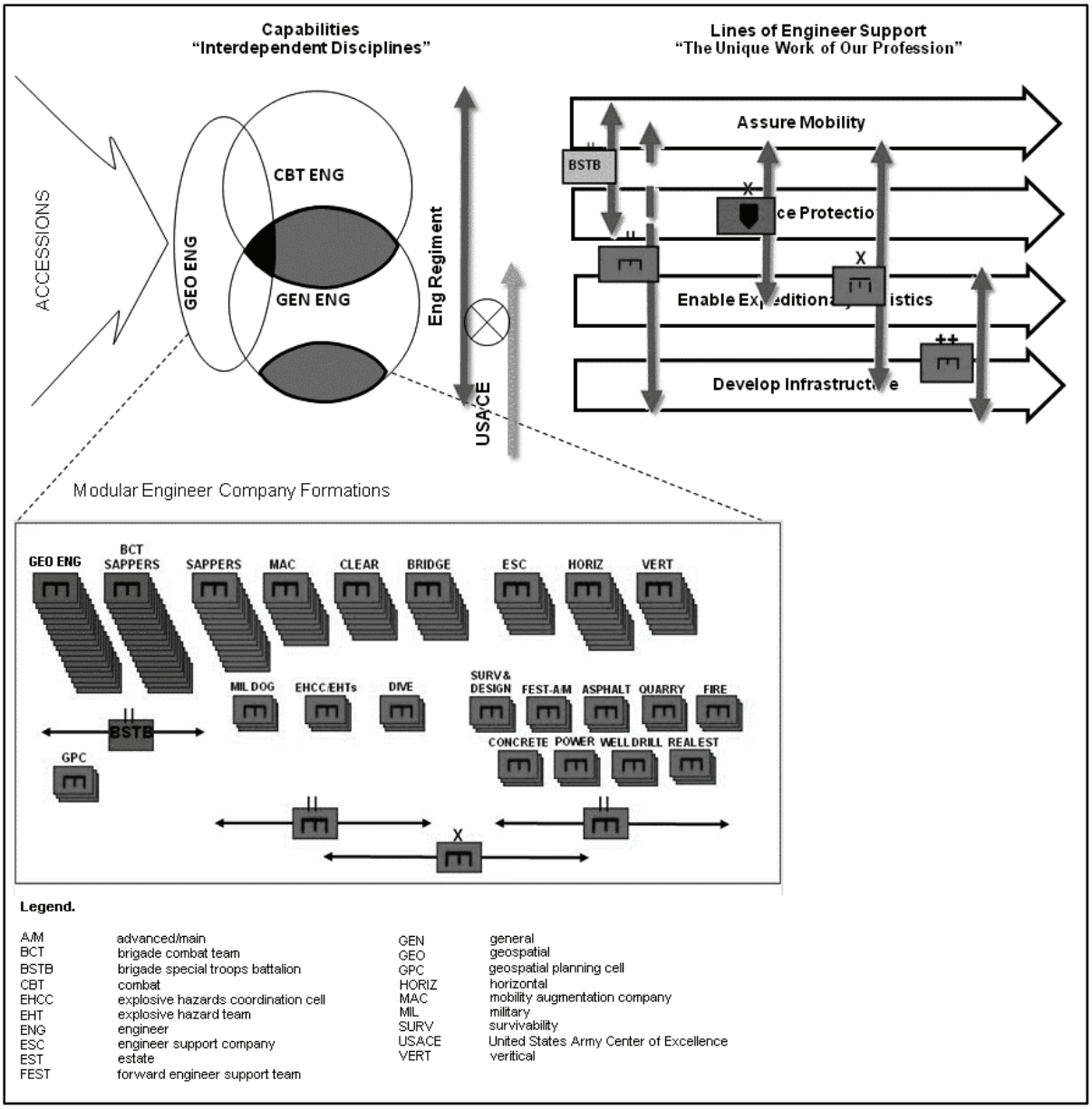

Figure 2-2. The Engineer Regiment from the tactical to operational level

2-19. USAES also hosts and manages several boards, centers, conferences, and cells, both standing and ad hoc, which support and gather feedback from engineers in the operational force. One example of an annual conference is the Engineer Force Conference that provides direct communication among senior engineer leaders. The Counter Explosive Hazards Center at the Maneuver Support Center of Excellence coordinates DOTMLPF solutions and integration for counter EH TTP. Operational support is provided to engineer forces and staffs through reachback, mobile training teams, and other mechanisms.

2-20. 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.

OPERATIONAL FORCE ENGINEERS

2-21. Engineers in 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 in conjunction with USACE as shown in figure 2-3. 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 joint operations area. This section provides an overview of engineers in the operational force. See appendix B for more details about each type of unit described in this chapter.

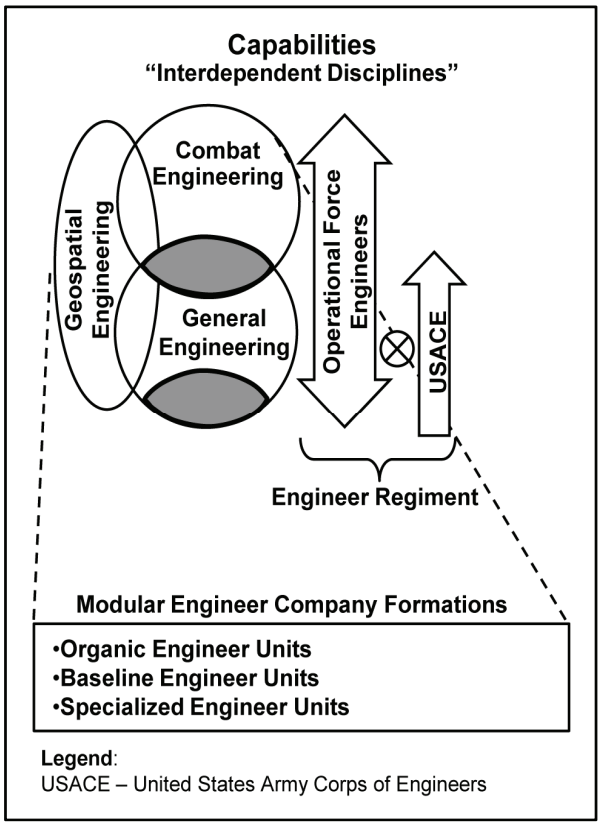

Figure 2-3. The Engineer Regiment and the engineer disciplines

MODULARITY

2-22. The Army's operational force is modular, as are the engineers in that force. There are four complementary and interdependent categories of engineer units in the operational force (including USACE-provided technical engineering and contract support as already discussed). (Figure 2-3 only depicts three of the four categories [organic, baseline, and specialized]. The other category—engineer headquarters units—is not shown.) The first category contains engineers organic to BCTs and higher-echelon headquarters. The other three categories comprise the engineer force pool, which augments organic engineers and provides engineer capabilities to echelons above the BCT. These categories include—

- Engineers that are organic to the BCTs provide the minimum combat and geospatial engineering capabilities required to support BCT operations. These units have very limited general engineering capability. Additionally, engineers are organic within the staffs of all echelons above BCT, providing engineer staff planning functions and integrating geospatial engineering support.

- Engineer headquarters units provide mission command for engineer missions and elements. Each has a staff that allows the commander to mission command assorted and various engineer organizations and other selected nonengineer units to support multifunctional missions such as combined arms breaching and combined arms gap crossing. The units in this category are the TEC, the engineer brigade, and the engineer battalion.
- Baseline engineer units provide combat and general engineering capabilities, focused primarily on the tactical to operational levels. They are used to augment organic engineers and to provide engineer capabilities to echelons above the BCT. When supporting a division or a corps, baseline engineer units are typically under the mission command of the maneuver enhancement brigade (MEB) or the engineer brigade. When supporting echelons above corps, they are typically under the mission command of a functionally focused engineer brigade, TEC, or the multifunctional MEB.
- Specialized engineer units are technically oriented (and often low-density) units that provide specialized capabilities in construction support, infrastructure development, EH mitigation, geospatial support, well drilling, real estate management, and firefighting. They primarily support the operational to strategic levels, but also provide selected support at the tactical level.

ORGANIC ENGINEER ELEMENTS

2-23. Each BCT has a combat engineer company. In the infantry brigade combat team (IBCT) and the heavy brigade combat team (HBCT), the engineer company is organic to the brigade special troops battalion (BSTB), but in the Stryker brigade combat team (SBCT) the engineer company is a separate company. Engineer staff elements are organic to the headquarters of BCTs, divisions, corps, and theater armies. Geospatial engineer teams are organic to the BCT, some modular support and functional brigades, and headquarters of divisions and corps.

2-24. These organic engineer elements provide the minimum combat and geospatial engineering capability to support BCTs. They can also perform a few general engineering tasks, but their focus is on maintaining friendly freedom of maneuver and inhibiting the enemy's ability to mass and maneuver.

2-25. Capabilities of organic engineers include—

- Providing geospatial data management and analysis.
- Conducting mobility, countermobility, and survivability operations.
- Providing mobility assessments.
- Detecting and neutralizing EH.
- Providing mission command for engineer forces.

2-26. During offensive and defensive operations, organic engineer elements require augmentation by baseline or specialized engineer units, or both. Often, this augmentation exceeds the mission command capability of the organic engineers and requires that an engineer battalion headquarters also be provided. Stability and civil support operations also require augmentation by mission-tailored engineer forces from the force pool.

FORCE POOL UNITS

2-27. Force pool units include—

- Engineer headquarters units.
- Baseline engineer units.
- Specialized engineer units.

Engineer Headquarters Units

2-28. There are three echelons of engineer headquarters units—the engineer battalion, the engineer brigade, and the TEC. Multifunctional units, discussed later in this chapter, may also provide mission command for engineer forces when engineer support is integral to the multifunctional mission. The engineer battalion is most often found in the engineer brigade, in the MEB, or in support of a BCT. The

engineer brigade, one of the Army's functional brigades, provides mission command for up to five engineer battalions at the divisions and corps level. The TEC provides mission command of engineer units for the combatant or JTF commander.

Theater Engineer Command

2-29. The TEC is designed to mission command engineer capabilities for the theater army. It is the only organization designed to do so without augmentation and can provide the JFC with an operational engineer headquarters, if required. It can also form, or provide augmentation for, a JTF engineer staff. The TEC provides mission command for all assigned or attached engineer brigades and other engineer units and missions for the joint force land component or theater army commander. When directed it may also provide mission command for engineers from other Service and multinational forces, and oversight of contracted construction engineers. The TEC is focused on operational-level engineer support across all three of the engineer disciplines and typically serves as the senior engineer headquarters for a theater army, land component headquarters, or potentially a JTF.

2-30. Considerations for organizing and employing the TEC include—

- The TEC provides support for all operational planning for the area of responsibility (AOR) across all of the engineer disciplines. It synchronizes all engineer planning and support for the geographic combatant commander (GCC) or JTF commander, providing peacetime training and support of military engagement for their supported respective CCDRs. The TEC coordinates closely with the senior contract construction agents in the AO.
- The TEC is a modular organization that can be tailored based on mission requirements. It can deploy modular staff elements and organizations to provide the operational commander with a wide range of technical engineering expertise and support. Each TEC can deploy its main command post (CP) and two deployable command posts (DCPs) to provide flexibility and rotational capability. USACE can deploy its FFE assets to augment DCPs, bringing capabilities in areas such as contracting, real estate, and interagency coordination. Their tele-engineering capabilities enable their deployed elements to collaborate with subject matter experts in USACE, other Service technical laboratories and research centers, and other sources of expertise in the civilian community.

Engineer Brigade

2-31. The engineer brigade, one of the Army's functional brigades, can control up to five mission-tailored engineer battalions having capabilities from any of the three engineer disciplines. It may also provide mission command for nonengineer units performing, for example, missions in support of a deliberate gap (river) crossing. Considerations for organizing and employing the engineer brigade headquarters include—

- A division or corps requires one or more engineer brigades whenever the number of engineer units, or the functional nature of engineer missions, exceeds the mission command 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 can support a JTF or a Service or functional component command (land, air, or sea) and provide mission command of all Service engineers and oversight of contracted engineering within an AO. The engineer brigade can provide DCPs with staff expertise in engineer support as required. With augmentation, it may serve as a joint engineer headquarters and may be the senior engineer headquarters deployed in a joint operations area 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.

Engineer Battalion

2-32. The engineer battalion can conduct engineer missions and control up to five mission-tailored engineer companies. The engineer battalion is typically found in the engineer brigade, in the MEB, or supporting a BCT. Except for the prime power battalion, which performs a specialized role, all engineer

battalion headquarters, when appropriately task-organized, can provide mission command for both combat and general engineering capabilities. Due to habitual training relationships, some battalion headquarters are more capable in combat engineering than in general engineering, or vice versa. Some battalion headquarters have additional capabilities such as airborne or air assault capabilities. Considerations for organizing and employing the engineer battalion headquarters include—

- Whenever two or more engineer modules are task-organized in support of a BCT, an MEB, an engineer brigade, or another unit, an engineer battalion headquarters may be required for the mission command and sustainment of those modules.
- An engineer battalion may support an MEB for combat or general engineering missions. The engineer battalion provides mission command 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 mission command of engineer missions. 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.
- When assigned construction or EH clearance missions, the battalion should receive construction design and survey teams or explosive hazards teams augmentation.

BASELINE ENGINEER UNITS

2-33. Baseline engineer units include both combat and general engineer units (see table 2-1). They are the primary building blocks for the organization of most engineer battalions. These units may augment the organic engineer capabilities of a BCT, or they may be task-organized under an engineer battalion headquarters to provide specific tailored capabilities to echelons above brigade (EAB). (See appendix B for more detailed information on baseline engineering units.)

Table 2-1. Baseline engineer units

Combat Engineer Units	*General Engineer Unit*
Sapper company	Engineer support company
Mobility augmentation company	Horizontal construction company
Clearance company	Vertical construction company
Multirole bridge company	

Combat Engineer Units

2-34. Baseline combat engineer units are focused on supporting combined arms operations at the tactical level. They are designed to provide close support to maneuver forces that are in close combat. All have the capability to fight as engineers or, if required, as infantry. An engineer battalion headquarters is typically included to provide the necessary mission command, logistics, and staff supervision for attached and assigned units when two or more are assigned to a BCT, an MEB, or another organization. Combat engineer (Sapper) units may construct tactical obstacles, defensive positions, and fixed and float bridges; repair CPs, LOCs, tactical routes, culverts, and fords; and conduct general engineering tasks related to horizontal and vertical construction, when augmented with appropriate tools, equipment, and training. Combat engineer units also provide engineer support for gap-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 to support 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) when required by the mission.

General Engineer Units

2-35. General engineer units include horizontal and vertical construction companies and engineer support companies. They can construct, rehabilitate, repair, maintain, and modify 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 units can be expanded by augmenting them with additional personnel, equipment, and training from specialized engineer units or other sources. Such augmentation can give them the capability to conduct bituminous mixing and paving, quarrying and crushing, pipeline construction, dive support, and major horizontal construction projects such as highways, storage facilities, and airfields.

SPECIALIZED ENGINEER UNITS

2-36. Specialized engineer units provide general and geospatial engineering capabilities at the operational and strategic levels, and they augment those capabilities at the tactical level (see table 2-2). Many of their capabilities are lower density than those of the baseline engineer units. These smaller, more specialized units are designed to support technical aspects within larger engineer-related missions or to augment selected headquarters elements.

Table 2-2. Specialized Army engineer force pool units

Explosive Hazard Support	*Construction Support*	*Infrastructure Support*	*Geospatial Support*	*Field Force Engineering*
• Explosive hazard coordination cell • Explosive hazards team • Military working dogs	• Survey and design team • Construction management team • Real estate team • Diving team • Asphalt team • Concrete section • Well drilling team • Quarry platoon	• Prime power company, platoon, or detachment • Engineer facility detachments • Firefighting team	• Topographic engineer company • Geospatial planning cell	• Forward engineer support team; advanced or main (with embedded environmental, contingency real estate, and other support teams as needed) (see paragraph 2-28)

Explosive Hazards Support

2-37. EH support provides mission command 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

2-38. Construction support provides mission command for management and procurement and oversight of contracted 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

2-39. 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 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. Engineer facility detachments support theater opening and closing, base development, construction management, contract technical oversight, base operations (to include waste management functions), and master planning. Firefighting teams provide first responder support for facilities and aviation operations.

Geospatial Support

2-40. Two specialized engineer units provide geospatial engineering capabilities (see ATTP 3-34.80). Topographic engineer companies provide geospatial support to deployed units that require augmentation. They provide modules tailored to support the GCC, JTF headquarters, theater army, corps and division headquarters, sustainment brigades, other joint or multinational division- and brigade-size elements, and the Federal Emergency Management Agency regions. Their geospatial engineering capabilities include analysis, collection, generation, management, finishing, and printing. Geospatial planning cells generate, manage, and disseminate geospatial data, information, and products in support of the ASCC headquarters and GCC.

2-41. 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 (ERTs) 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.

2-42. Table 2-3, page 2-12, shows the Regiment's various engineer organizations and capabilities at the tactical to operational level. Appendix B provides a more in-depth view of the organizations depicted in table 2-3.

Table 2-3. Elements of the Engineer Regiment

Engineer Element		*Component (COMPO)*		
		Active Component	*Army National Guard*	*United States Army Reserve*
Engineer Forces	Brigade Combat Team Engineer Company	m	m	
	Geospatial Engineer Team	m	m	
Engineer Headquarters Forces	Engineer Battalion Headquarters	m	m	m
	Engineer Brigade Headquarters	m	m	m
	Theater Engineer Command			m
Baseline Engineer Forces	Sapper Company	m	m	m
	Mobility Augmentation Company	m	m	m
	Clearance Company	m	m	m
	Engineer Support Company	m	m	m
	Horizontal Construction Company	m	m	m
	Vertical Construction Company	m	m	m
	Multirole Bridge Company	m	m	m
Specialized Engineer Forces	Survey and Design Team	m	m	m
	Concrete Section	m	m	m
	Asphalt Team		m	m
	Firefighting Team		m	m
	Explosive Hazard Team or Coordination Cell	m	m	m
	Engineer Squad (Canine)	m		
	Diving Team	m	m	
	Topographic Company	m	m	
	Geospatial Planning Cell	m		
	Construction Management Team	m	m	m
	Engineer Facility Detachment		m	m
	Prime Power Company*	m	m	
	Well Drilling Team		m	m
	Quarry Platoon		m	
	Real Estate Team			m
	Forward Engineer Support Team*	m	m	
	Area Clearance Platoon	m	m	m
*These units are assets of the United States Army Corps of Engineers				

UNITED STATES ARMY CORPS OF ENGINEERS

2-43. 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. Other services include wetlands and waterway management and disaster relief support operations (USACE has primary responsibility to execute Emergency Support Function #3, Public Works and Engineering, for DOD). Most of its assets are part of the generating force (see FM 1-01), but selected elements support the operational Army, to include various FFE teams (see paragraph 2-28) and the 249th Engineer Battalion (Prime Power). 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, 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.
- Army Geospatial Center.

UNITED STATES ARMY CORPS OF ENGINEERS MISSIONS

2-44. USACE capabilities include access to the expertise of U.S. Army Engineer Research and Development Center's centers and laboratories and all of the resources within the divisions, districts, and other sources. USACE has aligned its divisions with and assigned liaison officers to CCDR and Army commanders (see figure 2-2, page 2-5) to enable access to USACE resources to support engagement strategies and wartime operations. The USACE mission supports full spectrum operations with the following five major functions:

- Military support—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—balances requirements between water resources development and environment.

2-45. 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 mission command 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 reachback capabilities using tele-engineering when necessary. Tele-engineering is the communications architecture that facilitates reachback when the existing communications infrastructure will not support it. Tele-engineering is under the proponency of the USACE and is inherent in FFE.

