

Chapter 11

Engineer Operations

An adequate sustainment base is essential for the success of any operation. The Army's ability to marshal, transport, and distribute large quantities of material and to maintain assigned personnel and equipment can mean the difference between victory and defeat in conflict or war. The concept of material need in large quantities applies also to MOOTW, where the need for large quantities of Class IV force protection, obstacle, and force bed-down construction materials is significant. Establishing a theater sustainment base depends greatly on the extent and nature of the civil and military infrastructure existing in the theater before hostilities begin. In well-developed regions, military forces can begin operations quickly without having to construct the needed sustainment base. In less-developed regions of the world, the sustainment base may have to be constructed at the same time as combat and sustainment forces are deploying. In forward-presence theaters (such as the Republic of Korea), HNS agreements assist in operating and maintaining the sustainment base. Reception facilities are most critical during the initial stages of any potential conflict.

MISSION

The USACE provides support to the CINC, the AS CC, and engineer units having facilities management and construction missions. The theater USACE element commander may support multiple commanders within the ASCC and other service components. His mission includes—

- Planning and designing theater facilities for contract construction.
- Providing quality assurance for contract construction and troop construction, if requested.
- Managing the contract construction program.
- Planning for and acquiring real estate.
- Managing the LOGCAP contract, including acting as administrative contracting officer (ACO) for LOGCAP construction and providing technical support for logistics services provided by LOGCAP and, if required, a separate ACO for logistics services.
- Providing technical support to Theater Construction Management System (TCMS) and Theater Army Construction Automated Planning System (TACAPS) users.
- Managing finance and accounting for all appropriated military construction funds provided for in-theater construction.
- Providing USACE liaison to the CINC and ASCC staff engineers.

RESPONSIBILITIES

The ASCC tailors the engineer structure to theater requirements. All engineer units—combat, construction, or topographic—are focused on operations in the CZ. They also provide general engineering support to the theater. Engineers must be closely tied into

current and future operational planning and have their own C² structure to assure the timely and proper execution of the intent and scheme of maneuver.

Engineer forces at the operational level are responsible for constructing, maintaining, and

rehabilitating the theater support base. Their responsibilities include support to other services, agencies, and allied military forces in joint and multinational theaters of operations. The ability of CSS units to perform sustainment operations as well as movement and sheltering of combat/combat support forces depends on

adequate, responsive engineer support. The number and type of operational-level engineer support units depend on the size of the support base required, HN infrastructure, the mission, the availability of existing engineer support in the theater of operation, and perceived threat in the rear area.

SUPPORT FUNCTIONS

Engineer support in a mature theater is provided on a mission or area basis according to the theater commander's priorities and construction policy. Engineer units at the operational level provide topographic support to the theater, general engineer support to all US bases or base clusters in the COMMZ, and contract construction support. Additionally, operational-level engineers may be tasked to provide support to the combat area, a host nation, or another allied military force. Based on the policies and priorities established by the theater commander, the senior engineer commander in the theater organizes his forces to best support the Army and other services. The prioritized mission-type engineer support concept favors less restrictive command relationships; therefore, operational-level engineer units are normally employed in GS or DS of customer units. Operational control or attached relationships may prevent the senior engineer command from effectively managing the theater engineer resources.

TOPOGRAPHIC SUPPORT

Tailored to meet the requirements of the particular operational area, a topographic battalion is assigned to the senior engineer commander. Topographic missions include analyzing terrain for IPB and to aid tactical decisions, updating existing maps and charts, and establishing geodetic survey controls in the operational area. The theater CINC establishes topographic priorities. The HNS, through international agreements, or DMA provides all standard topographic products used in support of combat operations. The topographic battalion supplements and enhances DMA's efforts by compiling data from various sources into special-purpose topographic products such as:

- Maps.
- Map overprints.

- Overlays: line-of-sight, cross-country movement, cover and concealment, route analysis, and obstacles.
- Terrain studies.
- Satellite-image-based map substitutes.
- Digital data for C², mission planning, and rehearsal systems.
- Geodetic survey support for precise positioning of weapons.

