

**FMFM 4-4**

# **ENGINEER OPERATIONS**



**U.S. MARINE CORPS**

**PCN 139 000300 00**

USER SUGGESTION FORM

From:

To: Commanding General, Marine Corps Development and Education Command  
(Code D 036), Quantico, Virginia 22134

Subj: FMFM 4-4, Engineer Operations; recommendation(s) concerning

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## ENGINEER OPERATIONS

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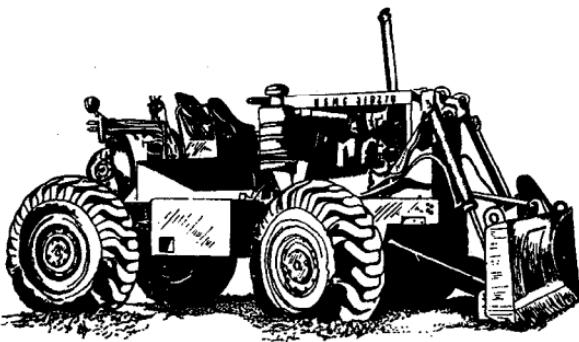
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## SECTION 1

### INTRODUCTION

#### 101. GENERAL

This section discusses the mission and capabilities of Fleet Marine Force engineers. Certain aspects of amphibious operations such as planning, shipping, landing of equipment, control, and supply, that are particularly pertinent to engineer operations, are described.

#### 102. GENERAL MISSION AND CAPABILITIES OF ENGINEERS

a. Mission.--The mission of Fleet Marine Force (FMF) engineers is to increase the combat effectiveness of the landing forces. This is done by providing essential engineer support to enable landing forces to breach hostile beach defenses and proceed inland. Tasks of both a constructive and destructive nature are accomplished. Engineer support enhances the landing force by construction of airfields, installation and operation of selected utilities, and other specialized tasks such as camouflage and mine warfare assistance to the landing force commander.

b. Capabilities.--FMF engineer units are organized and equipped to perform missions under any environment. Only minor changes in equipment are required for operations under extreme conditions of climate and terrain. Engineer units are organized to accomplish several engineer missions of a deliberate nature in support of the landing force. Engineers possessing survey capability extend control to the rear of the landing force and its major elements. All construction performed by FMF engineer units is essentially temporary in nature. Temporary, semipermanent, and permanent construction is performed by naval construction forces. Marine Corps FMF engineer units provide:

- (1) Combat engineer support required for landing force operations.

- (2) Establishment and maintenance of expeditionary airfields.
- (3) Construction and maintenance of routes of communication.
- (4) Potable water and hygienic services.
- (5) Class III and class III(A) bulk fuels.
- (6) Utility power support.
- (7) Establishment and maintenance of temporary camps.

#### 103. MAJOR CONSIDERATIONS AFFECTING ENGINEER OPERATIONS

Certain factors in an amphibious operation have a direct influence on accomplishing the engineer mission. These are analyzed below.

a. Intelligence.--Information about natural and manmade conditions in the objective area is essential to the planning and conduct of engineer operations. Detailed engineer information is not normally available and is difficult to obtain. The problem is aggravated because troops are not in contact with the enemy prior to landing in the objective area. Generally, information is obtained from three sources:

- (1) High level intelligence studies.
- (2) Imagery.
- (3) Pre-D-day amphibious reconnaissance.

b. Shipping.--The engineer mission dictates those items of equipment and material which are essential for operations in the objective area. Availability of assault shipping may, however, place certain limitations on the amount of equipment and material available for these operations. If the amount of shipping space available is inadequate, the quantities of items may have to be reduced. This results in a corresponding reduction of engineer support capability. To compensate for reduction in equipment and material, ingenuity, improvisation, and field expedients must be employed.

c. Landing of Equipment.--There are many problems related to landing of heavy engineer equipment during early phases of the amphibious assault. Due to these difficulties, engineer support may be initially limited. The type of amphibious assault shipping used will determine the time required for unloading. The use of landing ships is normally desirable; however, hydrographic conditions may delay or prevent their beaching. Under these conditions, the use of landing craft for movement to the beach may be required. Some items of heavy engineer equipment cannot be loaded in landing craft or if loaded makes beaching impossible, which requires these items to remain aboard assault shipping at sea until causeways have been prepared.

d. Control During the Assault.--During the initial stages of the assault phase, engineer control is decentralized by the attachment of engineer units to tactical units. Although this is necessary for landing, it restricts coordination of engineer activity. The capability of small, decentralized engineer units to provide engineer support is limited. Likewise limited is the capability to reinforce or realign engineer support

during the early stages of the landing, which emphasizes the requirement for optimum task organizing during the planning phase.

e. Supply.--The rapid buildup of materiel required for engineer operations during an amphibious operation is impaired by shipping limitations and distance from resupply sources. Even under the most ideal conditions, estimates of materiel requirements must be determined with utmost care.

f. Survey Control.--Engineer consideration is given to the necessity for establishing horizontal and vertical survey control for fire support and target acquisition agencies of the landing force in the landing area.