FIELD FORCE ENGINEERING

2-46. USACE is the primary proponent of FFE and related generating force support which enable engineer support to the operational Army. ***Field force engineering*** **is the application of the Engineer Regiment's**

capabilities from the three engineer disciplines (although primarily general engineering) to support full spectrum operations through both reachback and forward presence. It enables generating force engineer support to deployed operating forces and is provided by technically specialized personnel and assets (deployed or participating through reachback) or through operational force engineer Soldiers linked to reachback capabilities. 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 communication systems such as tele-engineering. The FFE concept is applicable in joint and multinational operations to provide technical engineer solutions that can be implemented faster and with a smaller footprint. The United States Air Force and United States Navy 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).

2-47. The USACE objective for FFE is to effectively leverage its generating force capabilities (engineering expertise, contract construction, real estate acquisition and disposal, and environmental engineering) in operations and maximize the use of reachback to provide technical assistance and enable operational force engineers in their support to the CCDR or JTF commander. One of the ways USACE accomplishes this is by training, equipping, and maintaining specialized deployable FFE teams. These deployable USACE organizations provide technical assistance, enable operational force engineers, and access additional technical support through reachback. Another way that USACE supports the operational force is through nondeployable teams that provide dedicated engineering assistance in response to requests for information from deployed teams or engineer Soldiers in the operational area. Focus areas for these teams include infrastructure assessment and base camp development.

2-48. FFE teams are the primary elements within USACE that are organized, trained, and equipped to provide technical solutions to engineering and construction-related challenges. These elements deliver FFE to supported units through their engineer staff. FFE teams serve as forward planning, execution, or liaison teams to support full spectrum operations or offer dedicated reachback support to deployed teams and engineer Soldiers in need of technical support. FFE teams are flexible and can be tailored for specific missions. They typically develop solutions employing their own available resources but have the option to employ reachback to the entire array of expertise within the USACE laboratories or centers of expertise for more complex engineering issues. USACE has expertise that may support the strategic, operational, or tactical level 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 missions. Teams include forward engineer support teams (FESTs), contingency real estate support teams (CRESTs), environmental support teams (EnvSTs), logistics support teams (LSTs), and base camp development teams (BDTs).

- A forward engineer support team-main (FEST-M) is a deployable team that provides construction management, real estate, environmental, geospatial, and other engineering support (typically to the theater army) and can provide mission command for deployed FFE teams. This team would typically support a JTF or the land component of a JTF, either task-organized to that headquarters or to a supporting engineer headquarters. The FEST-M operates as augmentation to either the joint force engineer staff or the engineer headquarters element or may operate as a discrete headquarters element. It is designed to provide mission command for additional FFE elements when task-organized with those organizations. In some cases, the FEST-M may provide the base upon which a contingency USACE district is established in theater. The FEST-M element conducts a variety of core essential tasks in support of stability operations, consequence management or civil support, and technical engineering missions. It requires sustainment and security support from the gaining or supported unit.
- A forward engineer support team-advance (FEST-A) is a deployable team that provides infrastructure assessment; engineer planning and design; and environmental, geospatial, and other technical engineering support (from theater army to brigade echelon) and augments the

staff at those echelons. This team could support any echelon configured as a joint force headquarters for limited interventions or may be task-organized at corps, division, and brigade echelons when configured as intermediate or tactical headquarters. The FEST-A operates as augmentation to either the supported force engineer staff or to the supporting engineer headquarters. It is designed to receive task-organized CREST and EnvST elements when those capabilities are required. A FEST-A may also provide FFE support within an assigned area as a subordinate element of a FEST-M. The FEST-A conducts a variety of core essential tasks in support of stability operations, consequence management or civil support, and technical engineering missions. The FEST-A requires sustainment and security support from the gaining or supported unit.

- A CREST is a deployable team which can acquire, manage, and dispose of real property on behalf of the U.S. government. This team could support any echelon but will typically be tailored to support an Army component headquarters configuration with support missions requiring real estate management. The CREST operates as augmentation to the supported force engineer staff or supporting engineer headquarters. It may also be task-organized to a tailored FEST. The CREST conducts real estate management tasks and should be deployed early in a contingency to facilitate acquisition of real estate in support of the development of facilities for U.S. forces. It requires sustainment and security support from the gaining or supported unit.
- An EnvST is a deployable team that conducts environmental assessments, baseline and other surveys, and studies. This team could support any echelon, but will typically be tailored in support of an Army component headquarters configuration with support missions requiring base camp development. The EnvST operates as augmentation to either the supported force engineer staff or to the supporting engineer headquarters. It may also be task-organized to a tailored FEST. The EnvST conducts environmental management tasks in support of base camps and other technical engineering missions. The team should be deployed as an initial element to perform assessments, identify environmental hazards, and remain as one of the last elements to provide remediation actions and support for base closure. The EnvST requires sustainment and security support from the gaining or supported unit.
- An LST is a deployable team that coordinates sustainment support for deployed FFE or emergency management elements when those requirements exceed or are not provided by the operational force logistics system. This team typically supports the FEST-M when that team provides mission command for additional FFE elements. The LST could operate in support of reception, staging, onward movement, and integration (RSOI) for deploying FFE elements. The LST conducts generating force-specific sustainment tasks in support of consequence management, civil support, and stability operations. The LST requires sustainment and security support from the gaining or supported unit.
- A BDT is a nondeployable team within a selected USACE district that can quickly provide base development engineering, master planning, and facilities design in support of FFE and other reachback requests for information. BDTs are trained and organized within the USACE divisions and maintain a rotational readiness cycle. While these teams are capable of responding to a variety of complex technical problems, they are also trained to exploit the entire array of expertise within the USACE laboratories or centers of expertise, as needed, for more complex engineering issues. Focus areas for the BDTs are engineering-related planning and development issues involved in locating, designing, constructing, and eventually closing or transferring base camps. Note that base camp operations and maintenance activities are not within the scope of FFE support but may rely on FFE applications to address specific technical engineering requirements when necessary. The BDT's resources and expertise are available to support FFE teams and operational forces through the USACE Reachback Operations Center, which can be contacted via <https://uroc.usace.army.mil.>

Note. See Engineer Pamphlet 500-1-2 for additional information on FFE.

DEPARTMENT OF DEFENSE CONSTRUCTION AGENTS

2-49. The Secretary of Defense has designated USACE and NAVFAC as contract 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.

Chapter 3

Foundations of Engineer Support to Operations

Army engineer support to operations encompasses a wide range of actions requiring many capabilities. Commanders use engineers in all elements of full spectrum operations and in all operational themes across the spectrum of conflict. They use them primarily to assure mobility, enhance protection, enable logistics, and develop infrastructure. This chapter describes lines of engineer support, engineering tasks, engineer support to combat power, and engineers in close combat.

OVERVIEW

3-1. All engineering tasks have providing freedom of action as their objective. These tasks provide freedom of action by loosening the grip of the terrain and the enemy on our forces. Engineering tasks that affect terrain deal with obstacles (including gaps), bridges, roads, trails, airfields, fighting positions, protective positions, deception positions, and a wide variety of other structures and facilities such as base camps, ports, utilities, and buildings. Engineers affect these by clearing, reducing, emplacing, building, repairing, maintaining, camouflaging, protecting, conserving, or modifying them in some way. Engineers reduce the grip of the enemy through tasks such as reducing obstacles, route clearance, support to search operations, infrastructure development in stability operations, and geospatial engineering support to intelligence. Many of these tasks fall under the categories of mobility, countermobility, or survivability operations.

3-2. Regardless of their category, engineering tasks have different purposes in different situations. For example, a task to clear EH from a road that has been designated a direction of attack may have the purpose of supporting the maneuver of a mechanized unit. But two days later, when that road has been designated as an MSR, a task to clear EH from that same road may have the purpose of supporting sustainment. The next month, when that road is needed by the population to get their goods to market or to get to the polls, a task to clear EH from that same road may have the purpose of supporting the improvement of civil conditions. In all three cases the same task is involved, but with different purposes. In addition to the different purposes an engineering task can have at different times, engineer support often involves simultaneous tasks with different purposes and supporting different warfighting functions (see below). This chapter explains how engineering tasks are grouped by purpose into lines of engineer support, how they are grouped into types of operations, how they contribute to the warfighting functions, and how engineers operate in close combat.

LINES OF ENGINEER SUPPORT

3-3. Fundamental to engineer support to operations is the ability to anticipate and analyze the problem and understand the operational context from chapter 1. Based on this understanding and the analysis of the problem, engineer planners select and apply the right engineer discipline and type unit capabilities to perform required individual and collective tasks. They must think in combinations of disciplines and arrange actions in concert with maneuver. Finally they provide necessary mission command for these combinations. The lines of engineer support are the framework that underpin how engineers think in combinations, and these lines provide the connection between capabilities and operations.

3-4. Commanders use lines of engineer support to synchronize engineering tasks with the rest of the combined arms force and to integrate them into the overall operation throughout the operations process. ***Lines of engineer support*** **are categories of engineer tasks and capabilities that are grouped by purpose for specific operations.** As depicted in figure 3-1, page 3-2, lines of engineer support help commanders and staffs combine the capabilities from all three engineer disciplines and from throughout the

Corps of Engineers and align their activities according to their purpose. The engineer disciplines are capabilities, based on knowledge and skills, organized in units. These units, organized based on discipline, execute individual and collective tasks. The combination of these tasks for a specific purpose, in the context of full spectrum operations, achieve the lines of support.

3-5. Regardless of where a task falls within the Army universal task list, task alignment with an engineer line of support is determined by the purpose of the task in a given situation. Engineer support is primarily focused on achieving purposes along four lines of engineer support: assure mobility, enhance protection, enable logistics, and develop infrastructure.

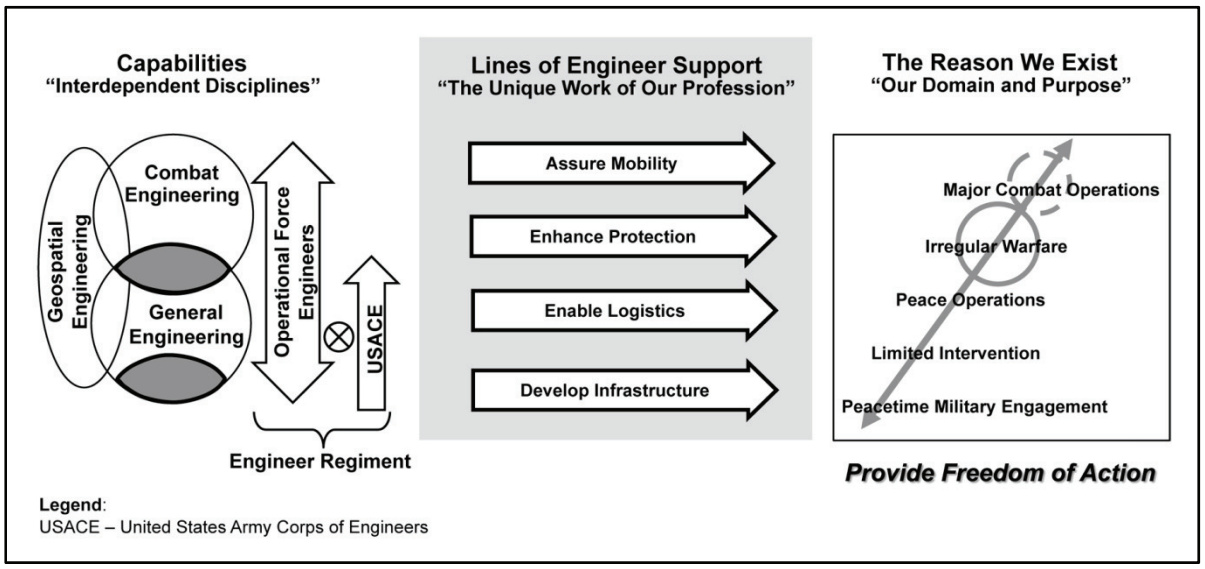

Figure 3-1. Lines of engineer support

3-6. All three engineer disciplines (see chapter 2) encompass tasks along the lines of engineer support. The combat engineering discipline, due to its close support to maneuver forces that may be in close combat, is primarily focused on tasks that assure mobility and enhance protection. The general engineering discipline performs tasks along all four lines. Geospatial engineering provides essential support to all four lines.

ASSURE MOBILITY

3-7. The assure mobility line of support is the orchestrating of combat engineering, general engineering, and geospatial engineering capabilities in combination in order to allow a commander to gain and maintain a position of advantage against an enemy. This includes denying the enemy freedom of action to attain his own position of advantage.

3-8. Tasks in this line of engineer support are intended to support the ability of a force to move or maneuver (see primarily FM 3-90, FM 3-90.4, and FM 90-7). This includes engineering tasks, primarily related to mobility and countermobility (see below), with a focus on the movement and maneuver warfighting function.

3-9. When supporting tactical maneuver, this line of engineer support consists primarily of mobility and countermobility tasks (though such tasks can be used in other lines, too). Both combat and general engineers conduct these tasks, although the conditions described in chapter 2 may require that combat engineers conduct them. When supporting operational maneuver or force projection, this line of engineer support often involves tasks such as constructing, repairing, and maintaining bridges, roads, and airfields.

SUPPORT TO MOBILITY OPERATIONS

3-10. Engineers are essentially always involved with mobility operations to mitigate the effects of obstacles and enhance freedom of movement and maneuver. While some mobility tasks are performed by

other disciplines, this section addresses only engineer-focused tasks that support mobility operations. (See FM 3-90.4 for more information on mobility operations and the more comprehensive list of tasks that support them.)

3-11. The engineering tasks that support mobility operations include those that reduce, clear, or mark obstacles (including gaps); clear or mark lanes and trails; and build, repair, or maintain roads, bridges, and airfields. Mobility operations include the following six primary tasks (see FM 3-90.4):

- Conduct breaching operations.
- Conduct clearing operations (see FM 3-34.210 and FM 3-90.119).
- Conduct gap-crossing operations.
- Construct and maintain combat roads and trails.
- Construct and maintain forward airfields and landing zones.
- Conduct traffic operations.

3-12. Engineering tasks to reduce, clear, or mark obstacles (including gaps) and tasks to clear or mark lanes and trails, frequently occur under conditions that require combat engineer units (as discussed in chapter 2) and most frequently occur when these tasks are conducted at the tactical level in support of maneuver. These tasks are often considered combat engineering tasks, even though general engineer units can perform them when the conditions allow.

3-13. Engineering tasks to build, repair, or maintain roads, bridges, and airfields usually do not occur under conditions that require combat engineer units. As a result, these tasks are often considered general engineering tasks, even though combat engineer units can perform them, given additional training and augmentation if necessary. (Combat engineers perform these tasks if performed under conditions of close support to maneuver forces that are in close combat.)

3-14. Engineer contributions to the planning of mobility operations occur at all levels of war (tactical, operational, and strategic) and in all four elements of full spectrum operations (offensive, defensive, stability, and civil support operations). The execution of engineering tasks in support of mobility predominately occurs at the operational and tactical levels of war, but will often have strategic level implications. At the tactical level of war, they frequently require combat engineer units, especially in offensive and defensive operations. At the operational level, they are typically performed by general engineer units. In offensive and defensive operations, they are focused on mobility of friendly forces. In stability and civil support operations, they are often focused on mobility of the population.

3-15. Engineer tasks that support mobility operations typically support the assure mobility line of engineer support, but may also support the other three lines. Similarly, a road constructed for a LOC has the purpose of enabling sustainment. Likewise, a bridge might be constructed to develop infrastructure, allowing the local population to transport goods to market. Engineers perform these tasks most frequently as part of the movement and maneuver warfighting function, but also perform them in support of protection, sustainment, or the other warfighting functions. Combat engineering is typically focused on mobility at the tactical level while general engineering is typically focused on mobility at the operational level (although general engineering may at times impact strategic mobility).

3-16. Mobility tasks are typically identified as essential tasks and may require integration into the synchronization matrix to account for the assets and time required to implement them. See chapter 5 for a discussion of planning considerations for mobility, countermobility, and survivability.

SUPPORT TO COUNTERMOBILITY OPERATIONS

3-17. ***Countermobility operations*** **are those combined arms activities that use or enhance the effects of natural and manmade obstacles to deny an adversary freedom of movement and maneuver.** 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.

3-18. Countermobility operations typically involve engineers and must always include proper obstacle integration with the maneuver plan, adherence to obstacle emplacement authority, and rigid obstacle control. Combined arms obstacle integration, which is further described in FM 90-7, is the process that synchronizes countermobility operations into the scheme of movement and maneuver and the scheme of fires. The engineer advises the commander on how to integrate obstacles and coordinates for obstacle emplacement authority, establishes obstacle control, recommends directed obstacles, supervises the employment of obstacles, and maintains obstacle status throughout the operation. 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.

3-19. Countermobility operations are discussed in detail in FM 5-102. The engineering tasks that support countermobility operations include those that emplace, build, repair, maintain, or camouflage obstacles (including gaps). These tasks are often performed under conditions of close support to maneuver forces that are in close combat, which require combat engineers units (as discussed in chapter 2). Such conditions most frequently occur when these tasks are conducted at the tactical level as part of offensive or defensive operations. They are often considered combat engineering tasks, even though general engineer units can perform them when the conditions allow. Countermobility operations include the following tasks:

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

3-20. The effects of natural and manmade obstacles are considered during planning at every level of war. At the tactical level of war, combat engineers play a more prominent role in the integration of tactical obstacles in support of offensive and defensive operations. General engineers also may be involved in countermobility operations intended to achieve operational (or even strategic) effects. Countermobility operations typically block, fix, turn, or disrupt the enemy's ability to move or maneuver, giving the commander opportunities to exploit enemy vulnerabilities or react effectively to enemy actions. In stability operations, countermobility tasks may support missions such as traffic control. (See FM 90-7 for information on combined arms obstacle integration and the integration of countermobility.)

3-21. Engineers usually perform these tasks under the first two lines of engineer support: to assure mobility and to enhance protection, although they may also be applicable in selected cases for the other two lines of engineer support. These tasks typically support the movement and maneuver and protection warfighting functions.

3-22. In conducting mining operations, U.S. forces use rules of engagement (ROE) to ensure their actions are consistent with current law and policy. 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 policy governing their use. The current U.S. land mine policy acknowledges the importance of protecting noncombatants while enabling legitimate operational 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 no longer uses nondetectable land mines of any type (see JP 3-15). The United States 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 (AT) effects with the ability to be turned on/off/on from a distance and recovered for multiple employments.

OTHER TASKS IN THE ASSURE MOBILITY LINE OF SUPPORT

3-23. Geospatial engineering provides the necessary geospatial information and products to help combat and general engineers visualize the terrain and perform tasks along this line of engineer support. Terrain analysis and visualization products provided by geospatial engineers are always important to this line, even when no other engineer disciplines are involved.

- Three-dimensional perspective views and fly throughs to enhance visualization of the terrain.
- Mobility corridor and combined obstacle overlays to identify assembly areas , plan movements, and develop engagement areas.
- Fields of fire and line of sight analysis products to locate defensible terrain, identify potential engagement areas, and position fighting systems to allow mutually supporting fires.
- Urban Tactical Planner that displays keys aspects of urban terrain in thematic layers overlaid on high resolution imagery or maps to facilitate mission planning in urban areas.

3-24. This line of engineer support does not include engineering tasks intended to support the administrative movements of personnel and materiel. Such tasks are normally intended to enable logistics (see below). The assure mobility line of engineer support is achieved through the assured mobility framework, which is described in chapter 5 and in more detail in FM 3-90.4.

ENHANCE PROTECTION

3-25. This line of support is the combination of the engineer disciplines in order to support the preservation of the force so the commander can apply maximum combat power. This line of engineer support consists largely of survivability tasks, but also can include selected mobility tasks (for example, construction of perimeter roads), countermobility tasks (for example, emplacement of protective obstacles), and explosive hazard (EH) operations tasks. This line includes survivability and other protection tasks performed or supported by engineers (see FM 5-103 and FM 3-37). Geospatial engineering tasks also support this line.

SUPPORT TO SURVIVABILITY OPERATIONS

3-26. *Survivability operations* are those military activities that develop and construct protective positions, such as earth berms, dug-in positions, overhead protection, and countersurveillance means, to reduce the effectiveness of enemy weapon systems. They also include other mitigation TTP, such as fire prevention and firefighting (see FM 5-415). Survivability operations range from employing camouflage, concealment, and deception (CCD) (including the supporting task of battlefield obscuration) to hardening facilities, mission command nodes, and critical infrastructure.