The theater topographic battalion provides the ASCC staff with a team for planning requirements. Included are the assistant theater topographic engineer, who helps the theater engineer arrange topographic support between the ASCC and DMA, other services, and allied organizations. FM 5-105 provides a detailed explanation of topographic support.

CONSTRUCTION SUPPORT

In consonance with JCS guidance, the combatant CINC establishes broad standards and policies for theater construction that guide engineer operations, whether they are performed by Air Force, Army, *or* Navy units. They are based on coordinated planning by construction representatives from all service components. Theater construction policies establish standards, priorities, and the theater construction management structure.

Organization

The combatant CINC may retain control at his level or delegate construction management to a regional contingency engineering manager (RCEM). When the Army is the RCEM, the senior engineer commander performs this function. The RCEM manages all construction, repair, and facility modification in the COMMZ. This structure provides centralized control with decentralized execution. The RCEM also manages all troop, contract, and

HN construction repair operations in the COMMZ. Such a structure ensures that theater construction assets are employed according to theater priorities. The RCEM's responsibilities are to-

- Manage troop construction.
- Manage contract construction.
- Integrate prioritized construction projects from all component commanders into a regional program.
- Prioritize US requests for HN construction support in the region.
- Manage and monitor procurement of Class IV construction materials.

Positioned within the established theater support structure, the senior engineer

command, with its subordinate engineer units, provides the framework for this structure. Defining parts of the theater as a region, a district, and an area, the following organization is formed:

- The senior Army engineer commander is the RCEM.
- The first subordinate engineer commander is the district contingency engineering manager (DCEM).
- The second subordinate engineer commander is the area contingency engineering manager (ACEM).

These designations result in engineer commanders becoming wartime construction managers in their operational areas. Figure 11-1 shows this organization.