## SECTION 2

## ENGINEER TASKS

## 201. GENERAL

Engineers support the landing force in the conduct of amphibious operations by the accomplishment of a wide variety of tasks. The nature of these tasks ranges from combat engineer support for the assault units, to general engineer support and service support functions for the landing force as a whole. Tasks required of landing force engineers in support of amphibious operations may include the following:

- a. Engineer reconnaissance.
- b. Obstacle breaching.
- c. Demolitions.
- d. Beach preparation.
- e. Helicopter landing site and zone preparation.
- f. Development and maintenance of routes of communication.
- g. Construction and maintenance of expeditionary airfields.
- h. Potable water production.
- i. Hygienic services.
- j. Obstacle installation.
- k. Installation, operation, and maintenance of bulk fuel handling systems.

1. Technical assistance in engineer matters.
- m. Construction and maintenance of standard and nonstandard bridges.
- n. Employment as infantry.
- o. Survey control.
- p. Civil engineer support.
- q. Other tasks as required.

## 202. ENGINEER RECONNAISSANCE

A thorough engineer reconnaissance is a prerequisite for accomplishment of essential engineer tasks. Such reconnaissance is basically the same as that for normal land warfare. Aerial reconnaissance missions at division and force level assist in this effort, and the use of helicopters for engineer reconnaissance by engineer personnel is desirable.

a. Routes of Communication.--Likely beach exits are determined by imagery, maps, and intelligence studies. Beach reconnaissance is conducted early to substantiate these preliminary findings. These exits should provide good routes of egress from the beach to supply dumps, principal inland areas, and interior road nets. During this period, close coordination with the shore party is essential in establishing an efficient traffic control system from the beach, inland dumps, and road nets. As soon as the tactical situation permits, a reconnaissance is made in connection with the establishment of the extensive routes of communication required to support the landing force scheme of maneuver ashore. This must be coordinated with the planned requirements for advanced base development.

b. Water Supply.--Initially, potable water is limited to that brought ashore by the landing force. To reduce the large logistic burden of providing packaged water from ships to shore, it is imperative that water supply sources be located and developed early in the amphibious operation, and engineer reconnaissance is required to locate these sources. Sources previously determined by aerial photos, maps, and intelligence studies are confirmed by ground engineer reconnaissance.

c. Engineer Material.--The sources of such material as lumber, timbers, standing timber, gravel, rock, sand, and other native engineer supplies are located by continuing engineer reconnaissance as the troops of the landing force advance inland.

d. Airfield Sites.--Airfield sites normally have been established prior to the landing; however, early physical reconnaissance is required to confirm their usefulness.

## 203. OBSTACLE BREACHING

Intelligence studies, imagery, and prelanding beach reconnaissance will normally indicate the type, approximate number, and general location of any obstacles that must be breached to ensure an expeditious landing and advance inland.

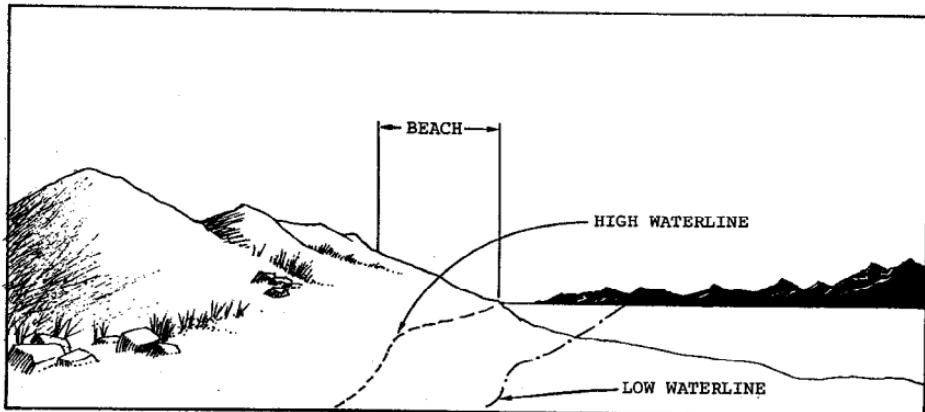


Figure 1.--High and Low Waterline.

a. Responsibilities.--Naval units are responsible for breaching underwater obstacles. All obstacles below the high waterline on the beach are considered underwater obstacles. (See fig. 1.) Landing force personnel are responsible for breaching obstacles inland from the high waterline. Responsibility for breaching of obstacles within the tidal range exposed at time of landing is resolved by the landing force and amphibious task force (ATF) headquarters. Such breaching operations should be accomplished under control of a single commander. Specific attention and the appropriate priority of importance is given breaching operations which will permit rapid movement of vehicles off the beach.

b. Beach Obstacles.--Amphibious landings may be required across obstructed beaches. Obstacles are normally an integral part of an organized defensive system and may consist of both reinforcing and existing obstacles. Breaching of vehicle lanes through such obstacles is a major function of combat engineers. Expedited breaching of obstacles is essential for the rapid buildup, consolidation, and advance inland of the landing force. Obstacles which may be encountered and must be considered in the breaching plan include:

(1) Reinforcing Obstacles

(a) Land mines, a most effective obstacle, particularly when coordinated with other types.