3-27. While survivability operations are traditionally recognized as an engineering task, units at all echelons have an inherent responsibility to improve their positions as part of their own protection. This section focuses on engineering tasks in support of survivability operations, which include tasks to build, repair, or maintain fighting and protective positions; and harden or camouflage roads, bridges, airfields, and other structures and facilities. 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.

3-28. Engineers typically perform these tasks under this line of engineer support—to enhance protection—and as part of the protection warfighting function (see FM 3-37). They frequently enable other protection tasks and systems, including air and missile defense, operational area security, antiterrorism, and CBRN operations. The concept of survivability (one of the protection tasks, see FM 3-37) 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, forward operating bases, base camps, and in many cases HN and other infrastructure support. Today's OE requires commanders to know all of the 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.

3-29. Engineering tasks that support survivability operations occur predominately at the operational and tactical levels of war and in all four elements of full spectrum operations. At the tactical level of war, they often occur under conditions of close support to maneuver forces that are in close combat, which require combat engineer units (as discussed in chapter 2). This most often occurs for tasks to build, repair, or maintain fighting and protective positions. Those tasks are often considered combat engineering tasks, even though general engineer units can perform them when the conditions allow. At the operational level, engineering tasks that support survivability operations are typically performed by general engineer units. In offensive and defensive operations they are focused on protection of friendly forces, but in stability and civil support operations they sometimes focus on protection of the population.

3-30. 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 AT guided missiles (shoulder-launched munitions and close combat missiles), crew-served weapons, and tanks. Defensive protective positions include mission command 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 petroleum, oil, and lubricants 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. (See graphic training aid 90-01-011 for additional considerations for survivability of forward operating bases.)

OTHER TASKS THAT ENHANCE PROTECTION

3-31. Engineers also enhance protection through explosive hazard operations (see FM 3-34.210). These include area and route clearance; specialized search using engineer working dog teams; and the collection, analysis and dissemination of explosive hazard information. These efforts to mitigate the effects of EH can be performed by engineers at all echelons or be by specialized units such as the explosive hazard coordination cells (see ATTP 3-34.23) and area clearance platoons.

3-32. Engineer mobility and countermobility tasks typically support the assure mobility line of engineer support, but may also support this line of support. For example, if a trail is being constructed for the purpose of being used as a perimeter road to secure a base, then its purpose is to enhance protection. Countermobilty tasks can be used to provide protective obstacles for the protection of military bases (see FM 3-37). Constructing an entry control points, a countermobility task, would also be included in this line of support since its purpose is to provide protection to the base.

ENABLE LOGISTICS

3-33. Engineers combine capabilities from all three engineer disciplines to enable the movement and support of forces. These capabilities are applied to establish and maintain the infrastructure necessary for sustaining military operations in theater. Tasks in this line of engineer support are primarily intended to support the logistics component of the sustainment warfighting function. This line consists largely of building, repairing, and maintaining roads, bridges, airfields, and other structures and facilities needed for APODs, SPODs, MSRs, and base camps. Mobility tasks sometimes support this line and geospatial engineering tasks are also key enablers. For example, geospatial engineers would provide LOC overlays that display road network, airfield, and port information and capabilities to facilitate movement planning.

3-34. Task in the enable logistics line of support are primarily general engineering tasks because they are usually not performed under conditions of close support to maneuver forces that are in close combat. These tasks, which are covered in more detail in FM 3-34.400, include—

- Restoring damaged areas (including environmental damage).
- Constructing and maintaining sustainment LOCs, including constructing and maintaining—
  - Roads and highways.

  - Over-the-shore facilities.
  - Ports.
  - Railroad facilities.
  - Airfield facilities.
  - Pipelines and tank farms.
  - Standard and nonstandard fixed bridges.
- Providing engineer construction support.
- Supplying mobile electric power.
- Providing facilities engineering support, including—
  - Utilities and waste management.
  - Real estate acquisition, management, remediation, and disposition.
  - Firefighting.
  - Base and installation design, construction, management, and maintenance.

3-35. These typically general engineering focused tasks.

- May be performed by modular units or through the use of commercial contract construction management assets such as USACE; NAVFAC; the Air Force Center for Engineering and the Environment; or multinational, HN, and other agencies.
- 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.
- 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, management, remediation, and disposal of real estate and real property.
- Include those survivability planning and construction tasks that are not considered under combat engineering.
- May include the performance of environmental support engineering missions.
- May include base or area denial missions.
- May 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 3-34.5).

DEVELOP INFRASTRUCTURE

3-36. Engineers combine capabilities from across all three disciplines to support the improvement of civil conditions, which are vital to stability and civil support operations. This line consists primarily of building, repairing, and maintaining various infrastructure facilities, providing essential services, and more importantly, improving HN capabilities to perform such tasks. Linkages to stability and civil support tasks are predominant in this line; particularly restore essential services and support to economic and infrastructure development (see FM 3-07).

3-37. This line of support consists primarily, but not exclusively, of general engineering tasks. Many of the tasks that support this line are the general engineering tasks listed previously in the enable logistics line of support. However, the key difference from the enable logistics line of support is the purpose and desired effect. The primary purpose of the tasks in the develop infrastructure line of support is to support the commander in improving the conditions of the HN population and influencing them to achieve military objectives, not the sustaining support to our forces. Mobility tasks also support this line and geospatial engineering tasks are key enablers.

3-38. The different purposes of develop infrastructure and enable logistics will in most cases significantly change the manner in which the task is executed. For example, building a road could be a task for either the enable logistics or the develop infrastructure line of support. While the completed road may be the same for either line, the conditions and requirements to build it may be very different due to its intended purpose. If the road is being built to improve the local economic conditions, using local labor in order to increase employment may be more important than just completing the work in the quickest manner possible. Additionally, a road for the local populace may require coordination with many different local agencies, organizations, and ministries in order to support the local government and assist them in establishing legitimacy. Engineers may be required to provide technical training to HN managers and engineers in planning, designing, and constructing the road. The interaction with the population in the process of building the road may likely take priority over the quality and speed of completion of the road itself.

3-39. Included in the develop infrastructure line of support is the engineer's role in capacity building (see FM 3-07). Tasks to improve HN infrastructure will require coordination with local or national-level government agencies or ministries that maintain or control infrastructure. These tasks may emphasize development of local technical and engineering capacity. Engineers may be required to train and develop local leaders, engineers, and organizations in the process of executing a task in this line of support. For example, an engineer unit that is assisting the local populace in improving drinking water systems will also have to train the local public works to operate and maintain the system.

3-40. While engineers at all echelons may have some support to capacity building requirements, USACE field force engineering units have additional expertise to support host nation capacity building and spur long-term development. Engineers supporting BCT support may capacity development in training individuals and local organization to provide essential services.

ENGINEER RECONNAISSANCE

3-41. Engineer reconnaissance provides data that contributes to answering the commander's critical information requirements and is necessary in all lines of engineer support. Engineers must fight for information to answer these requirements in order to accomplish all four lines of engineer support. Reconnaissance is inherent in all three disciplines; however, the information they must fight for may be different and be tactical or technical in nature. The engineer disciplines 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 disciplines or warfighting functions.

3-42. The majority of tactical engineer reconnaissance capabilities enable the collection of technical information in support of the combat engineer discipline. Reconnaissance in support of mobility, countermobility, and survivability (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.

3-43. 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.

3-44. 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 direct support (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.

3-45. Technical capabilities include robust support from joint Service, multiagency, contractor, HN, multinational, and reachback elements. FFE provides a broad range of primarily generating force activities linked through the general engineering element on the ground to apply a higher degree of technical expertise to the assessment or survey mission. FFE, as it relates to reconnaissance, is discussed in greater detail in FM 3-34.170.

ENGINEER SUPPORT TO WARFIGHTING FUNCTIONS

3-46. Full spectrum operations require the continuous generation and application of combat power, often for protracted periods. Combat power is the total means of destructive, constructive, and information capabilities that a military unit/formation can apply at a given time. Army forces generate combat power by converting potential into effective action (FM 3-0). There are eight elements of combat power: leadership, information, movement and maneuver, intelligence, fires, sustainment, mission command, 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, mission command, and protection—are collectively described as the warfighting functions. In full spectrum operations, Army forces combine the elements of combat power to defeat the enemy and master each situation.

3-47. Engineer support contributes significant combat power, both lethal and nonlethal in nature, to all the elements of full spectrum operations. To effectively support the combined arms team, engineer capabilities are organized by the engineer disciplines and synchronized in their application through the warfighting functions. This section will describe selected engineer activities directed through and primarily supporting warfighting functions. These warfighting functions also provide the framework for engineering tasks in the Army universal task list.

3-48. Every unit, regardless of type, generates combat power and contributes to the operation. A variety of engineer capabilities and unit types are available to contribute to combat power. Engineer disciplines are each generally aligned in support of specific warfighting functions although they have impact in and across the others (for example, survivability support may be provided with linkages to the fires warfighting function). 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; geospatial engineering is primarily aligned with the mission command and intelligence warfighting functions.

3-49. Combined arms is the synchronized and simultaneous application of the elements of combat power—to achieve an effect greater than if each element of combat power was used separately or sequentially (FM 3-0). 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 3-2, page 3-10). (See FM 5-0 for information on how these disciplines and warfighting functions are discussed and arrayed within the operations process and orders formats.)

MISSION COMMAND

3-50. Mission command is unique among the warfighting functions in that it integrates the activities of the other warfighting functions. Given the nature of operations, effective mission command 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.

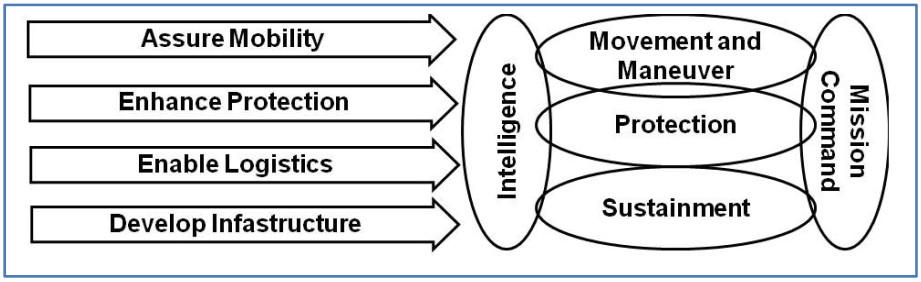

Figure 3-2. Engineer application of combat power

3-51. Whether a subordinate or supporting unit, engineer unit commanders and their staffs must understand and exercise the art and science of mission command 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 theater army headquarters, those unit commanders and staff must recognize and integrate within the respective mission command structure. The engineer headquarters elements provide mission command for the conduct of engineer support, but also add depth to the engineer staff capabilities within the supported or gaining headquarters. Similarly, task organized units face challenges in quickly recognizing and integrating into the distinct character of their "new unit." Thorough understanding of and practice with the mission command 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 mission command function and the operations process it drives adheres closely to the ideal described in Army doctrine (and applicable joint doctrine when operating as a JTF).

3-52. Finding ways to accomplish the mission with an appropriate mix of lethal and nonlethal actions 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 disciplines through the warfighting function framework by integrating into the operations process. Chapters 4 and 5 discuss mission command considerations and the operations process in more detail.

MOVEMENT AND MANEUVER

3-53. 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). Engineers support the movement and maneuver warfighting function by performing tasks associated with geospatial engineering operations, engineer reconnaissance, mobility operations, countermobility operations, and other tasks. (See the sections above for more details about those tasks.) All three engineer disciplines support the movement and maneuver warfighting function. Combat engineer support applied through the movement and maneuver warfighting function is focused on support to close combat in mobility operations (see FM 3-90.4) and countermobility operations (see FM 90-7).

3-54. 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). Although general engineer support is typically applied through the sustainment warfighting function, it 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 forward aviation combat engineering exceeding the capabilities of combat engineer assets, to include repairing paved, asphalt, and concrete runways and airfields; conducting airfield surveys; providing firefighting and aircraft rescue services; and marking airfield landing and parking surfaces.
- Construct bridging.
- Ensure theater access through the construction and upgrade of ports, airfields, and RSOI facilities.

3-55. 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.) Although listed here under movement and maneuver, engineers also support the protection aspects of maneuver support operations.

INTELLIGENCE

3-56. The *intelligence warfighting function* is the related tasks and systems that facilitate understanding of the operational environment, enemy, terrain, weather, and civil considerations (FM 3-0). Engineer capabilities can be employed during key activities in the operations process to add to the commander's SU. Engineers play a major role in the IPB process by anticipating and providing terrain analysis products of likely contingency areas. Geospatial engineering operations improve understanding of the physical environment and are an essential component of the intelligence warfighting function. Engineer reconnaissance can provide data that contributes to answering the commander's critical information requirements. (See the sections above for more information about geospatial engineering operations and engineer reconnaissance.)

FIRES

3-57. Engineer capabilities significantly contribute to this warfighting function when they are used to emplace obstacles that enhance the effect of fires, construct survivability positions for fires units, support their mobility during displacements, and other such tasks.

SUSTAINMENT

3-58. 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 (the definition was shortened, and the complete definition is printed in the glossary) (FM 3-0). Engineers support the sustainment warfighting function by performing tasks associated with mobility operations and tasks such as those described in the section beginning with paragraph 3-31.

3-59. 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.

3-60. 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 the logistics civil augmentation program (LOGCAP), the Air Force contract augmentation program , or the Navy's global contingency construction contract.

PROTECTION

3-61. The *protection warfighting function* is the related tasks and systems that preserve the force so the commander can apply maximum combat power (FM 3-0). 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 CCD support to tactical ground maneuver forces. Combat engineers typically provide the basic hardening and CCD support, while general engineering support is focused on longer term survivability efforts. General engineer support is also applied through the protection warfighting function to control pollution and hazardous materials as well as to harden facilities. Survivability operations include the following engineering tasks:

- Protect against enemy hazards within the AO. This task includes—
  - Constructing vehicle fighting positions, crew-served weapon fighting positions, or individual fighting positions.
  - Constructing protective earth walls, berms, and revetments; or constructing vehicle, information systems, equipment, and material protective positions.
  - Employing protective equipment such as vehicle crash barriers and security fences.
  - Installing bridge protective devices for an existing float bridge or river-crossing site to protect against waterborne demolition teams, floating mines, or floating debris.
  - Installing or removing protective obstacles.
- Conduct actions to control pollution and hazardous materials (see FM 3-34.5).
- Conduct CCD tasks.
- Conduct tactical fire fighting (see FM 3-37 and FM 5-415).

3-62. When conducting stability operations or civil support operations, survivability remains a key concern. Though 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, forward operating bases, 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 survivability 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, though relatively inflexible, survivability capability. Networked munitions, with their built-in sensor capabilities and central control, provide a flexible intrusion detection and denial system.

ENGINEERS IN CLOSE COMBAT

3-63. As discussed in chapter 2, all engineer units must be prepared to conduct their mission while in close combat. This is referred to as fighting as engineers and is inherent to the primary mission of engineer units. Engineer units, particularly combat engineer units, also have the secondary mission to be prepared to fight as infantry. This section discusses both cases of engineers in close combat.

FIGHTING AS ENGINEERS

3-64. Combat engineers are well forward because they fight alongside 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.

3-65. Combat engineers are organized, trained, and equipped to fight and destroy the enemy, in addition to their primary responsibilities within combat engineering. Combat engineers 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.

3-66. General and geospatial engineer units are armed primarily with small arms and have only 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.

3-67. 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, terrain reinforcement, 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.

3-68. When involved in an assault, engineers will fight dismounted on the objective. However, they will focus on breaching the close-in protective obstacles and performing 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.

3-69. 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 AT and self-destructing antipersonnel mines to support the defensive scheme.

3-70. Combat engineers must be prepared to operate or fight the networked munitions they emplace in support of defensive and offensive operations. These weapons systems provide rapidly emplaced, highly lethal capabilities to the combined arms team, but require trained operators to engage the enemy at the appropriate time and place during the enemy attack. Therefore, when engineers are required to emplace networked munitions and then stay and fight these systems, these engineers must integrate their units into the scheme of maneuver and scheme of fires and fight as part of the combined arms team. They should also participate fully in the combined arms rehearsals to achieve the maximum effectiveness from these weapons systems.

3-71. 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

3-72. Throughout history, engineer organizations have been required to fight as infantry as a secondary mission. A combat engineer organization is capable of executing infantry tasks or task-organizing to fight as infantry with other combat units. However, engineers have organizational deficiencies that include a lack of organic fire control personnel, communications equipment, and medical personnel. Additionally, no general engineer unit is designed with squad-size elements that mirror an infantry organization. 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. It may also require significant reorganization. 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.

3-73. 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 to which the unit is assigned. Employing engineers merely implies that the gaining commander will be using the engineers for a short period of time. On the other hand, reorganization requires resources, time, and training.

3-74. An emergency or immediate requirement for infantry may not require reorganization as engineers are simply committed to the fight, to fight as engineers, and understanding their limitations. Reorganization occurs when time allows, moving unneeded engineer elements and equipment from the battlefield and augmenting the engineer structure with additional capabilities. A commander normally considers reorganizing when forecasting a shortage of infantry before a future operation or phase of an operation. The commander makes a decision after weighing the factors of METT-TC; determining an acceptable risk level; and considering the resources, time, and training required to reorganize engineer units as infantry.

Chapter 4

Mission Command Considerations

As shown in the previous chapters, the Engineer Regiment, with its three interdependent engineer disciplines, is focused on supporting the Army and its mission. Engineer units perform engineer tasks along four lines of engineer support. This chapter describes force tailoring, task-organizing, and mission command of engineer forces. Most of the tasks associated with the discussion of mission command are aligned with the mission command warfighting function.

OVERVIEW

4-1. The Engineer Regiment has a wide variety of engineer units, focused on three interdependent engineer disciplines. Employing the right unit, with the right capabilities, to perform the right tasks along the right line of engineer support is a significant challenge. Engineer force tailoring, mission command of engineer forces, and the use of the operations process all help commanders and their staffs to meet that challenge.

ENGINEER FORCE TAILORING

4-2. 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 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 force and generating force elements.

4-3. 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 to think beyond garrison structures and embrace combinations of modular engineer capabilities and scalable mission command 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.

4-4. 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.

4-5. 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 2, ATTP 3-34.23, and FM 3-34.22.

MODULAR FORCE ORGANIZATION

4-6. 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. The modular force structure, described in the following paragraphs, enables expeditionary action and flexible tailoring of forces to meet changing situations.

4-7. As shown in figure 4-1, mission command across the lines of engineer support is primarily provided by the engineer battalion, the engineer brigade, and the TEC. Multifunctional units at both battalion and brigade echelons, such as the BSTB or the MEB, may also provide mission command for engineer forces in cases where engineer support is integral to the multifunctional mission. Analysis of operational variables establishes the suitable tailoring of functional and multifunctional headquarters while mission variables are analyzed to determine task organization.