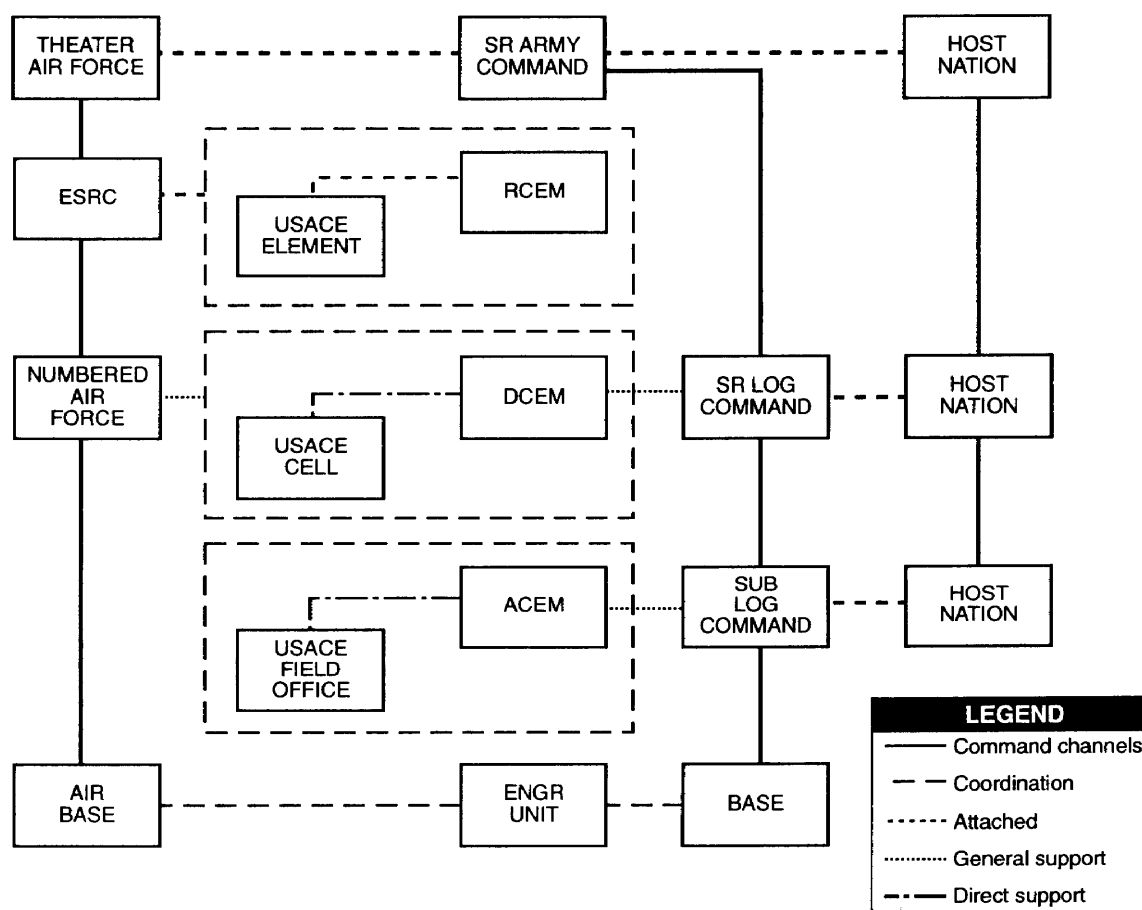


Figure 11-1. Wartime Construction Management Organization

Procedures

Construction directives may be issued at the senior engineer command; however, this is normally only for large installation requirements such as a base camp or logistical facility. The ACEM issues construction directives to subordinate units that contain the specifications and drawings needed to construct a new facility. These directives are generally for construction only. Occasionally, the ACEM issues directives for design and construction. These are normally limited to the upgrade or repair of existing facilities or site adaptation of standard designs. The ACEM's staff inspects unit projects for compliance with plans, specifications, and sound construction practices. If support from a construction support company, a dump truck company, a pipeline construction company, or a port construction company is required, the ACEM issues a separate directive to that unit specifying the particular support it is to provide.

Decentralized execution of the wartime construction program necessitates that work requests enter the system at the lowest possible level. Alignment along area support boundaries provides established conduits through the senior logistics organization. If the senior logistics organization cannot accomplish the work with its organic assets, it prioritizes the requests and provides them to the supporting ACEM.

CA teams receive HN requests for US engineer support and pass them to the ACEM for execution. The ACEM adds these requests to the existing work load according to established theater priorities and accomplishes them by troop, contract, or HN effort, as applicable. When they cannot accomplish work, the ACEM enters it into a construction/repair backlog and passes it to the engineer brigade/DCEM for resolution.

Other US services submit work requests directly to the DCEM in charge of the operational area. The DCEM prioritizes requests according to theater priorities and provides them to the ACEM supporting the area that requires the work. When work cannot be foreseeably accomplished, the RCEM resolves the problem.

The RCEM may receive work from the theater base development plan (BDP). He prioritizes it and passes it to the appropriate DCEM for accomplishment. He may also redistribute backlog work to other DCEMs that are not fully committed.

This two-way flow of backlog and tasking identifies the required workload to each level of the wartime construction management organization. The ACEM can do objective scheduling according to theater priorities. Only an exceptional case needs to be referred to higher headquarters to settle a question of priority. FM 5-116 contains a detailed flow chart that summarizes these procedures.

Priorities

The combatant CINC or JFC establishes his mission priorities. Each engineer headquarters must prioritize its requirements according to operational-area priorities and resolve conflicts through the chain of command. Engineer work requirements throughout the operational area normally exceed capabilities. The establishment of a broad priority system by the theater commander assists in applying resources against only those tasks that are most critical to success. The following implications of *non* support provide the framework for assessing the priority of required engineer support:

- Priority 1- High loss of life or defeat in combat.
- Priority 2- Degraded combat effectiveness or increased vulnerability on the battlefield.
- Priority 3- Degraded noncritical CSS.