(b) Tetrahedrons, hedgehogs, horned scullies, dragon teeth, and other similar obstacles constructed of concrete, steel, or both.

(c) Walls constructed of concrete, steel, logs, and earth or sand revetments.

(d) Posts constructed of steel, timbers, or logs, and embedded vertically or at an angle.

(e) Barbed wire entanglements.

(f) Abatis constructed by felling trees or heavy vegetation and felled so branches and trunks are crisscrossed, entangled, and interlaced.

(g) Earthworks such as ditches, craters, or mounds of natural materials.

(2) Existing Obstacles

(a) Trees.

(b) Mud flats.

(c) Marshes.

(d) Reefs and rocks.

(e) Excessive terrain gradients.

(f) Dunes.

(g) Built-up areas.

c. Obstacles Inland.--Combat engineers operating with tactical units of the landing force supervise and assist in breaching and clearing tasks normally required to facilitate execution of tactical and service support plans. In addition to beach obstacles, there are existing obstacles that may be encountered in operations inland from the beach. These include streams, canyons, mountains, rice paddies, dense vegetation, and canals. Engineer breaching and obstacle clearing during the advance inland employ the principles and techniques of land warfare.

## 204. DEMOLITIONS

Landing force engineer units are capable of executing demolition work of both a constructive and a destructive nature. Engineer units have the specific function of performing demolition missions exceeding the capabilities of other units; therefore they may be required to supplement the demolition capabilities of other units. For example, they may prepare hand placed explosives for the destruction or closure of heavy weapons emplacements and instruct the infantry in their use. Missions of this type are not a primary duty of engineer units since the infantry units have the necessary equipment and personnel for this work. In organizing the defense of a sector or beachhead, the engineers may assist by performing demolition tasks on the flanks or perimeter. They may also provide technical supervision of other landing force units engaged in demolition work.

## 205. BEACH PREPARATION

a. Landing force preparation of the beach area initially includes the breaching of minefields and other obstacles from the high waterline inland, to facilitate the landing and movement inland of tactical units. The followup preparation of the immediate beach area for unloading, dispersal, and segregation of supplies and equipment is the primary responsibility of the force landing support group (shore party). Engineer units

of the landing force will be task organized into the shore party to provide the necessary support for preparation of the beach support areas.

b. Upon completion of the breaching of lanes, beach obstacle clearance beyond the capabilities of the shore party is accomplished by engineers. Shore party will clear only those obstacles and mines in areas where their personnel must operate. The combat engineer battalion will augment the shore party for deliberate clearance of the beach. Routes of egress from the beach may be prepared with matting, corduroy, coral, gravel, or other readily available material. The road net and storage areas for use by the shore party in the beach support area will be constructed by engineer units, and engineer assistance may be provided in the installation of ramps, piers, and causeways. The type and amount of engineer effort required will vary with the physical aspects of the beach, method of landing and unloading, size and composition of the landing force, and the combat service support mission of the particular beach.

#### 206. HELICOPTER LANDING SITE AND ZONE PREPARATION

Helicopterborne operations will require combat engineer support of a pioneer nature to improve helicopter landing sites. Helicopter landing sites are initially improved by expedient methods such as use of demolitions, hand tools, and chain saws. Depending on the planned use and time available, helicopter landing sites may be further improved by such work as completely clearing the area of brush and trees, clearing approach lanes, improving drainage, preparing parking areas for dispersal and camouflage of helicopters, and preparing storage areas for supplies and equipment. Engineer units may be task organized into the force landing support party (helicopter support team (HST)/group) to provide this support.

#### 207. DEVELOPMENT AND MAINTENANCE OF ROUTES OF COMMUNICATION

Construction, repair, and maintenance of routes of communication constitute a major function of landing force engineers. Adequate routes of communication are essential for expeditious troop movements, supply, and evacuation, and may be considered one of the major factors affecting the rapid consolidation of the beachhead. Routes of communication may include trails, primary and secondary roads, fords, ferries, rafts, culverts, permanent bridges, and military prefabricated bridges.

a. Construction and Maintenance.--Routes of communication normally receive a high priority among the many engineer functions. Landing force engineers are trained and equipped to construct and maintain routes of communication in the objective area. Development and maintenance of the road net is a continuing task. It begins with early construction of routes of egress from the beach to the inland dumps and may require repair of existing bridges, construction of fords, installation and operation of ferries, construction of bypasses, and the construction and maintenance of culverts and bridges. This may entail use of local material, field expedients, or employment of prefabricated bridging of either fixed or floating types.

b. Traffic Control.--Landing force engineer units assist in development of traffic control and road circulation planning. They provide all types of road signs essential for traffic control. It is an engineer responsibility, in accordance with FM 5-36, Route Reconnaissance and Classification, to classify and mark bridges.