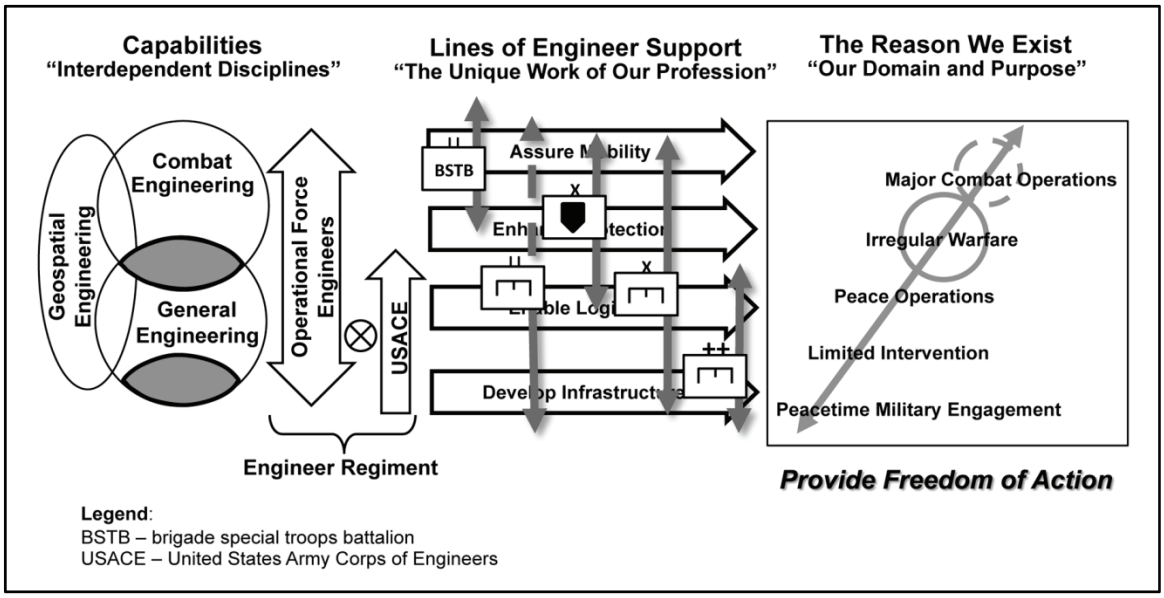

Figure 4-1. Mission command for engineer units

4-8. Engineer and multifunctional mission command headquarters include the following:

- **BSTB**. Within the HBCT and IBCT, the BSTB is a multifunctional battalion that provides the BCT with organic military intelligence support and communications, engineer, military police, and CBRN reconnaissance capabilities. The BSTB of the IBCT and HBCT each have an organic engineer company, although the composition of the company is varied. Engineer units augmenting the BCT may also be placed under the mission command of the BSTB. The BSTB has very few engineers in its staff. See FM 3-90.61 for additional information on the BSTB.
- **Engineer Battalion**. The engineer Battalion can provide mission command for up five mission tailored engineer companies from the combat and general engineer disciplines and operate across all lines of Engineer Support. See Chapter 2 for a full description of the Engineer Battalion.
- **MEB**. The MEB is a headquarters with a robust multifunctional brigade staff that is optimized to conduct maneuver support operations. The MEB contains no organic units other than its headquarters and headquarters company, network support company, and brigade support battalion (BSB), but typically includes a mix of several types of battalions and separate companies which may include CA, CBRN, engineer, EOD, and military police units. The MEB does have an engineer cell as part of its staff, but not to the extent of an engineer brigade headquarters. See FM 3-90.31 for additional information on the MEB.

- **Engineer Brigade.** This functional brigade can provide mission command for up five mission tailored engineer battalions from any of the three engineer disciplines as well as non-engineer units. See Chapter 2 for a full description of the Engineer Brigade.
- **TEC**. The TEC is designed to provide mission command for engineer capabilities for the theater army.

Force Tailoring For Different Echelons

4-9. Command headquarters consist of the BCT, divisions, corps, and theater army headquarters. All three headquarters above the BCT have engineer staffs that support the mission command of engineer units.

Brigade Combat Team

4-10. The BCTs have limited engineer capability, one organic company, and will likely require additional engineer units based on mission variables. Higher commanders augment BCTs for a specific mission with capabilities not organic to the BCT structure. This augmentation will most likely be accomplished through task organizing but in some cases may be tailored prior to deployment. The task organization is accomplished using force pool engineer units that are force tailored to higher headquarters (division, corps, and theater army). See mission command section below for a detailed discussion of BCT task organization considerations.

Division

4-11. 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 under both functional and multifunctional headquarters. 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 4-2, page 4-4, provides a notional organization for both an engineer brigade headquarters and an MEB supporting a division.

4-12. The division construct normally starts with an MEB and then adds a functional engineer brigade when the type (technical requirement), size (magnitude of subordinate engineer elements) of the engineer mission, or the requirement to integrate engineer capabilities across the force becomes too large for the MEB. (The same dynamic applies within the BCT, but the functional engineer headquarters in that case would be the engineer battalion.)

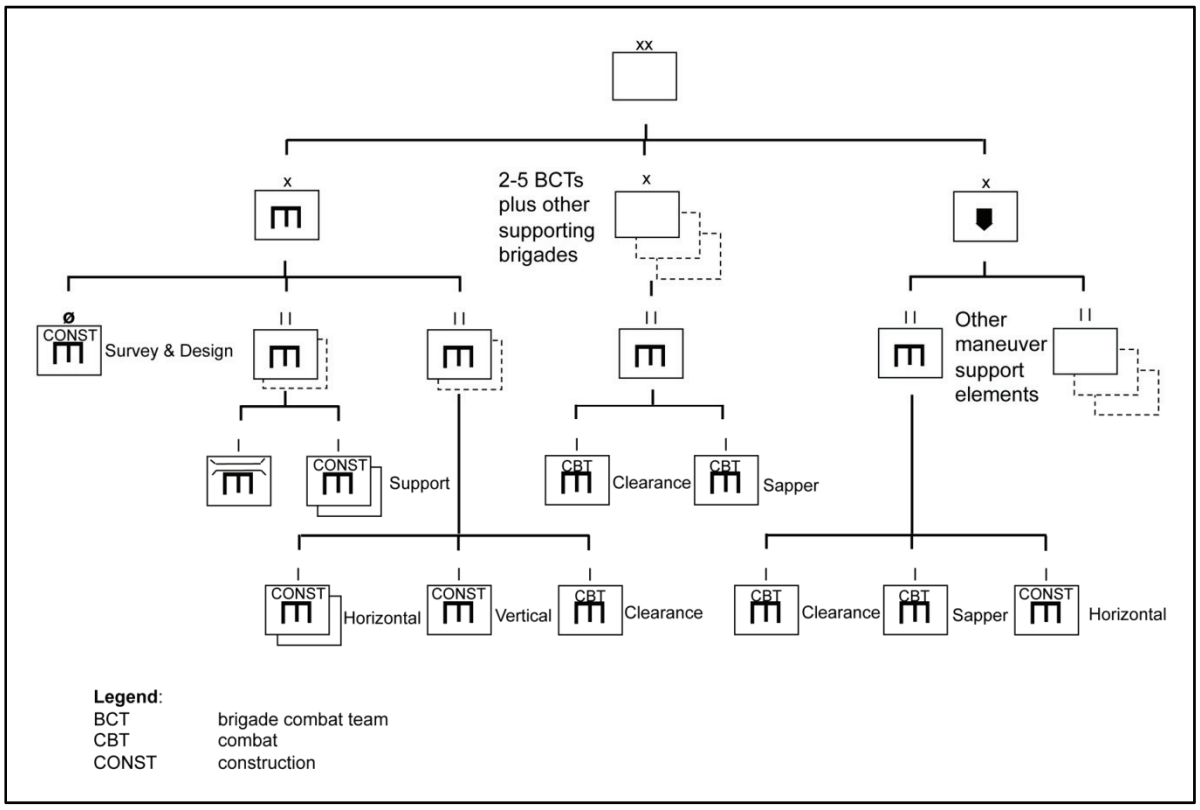

Figure 4-2. Notional division engineer force

Corps

4-13. 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.

4-14. In some instances, an MEB may also be required at the corps level; for example, to provide mission command of a SPOD or an APOD (both missions are terrain-focused) during early-entry operations or to support a movement corridor within a corps area of operations. The MEB provides multifunctional capability with a smaller footprint and has the ability to control terrain for these types of operations. See FM 3-90.31 for additional information on the MEB.

Theater Army

4-15. The theater army normally receives one TEC (see figure 4-3). The TEC is a modular organization that can be tailored based on mission requirements. Within the TEC, there are two deployable CPs that provide flexibility for multiple missions or rotational capability in support of a single mission. Each TEC can deploy its main CP 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.

4-16. The TEC provides mission command 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

engineering operations, construction, real-property maintenance activities, LOC sustainment, engineer logistics management, and base development. The TEC has primary responsibility for theater infrastructure development.

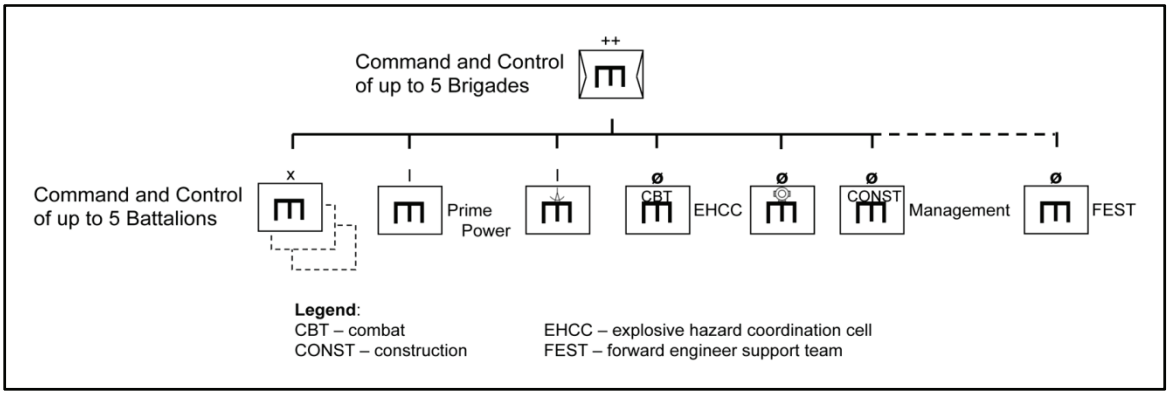

Figure 4-3. Notional theater engineer command

4-17. The TEC develops plans, procedures, and programs for engineer support for the theater army, including operational mobility and countermobility, general engineering, power generation, area damage control, 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 support to operations in the AOR 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 AOR. 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.

ARMY FORCE GENERATION

4-18. Execution and adherence to the Army Force Generation model is problematic for engineer units. There is a limited amount of engineer force structure compared to the Army BCT structure and potential BCT mission requirements, a minimal number of engineers that are organic to BCT organizations, and a high percentage of engineer forces that are resident in the Reserve Components. The implications of Army Force Generation on the engineer force are similar to other support branches within the Army where a majority of their forces are not organic to a BCT structure. Activating an engineer unit early in the Army Force Generation process will have secondary and tertiary effects for operational, sustainment, and personnel planners and reduces even further the availability of units later in the cycle. A surge of engineer units can be accomplished for short periods, but not indefinitely without looking at increasing engineer units in the inventory or through the use of HN or contract engineers. See FM 1-01 for additional information regarding Army Force Generation.

MISSION COMMAND OF ENGINEER FORCES

4-19. All engineer units must execute mission command and the operations process activities for their own unit, and many engineer units will interact with the mission command 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. This manual addresses mission command of engineer forces separately from engineer staff participation in the supported commander's mission command.

4-20. There are typically not enough engineering capabilities available to accomplish all the desired engineer 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 requirements with 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 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 administrative control (ADCON) responsibilities.

CONSIDERATIONS AND RELATIONSHIPS IN THE BRIGADE COMBAT TEAM

4-21. Each of the three types of BCTs is organized with organic engineer company-level units (see appendix B). These engineer companies support the BCT or its subordinate organizations by providing engineer support 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). The engineer companies organic to the BCT may be further task-organized to maneuver TFs or the reconnaissance squadron, or even to a subordinate company or troop. These unit commanders and leaders are fully integrated participants in the mission command structure and activities of the BCT or its subordinate elements which they routinely support.

4-22. Integrating additional engineer support in any of the BCTs is challenging due to the limited structure within the BCT for mission command of engineer forces. The organic engineer company employs troop leading procedures rather than the military decisionmaking process (MDMP) and has very limited capability to integrate augmenting engineer elements. The BSTB and the BCT headquarters have more robust mission command capability, but are multifunctional in nature with limited engineer staff capability. In many situations the augmentation of a BCT by a task-organized engineer battalion headquarters will provide the necessary additional mission command to orchestrate engineer support. Similarly, a task-organized engineer battalion may be required in situations requiring engineer support to one of the various support brigades.

4-23. Additional engineer units augmenting the BCT (or a support or functional brigade) are task-organized to the BCT in either a command or a support relationship as summarized in FM 5-0, tables F-1 and F-2. Command relationships are used when the most responsive employment of the augmenting engineer units is required, with engineer units either attached or placed in operational control (OPCON) to the gaining BCT. Attachment (although temporary) is often relatively long-term compared to being placed in OPCON, normally for a given mission (lasting perhaps just 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.

4-24. 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. A DS relationship is typically used to provide the supported unit with dedicated engineer support that is more responsive to that unit. In a GS relationship, the engineer unit supports the maneuver element as a whole. Such a relationship is appropriate when central control and flexibility in employing limited engineer forces is required. A GS relationship may be used when a BCT's higher headquarters desires to maintain control over an engineer mission within the BCT AO. In that case, the requirement must be coordinated with the impacted BCT and any missions must be executed through close coordination with the BCT.

JOINT CONSIDERATIONS AND RELATIONSHIPS

4-25. Army engineers frequently operate in a joint environment and must understand joint command and support authorities and relationships (described in JP 1), which are similar but not identical to Army command and support relationships. They must understand how these are applied in joint engineer operations, as described in JP 3-34. 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.

THE ENGINEER STAFF OFFICER

4-26. The staff assigned to BCT, division, corps, theater Army, GCC, and other joint organizations includes a number of engineers in various sections and cells. One of these engineers, typically the senior engineer officer on staff, is designated as the engineer staff officer to advise the commander and assist him in exercising control over engineer forces in the AO. The engineer staff officer is responsible for coordinating engineer assets and operations for the command. Although there may be more than one engineer officer on a staff, only one is designated as the engineer staff officer for the command. Each echelon down to the BCT level has an organic engineer planner and staff element to integrate engineers into the combined arms fight. The TF and company levels may have a designated engineer planner, but their engineer is not typically 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.

4-27. 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 mission command 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 officer and the engineer unit 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? It is critical that the engineer staff officer for the supported unit maintains close coordination with the supporting engineer unit commander and staff to ensure synchronization of effort.

4-28. The engineer staff will include key members on many of the working groups, boards, or cells established by commanders to coordinate functional or multifunctional activities. The engineer staff officer may chair construction-related groups.

4-29. The specific roles, responsibilities, and consideration for the engineer staff officer are similar but not identical at each echelon. FM 3-34.22 addresses these for the BCT engineer staff officer, while ATTP 3-34.23 addresses them for the engineer staff officer at echelons above the BCT.

CONTROL MECHANISMS

4-30. The control mechanisms established in FM 3-0, FM 5-0, and FM 6-0 are essential tools to help engineers accomplish the mission in accordance with the commander's intent. One such control mechanism is the engineer work line (EWL), which 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. 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.** See FM 3-34.400 for more information on General Engineering Operations.

Chapter 5
Integrating Engineer Support

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. Integrating engineer support includes multiple interactions with the mission command 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 mission command, 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 the operations process activities at that headquarters. This chapter discusses the operations process as the context for integration of engineer support to operations. It enters the operations process by discussing various planning activities required for effective engineer support. It describes planning responsibilities, integration, and processes for engineer units and for engineer planners in nonengineer units. Finally, it discusses preparation, execution, and continuous assessment of the entire spectrum of engineer support.

SECTION I – INTEGRATED PLANNING

5-1. 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 activities at their echelon of employment. Supporting engineer unit commanders and leaders conduct parallel planning which provides 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.

5-2. Engineer support is complex, resource intensive (requires much time, manpower, equipment, and materials), and requires 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. Engineer support 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 which form the base logic for the planning processes (see FM 5-0). Engineer support 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

5-3. Engineers conduct planning at the strategic, operational, and tactical levels. It is important to understand planning within the context of the levels of war (see figure 5-1, page 5-2). Scope, complexity, and length of planning horizons differ between operational and tactical planning, yet as echelons of responsibilities have blurred, essentially any engineer headquarters may find itself 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.

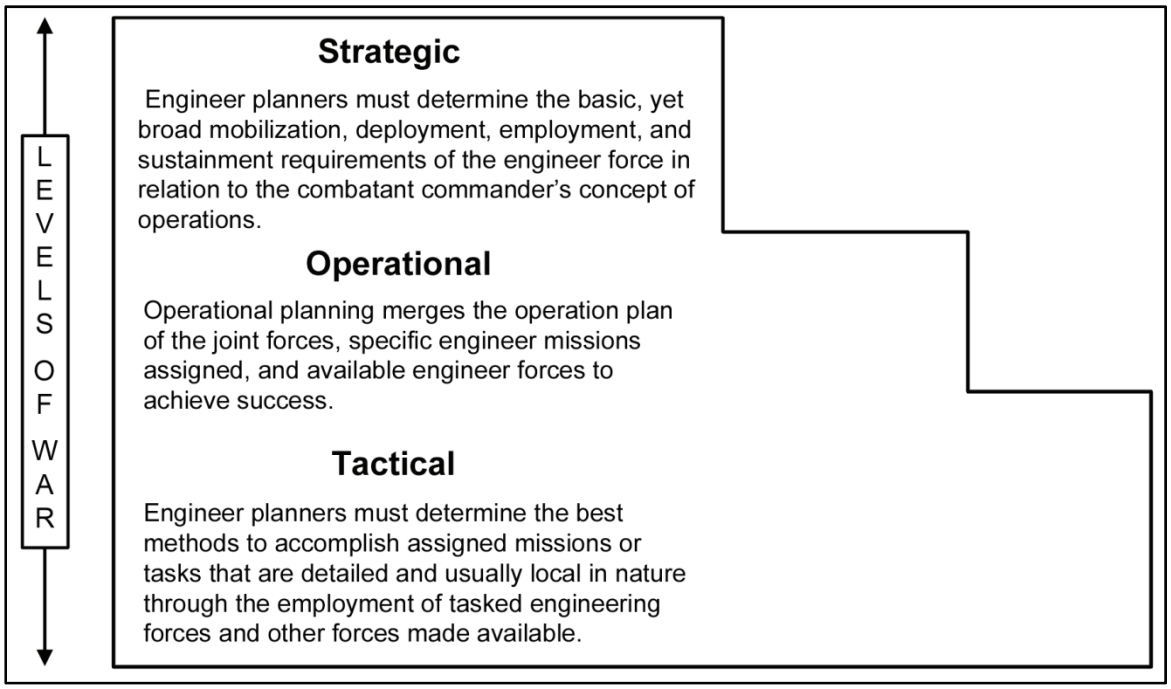

Figure 5-1. Engineer planning at each level of war

5-4. 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 engineer staff officer 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 engineer staff officer is the special staff officer responsible for coordinating engineer assets and operations for the command, including engineer planning. The engineer staff officer is usually the senior engineer officer on the staff, but may be a senior engineer commander supporting the force.

5-5. In planning at every level, the engineer planner should consider a number of general considerations, including speed, economy, flexibility, decentralization of authority, and establishment of priorities:

- S**peed.** 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.

CONSIDERATIONS FOR FULL SPECTRUM OPERATIONS

5-6. During combat operations, engineer units will tend to have command relationships to maneuver commanders. Especially at higher echelons, engineer units are more likely to be attached than placed 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 enemy's intent through a thorough understanding of the threat, its 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. See FM 3-34.170 for a full discussion of engineer reconnaissance capabilities. A greater degree of planning is required for a penetration from the breach to the ultimate control of the decisive objective.

5-7. Planning for defensive operations is inextricably linked to offensive operations and, for planning purposes, must consider the transition from offensive operations, as well as the 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 engineer staff officer works with the 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.

5-8. 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). An 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 engineer staff officer considers HN, third party NGOs, or other multinational forces involved with engineering capabilities. Interaction with these other 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.

5-9. Planning for civil support operations is significantly different from offense, defense, 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 which delegates responsibility to various federal agencies for emergency support function. The USACE and other engineering capabilities of the generating force will have a prominent role in civil support operations. See FM 3-28 for more information about civil support operations and proponency for the various emergency support functions.

5-10. 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 ATTP 3-34.23 for a more detailed discussion of planning for engineer applications in civil support operations.

PARALLEL PLANNING

5-11. Engineer commanders and the engineer staff officer must ensure that parallel planning occurs between the supported unit and their task-organized engineer units. Although the senior engineer commander may, in selected cases, be dual hatted as commander and engineer staff officer at lower echelons, this is no longer the preferred engineer staff relationship (see discussion in chapter 4). At the brigade level and above, the engineer staff officer should not be a supporting engineer unit commander. 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, maximizing the time available for execution.