Planning

Successful theater construction depends on an adequate supply of materials as well as construction capability. Typically, during the early stages of a contingency operation, war-damage repair and construction of mission-essential facilities dominate engineer construction activities. As the operational area matures, it requires more substantial facilities and more construction forces. One of the primary responsibilities of the senior engineer command staff is to forecast the types and quantities of engineer materials required for

the theater. The Civil Engineer Support Plan (CESP) usually establishes initial requirements during predeployment planning. Planning during the operation requires reliable intelligence concerning damaged roads, airfields, or infrastructure facilities, facilities requiring upgrade, and facilities that are needed. TACAPS—an Army Facilities Components System (AFCS) software package—was designed to assist engineer planners in assessing theater facility requirements for deploying forces. The AFCS is a guide to determining material requirements for needed facilities.

The senior engineer command staff must also determine what materials are available from local manufacturers, local commercial stockpiles, and/or HN government assets. Materials not locally available must either be procured out of theater or produced in theater by engineer units. Materials in the latter category include aggregate, concrete, construction water, asphalt, and lumber. A local procurement system must be established to expedite the procurement of local materials. Local procurement may be restricted in some theaters or the contracting officer representatives (COR) may set prices to avoid inflating the cost of construction materials in the HN. When planning construction projects in a theater of operations, the following principles apply:

- Accomplish construction within the allotted time, using a minimum of materials, equipment, and manpower.
- Make maximum use of the installations and facilities described in the AFCS and other applicable standard drawings.
- Use simple, flexible designs.
- Incorporate available materials—either locally procured or normal supply items—in designs.
- Follow the theater commander's established construction standards.
- Repair or modify existing facilities before constructing new ones.
- Provide only the minimum facilities consistent with military necessity.

- Avoid creating lucrative targets; disperse the facilities.
- Plan camouflage and deception during site selection and construction.

Design

Theater-specific standard designs are usually developed at the senior engineer command for use throughout the theater. Designers must consider the availability of construction materials when designing projects for the operational area. Many designs may not be practical because of logistics. For example, although AFCS and TCMS designs are adjusted for various climates—such as temperate, desert, tropic, and arctic—they may have to be modified to use unique local building materials and practices. Military designers must know construction standards and materials commonly used in the region. Designs must include the use of local materials or provide flexible use of substitute materials. This is particularly important when designing structures in contingency theaters. Many facilities are turned over to local authorities whose operating and maintenance capabilities during long-term use must be considered.

Standards

The construction standards for an operational area are initial standard: up to 6 months expected use, or temporary standard: up to 24 months expected use. Since the design life is short, only essential utilities are provided, also reducing engineer material requirements. Generally, wartime requirements for facilities are satisfied, in order of priority, by—

- Using existing US- or HN-controlled facilities.
- Modifying existing facilities rather than new construction.
- Constructing new facilities, using austere design and construction techniques.
- Appropriately balancing use of US engineer troop units and contractors.

Army forces deployed to developed areas capitalize on an established infrastructure by maximizing the use of existing facilities. Construction management focuses on facility

modification and battle damage repair, making maximum use of HNS manpower, equipment, and materials. Army forces deployed to lesser developed operational areas rely more on construction of new, austere facilities. HNS may be less available than in developed areas; however, a LOGCAP contractor may be available to assist in theater construction and/or repair requirements.

Materials

Adequate Class IV supplies and timely delivery of the materials to the work site are essential to mission accomplishment. If they are to be successful in the theater of operations, engineer commanders must understand the logistics system and know where to go for required logistical support. Massive requirements for Class IV construction materials distinguish engineer requirements from those of other units in the theater. They are central to the ability of operational engineer units to construct and maintain facilities to support the sustainment base. For this reason, the senior engineer command usually plays a key role in managing the allocation of theater construction materials.

Engineers look to their supporting MMC for most of their Class IV construction items. They must identify requirements with considerable specificity and work with their supply support activity to develop a delivery plan that gets the required materials to the right place and at the right time to keep engineers working. Engineer participation in local purchasing and cooperation with the supporting MMC are key to adapting and substituting locally available materials.