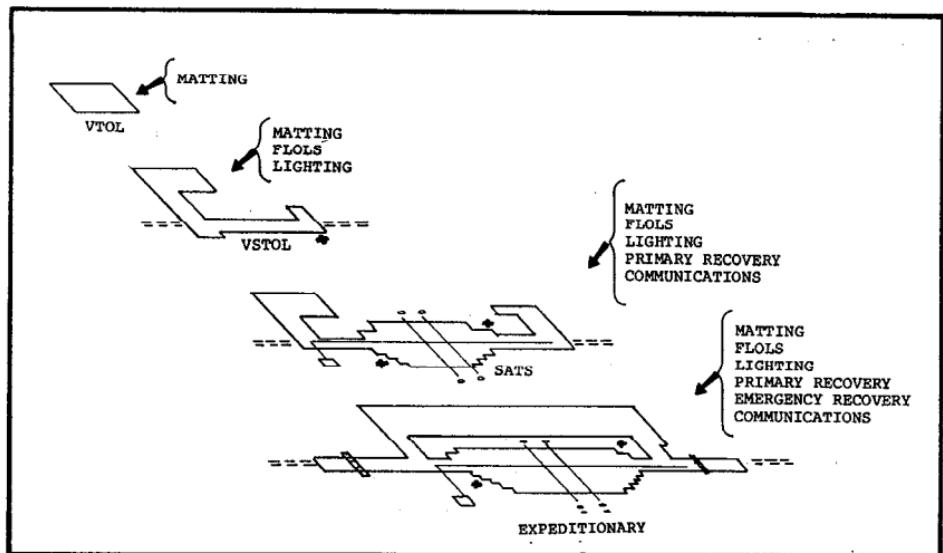


Figure 2.--Expeditionary Airfield Configurations.

## 208. CONSTRUCTION AND MAINTENANCE OF EXPEDITIONARY AIRFIELDS

a. Expeditionary Airfields.--Expeditionary airfields consist of a family of four configurations: vertical takeoff and landing (VTOL), vertical/short takeoff and landing (V/STOL), short airfield for tactical support (SATS), and expeditionary airfields. Figure 2 illustrates the general configuration of each type facility. The airfields may be constructed in a sequential building block fashion by expanding each configuration to the next larger.

b. Engineer/Naval Construction Force Responsibilities.--Marine landing force engineers are organized and equipped to construct, repair, and maintain expeditionary airfields. They are equipped to construct these airfields in locations such as abandoned or existing airfields, highways, or reasonably level terrain with suitable soil conditions that require a minimum of construction effort. When the engineer requirements exceed the availability of Marine landing force engineers, assistance from naval construction forces (mobile construction battalions) is required.

c. Aviation Responsibilities.--Certain expeditionary airfield components (i.e., ground control approach (GCA) and tactical air navigation system (TACAN)) are installed by aviation units and are not specified engineer responsibilities; however, other components, not limited to, but including those identified in figure 2, which are Marine air base squadron organic equipment, do require engineer assistance (i.e., airfield lighting and recovery equipment).

## 209. POTABLE WATER PRODUCTION

Production of potable water is a function of engineer units, but delivery to using units is not an engineer function. Water supply must be established ashore early and as close to the consumer as the tactical situation permits. Limitations on shipping space for fresh water make this a function of prime importance. Development of water sources in the objective area may require water distillation, water purification, well drilling, and rehabilitation of existing water supply systems. Water purification will be required where natural fresh water sources are available. Water supply points using portable purification equipment are operated as close to the assault units as the tactical situation allows. Production of potable water at large centrally-located water points is accomplished by employment of large capacity, mobile purification units.

## 210. HYGIENIC SERVICES

Hygienic services are those functional tasks required in conjunction with bath, laundry, decontamination, and fumigation operations. Engineer units possess the necessary equipment and Marines to provide these services to Marine air-ground task forces (MAGTF's). The production of potable water is related to the hygienic services and planning must consider the requirements for potable water.