5-12. To facilitate effective parallel planning at the engineer unit level, engineer unit commanders and staff planners must—

- Understand the commander's intent and planning guidance of both the parent (engineer) unit and the supported unit.
- Analyze the terrain, information on obstacles, 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 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 engineer activities. 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

5-13. 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 describes 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 those 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.

SECTION II – PLANNING PROCESSES

5-14. 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. MDMP and troop leading procedures are the two Army doctrinal planning procedures defined in FM 5-0. Both procedures hinge on the commander's ability to visualize and describe the mission or operation. Each is a means to an end, and their value lies in the result, not the process. Both processes can be performed in detail, if time permits, or in an abbreviated fashion in a time-constrained environment.

5-15. Although not fully developed planning procedures, engineers use a number of other processes, activities, and frameworks to facilitate the planning and integration of engineer support. They include—

- The running estimate (described in FM 5-0).
- Plans and orders.
- The framework of assured mobility.
- The development of essential tasks for M/CM/S.

Note. FM 5-0 describes the rapid decisionmaking 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 section IV of this chapter.

5-16. For information about joint planning see Chairman of the Joint Chiefs of Staff manual (CJCSM) 3122.01A and JP 5-0. The primary joint doctrinal publication for planning engineer operations is JP 3-34.

THE MILITARY DECISIONMAKING PROCESS

5-17. Table 5-1 lists some of the generic engineer planning considerations as they pertain to each step of the MDMP (defined in detail in FM 5-0), focused primarily at operational-level planning. However, each mission will present unique characteristics that engineer planners must consider in evaluating the situation.

Figure 5-1. Engineer considerations in the military decisionmaking 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 area of operations. • Establish engineer-related boards as appropriate.
Mission Analysis	• Analyze the available information on existing obstacles. Evaluate terrain, climate, and threat capabilities to determine the potential impact on M/CM/S. • Develop the essential tasks for M/CM/S. • Identify the available information on routes and key facilities. Evaluate lines of communications, aerial port of debarkation, and seaport of debarkation requirements. • Determine the availability of construction and other engineering materials. • Review the availability of engineer capabilities to include Army, joint, multinational, host nation, and contracted support. • Determine the beddown requirements for supported force. Review theater construction standards and base camp master planning documentation. Review unified facilities criteria as required. • Review the existing geospatial data on potential sites, conduct site reconnaissance (if possible), and determine the threat (to include environmental and explosive hazards). • Obtain the necessary geologic, hydrologic, and climatic data. • Determine the level of interagency cooperation required. • Determine the funding sources as required. • Determine the terrain and mobility restraints, obstacle intelligence, threat engineer capabilities, and critical infrastructure. Recommend commander's critical information requirement. • Integrate the reconnaissance effort.

Table 5-1. Engineer considerations in the military decisionmaking process (continued)

COA Development	• Identify the priority engineer requirements, including essential tasks for M/CM/S developed during mission analysis. • Integrate engineer support into COA development. • Recommend an appropriate level of protection effort for each COA based on the expected threat. • Produce construction designs that meet the commander's intent. (Use the Theater Construction Management System when the project is of 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	• Wargame and refine the engineer plan. • Use the critical path method to determine length of different COAs and the ability to crash the project.
COA Comparison	• Determine the most feasible, acceptable, and suitable methods of completing the engineering effort.
COA Approval	• Determine and compare the risks of each engineering COA. • 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. • Conduct preinspections and construction meetings. • Synchronize construction plan with local and adjacent units.
Execution and Assessment	• Implement protection construction standards including requirements for security fencing, lighting, barriers, and guard posts. • Conduct quality assurance and midproject inspections. • Participation in engineer-related boards. • Maintain "As Built" and "Red Line" drawings. • Project turnover activities.
Legend: COA - course of action M/CM/S - mobility, countermobility, and survivability MDMP - military decisionmaking process	

ENGINEER STAFF'S RUNNING ESTIMATE

5-18. The engineer staff officer uses the running estimate as a logical thought process and extension of the MDMP. It is conducted by the engineer staff officer, 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 the following: 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.
- The OE's effect on current and future operations from the section's perspective.

5-19. 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 5-2 shows the relationship between the MDMP and the engineer staff running estimate.

Table 5-2. The military decisionmaking process and the engineer estimate

Military Decisionmaking Process	*Engineer Staff Running Estimate*
Mission Analysis: • Analyze the higher headquarters plan or order. • Perform the initial IPB. • Determine the specified, implied, and essential tasks. • Review the available assets and identify resource shortfalls. • Determine the constraints. • Identify the critical facts and develop assumptions. • Begin the composite risk assessment. • Determine the CCIRs and EEFIs. • Develop the intelligence, surveillance, and reconnaissance synchronization plan. • Update the plan for the use of available time. • Develop the initial information themes and messages. • Develop the proposed mission statement. • Present the mission-analysis briefing. • Develop and issue the initial commander's intent. • Develop and issue the initial planning guidance. • Develop the COA evaluation criteria. • Issue the warning order.	Mission Analysis: • Analyze the higher headquarters orders. ▪ Commander's intent. ▪ Mission. ▪ Concept of operation. ▪ Timeline. ▪ Area of operations. • Conduct the IPB and develop engineer staff running estimate. ▪ Terrain and weather analysis. ▪ Enemy mission and M/CM/S capabilities. ▪ Friendly mission and M/CM/S capabilities. • Analyze the engineer mission. ▪ Specified M/CM/S tasks. ▪ Implied M/CM/S tasks. ▪ Assets available. ▪ Limitations. ▪ Risk as applied to engineer capabilities. ▪ Time analysis. ▪ Identified essential tasks for M/CM/S. ▪ Restated mission. • Conduct the risk assessment. ▪ Safety. ▪ Environment (Conduct EBS/OEHSA). • Determine the terrain and mobility restraints, obstacle intelligence, threat engineer capabilities, and critical infrastructure. • Recommend the CCIR. • Integrate the engineer reconnaissance effort.

Table 5-2. The military decisionmaking process and the engineer estimate (continued)

Military Decisionmaking Process	*Engineer Staff Running Estimate*
COA Development	Develop the scheme of engineer operations. ▪ Analyze the relative combat power. ▪ Refine the essential tasks for M/CM/S. ▪ Identify the engineer missions and allocation of forces and assets. ▪ Determine the engineer priority of effort, support. ▪ Refine the commander's guidance for M/CM/S operations. ▪ Apply the engineer employment considerations. ▪ Integrate the engineer support into the maneuver COA.
COA Analysis	Wargame and refine the engineer plan.
COA Comparison	Recommend a COA.
COA Approval	Finalize the engineer plan.
Order Production	Create the input to basic operation order. ▪ Scheme of engineer operations. ▪ Essential tasks for M/CM/S. ▪ Subunit instructions. ▪ Coordinating instructions. Create the engineer annex and appendixes.
Legend:	
CCIR – commander's critical information requirement COA – course of action EBS – Environmental Baseline Survey EEFI – essential elements of friendly information	IPB – intelligence preparation of the battlefield M/CM/S – mobility, countermobility, and survivability OEHSA – Occupational Environmental Health Site Assessment

PLANS AND ORDERS

5-20. The staff prepares the order or plan by turning the selected course of action (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.

5-21. 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. CJCSM 3122.03 series is used for joint plans and orders formats and guidance. In addition to developing input for the functionally specific paragraphs in the base plan as well as annexes and appendixes of the plan, engineer planners must review other sections as well. 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. Engineers review operations sections, annexes, and overlays to ensure the inclusion of obstacle effects or other graphics and assist in conveying engineer support. In the fires sections, engineers work with the fire support officer and other members of the staff to integrate obstacles with fire. Of particular interest are SCATMINEs and confirming that all obstacles are covered by fire.

5-22. 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—

- Engineer staff officer's overall description of the scheme of 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 and Class V supplies (barrier materials).

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

5-23. The engineer staff officer 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.

5-24. The engineer staff officer 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. See FM 3-34.5 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 the higher headquarters orders or plans that are not already included in a unit standing operating procedure. If this appendix is not written, appropriate material will be placed in the coordinating instructions of the basic order.

ASSURED MOBILITY

5-25. 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 disciplines in accomplishing this.

5-26. Assured mobility is applied at the strategic, operational, and tactical levels of war to facilitate the commander's freedom to move and maneuver. While engineers are the principal staff integrator for assured mobility, other staff sections play critical roles in ensuring the effective application of mobility, countermobility, and associated protection tasks. Ultimately, assured mobility is the commander's responsibility. The fundamentals of assured mobility are predict, detect, prevent, avoid, neutralize, and protect and are described in detail in FM 3-90.12 (and their application in the defeat of improvised explosive devices [IEDs] is described in FM 3-90.119).

ESSENTIAL TASKS FOR MOBILITY, COUNTERMOBILITY, AND SURVIVABILITY

5-27. 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 engineer staff officer and other staff members assist the maneuver commander in his decision by identifying essential tasks for M/CM/S.

5-28. 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; military police; 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 as explained in the following paragraphs:

- **Task**. A task is one or more clearly defined and measurable activities accomplished by individuals and organizations required to achieve the desired effects (FM 7-0). These are the most important M/CM/S tasks which 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 commanders so that they can be reactive as the situation changes.

5-29. Maneuver commanders use essential tasks for M/CM/S to communicate to subordinate maneuver units what they want 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, military police, psychological operations, CA, and other nonengineer elements' clearly articulated tasks related to M/CM/S. Example engineer-related essential tasks for M/CM/S might include—

- **Essential task for M/CM/S #1** (see FM 3-34.170).
  - **T**: Conduct engineer reconnaissance of MSR Tigers from CP 1 to CP 2.
  - **P**: Classify 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).
  - **T**: Conduct engineer reconnaissance of Crossing Area WHITE.
  - **P**: 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).
  - **T**: Conduct an infrastructure reconnaissance of the power station at grid ST231546.
  - **P**: 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).
  - **T**: Conduct engineer reconnaissance of buildings at grid ST234544.
  - **P**: Determine if buildings are adequate to house BCT headquarters from protection standpoint.
- **Essential task for M/CM/S #5** (see FM 3-34.2).
  - **T**: Conduct deliberate breach at point of penetration 1 and 2.
  - **P**: 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).
  - **T**: Conduct a route clearance of Route Dolphin.
  - **P**: To clear the route of all obstacles and EHs to facilitate the uninterrupted movement of critical sustainment elements to allow resupply of BCT elements.
- **Essential task for M/CM/S #7** (see FM 5-103).
  - **T**: Employ sensored, scaleable obstacles as part of base camp security.
  - **P**: 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).
  - **T**: Support hardening of forward operating base Bears.
  - **P**: Construct revetments and berms to protect key assets at the forward operating base.

5-30. Essential task 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 engineer staff officer 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 engineer staff officer and other planners integrate them into COA development.

SECTION III – OTHER PROCESSES

5-31. Engineers also participate in or perform a number of other processes that address specific engineer functional requirements or support the integration of engineer activities with the overall operation. Force projection is critical to ensuring that engineer forces are available to execute engineer missions when needed. Engineers plan for the acquisition, construction, management, and disposal of facilities to support the force, and they use project management to complete projects that meet expectations for quality, timeliness, and cost.

FORCE PROJECTION

5-32. *Force projection* is the ability to project the military instrument of national power from the continental United States (CONUS) or another theater in response to requirements for military operations. Force projection operations extend from mobilization and deployment of forces to redeployment to CONUS or home theater (JP 1-02). 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.

5-33. Force projection encompasses six processes—*mobilization; deployment; joint RSOI; employment; sustainment; and redeployment*—that normally occur in a continuous, overlapping and iterative sequence for the duration of the mission (see FM 3-35 and JP 3-35).

FACILITIES AND CONSTRUCTION PLANNING

5-34. 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, ports).
- Logistics facilities (such as maintenance facilities, supply points, warehouses, ammunition supply points, waste management areas/facilities, 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 facilities for joint reception, staging, onward movement, and integration).
- Protection facilities (such as site selection, proximity to potential threat areas, and sniper screening).
- Completion of an environmental baseline survey and occupational environmental health site assessment before site selection or use of facilities to ensure minimal exposure to contaminants (see FM 3-34.5).

5-35. 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:

- U.S.-owned, occupied, or leased facilities (including captured facilities).
- U.S.-owned facility substitutes pre-positioned in theater.

- HN, allied, and coalition support where an agreement exists for the HN, allied, or coalition nation to provide specific types and quantities of facilities at specified times in designated locations.
- 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.

5-36. 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 (such as rapid construction techniques like prefabricated building sand clamshell structures) should also be considered, as these methods can be selectively employed with minimum time, cost, and risk.

5-37. Adequate funding (see JP 3-34, appendix E) 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.

5-38. 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. The beddown and basing continuum (discussed in FM 3-34.400 and JP 3-34) 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 Joint Facilities Utilization Board 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 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.)

5-39. 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 the USACE, the 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.

5-40. 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 <http://65.204.17.188//report/doc_ufc.html>.
- USACE TECHINFO Internet site <http://www.hnd.usace.army.mil/techinfo>.
- NAVFAC Engineering Innovation and Criteria Office Internet site <http://www.wbdg.org/references/pa_dod.php>.
- Construction Criteria Base System maintained by the National Institute of Building Sciences at Internet site <http://www.wbdg.org/ccb>.

5-41. General engineer planners must consider any and all construction standards established by CCDRs and ASCCs for their AOR. Specific examples of these are the United States European Command's *Camp Facilities Standards for Contingency Operations* (commonly known as *The Red Book*) and the United States Central Command's CCR 415-1, *Construction and Base Camp Development* (commonly known as *The Sand Book*). 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 also establish standards for construction in OPORDs and fragmentary orders (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

5-42. 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. The project management process (see FM 3-34.400) divides the effort into preliminary planning, detailed planning, and project execution. Today, when engineer planners are focused on general engineering tasks, they often rely on the Theater Construction Management System (TCMS) to produce the products required by the project management system. These products include the design, the activities list, the logic network, the critical path method or Gantt chart, the 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. Examples of such tools and organizations include the USAES; USACE Reachback Operations Center, 412th and 416th TECs; the AFCESA; and the NAVFAC. See chapter 2 for additional information on how to access reachback support.

5-43. 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, a FRAGO, a warning order, or verbally. When leaders analyze a construction directive, they 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.

SECTION IV – PREPARING, EXECUTING, AND ASSESSING ENGINEER SUPPORT

5-44. Full spectrum operations conducted overseas simultaneously combine three elements: 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.

5-45. Synchronized through the warfighting functions, engineer support contributes 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. Section I of this chapter entered the operations process by discussing various planning activities required for effective engineer support. This section continues in that context by discussing preparation, execution, and continuous assessment of the entire spectrum of engineer support to operations.

SIMULTANEOUS COMBINATIONS

5-46. Full spectrum operations require simultaneous combinations of four elements—offense, defense, stability, and civil support. FM 3-0 lists the primary tasks associated with the elements and the purposes of each element. Each primary task has numerous associated subordinate tasks.

5-47. Engineer capabilities are organized by the engineer disciplines and synchronized in their application through the warfighting functions. As described in chapter 4, the operations process activities provide the context in which both the synchronization and the application are integrated into the combined arms operation.

5-48. The first three sections of this chapter described integration of engineer support through the planning activities. This section will discuss integration through the preparation, execution, and continuous assessment activities of the process.

OPERATIONS PROCESS ACTIVITIES

5-49. Preparation consists of activities performed by the unit before execution to improve its ability to conduct the operation. 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 intelligence, surveillance, and reconnaissance 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—

- Completing and reviewing the design. In a design-build process the design will typically only be completed at a ten- to thirty-percent resolution before execution.
- Conducting any necessary preconstruction studies or surveys.
- Identifying additional technical support required.
- Completing any detailed planning activities not yet completed from the project management process; for example, estimates, bill of materials, and schedules.
- Preparing the construction site as required; for example, staging equipment, stockpiling materials, and completing temporary construction.

5-50. 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—

- Implementing and maintaining a construction safety program.
- Implementing and enforcing quality controls.
- Periodically reviewing design and construction.
- Preparing as-built drawings.
- Responding to construction contingencies.

5-51. 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 measures of performance and measures of effectiveness.

OFFENSIVE OPERATIONS

5-52. Engineer support to the offense includes simultaneous application of combat, general, and geospatial engineering capabilities through synchronizing warfighting functions and throughout the depth of the AO. Combat engineering in close support of maneuver forces is the primary focus in offensive operations; however, all three disciplines 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.

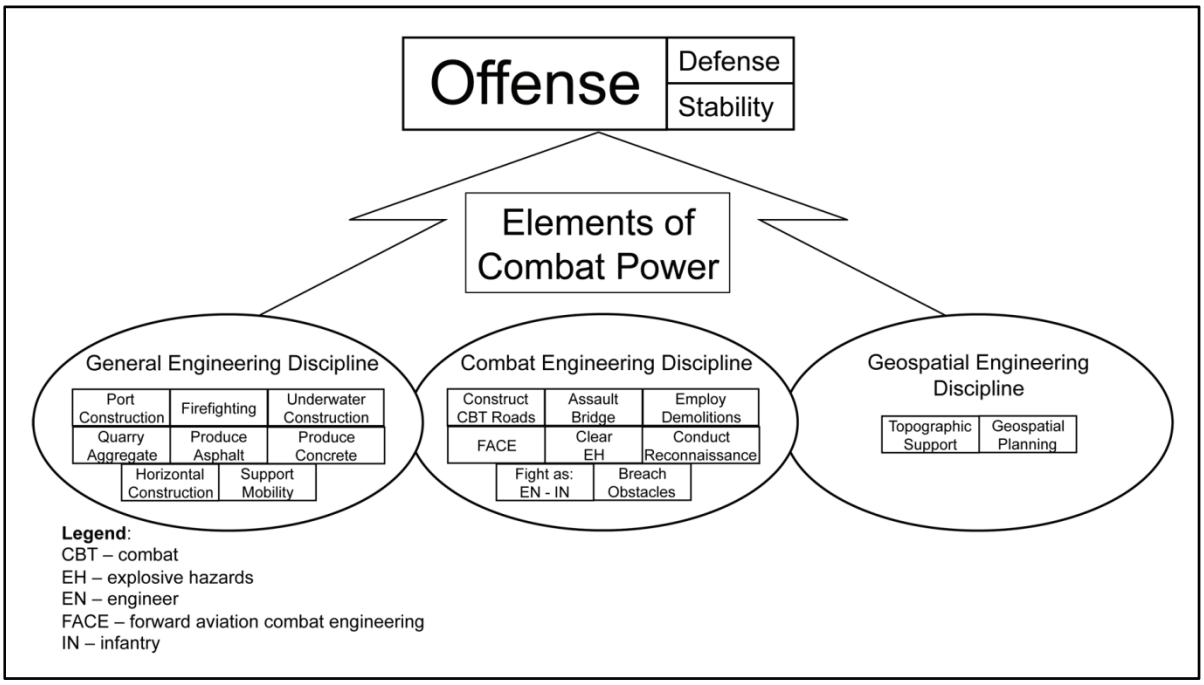

Figure 5-3. Notional engineer support to offensive operations

5-53. 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 engineer staff officer at the appropriate echelon coordinates engineer reconnaissance focused to support the collection of the appropriate information to create obstacle intelligence. 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.

5-54. Engineer staff officers 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, a command relationship with the supported engineer unit is often more effective. 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 activities 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. Such general engineer support is primarily applied to enable the sustainment warfighting function, but may also be critical to the preparation for an offensive operation to include support to operational mobility.

5-55. During offensive operations, fighting and protective position development is minimal for tactical vehicles and weapons systems. The emphasis lies on mobility of the force. Protective positions for artillery, air and missile defense, and logistics positions may be required in the offense and defense, although more so in the defense. Stationary mission command 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 weapons systems, mission command 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.

5-56. When executing offensive operations, the maneuver force uses its COP to link its 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

5-57. Engineer support to the defense includes simultaneous application of combat, general, and geospatial engineering capabilities through synchronizing warfighting functions and throughout the depth of the AO. Combat engineering in close support of maneuver forces is the primary focus in defensive operations; however, all three disciplines are applied simultaneously to some degree. Figure 5-4 shows a notional application of engineer capabilities supporting defensive operations.