Unlike other classes of supply, Class IV construction materials are not provided based on documented consumption rates, and there are no anticipated surge rates. Several months may elapse between the initiation of a requisition and the arrival of the material in the theater. Therefore, it is crucial that operational-level engineers estimate their requirements as soon as possible and initiate requisitions in advance of deployment or operations. Class IV procurement will often require extraordinary procedures such as local purchase, LOGCAP, or contracting at locations in the proximity of the theater. The senior

engineer command submits initial material forecasts using AFCS and/or CESP data and BDPs.

CONTRACTOR SUPPORT

The USACE or Naval Facilities Engineering Command (NAVFACENGCOM) construction contract management organization controls contract work. In a forward-presence theater, personnel staffing an existing USACE organization in that theater—such as the US Army Engineer District-Europe in Central Europe or the US Army Engineer Far East District in Korea—provide USACE support. In a contingency theater in countries that do not have an assigned contract construction agent, the CINC, ASCC, and USAC will determine this support.

Contractor operations are under the control of contracting officers. Various service and construction agents throughout the world perform contract construction. Each service has its own geographic areas of operation, but only one design construction agent is in any one area. DOD assigns regional contract construction responsibilities as follows:

- USACE: Northeast and Central Asia, Central and Northern Europe, North and South America, the Middle East, and Northeast Africa.
- NAVFACENGCOM: the Iberian Peninsula, the South Pacific, the Caribbean Sea, Antarctica, Southeast Asia, and the Mediterranean Basin.
- Air Force Regional Civil Engineer: the United Kingdom.

Contract management offices may operate in support of engineer brigades and groups or they may operate independently, depending on the nature of the contingency and the theater location.

BASE DEVELOPMENT

The theater BDP results from concurrent planning by the CINC's staff and the service component staff considering strategic plans and resources. The senior engineer commander has overall responsibility for base development and is responsible for the more detailed planning for each base. His staff, in

coordination with the senior Army staff, identifies general locations for major facilities and tasks the DCEM or the ACEM to do the detailed planning and the facility siting. Base development planning is normally not performed below the ACEM level. The senior engineer command develops a time-phased BDP, considering the facilities needed and the construction assets and construction materials available. The senior engineer command passes this plan to the RCEM for execution.

The ACEM or DCEM staff reconnoiters the proposed sites and develops plans and specifications in close coordination with the major logistical commands that use the facilities. The staff forwards these designs through the DCEM to the senior engineer command for approval and incorporation into the overall theater BDP.

Planning is an ongoing process. In peacetime, the CINC develops contingency plans for various scenarios. CSS planning is general in nature and is only done to the extent necessary to identify resource requirements and assess OPLAN supportability. In a wartime environment, strategic changes may cause a shift in theater objectives to a new operational area. This, in turn, generates a requirement for new bases and/or major construction projects at existing bases in the new operational area. Under these circumstances, base development planning is more general in support of the development of COAs and then detailed by the senior engineer command to support the selected COA.

The senior engineer command can use the AFCS or the TCMS to help determine the engineer force structure required to execute the BDP. It also considers HN construction capabilities and contractor availability along with the availability of construction materials from HN sources in developing a time-phased plan for constructing the needed facilities. An additional consideration is ensuring that adequate port facilities are available early in base development to provide reception facilities for equipment and materials required to execute the plan. This may require early development of LOTS operation sites and may involve dredging of ship channels to provide access to oceangoing vessels. Other specialized

engineer capabilities like well-drilling or diving detachments may also be necessary early in the base development process. In any theater, base development is an important initial consideration. Force bed-down is a substantial sustainment function in all theaters. Whether using existing facilities or constructing temporary camps, developing the operating base from an austere to developed environment requires integrated planning.

REAL ESTATE PLANNING AND ACQUISITION

The USACE theater element provides technical real estate guidance and advice to the theater commander. In addition to recommending real estate policies and operational procedures, it acquires, manages, disposes of, administers payment for rent and damages, handles claims, and prepares records and reports for real estate used within the theater. The theater element also exercises staff supervision over real estate operations of subordinate Army commands and provides real estate support to other US services.