## 211. OBSTACLE INSTALLATION

During the landing and initial assault by the landing force, installation of obstacles is a major engineer consideration. Obstacles may be logs, walls of earth, ditches, craters, landslides, posts imbedded vertically or at an angle, abatis constructed by felling of trees, and barbed wire entanglements. Mines are both an obstacle and a weapon. As an obstacle, they may be used in conjunction with other types of obstacles or they may be employed separately. When employed alone, they will normally be in the form of a protective or tactical minefield. Landing force engineers landed early in the assault may be required to assist in the anti-mechanized defense by the installation of obstacles. These will be installed initially across or along probable avenues of armored approach and on beach flanks. Obstacles to delay or prevent enemy counterlanding, either by air or water, may be erected and installed at or near the beach and in the vicinity of existing airfields, potential drop zones, and helicopter landing zones. This may be accomplished by landing force engineers and by other troops under engineer supervision. During the early stages of the operation, the requirement for landing force engineers to install obstacles is influenced by the nature of the terrain and by the availability of material, transportation, time, and other troops.

## 212. INSTALLATION, OPERATION, AND MAINTENANCE OF BULK FUEL HANDLING SYSTEMS

Engineer units will install, operate, and maintain bulk fuel handling systems. Increasing requirements for fuel ashore require that the engineers plan for early installation of the amphibious assault fuel system (AAFS), the tactical airfield fuel dispensing system (TAFDS), and the helicopter expedient refueling system (HERS). Engineer units will be included within the shore party to commence the installation of the fuel system ashore. Naval elements of the shore party (amphibious construction battalion) will install and operate the seaward portion of the AAFS. Marine engineer responsibilities begin at the high watermark.

### 213. TECHNICAL ASSISTANCE IN ENGINEER MATTERS

There are certain general engineer tasks for which units of the landing forces are responsible, within their capabilities. These include such tasks as camouflage, construction of field fortifications, and employment of mines and demolitions. When requirements for these tasks exceed the unit's capabilities, landing force engineers provide technical assistance and supervision as required. In defensive or stabilized situations, field works requiring special skills and heavy engineer equipment are constructed by landing force engineers.

### 214. CONSTRUCTION AND MAINTENANCE OF STANDARD AND NONSTANDARD BRIDGES

The construction and maintenance of bridges is usually necessary to open and maintain routes of communication in support of mechanized operations and to permit ground service support of other forces in sustained operations. In the initial stages of an operation, particularly mechanized column movements, time is critical, and necessary bridging must be installed as rapidly as possible. Engineer units, with attached bridging personnel and equipment, will normally install standard prefabricated military bridges, either fixed or floating, to meet the initial requirement. When time permits, standard bridging is replaced with nonstandard type bridges utilizing timbers, steel beams, or concrete. These are then maintained as required and the prefabricated tactical bridging equipage is repaired and made ready for future use.

### 215. EMPLOYMENT AS INFANTRY

a. General.--In an emergency situation, landing force engineers may be relieved of their engineer task assignments and be employed as infantry. This employment is not normal and is undesirable. The resulting cessation of engineer work may cause a lack of mobility and flexibility to the landing force, and thus reduce combat power at the time it is most needed. During periods of emergency, landing force engineers should be employed to keep routes of communication open and impede the movement of the enemy by creating obstacles. This may be accomplished by use of minefields, water obstacles, the flooding of areas, and the destruction of bridges, roads, railroads, and embankments. At the same time, the engineer effort should also be required to develop new defenses. If landing force engineer units must be employed as infantry, they should retain their own commanders.

b. Limitations.--There are certain limitations which must be considered before engineers are employed as infantry:

(1) Cessation of engineer work.

(2) The limited number of crew-served weapons reduces their capability for infantry duty.

(3) The organization of engineer units does not lend itself to employment as infantry; for example, squads are not organized on the basis of fire teams.

(4) Communication personnel and equipment authorized engineer units are insufficient to support engineers as infantry.

(5) The training of engineer personnel emphasizes technical and tactical support functions to a greater degree than it does advanced infantry training.

## 216. SURVEY CONTROL

When adequate topographic and geodetic data are not available for the objective area, augmentation of the landing force engineer survey capability is requested to include an appropriate engineer topographic unit. The landing force artillery may be assigned certain survey responsibilities when an adequate survey capability does not exist in the engineers. Procurement and distribution of trigonometric lists, which contain geodetic or survey information for a stated area are the responsibility of the intelligence (G-2) section. Responsibility for maintenance of these lists is assigned by the landing force headquarters on the recommendation of the engineer officer. See FMFM 2-1, Intelligence, and FMFM 7-4, Field Artillery Support, for additional discussion of survey responsibility and provisions for trigonometric lists (lists of geodetic data).

## 217. CIVIL ENGINEER SUPPORT

Civil engineer support is primarily a responsibility of naval construction forces and is of a progressive nature. It may be started during the assault phase by landing force engineers and continued by the naval construction forces after the amphibious operation is completed. Planning coordination must be achieved between the amphibious task force, landing force, and other major commanders. The civil engineer support plan is distributed to tactical construction units such as naval construction forces and landing force engineers. The landing force engineer may plan for the initiation of civil engineer support in the objective area, and all such work done by the landing force engineers must follow the civil engineer support plan.