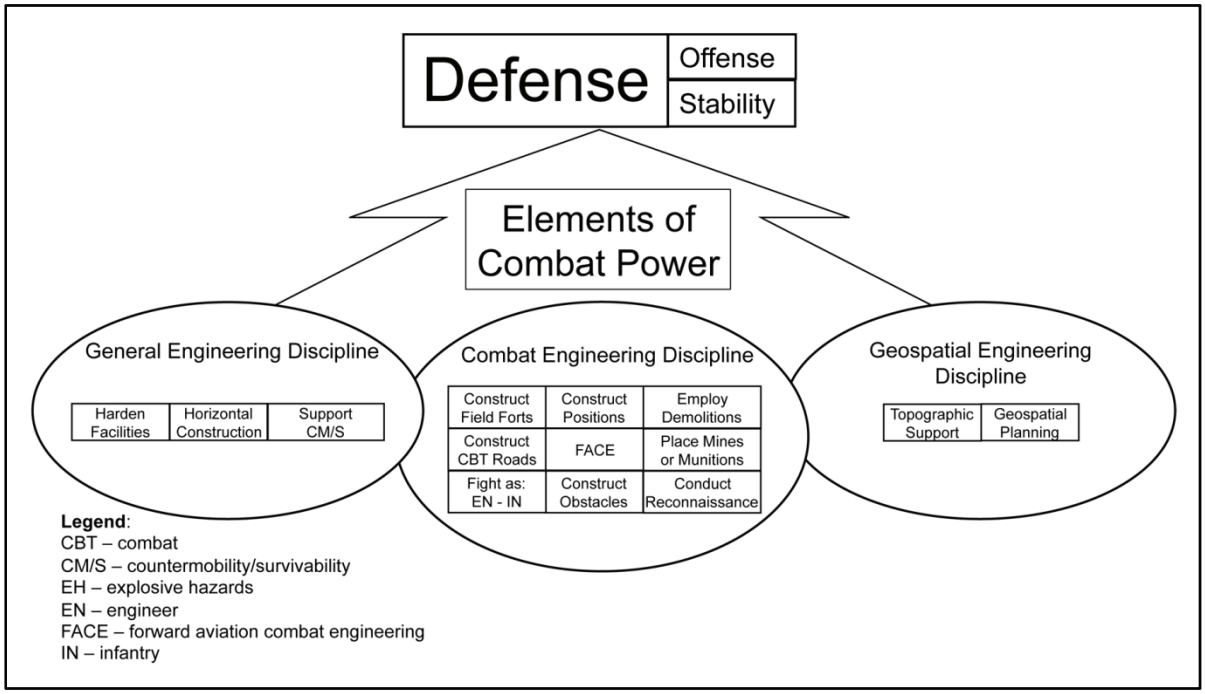

Figure 5-4. Notional engineer support to defensive operations

5-58. 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 facilitate mobility for friendly repositioning or counterattacking forces. Defensive missions demand the greatest survivability effort. Activities in the defense include constructing survivability positions for headquarters, artillery, air and missile defense, 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.

5-59. 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 to provide mobility support for the reserve or mobile strike force. The engineer staff officer at the appropriate echelon coordinates for reconnaissance and surveillance 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.

5-60. At the operational level, general engineer support will be continuously conducted to harden and prepare protective positions for facilities and installations. These activities are primarily applied through the protection warfighting function. General engineer support to protection and survivability 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 Operating Base Handbook). Other general engineer activities 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

5-61. Stability operations consist of the following 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.

5-62. Engineer support for stability operations includes simultaneous application of combat, general, and geospatial engineering capabilities through synchronizing warfighting functions and throughout the depth of the AO. General engineer support for restoration of essential services and infrastructure development is the primary engineer focus in stability operations; however, all three disciplines are applied simultaneously to some degree. Figure 5-5, page 5-18, shows a notional application of engineer capabilities providing support to stability operations. The participation of engineer generating force elements such as the USACE to stability operations will be significant and is typically realized as general or geospatial support. The TEC includes the capability to provide mission command of the USACE effort. (FM 3-07 discusses in detail those tasks performed in support of stability operations.)

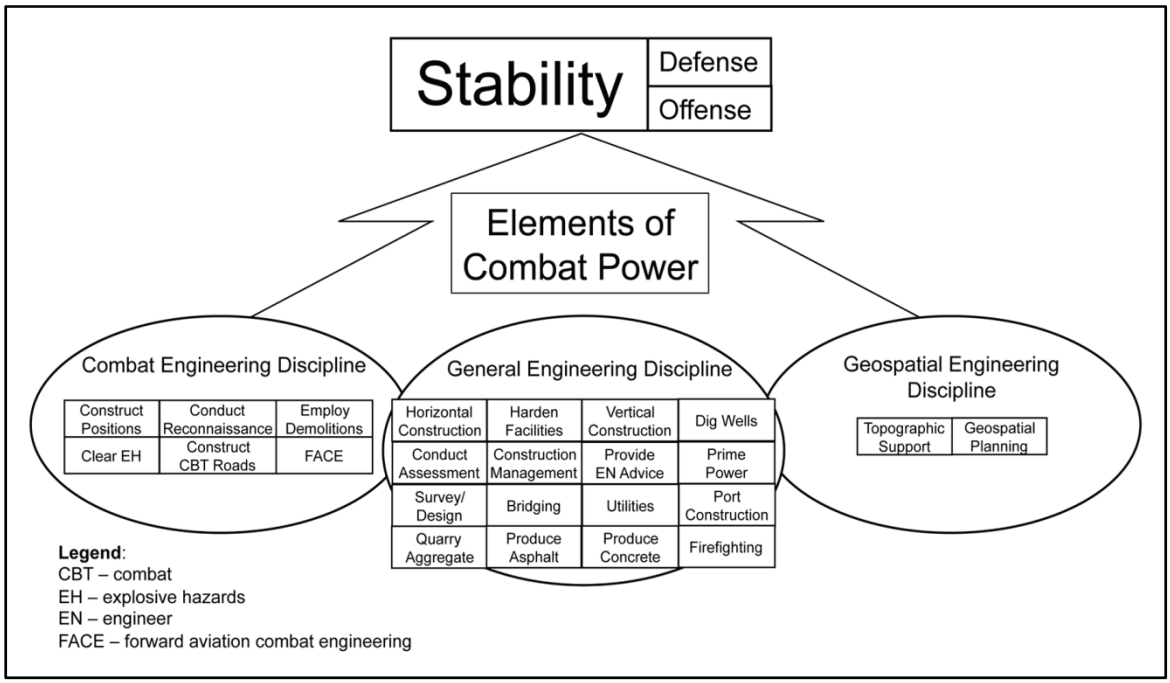

Figure 5-5. Notional engineer support to stability operations

5-63. 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 waste 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.
- Providing camp construction and power generation.
- Conducting infrastructure reconnaissance, technical assistance, and damage assessment.
- Conducting emergency demolition.
- Conducting debris or route clearing operations.

5-64. 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 protection 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.

5-65. 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, Air Force contract augmentation program, or the Navy's global contingency construction contract.

5-66. CA operations are activities performed or supported by CA/general purpose personnel that support 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 civil government. These operations involve establishing, maintaining, influencing, or exploiting relations between military forces and all levels of HN government/nongovernmental 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 core tasks in support of the commander's civil military operations. CA elements 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 civilian populace. They may implement 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. Many CA personnel have had extensive experience in other branches before assignment to CA units. With guidance from the commander, 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 reserve component CA units possess enable them to assess and coordinate infrastructure activities. (See FM 3-05.40 for more details.)
- CA operations may be critical to engineer support, which may 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 engineer staff officer and CA staff at the CMOC.

5-67. 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, logistics 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 protection requirements.
- Existing geospatial product availability and requirements for new terrain visualization products.
- Specialized engineer requirements such as prime power, well drilling, firefighting support, and support to other emergency services.
- Specialized engineer requirements available only in the capabilities of generating force elements of the Engineer Regiment.
- Command and control 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

5-68. 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 four primary tasks as follows: provide support for domestic disasters; provide support for domestic chemical, biological, radiological, and nuclear and high yield explosives incidents; provide support for domestic civilian law enforcement agencies; and provide other designated support. (FM 3-28 discusses these tasks in detail.)

5-69. Engineering in civil support operations 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 mission command, 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 the USACE will play a critical and significant role in civil support operations. TECs, under their OPCON relationship with USACE, can provide mission command support.

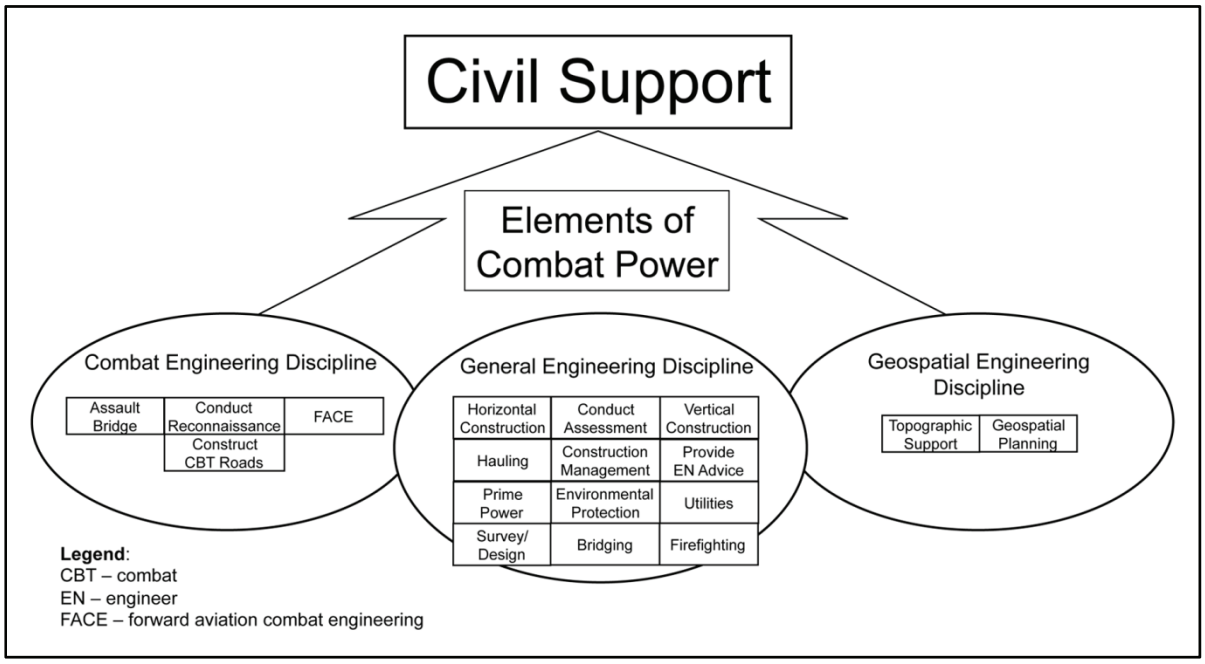

Figure 5-6. Notional engineer support to civil support operations

5-70. 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 United States 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 disaster. Within this context, a focus for engineers during civil support operations will be the restoration of essential services. Essential services of concern for engineers include providing—

- Urban search and rescue.
- Food and water.

- Emergency shelter.
- Basic sanitation (sewage and waste disposal).
- Minimum essential access to affected areas.

5-71. 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 engineer missions are similar to those required in stability operations, except that they are not 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.
- Providing camp construction and power generation.
- Conducting infrastructure reconnaissance, technisa assistance, and damage assessment.
- Conducting emergency demolition.
- Conducting debris or route clearing operations.

5-72. Engineer support to civil support 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 protection requirements of the force and may be extended to support other agencies. Likely missions include—

- Base camp construction and power generation.
- Debris or route clearing operations.
- Construction and repair of expedient (temporary) roads and trails.
- Forward aviation combat engineering to include the repair of paved, asphalt and concrete runways and airfields.
- Installation of assets that prevent foreign object damage to rotary wing aircraft.
- Construction of temporary bridging.
- Construction and upgrade of ports, airfields, and RSOI facilities to ensure access to the region.

5-73. 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. The USACE maintains significant response capability and will normally be involved in providing engineering support to civil support operations. The 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

5-74. Army commanders will likely determine that operations in the 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 full spectrum urban operations may be the commander's sole focus or only one of several tasks nested in an even larger operation. Although urban operations potentially can 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 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).

5-75. 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 in the reduction of EH (improvised explosives and unexploded explosive ordnance) to minimize collateral damage, military police to enable the movement of civilians along routes, and with CBRN elements for potential agents along the routes and at other locations within the AO.

5-76. Full spectrum operations present a broad range of potential tasks to any engineer commander. It may appear daunting as the mission-essential task list 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 for and prepare for those. Projected support relationships will allow discussion with higher headquarters and those units the engineer unit is likely to support and will assist the commander in narrowing the list of missions and prioritizing their training. There is no substitute for having a trained and disciplined unit 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 Considerations for Engineer Support to Operations

Engineer support to operations carries special sustainment challenges which, if not overcome, can seriously inhibit or even stop engineer support. Engineers must anticipate these challenges and work within the sustainment warfighting function to overcome them. Doing so requires that engineers thoroughly understand the sustainment warfighting function, including sustainment organizations, the principles of sustainment, sustainment roles and responsibilities, the sustainment functions, and the integration of sustainment into operations, as described in FM 4-0. This chapter focuses on sustainment support for engineer capabilities and highlights the sustainment considerations that will affect engineer support. For additional information on sustainment see FM 4-0.

SUSTAINMENT CHALLENGES FOR ENGINEER SUPPORT

6-1. Many sustainment challenges are common to all units, but engineer units face several unique sustainment challenges. Engineers and staffs that will employ engineer units/capabilities need to thoroughly understand, anticipate, and work to overcome these challenges.

6-2. Many engineer tasks require the use of engineer equipment that is large and heavy, requiring low-density haul assets to move more than short distances. Engineer equipment often exceeds size and weight restrictions, making its movement even more challenging.

6-3. Much engineer equipment is also low-density, which poses challenges to its maintenance and repair. Obtaining engineer-specific Class IX repair parts often requires extraordinary coordination. Mechanics capable of maintaining and repairing engineer equipment may also be in short supply, adding to the difficulty in keeping engineer equipment operating.

6-4. Engineer equipment also consumes large amounts of fuel (higher than most equipment found in an IBCT or SBCT). Refueling is often complicated by the fact that much engineer equipment cannot easily travel to refueling points. On the one hand, any time spent travelling between work sites and refueling points can significantly reduce productivity. On the other hand, bringing fuel trucks to the work sites can be difficult, especially when the sites are widely scattered over large distances in difficult terrain, and it increases risk for fuel trucks. It also reduces the availability of fuel trucks for other critical missions.

6-5. Engineer tasks frequently require large amounts of Class IV and V supplies. Survivability and countermobility operations require fortification and barrier materials along with mines and demolitions, while mobility operations require demolitions and construction materials. Construction projects often require significantly large amounts of construction materials. These materials are typically difficult to move and require a large commitment of transportation and material handling equipment support. They also need security, protection, and control, which place additional demands on other resources.

6-6. Construction materials often require long lead times and can be difficult to acquire in the required quantities and specifications. Statutory, regulatory, and command policies may dictate the source of construction materials, requiring the maximum use of local procurement for example.

6-7. All of the above are further complicated by engineers' frequent movement within the AO as well as likely changes to task organization and command and support relationships. Limited engineering assets often require that they be frequently shifted throughout the AO to meet the mission requirements. These movements and changes often have a ripple effect in the sustainment system, which may have difficulty

keeping up with these types of multiple changes. This is exacerbated when, as is often the case, engineer missions are conducted in austere environments while infrastructure is being established or improved.

6-8. The requirements for engineer units and assets almost always exceed the capacity of available engineer units. This inevitably imposes pressure to delay preventive maintenance, checks, and services to avoid work stoppages, which only increases the likelihood and length of future equipment failures and further compounds maintenance difficulties. It also frequently leads to the procurement of locally available construction materials, repair parts, and construction services. These bring their own unique challenges along with the need for financial management and contract management support. Most engineer units (less FEST-A teams) do not have any dedicated contingency contracting teams, and this support is provided on a GS basis from the supporting contracting support brigade (or joint command if established).

6-9. Some key differences between contracted and military support 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 representative.
- Contractors perform only tasks as specified in contracts by the terms of their contract. .

6-10. All of these challenges are predictable and none of them should catch engineer leaders, or the staffs that support them, by surprise. Engineers and staffs must anticipate such challenges, work to prevent them, and be prepared to overcome them. Because of the critical impact that sustainment has on engineer missions, engineer commanders and staff must be thoroughly familiar with sustainment doctrine and organizations as described in FM 4-0 and subordinate publications. The importance and unique challenges of contracted support require engineer commanders and staffs to fully understand their role in planning for and managing contracted support as described in FM 4-92 and FM 4-94.

ORGANIZATIONS AND FUNCTIONS

6-11. Sustainment support for engineers is provided by different organizations based on various factors such as the echelon of the supported unit and command and support relationships. Although engineers should be familiar with all the sustainment organizations described in FM 4-0, some organizations provide support to engineers more frequently than others.

6-12. Engineers operating in support of headquarters above the BCT level will work closely with the sustainment brigade. In an HBCT and IBCT, the organic engineer companies are supported by the BSTB. In an SBCT they are supported by the BSB and headquarters and headquarters company of the BCT. Other engineer units operating within the BCT will work closely with the BSB or BSTB. If an engineer battalion headquarters is task-organized to a BCT, it should be accompanied by appropriate sustainment support that has been task-organized to the battalion to provide necessary augmentation of the sustainment capabilities of the BSB or BSTB. Engineer battalions provide logistics support to subordinate units through organic forward support companies.

PRINCIPLES OF SUSTAINMENT

6-13. As discussed in FM 4-0, the principles of sustainment (integration, anticipation, responsiveness, simplicity, economy, survivability, continuity, and improvisation) are essential to maintaining combat power, enabling strategic and operational reach, and providing Army forces with endurance. The sustainment challenges for engineer support (described at the beginning of this chapter) make it essential that engineer leaders and staff effectively apply these principles. This section describes some ways that engineers apply the principles of sustainment.

6-14. Engineers must integrate sustainment with engineer plans. Sustainment must not be an afterthought. Engineers must coordinate and synchronize their operations with the elements of sustainment. This must occur at all levels of war and throughout the operations process at all echelons. Engineer planners evaluate the sustainment significance of each phase of the operation during the entire planning process. They create a clear and concise concept of support that integrates the commander's intent and concept of operation. This

includes analyzing the mission; developing, analyzing, wargaming, and recommending a COA; and executing the plan.

6-15. Engineers must visualize future operations and identify appropriate required support. They must then start the process of acquiring the materiel or placement of support that best sustains the operation. As early as possible, engineers must forecast requirements for Class IV and V supplies (and the transportation and material handling support needed to move them) and initiate actions to acquire and place them where they will be needed. Engineer staff officers must do this long before specific engineer missions are assigned to specific engineer units. Otherwise, sufficient resources likely will not be available when needed. Engineers must also anticipate requirements for financial management and contract management support for local procurement of construction materials and services and repair parts. They must anticipate requirements for fuel and for maintenance support and other supplies and services common to all units.

6-16. The planner who anticipates is proactive—not reactive—before, during, and after operations. 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 abilities of the commanders, logisticians, and engineers to anticipate requirements. Engineers consider joint, multinational, contract civilian, and interagency assets when planning support for engineer missions. 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; they 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.

6-17. The engineer staff officer must anticipate likely task organization changes that will affect the flow of sustainment to engineer organizations. Additional missions will be created by the sustainment plan (for example, clearing an LZ for aerial resupply). These missions and tasks must be anticipated and planned for during the mission analysis.

6-18. Engineers must develop and maintain responsiveness. They must seek to ensure that sufficient resources are identified, accumulated, and maintained to meet rapidly changing requirements. For example, engineers conduct reconnaissance to identify local materials and other resources that could be used to support potential engineer missions. They establish preconfigured loads, pre-position supplies and equipment, and ensure that trained and certified personnel are available to support local purchase of materials and services.