A planning group that includes the USACE theater element and representatives of all service commanders must initiate real estate planning in the preparatory phases of a campaign. The theater engineer participates in all planning activities. In addition to plans for real estate operations during hostilities, consideration should be given to real estate requirements for the occupation period after hostilities cease.

US forces acquire real estate in theater by seizing or requisitioning it without formal documentation. Seizure is resorted to only when an urgent military necessity exists and only with the approval of the commander who has area responsibility. HN property may be occupied without documentation to the extent that tactical operations dictate and according to US/HN agreements. Normally, property is obtained through requisition, which involves a demand on the owner of the property or the owner's representative. No rent or other compensation is paid for seized or requisitioned property in the CZ or for damage resulting from acts of war or from ordinary military wear and tear.

Outside the active CZ, property is normally acquired by lease or HN agreements, and all transactions are documented thoroughly under the applicable provisions of theater directives. Large tracts of real estate are required for ports, staging areas, training and maneuver areas, leave centers, supply depots, and headquarters installations. Some of this property may be highly developed and have considerable value to the civilian population. Procedures must be followed to acquire the required property while ensuring that the legal rights of owners are protected.

REAL PROPERTY MAINTENANCE

The combatant CINC has overall responsibility for real property maintenance activities (RPMA). He normally delegates authority to the ASCC or senior Army commander, who may further delegate to the senior logistics command. The senior logistics command, through its subordinate logistics commands and installation commanders, normally provides the needed RPMA support. Principal RPMA in a theater of operations include operation, repair, and maintenance of facilities and utilities, fire prevention and protection, and refuse collection and disposal. RPMA requirements that exceed the logistics organization's capabilities are forwarded to the supporting ACEM for execution according to theater priorities. The senior logistics command provides technical RPMA guidance to subordinate logistics organizations. The subordinate logistics organizations provide RPMA support to all Army facilities in its OA, including leased facilities unless HNS is available for leased facilities.

Configuring engineer units to support the logistics organization is based on the expected RPMA work load. The degree of nonstandardization among subordinate logistics organizations—such as the coverage area, the number and types of units supported, and the theater of operations—necessitates flexible engineer unit design. Engineer units are tailored to the specific logistics organization to accomplish RPMA missions, and they depend on the logistics organization for sustainment support. A possible engineer

organization consists of a C² headquarters, fire-fighting teams, and utilities teams.

- An engineer administration and headquarters team provides C², command support, and minimal administrative and logistical support for two or more platoons.
- Fire-fighting teams are task-organized based on facility requirements. A fire-fighting headquarters normally controls from four to five fire-fighting teams consisting of a combination of the following trucks: water, fire, brush-fire, and crash rescue. The organization provides the capability to implement fire-prevention and fire-fighting programs.
- Utilities teams are assigned based on the population serviced by the logistics organization. Geographic considerations aside, planning factors provide one team for each installation with a population between 2,500 and 4,000. The utilities team is capable of providing facilities engineering support, limited carpentry, masonry, electrical, plumbing, and road maintenance and repair. It is also capable of performing limited unit maintenance.

Operation, Repair, and Maintenance of Facilities and Utilities

Electrical power may be available from commercial sources in a mature theater. Power generation capability, however, is required in most contingency theaters where commercial power is unreliable. Distribution systems are required and adequate engineer units must be provided to do the necessary work. Standby power is required for critical facilities served with commercial power. A potable water supply and waste-water collection systems require maintenance at most COMMZ installations and bases. The HN may provide the water and operate sewage treatment facilities, but RPMA assets are required to maintain the utilities systems on bases and installations in the COMMZ to repair limited war damage. Austere water and sanitary facilities are used for troop bases constructed in a contingency operation. The operation, maintenance, or repair of tactical generators is not an RPMA function. Normally, each logistics organization has an assigned unit that provides RPMA support to

facilities located within the logistics organization AOR.