## 218. OTHER TASKS AS REQUIRED

In addition to the major tasks described, landing force engineers have other areas of responsibility. These include:

- a. The location, development, and operation of quarries, sand and gravel pits, and other sources of materials.
- b. The furnishing of utilities essential to the prosecution of the campaign.
- c. The location, receipt, repair, and operation of captured enemy engineer equipment, when the augmentation of landing force engineer equipment with such equipment is necessary and feasible.
- d. The supply and maintenance of engineer equipment as outlined in sections 3, 4, and 5.
- e. The topographic platoon of the Fleet Marine Force supplements the normal map supply by preparation of a limited quantity of mosaics, overlays, overprints, sketches, and map substitutes for the landing force. It conducts ground control surveys, extends ground control for use of artillery units, and provides coastal survey teams for participation in collection missions to obtain beach and coast information.
- f. The construction of temporary camps, limited to essentials and designed to minimum standards.
- g. The construction of fire support bases.
- h. Assist in the development of the combat service area(s).





### SECTION 3

#### DIVISION ENGINEER CAPABILITY

##### 301. GENERAL

The unit that provides engineer support within the Marine division is the combat engineer battalion. The combat engineer battalion is examined in detail in the paragraphs below.

##### 302. COMBAT ENGINEER BATTALION

a. Mission.--The primary mission of the combat engineer battalion is to increase the combat effectiveness of the Marine division by rendering close combat engineer support.

b. Organization.--As illustrated by figure 3, the combat engineer battalion consists of a headquarters and service (H&S) company, an engineer support company, and four combat engineer companies.

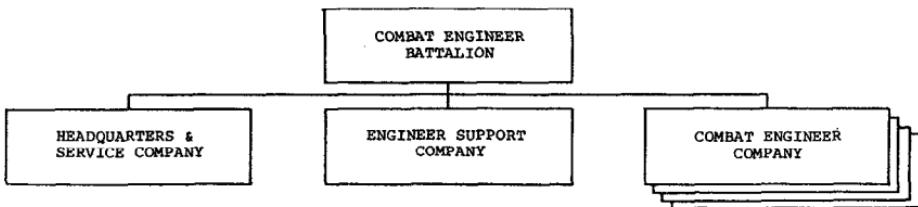


Figure 3.--Combat Engineer Battalion.

(1) Command and Control.--The battalion staff is organized to permit command and control over the battalion and engineer reinforcing elements. The battalion is capable of providing communications between all echelons of command. See FMFM 10-1, Communications, for additional information on communications. Intelligence requirements are met by collection efforts of subordinate units, support from external agencies and through the battalion S-2 section. The battalion S-2 section provides the only engineer intelligence officer in the division and must, therefore, conduct the engineer portion of the division intelligence effort. The battalion is capable of self-administration.

(2) Armament.--Firepower is provided by individual weapons, organizational machineguns, and light antitank assault weapons (LAAW's).

(3) Mobility.--The engineer companies are helicopter transportable, having organic to them small, general purpose vehicles. Adequate ground mobility means (command, medical, and logistic support vehicles including heavy trucks) are organic to the battalion to facilitate accomplishment of the primary mission.

(4) Logistics.--The maintenance, medical, transportation, supply, and messing capabilities of the battalion are as follows:

(a) Maintenance.--The battalion performs organizational (second echelon) maintenance of all materiel authorized.

(b) Medical.--Medical support is provided from the medical section, H&S company, decentralized as necessary to meet requirements of tactically deployed elements of the battalion.

(c) Transportation.--Transportation means organic to the battalion consist of small, multipurpose, helicopter-transportable vehicles for command, communications, medical, and logistics support, and heavy vehicles required by the battalion to accomplish its mission.

(d) Supply.--The battalion is capable of requisitioning, receiving, storing, and distributing all classes of supply for the battalion.

(e) Messing.--This unit is capable of operating a battalion mess in garrison or in the field and of furnishing limited galley facilities for separated units of the battalion when the tactical situation permits.

(f) Mobile Electric Power Generating Sources (MEPGS).--The battalion will provide, install, and maintain MEPGS equipment and will train and license operators for designated organizations of the division.

c. Concept of Employment.--The engineer battalion provides both tactical and service support. It is organized so an engineer company may provide close combat support for each infantry regiment and its task elements. The fourth company normally will provide support to the force landing support party and division rear area organizations, while maintaining the flexibility to augment the other engineer companies in forward areas. The engineer company performs essential engineer support functions under moderate conditions of climate, weather, and terrain. Engineer companies are augmented with personnel and equipment from the engineer support company and H&S company as required by the assigned mission, permitted by transportation means and imposed by conditions of terrain and weather. The

widespread scope of division combat operations may require reinforced engineer companies to be attached to or in direct support of infantry task groupments. Engineer support requirements to the rear of forward elements of the division will be accomplished under centralized battalion control by the remaining elements of the battalion. Conditions permitting, engineer companies revert to battalion control to contribute to the battalion's general engineer support effort. When conditions do not permit this reversion to battalion control, reinforcement from the engineer support battalion may be required to augment and expand capabilities within the division's rear area. The organization and equipment of the battalion is based upon the following criteria:

(1) Construction support will be limited to those essential items which are temporary in nature and designed to minimum standards to meet basic combat requirements.