6-19. 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 4-92 and FM 4-94). General engineers will often be required to provide subject matter expertise for the supervision of contracted materials and services.

6-20. Engineers use mission-type orders and standardized procedures to contribute to simplicity. Engineer commanders and staffs establish priorities and allocate classes of supply and services to simplify sustainment operations. They use preconfigured loads of specialized classes of supply to simplify transport.

6-21. 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.

6-22. Engineers must protect the resources they need to sustain their units and accomplish their mission. In addition to protecting their own units, personnel, and equipment, engineers must also emphasize security

and protection for Class IV and V supplies. These supplies are not easily replaced and can be tempting targets for enemy action.

6-23. 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 or other types of hardening for petroleum, oil, and lubricants products.

6-24. The tempo of operations requires a constant vigilance by the logistician and engineer commander to ensure a constant flow of support. Supplies are pushed forward (unit distribution method) 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.

6-25. When faced with unexpected situations or circumstances, engineers must improvise. They must be aware of the resources available in the local area and must regularly train on using improvised methods of accomplishing engineer tasks.

ENGINEER LEADER AND STAFF RESPONSIBILITIES FOR SUSTAINMENT

6-26. Successful sustainment of engineer organizations and capabilities requires active involvement by engineer staff and commanders at every echelon. In addition to ensuring the sustainment of their units, engineers must work closely with their supported units. This is because the supported unit is responsible for providing the fortification, barrier, and construction materials, and the mines and demolitions needed for the tasks they assign to the supporting engineer unit, regardless of the command and support relationship between them. The higher echelon engineer staff officer must retain an interest in the sustainment of subordinate engineer units and capabilities, regardless of their command and support relationships with the units they support. Within a supported unit, the engineer staff officer must work closely with the logistics staff to assist in planning, preparing, executing, and assessing operations requiring engineer materials and resources. Within engineer or multifunctional modular headquarters units, the logistics staff provides sustainment planning for the engineer force under its mission command.

6-27. Within engineer units, leaders and staff must monitor, report, and request requirements through the correct channels and ensure that sustainment requirements are met when sustainment is brought forward to the engineer unit. Accurate and timely submission of personnel and logistics reports, and other necessary information and requests, is essential.

Note. Sustainment responsibilities specific to various echelons are discussed in ATTP 3-34.23 and FM 3-34.22.

ENGINEER STAFF OFFICER

6-28. The engineer staff officer 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 engineer staff officer recommends the most effective command or support relationship, including considering the impact of inherent sustainment responsibilities. The engineer staff officer—

- Writes the engineer annex and associated appendixes to the OPLAN or OPORD to support the commander's intent. Included in these is a 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 V supplies. This site(s) is coordinated with the unit responsible for the terrain and the appropriate logistics staff officer (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. This site(s) is 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 III supplies in support of construction.
- Provides the appropriate S-4 or G-4 with an initial estimate of required Class IV and 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 engineer staff officer is the timely delivery at required specifications, whatever the source for construction materials.
- Tracks the flow of mission critical Class IV and 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.
- Considers environmental impacts of all decisions.

ENGINEER UNIT COMMANDER

6-29. 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's 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's standing operating procedure and OPORD.
- Monitors equipment locations and maintenance status.
- Updates the engineer-specific Class IV and 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.

SUSTAINMENT PLANNING CONSIDERATIONS

6-30. The engineer staff officer, the engineer unit commander, the supported unit S-4 or G-4, and the supporting sustainment unit work closely to synchronize sustainment for engineer capabilities. When the supported unit receives a warning order (directly or implied) as part of the MDMP, the engineer staff officer initiates the engineer portion of the logistics estimate process. The engineer staff officer 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.

6-31. The engineer staff officer uses the running estimate to determine the requirements for unit and mission sustainment and 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 supporting sustainment unit or forward support element to ensure that the needed supplies are identified and resourced.

6-32. The engineer staff officer 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.

6-33. In each of the different types of BCTs, the engineer staff officer, 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 engineer staff officer in providing the overall engineer status to the brigade commander and allows the engineer staff officer to intercede in critical sustainment problems when necessary. The engineer staff officer 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 engineer staff officer to execute these missions properly, accurate and timely reporting and close coordination between the engineer staff officer, sustainment planners and providers, the TF engineers (or in some cases the engineer unit commander in the SBCT), and supporting EAB engineers are essential. Supporting EAB engineer units must affect linkup with the existing engineer sustainment to ensure their synchronization of effort.

6-34. Some important considerations for engineer planners include—

- Coordinating for a field maintenance team to support each engineer unit to ensure quick turnaround of maintenance problems.
- Coordinating closely with the logistics staff to assist in management of required construction materials. The engineer staff helps the logistics staff identify and forecast requirements to ensure a quality control process is in place for receipt of the materials. 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.
- Using expeditionary support packages of barrier materials. See FM 3-90.6 for additional information on expeditionary support packages.
- Coordinating closely with the theater support command or sustainment commands (expeditionary) support operations officer, the ARFOR G-4, the supporting contract support brigade, and the associated LOGCAP planner to ensure that engineer requirements are properly integrated and captured in the contracting support plan and/or specifically addressed in the engineer support plan.

6-35. Engineers must consider 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.

Appendix A

Multinational, Interagency, Nongovernmental Organization, and Host Nation Considerations

Military engineers may need to coordinate their activities with other nations' forces, U.S. government agencies, NGOs, United Nations, 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 combatant 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 exchanged with these agencies.

SECTION I – MULTINATIONAL CONSIDERATIONS

UNITS AND ORGANIZATIONS

A-1. When military operations are considered, the United States 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, collocated, 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

A-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 vary 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

A-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 Allied Tactical Publication-52(B) provide a necessary starting point for working with allied engineers.

MULTINATIONAL ENGINEER MISSION COMMAND

A-4. Depending on the multinational force arrangement in theater, Army engineers may control or work closely with engineers from other nations. Command and control relationships for multinational engineer forces are established to foster cooperation and share information. Critical to this process is providing adequate U.S. engineer liaison officer support, including linguist support, communications equipment, and transportation.

MULTINATIONAL ENGINEER CONSIDERATIONS

A-5. During force projection operations, the initial engineer capabilities in theater will most likely be a mix of HN, contracted, and multinational capabilities. As Army engineers deploy into a theater, they may be joined by multinational and joint engineers. When coordinating multinational engineer plans and operations, the theater army engineer staff should consider including the following (in addition to joint considerations addressed in JP 3-34):

- Requesting the latest intelligence information concerning the HN or multinational engineers' structures and logistics requirements.
- Requesting the latest engineer intelligence data from the HN or deploying multinational 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 theater army, HN, and multinational engineer force staff sections through the JTF or combatant command engineer staff and headquarters.
- Executing NATO multinational mission command with the NATO OPORD format and the NATO decisionmaking process.
- Providing necessary Army engineer liaison officer support.
- Developing the multinational task-organization relationships that enhance HN and multinational engineer capabilities following the deployment of Army engineers.
- Assessing the need for HN and multinational engineer support following the arrival of Army engineer units in theater.
- Determining if multinational engineer units need augmentation from Army engineer 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

A-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, they also increase and complicate the coordination necessary to conduct operations. Engineer support to operations may be significantly impacted by the participation of interagency organizations. In civil support operations, Army forces provide mission command, protection, and sustainment to government agencies at all levels until they can function normally. Engineer support may be a key enabler to such operations. In stability operations, interagency organizations will employ contract or other construction capabilities concurrently with ongoing military engineer support. 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:

- Federal Emergency Management.
- Environmental Protection Agency.
- Drug Enforcement Administration.
- National Oceanic and Atmospheric Administration.
- United States Geological Survey.
- Public Health Service.
- Civil Air Patrol.
- Department of Agriculture.
- Department of State and the United States Agency for International Development.
- Office of Foreign Disaster Assistance.
- Department of the Interior, Fish and Wildlife Agency.
- General Accounting Office.
- National Geospatial Intelligence Agency.

A-7. USACE routinely operates with many of these organizations and may, through FFE, provide assistance in coordination. See JP 3-08 for an in-depth discussion of interagency coordination during joint operations.

NONGOVERNMENTAL ORGANIZATIONS

A-8. Relationships with international and domestic NGOs must be established through negotiation. Most agreements are made at the strategic level (combatant 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 supplies, 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.

A-9. The United Nations 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

A-10. In a forward-deployed theater, the ASCC (in conjunction with the other component commanders, the CCDR, allies, and 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.

A-11. The product of these analyses is the engineer support plan. 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 RSOI. Engineering support from the HN usually involves providing—

- Land.
- Facilities.
- Construction support.
- Manpower.
- Equipment.
- Materials.
- Services.
- Hazardous-waste disposal.

A-12. Written agreements with HNs regarding support items foster an understanding of the assistance levels and increase the likelihood of execution.

REAL ESTATE CONSIDERATIONS

A-13. Real estate is required for most military operations. Examples of real estate requirements include—

- Air bases.
- Base camps.
- Medical and logistics complexes.
- Ranges and training sites.
- Quarry and borrow sites.
- Trailer transfer points.
- Traffic control points.

A-14. Acquiring land and facilities not owned by the U.S. 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. 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.

A-15. 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.

A-16. 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, is 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. 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

A-17. 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 host nation support (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.

A-18. Pre-positioning engineer equipment within the region reduces the response time into a particular theater by allowing engineer forces to deploy by air and fall in on war stocks within the region. These pre-positioning locations are a critical element of the U.S. force projection national strategy and represent a significant contribution of HNS. 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 engineer equipment, supplies, or funding, much like the Japanese provided during the Gulf War.

A-19. During a conflict, the HN may provide construction organizations to repair or construct facilities. 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. 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.

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Appendix B

Army Engineer Operations

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 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. (For information about geospatial engineer teams, see ATTP 3-34.80, appendix E.)

Table B-1. Organic engineer units

Unit	*Figure Number and Page*
HBCT engineer company	B-1, B-3
IBCT engineer company	B-2, B-3
SBCT engineer company	B-3, B-4

ENGINEER HEADQUARTERS UNITS

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

Table B-2. Headquarters units

Unit	*Figure Number and Page*
Theater engineer command	B-4, B-4
Engineer brigade	B-5, B-5
Engineer battalion	B-6, B-5

BASELINE ENGINEER UNITS

B-3. Table B-3 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 and sapper company (wheeled)	B-7, B-6
Sapper company (airborne)	B-8, B-6
Mobility augmentation company	B-9, B-7
Multirole bridge company	B-10, B-7
Clearance company	B-11, B-8

Table B-3. Baseline engineer units

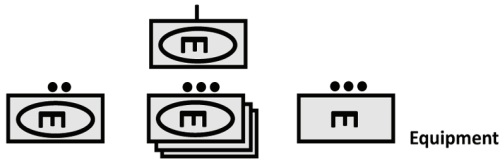
Unit	*Figure Number and Page*
Horizontal construction company	B-12, B-8
Vertical construction company	B-13, B-9
Engineer support company	B-14, B-9
Engineer support company (airborne)	B-15, B-10

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*
Prime power company	B-16, B-10
Topographic engineer company	B-17, B-11
Equipment support platoon	B-18, B-11
Quarry platoon	B-19, B-12
Facility engineer detachment	B-20, B-12
Construction management team	B-21, B-12
Survey and design team	B-22, B-13
Concrete section	B-23, B-13
Forward engineer support team–main	B-24, B-13
Forward engineer support team–advance	B-25, B-14
Firefighting headquarters	B-26, B-14
Firefighting team	B-27, B-14
Asphalt team	B-28, B-15
Diving team	B-29, B-15
Real estate team	B-30, B-15
Well drilling headquarters	B-31, B-16
Well drilling team	B-32, B-16
Engineer detachment headquarters (canine)	B-33, B-16
Engineer squad (canine)	B-34, B-17
Explosive hazards team	B-35, B-17
Explosive hazards coordination cell	B-36, B-17
Geospatial planning cell	B-37, B-18
Area clearance platoon	B-38, B-18

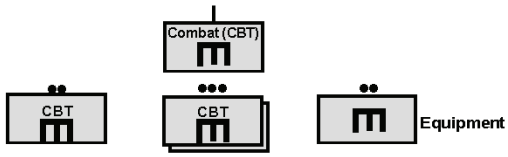


MISSION: To increase the combat effectiveness of the BCT by accomplishing mobility, countermobility, survivability, and limited general engineering tasks, or to perform combat tasks when required.

TYPICAL ALLOCATION: One per heavy BCT.

Legend:
BCT – brigade combat team

Figure B-1. HBCT engineer company

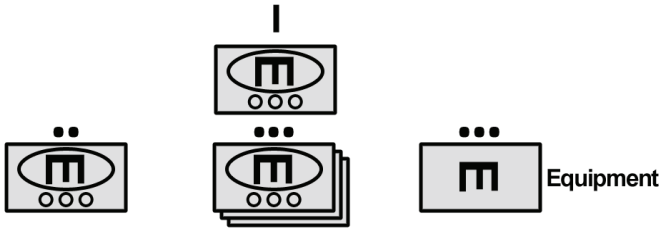


MISSION: To increase the combat effectiveness of the BCT by accomplishing mobility, countermobility, survivability, and limited general engineering tasks, or to perform combat tasks when required.

TYPICAL ALLOCATION: One per infantry BCT.

Legend:
BCT – brigade combat team
CBT – combat

Figure B-2. IBCT engineer company

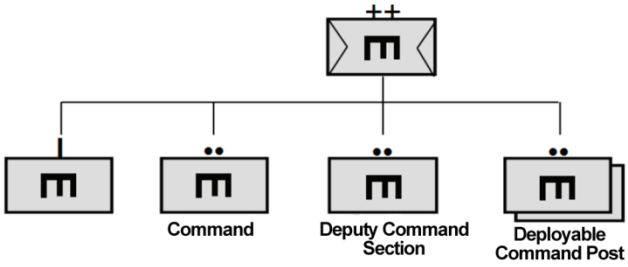


MISSION: To increase the combat effectiveness of the BCT by accomplishing mobility, countermobility, survivability, and limited general engineering tasks, or to perform combat tasks when required.

TYPICAL ALLOCATION: One per Stryker BCT.

Legend:
BCT – brigade combat team

Figure B-3. SBCT engineer company

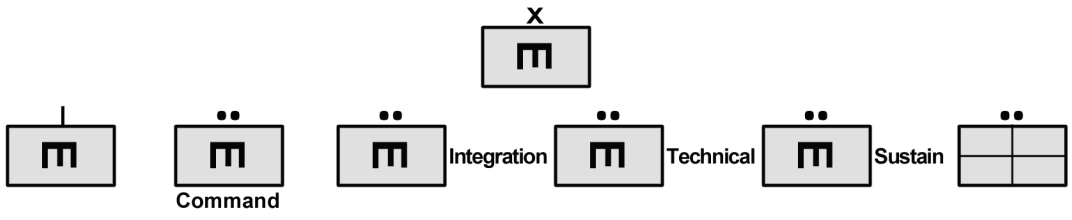


MISSION: To provide a senior engineer headquarters for command and control of engineer operations in a theater of operations.

TYPICAL ALLOCATION: One per major combat operation. Mission-tailored theater engineer command modules as required for contingency operations.

SUPPORTS: Mission-tailored to conduct theater army or corps echelon engineer operations.

Figure B-4. Theater engineer command



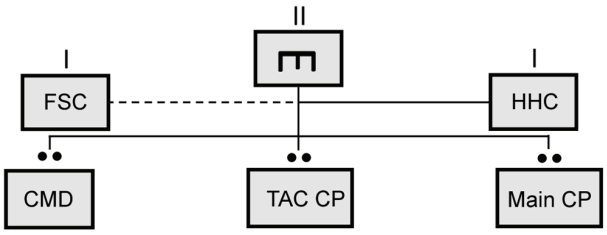
MISSION: To provide an engineer headquarters for command and control of engineer operations throughout the area of operations.

TYPICAL ALLOCATION: One engineer brigade headquarters per 2-5 engineer battalions.

SUPPORTS:

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

Figure B-5. Engineer brigade



MISSION: To provide an engineer for command and control of engineer operations in the area of operations.

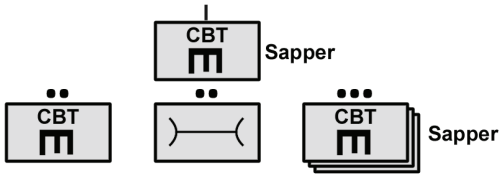
TYPICAL ALLOCATION: One engineer battalion HQ per 2-5 engineer companies.

SUPPORTS: The battalion HQ provides command and control for engineer operations supporting brigade, division, or corps operations.

Legend:

CMD – command	HHC – Headquarters and headquarters company
CP – command post	HQ – headquarters
FSC – forward support company	TAC – tactical

Figure B-6. Engineer battalion



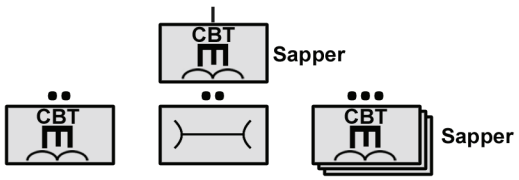
MISSION: To conduct mobility, countermobility, and survivability tasks, and provide support for general engineering missions as part of a tailored force package or task-organized to the BCT.

TYPICAL ALLOCATION:
- One per clearance company conducting clearance operations.
- One per BCT conducting combat operations.
- 1.5 per general construction workload.

SUPPORTS:
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a brigade special troops battalion, combat aviation brigade, or other battalion conducting combined arms operations.

Legend:
BCT – brigade combat team
CBT – combat

Figure B-7. Sapper company and sapper company (wheeled)



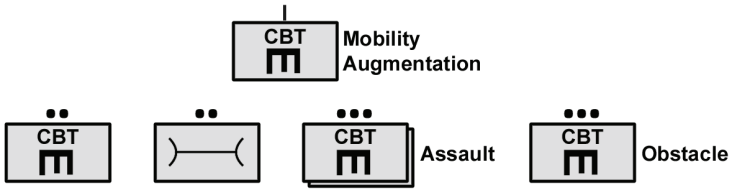
MISSION: To conduct mobility, countermobility, and survivability tasks, and provide support for general engineering missions as part of a tailored force package or task-organized to the BCT.

TYPICAL ALLOCATION:
- One per clearance company conducting clearance operations.
- One per BCT conducting combat operations.
- 1.5 per general construction workload.

SUPPORTS:
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a brigade special troops battalion, combat aviation brigade, or other battalion conducting combined arms operations.

Legend:
BCT – brigade combat team
CBT – combat

Figure B-8. Sapper company (airborne)



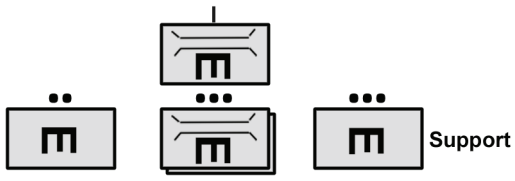
MISSION: To conduct assault gap crossings, mounted and dismounted breaches, and obstacle emplacement as part of a tailored force package or task-organized to the BCT.

TYPICAL ALLOCATION:
- One per infantry or Stryker BCT conducting combat operations.
- Two per heavy BCT conducting combat operations.

SUPPORTS:
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a brigade special troops battalion, combat aviation brigade, or other battalion conducting combined arms operations.

Legend:
BCT – brigade combat team
CBT – combat

Figure B-9. Mobility augmentation company



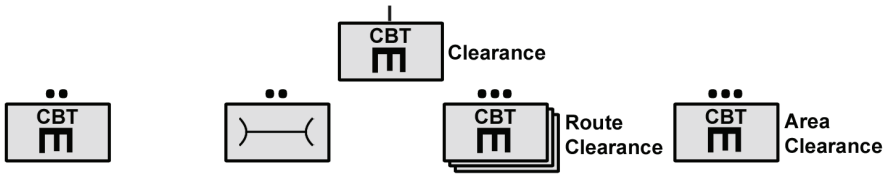
MISSION: To provide personnel and equipment to transport, assemble, disassemble, retrieve, and maintain all standard U.S. Army bridging systems, and to provide transportation of Palletized Loading System configured cargo.

TYPICAL ALLOCATION: One per two brigade combat teams.