Fire Prevention and Protection

Engineer fire-fighting units supporting the senior logistics command provide needed fire protection that is not available from the HN or the installation directorate of public works. Fire-fighting assets are allocated based on the troop population and the size of storage areas.

Refuse Collection and Disposal

The senior logistics commands are responsible for establishing sanitary landfills for their operational areas. An engineer utilities detachment supporting a subordinate logistics command normally establishes and operates the landfill. In many areas, they use existing HN landfills; in others, contract landfills are available. The subordinate logistics command may use local labor to operate landfills. Commanders must give special consideration to hazardous waste, particularly waste products generated by medical facilities and maintenance operations. Special considerations may apply to the disposal of hazardous waste. US federal or HN environmental laws may require packaging and or removal of these containers from theater.

SUPPORT TO DEVELOPING THEATERS

Support for force projection/contingency operations in undeveloped theaters may or may not involve combined arms operations but does involve the creation of a sustainment base where none usually exists. HNS usually is not available and, if present, is normally limited. Additionally, the existing infrastructure may not support the needs of CS or CSS units.

When planning contingency operations, planners must identify general engineering support requirements and corresponding engineer forces early. While forces participating in the force projection/contingency operations may be corps level and below, the majority of construction engineer units are located in operational-level engineer organizations. Tailoring an engineer force from

a mixture of multiechelon units will probably be the norm for most contingency operations.

The contingency engineer force may be built around a brigade or group headquarters. Support such as construction contracting, construction Class IV supply, and real estate teams is provided from other TOE or TDA engineer organizations, such as the USACE, in order to meet theater sustainment needs. Because of its familiarity with operational-level engineer units, the senior engineer headquarters should be consulted during task organization planning.

Developing immature theaters presents much the same problem as contingency theaters. Operational-level engineer units perform general engineering tasks well before a COMMZ is established. The deployment plan contains an orderly progression of the JTF based on the arrival of operational-level engineer units. As in a contingency theater, certain elements will usually be required from the operational level in the early stages of an operation. Normally, these elements are assigned to the senior Army engineer command in theater. Since the mission, logistical support, and geographic orientation of operational-level engineers differ from corps and below engineers, separate command structures are necessary. Until the engineer force grows to sufficient numbers to require separate command structures, the senior engineer command in theater—often a maneuver engineer headquarters—may be augmented by staff with responsibilities to plan and coordinate general engineer support and to perform the functions of the RCEM, DCEM, and ACEM.

AREA DAMAGE CONTROL (ADC)

ADC is the measures taken before, during, and after hostile action to reduce the probability of damage and to minimize its effects. The rear operations center (ROC) coordinates all engineer support of A-DC with the supporting ACEM, making maximum use of HN capabilities. It coordinates all HNS through the CA team. Base commanders and base cluster commanders develop ADC plans in coordination with the ROC. In most instances, bases and base clusters have to rely on their

own assets; however, engineer units may be used in critical situations, depending on the priority of their other work. Engineer units execute rear area restoration missions according to theater construction priorities. Typical missions include power restoration and production, rubble clearance, removal of downed trees, and repair of critical war-damaged facilities and installations.

Engineer units develop SOPS that integrate engineer support into the ADC team composition. The number and size of the teams depend on the ROC ADC plan. The basic unit is an engineer squad equipped with squad tools, air compressors, dozers, and a crane or wrecker. From the squad, the team can be increased to platoon, company, or battalion size, depending on the situation. Principal missions involve clearing the LOC of rubble

and debris, fighting fires and floods, salvaging equipment, rescuing people, and preparing sites for deliberate decontamination operations.

The ROC directly tasks emergency ADC missions to the AC EM. The wartime construction manager prioritizes other ADC missions, including preattack measures and any damage repair missions. Engineers coordinate with the ROC for MP and explosive ordnance disposal (EOD) support.

Engineer units may also be tasked to perform ADC missions in support of the Air Force. The ACEM forwards emergency repair requests beyond its capability to the DCEM. When operating on the air base, the base civil engineer establishes mission priorities. FMs 5-104, 5-116, and 90-23 provide additional information regarding ADC.