(2) There is a requirement to provide utilities support in the areas of water supply and hygienic services for the Marine division.

(3) Combat service support within the division will be only partially dependent upon ground transport because of a combat service support capability in the form of helicopter transport and air drop. Reinforcement will be required to provide a complete road net for support of all division units.

d. Functions.--The following functions are performed by the combat engineer battalion:

(1) Engineer reconnaissance within the division zone of action or sector of defense. Infantry support is required when conducting engineer reconnaissance in areas under enemy control.

(2) Temporary repair and maintenance of existing roads and limited new construction and maintenance of pioneer roads for moderate combat service support traffic.

(3) Erecting standard, prefabricated fixed and floating bridges. Bridges and supervisory personnel are provided by the engineer support battalion.

(4) Constructing pioneer type timber bridges from local materials when available.

(5) Constructing and operating rafts.

(6) Reinforcing, repairing, maintaining bridges other than pre-fabricated types.

(7) Constructing and maintaining expeditionary airfields for observation aircraft, helicopters, and VTOL type aircraft.

(8) Providing potable water and hygienic services for the division.

(9) Providing electrical utilities for the division command post.

(10) Constructing and positioning obstacles requiring special engineer equipment or technical skills.

(11) Supervising the placement of extensive minefields and booby-traps.

(12) Furnishing technical and mechanical assistance for the construction of cut-and-cover type temporary fortifications.

(13) Performing specialized demolition missions beyond the capability of the infantry.

(14) Providing specialized assistance in breaching obstacles, including mines, from the high water mark inland.

(15) Supervising extensive or sensitive minefield clearance.

(16) Supervising specialized camouflage tasks, primarily concealment and deception measures of major significance to the division as a whole.

### 303. HEADQUARTERS AND SERVICE COMPANY, ENGINEER BATTALION

a. Mission.--The primary mission of the H&S company is to provide command, control, and administrative elements to supervise the operations of the battalion, including the provision of supply, communications, mess, and medical support.

b. Organization.--As illustrated by figure 4, H&S company consists of a battalion headquarters, company headquarters, communication platoon, supply platoon, medical section, and chaplain section.

(1) Command and Control.--The company commander directs and controls all matters pertaining to administration, logistics, and security of the company. Internal communications are provided by the communication platoon.

(2) Armament.--For local protection of the battalion headquarters, firepower is provided by individual weapons, machineguns, and LAW's.

(3) Mobility.--Command and logistics support vehicle augmentation is provided from the engineer support company for the accomplishment of the mission.

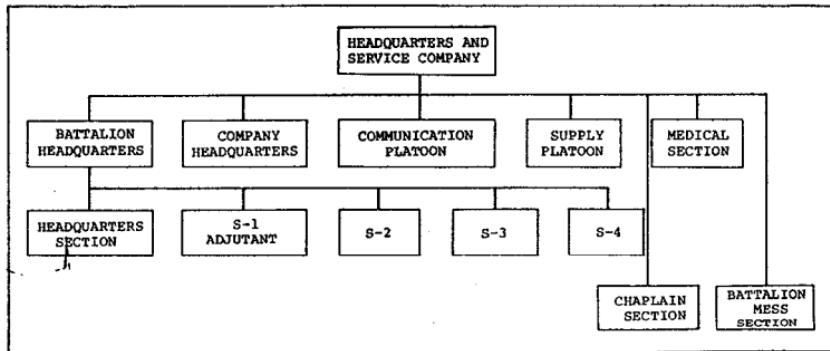


Figure 4.--Headquarters and Service Company.

(4) Logistics.--The maintenance, medical, transportation, supply, and messing capabilities of the company are as follows:

(a) Maintenance.--All elements of the company perform organizational (first echelon) maintenance of all material authorized and organizational (second echelon) maintenance on assigned infantry weapons.

(b) Medical.--The medical section provides for emergency treatment of battalion casualties and preparation for their evacuation. It is capable of operating a field dispensary for treatment of minor illnesses and injuries. The section can be decentralized as necessary to meet requirements of tactically deployed elements of the battalion. It exercises technical supervision measures for prevention and control of disease.

(c) Transportation.--The transportation means required for command and combat service support are provided by the engineer support company. Vehicular-mounted communication equipment is organic to the communication platoon. One 1/4-ton, 4x4 ambulance is organic to the medical section.