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.

Legend:
U.S. – United States

Figure B-10. Multirole bridge company



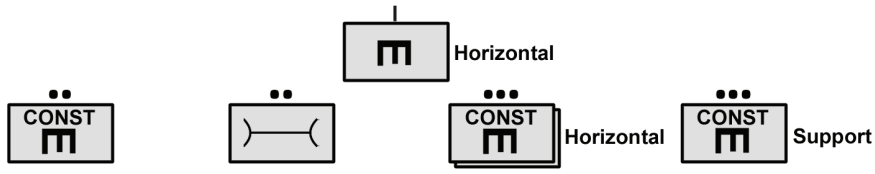
MISSION: To detect and neutralize explosive hazards along routes and within designated areas as part of a tailored force package or task-organized to the BCT.

TYPICAL ALLOCATION: One per four BCTs or per requirement for 255 kilometers (156 miles) of two-way route clearance per day.

SUPPORTS:
- Force tailored with an engineer battalion conducting engineer operations in support of brigade, division, or corps operations.
- May be task-organized to a brigade special troops battalion, combat aviation brigade, or other battalion conducting combined arms operations.

Legend:
BCT – brigade combat team
CBT – combat

Figure B-11. Clearance company



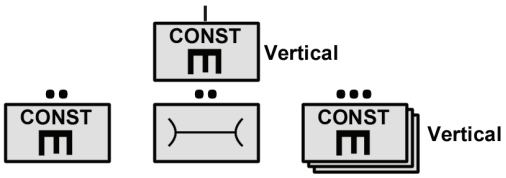
MISSION: To repair, maintain, or construct roads and airfields; emplace culverts; haul construction materials; conduct clearing and grubbing; and provide other horizontal construction.

TYPICAL ALLOCATION:
- One per division.
- One per brigade combat team during defensive 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 horizontal construction operations.

Legend:
CONST – construction

Figure B-12. Horizontal construction company



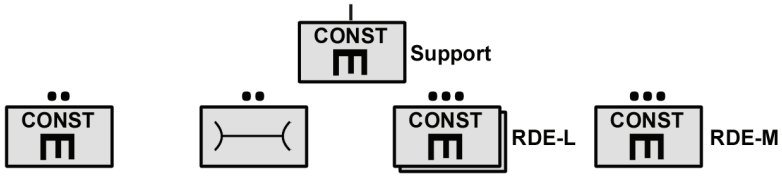
MISSION: To provide vertical construction required in the development of base camps and to construct, repair, and maintain other facilities and infrastructure as required.

TYPICAL ALLOCATION: One per vertical construction workload of 1,000 man hours per day.

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.

Legend:
CONST – construction

Figure B-13. Vertical construction company



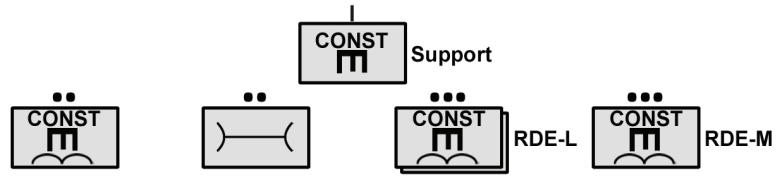
MISSION: To provide construction support for base camp development, road maintenance and repair, runway repair and airfields, and nonexplosive obstacle clearance.

TYPICAL ALLOCATION: One per horizontal construction workload of 1,000 man hours per day.

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.

Legend:
CONST – construction
RDE-L – rapidly deployable equipment-light
RDE-M – rapidly deployable equipment-medium

Figure B-14. Engineer support company



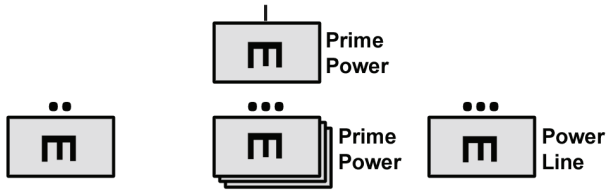
MISSION: To provide construction support for base camp development, road maintenance and repair, runway repair and airfields, and nonexplosive obstacle clearance.

TYPICAL ALLOCATION: One per horizontal construction workload of 1,000 man hours per day.

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.

Legend:
CONST – construction
RDE-L – rapidly deployable equipment-light
RDE-M – rapidly deployable equipment-medium

Figure B-15. Engineer support company (airborne)

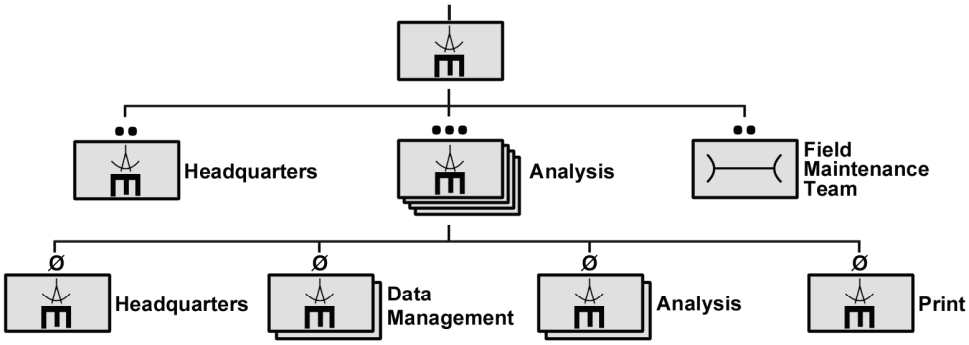


MISSION: To generate electrical power and provide advice and technical assistance on all aspects of electrical power and distribution in support of military operations.

TYPICAL ALLOCATION: One per theater army.

SUPPORTS:
- Force tailored with the theater engineer command, an engineer brigade, or an engineer battalion to provide prime power.
- Each of the prime power platoons may be tailored for deployment and operation of assigned equipment.
- The power line platoon may be tailored with the prime power platoons or independently to construct, maintain and/or repair electrical distribution systems.

Figure B-16. Prime power company

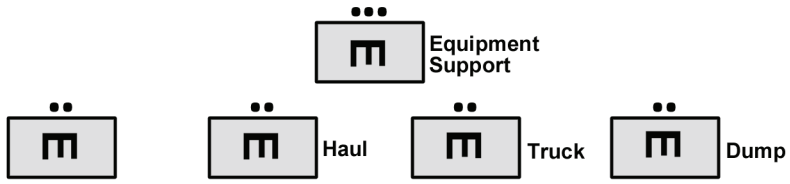


MISSION: Plans, conducts, prepares, and provides management, analysis, and distribution of geospatial data and mobility assessments. Provide division, corps or joint task force, theater army, and Federal Emergency Management Agency regions with analysis, collection, generation, management, finishing, and printing capability. Enable protection or consequence management in support of homeland security operations.

TYPICAL ALLOCATION: One per theater army.

SUPPORTS: Force tailored with the theater engineer command, an engineer brigade, or an engineer battalion to provide geospatial engineering.

Figure B-17. Topographic engineer company

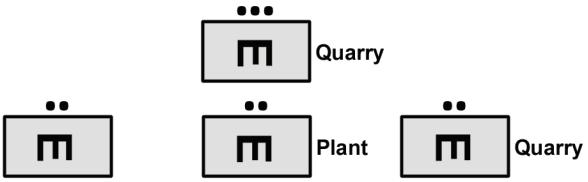


MISSION: To conduct borrow pit operations (light) and provide lift and load support in order to remove stockpiles, haul material, remove rubble, or raze and remove structures in support of construction missions.

TYPICAL ALLOCATION: 0.25 per horizontal company.

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

Figure B-18. Equipment support platoon



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.

TYPICAL ALLOCATION: 0.125 per horizontal company.

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

Figure B-19. Quarry platoon

MISSION: To provide facilities engineering and management to support base development.

TYPICAL ALLOCATION:
- One per theater support command.
- One per theater opening group.

SUPPORTS:
- Force tailored with the TEC, engineer brigade, or deploying TEC or brigade module
- May be task-organized to support theater army forces.

Legend:
TEC – theater engineer command

Figure B-20. Facility engineer detachment

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

TYPICAL ALLOCATION: One per engineer battalion consisting of any combination of three horizontal companies, vertical companies, or engineer support companies.

SUPPORTS:
- Force tailored with the theater engineer command, engineer brigade, or engineer battalion.
- May be task-organized to support theater army forces.

Legend:
CONST – construction

Figure B-21. Construction management team

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

TYPICAL ALLOCATION: One per engineer battalion consisting of any combination of three horizontal companies, vertical companies, or engineer support companies.

SUPPORTS: Force tailored with the theater engineer command, engineer brigade, or engineer battalion.

Legend:
CONST – construction

Figure B-22. Survey and design team

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.

TYPICAL ALLOCATION: 0.6 per vertical company.

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

Legend:
CONST – construction

Figure B-23. Concrete section

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

TYPICAL ALLOCATION: One per theater army.

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 theater engineer command or engineer brigade.

Legend:
FEST-M – forward engineer support team-main
USACE – United States Army Corps of Engineers

Figure B-24. Forward engineer support team–main

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

TYPICAL ALLOCATION: One per brigade combat team.

SUPPORTS:
- Force tailored with a corps, division, or brigade headquarters.
- May be task-organized to the theater engineer command or engineer brigade.

Legend:
FEST-A – forward engineer support team-advance
USACE – United States Army Corps of Engineers

Figure B-25. Forward engineer support team–advance

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.

TYPICAL ALLOCATION: One per three to eight engineer firefighting teams.

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

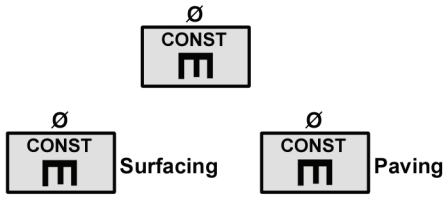
Figure B-26. Firefighting headquarters

MISSION: To provide firefighting and rescue operations support to aircraft crash incidents, vehicle emergencies, natural cover fires, and emergency response including hazardous material incidents and manmade or natural disasters.

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.
- One per airfield operations battalion.

SUPPORTS: Force tailored with an engineer firefighting headquarters.

Figure B-27. Firefighting team



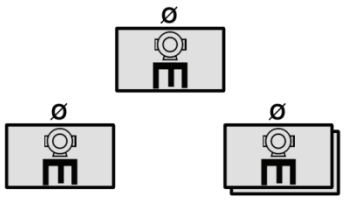
MISSION: To provide bituminous mixing and paving in support of major horizontal construction projects such as highways, storage facilities, and airfields.

TYPICAL ALLOCATION: 0.125 per horizontal company.

SUPPORTS:
- Force tailored with the horizontal or engineer support company.
- May be task-organized to support other construction units.

Legend:
CONST – construction

Figure B-28. Asphalt team



MISSION: To provide heavy diving support in the areas of ports, harbors, and coastal zones.

TYPICAL ALLOCATION: One per two major ports.

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

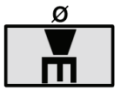
Figure B-29. Diving team

MISSION: To perform functions related to the acquisition, utilization, and disposal of real property for military purposes.

TYPICAL ALLOCATION: One per Army service component command.

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

Figure B-30. Real estate team

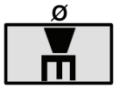


MISSION: To provide command and control for water resource development and well drilling.

TYPICAL ALLOCATION: 0.167 per well drilling team.

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

Figure B-31. Well drilling headquarters



MISSION: To provide drilling for development of water wells.

TYPICAL ALLOCATION: One well drilling team per 1,000 short tons (240,964 gallons) consumption of water per day.

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

Figure B-32. Well drilling team

MISSION: To provide command and control of engineer canine clearance and specialized search operations.

TYPICAL ALLOCATION: One per headquarters and headquarters company, theater engineer command.

SUPPORTS:
- Force tailored with the engineer battalion or clearance company.
- May be task-organized to a brigade combat team, support brigade, or other headquarters conducting clearing operations.

Legend:
CBT – combat

Figure B-33. Engineer detachment headquarters (canine)

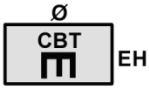
MISSION: To support units by detecting casualty-producing devices for route clearance, area clearance, and specialized searches.

TYPICAL ALLOCATION:
- One per division.
- One per six route/area clearance operations in Logic Region 1, 2 and 3.
- One per 0.222 acres of route/area requiring detection/proofing per day in Logic Region 1, 2, and 3.

SUPPORTS: Force tailored with the engineer detachment headquarters (canine).

Legend:
CBT – combat

Figure 3-34. Engineer squad (canine)



MISSION: To provide staff element for collection, analysis, and dissemination of EH information.

TYPICAL ALLOCATION: One per theater army or joint operations area.

SUPPORTS: Force tailored to the corps, division, or brigade headquarters.

Legend:
CBT – combat
EH – explosive hazards

Figure B-35. Explosive hazards team

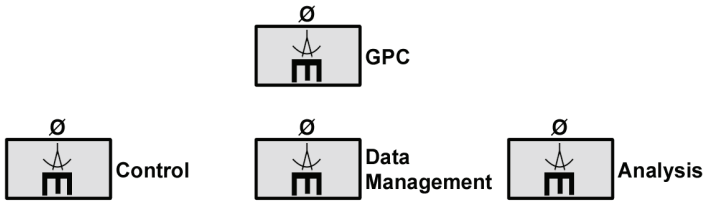
MISSION: To provide staff element for collection, analysis, and dissemination of EH information.

TYPICAL ALLOCATION: One per theater army or joint operations area.

SUPPORTS: Force tailored to the corps, division, or brigade headquarters.

Legend:
CBT – combat
EH – explosive hazards
EHCC – explosive hazards coordination cell

Figure B-36. Explosive hazards coordination cell



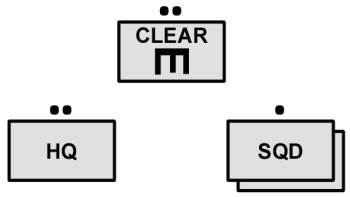
MISSION: Collect, manage, generate, and disseminate the TGD for all units operating in the GPC's AOR. Generate new geospatial data, value-add to existing NGA data, and collect field-generated data from units operating within the GPC's AOR for inclusion into the TGD. Distribute generated and field-collected data to NGA for inclusion into their national geospatial data holdings. Coordinate with other geospatial engineer teams to ensure field-collected data is incorporated into the TGD, to minimize duplication of effort, and to ensure all units operate off of a common geospatial data set which forms the foundation of the common operating picture for all battle command systems operating within the operational area.

TYPICAL ALLOCATION: One per Army service component command.

SUPPORTS: Assigned to a corps or theater army headquarters.

Legend:
AOR – area of responsibility
GPC – geospatial planning cell
NGA – National Geospatial-Intelligence Agency
TGD – theater geospatial database

Figure B-37. Geospatial planning cell



MISSION: To conduct area clearance, minesweeping, and enemy or unobserved minefield clearing operations. The platoon clears obstacles with engineer (countermine) equipment or uses demolitions and performs engineer reconnaissance.

TYPICAL ALLOCATION:
- One per committed division or Army service component command.
- One per 0.5 acres of area requiring clearing and proofing per day in BCT, division, corps, or theater army area of operation, or port area.

SUPPORTS: Force tailored with a clearance company.

Legend:
BCT – brigade combat team
CLEAR – clearance
HQ – headquarters
SQD – squad

Figure B-38. Area clearance platoon

Glossary

SECTION I – ACRONYMS AND ABBREVIATIONS

ADCON	administrative control
AFCESA	Air Force Civil Engineer Support Agency
AJP	allied joint publication
AO	area of operations
AOR	area of responsibility
APOD	aerial port of debarkation
ARFOR	*See* ARFOR under terms
ARNG	Army National Guard
ASCC	Army service component commander
AT	antitank
ATP	allied tactical publication
ATTP	Army tactics, techniques, and procedures
BCT	brigade combat team
BDT	base camp development team
BSB	brigade support battalion
BSTB	brigade special troops battalion
CA	civil affairs
CBRN	chemical, biological, radiological, and nuclear
CCD	camouflage, concealment, and deception
CCDR	combatant commander
CJCSM	Chairman, Joint Chiefs of Staff Manual
CMOC	civil-military operations center
COA	course of action
CONUS	continental United States
COP	common operational picture
CP	command post
CREST	contingency real estate support team
DA	Department of the Army
DCP	deployable command post
DOD	Department of Defense
DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel, and facilities
DS	direct support
EAB	echelons above brigade
EH	explosive hazards
EnvST	environmental support team
EOD	explosive ordnance disposal
ERT	engineer reconnaissance team

***EWL**	engineer work line
FEST	forward engineer support team
FEST-A	forward engineer support team – advance
FEST-M	forward engineer support team – main
***FFE**	field force engineering
FM	field manual
FRAGO	fragmentary order
G-4	Assistant Chief of Staff, Logistics
GCC	geographic combatant commander
GEOINT	geospatial intelligence
GS	general support
HBCT	heavy brigade combat team
HN	host nation
HNS	host nation support
IBCT	infantry brigade combat team
IED	improvised explosive device
IPB	intelligence preparation of the battlefield
JFC	joint force commander
JOPES	Joint Operation Planning and Execution System
JP	joint publication
JTF	joint task force
LOC	line of communications
LOGCAP	logistics civil augmentation program
LSE	logistics support element
LST	logistics support team
LZ	landing zone
M/CM/S	mobility, countermobility, and survivability
MCRP	Marine Corps reference publication
MCWP	Marine Corps warfighting publication
MDMP	military decisionmaking process
MEB	maneuver enhancement brigade
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, civil considerations
MSR	main supply route
NATO	North Atlantic Treaty Organization
NAVFAC	Naval Facilities Engineering Command
NGO	nongovernmental organization
OE	operational environment
OPCON	operational control
OPLAN	operation plan
OPORD	operation order

PMESII-PT	political, military, economic, social, information, infrastructure, physical environment, time (operational variables)
RDSP	rapid decisionmaking and synchronization process
ROE	rules of engagement
RSOI	reception, staging, onward movement, and integration
S-4	logistics staff officer
SBCT	Stryker brigade combat team
SCATMINE	scatterable mine
SPOD	seaport of debarkation
SU	situational understanding
TC	training circular
TCMS	Theater Construction Management System
TEC	theater engineer command
TF	task force
TSC	theater support command
TTP	tactics, techniques, and procedures
UFC	unified facilities criteria
U.S.	United States
USACE	United States Army Corps of Engineers
USAES	United States Army Engineer School
USAR	United States Army Reserve

SECTION II – TERMS

Term

Definition

ARFOR

The Army Service component headquarters for a joint task force or a joint and multinational force. (FM 3-0)

***combat engineering**

(Army) The engineer discipline that is focused on affecting terrain while in close support to maneuver forces that are in close combat.

***countermobility operations**

(Army) Those combined arms activities that use or enhance the effects of natural and man-made obstacles to deny an adversary freedom of movement and maneuver. (Upon its publication, FM 3-90.8 will become the proponent manual for countermobility operations.)

***engineer disciplines**

The interdependent areas of expertise within the Engineer Regiment. The three engineer disciplines are combat, general, and geospatial engineering.

***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** in FM 1-02.

***field force engineering**

(Army) The application of the Engineer Regiment's capabilities from the three engineer disciplines (although primarily general engineering) to support full spectrum operations through both reachback and forward presence.

***general engineering**

(Army) The engineer discipline that is focused on affecting terrain while not in close support to maneuver forces that are in close combat.

***geospatial engineering**

(Army) The engineer discipline that is focused on applying geospatial information to improve understanding of terrain for military operations.

***lines of engineer support**

Categories of engineer tasks and capabilities that are grouped by purpose for specific operations.

***survivability operations**

Those military activities that develop and construct 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** in FM 1-02. (Upon its publication, ATTP 3-34.XX will become the proponent manual for survivability operations.)

***terrain reinforcement**

The emplacement of obstacles or the construction of fighting positions and cover to degrade enemy mobility or to enhance friendly survivability. See also **countermobility operations; obstacle; survivability operations** in FM 1-02

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DOCUMENTS NEEDED

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READINGS RECOMMENDED

None.

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FM 3-34
4 August 2011

By order of the Secretary of the Army:

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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.