(d) Supply.--The supply platoon requisitions, receives, stores, and issues all classes of supply for the battalion. The company headquarters receives supplies for internal support of the company and provides for distribution.

(e) Messing.--The battalion mess section operates a battalion mess and provides limited galley facilities for combat engineer companies when the tactical situation permits.

c. Concept of Employment.--The company decentralizes its support functions in the fields of supply, communications, medical, and messing to the extent necessary to meet the requirements of tactical disposition of other elements of the battalion. The company headquarters is employed primarily to direct and control all matters pertaining to internal administration, logistics, and security of the company. The physical layout, support, and displacements of battalion headquarters are directed toward providing the battalion commander and his staff with the most effective means for directing and controlling the battalion.

d. Functions.--The company is organized into functional groupings to provide for:

(1) A battalion headquarters which plans, directs, and coordinates actions of the battalion and reinforcing elements.

(2) A company headquarters which provides administrative, security, and logistics support for the company.

(3) A communication platoon which provides facilities to exercise control and coordination between all echelons of command.

(4) A supply platoon which accomplishes organic supply functions for the battalion.

(5) A medical section which provides medical support for the battalion.

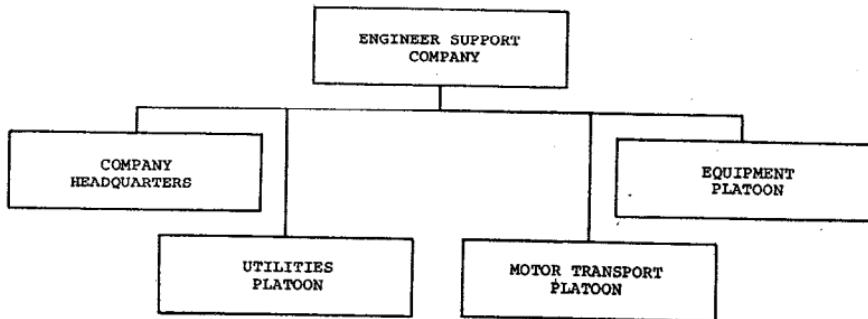


Figure 5.--Engineer Support Company.

(6) A battalion mess section which operates a battalion mess in garrison or in the field, and furnishes limited galley facilities for combat engineer companies when the tactical situation permits.

### 304. ENGINEER SUPPORT COMPANY

a. Mission.--The primary mission of the engineer support company is to provide personnel, equipment, and appropriate task units for augmentation of the operations of other elements of the battalion and to provide potable water, electric power, and hygienic service for designated elements of the division.

b. Organization.--As illustrated in figure 5, the engineer support company is functionally organized and consists of a company headquarters, utilities platoon, equipment platoon, and motor transport platoon. It has the capability of being rapidly task organized to meet battalion needs.

(1) Command and Control.--The company commander with his company headquarters performs command and staff functions necessary for planning, direction, and supervision in execution of assigned missions. The motor transport platoon commander, the utilities platoon commander, and equipment platoon commander serve as technical advisors to the battalion commander. The company must be augmented with personnel and equipment from communication platoon, H&S company, to provide radio and wire communications between company, subordinate units, and higher headquarters.

(2) Armament.--Firepower for local protection is provided by individual weapons, machineguns, and LAW's.

(3) Mobility.--Command and combat service support vehicles are provided to support all units of battalion as required by assigned tasks.

(4) Logistics.--Maintenance, medical, transportation, and supply capabilities of the company are as follows:

(a) Maintenance.--The company performs organizational (second echelon) maintenance of all equipment authorized.

(b) Medical.--The company has no organic medical personnel. Augmentation is provided from the medical section, H&S company, as required.

(c) Transportation.--Transportation means organic to the company consist of vehicles for command and combat service support purposes, including heavy trucks, to support all units of the battalion.

(d) Supply.--The company contains no organic supply capability. It receives and internally distributes supplies provided by the battalion supply section, H&S company.

c. Concept of Employment.--The engineer support company accomplishes essential engineer support functions in rear areas of the division. It also augments companies with motor transport vehicles, equipment, operators, and support personnel when required by specific missions. When this is done, control of the augmentation elements is passed to the combat engineer company requiring such assistance. The company provides motor transport support for the H&S company and operation of battalion headquarters. It is capable of performing all functions for which the battalion is responsible. The company is employed under centralized control of the battalion commander when feasible. It provides specialist personnel for service as individuals or for task elements tailored for specific missions. The utilities platoon provides for power generation and electrical distribution, bath, laundry, and decontamination essential to division operations.

d. Functions.--Subject to criteria stated in subparagraph 302c, the engineer support company can perform all functions for which the battalion is responsible. See subparagraph 302d for specific functions.

### 305. COMBAT ENGINEER COMPANY

a. Mission.--The primary mission of the combat engineer company is to provide close combat engineer support as necessary to meet the essential requirements of an infantry regiment and associated task elements in combat operations.

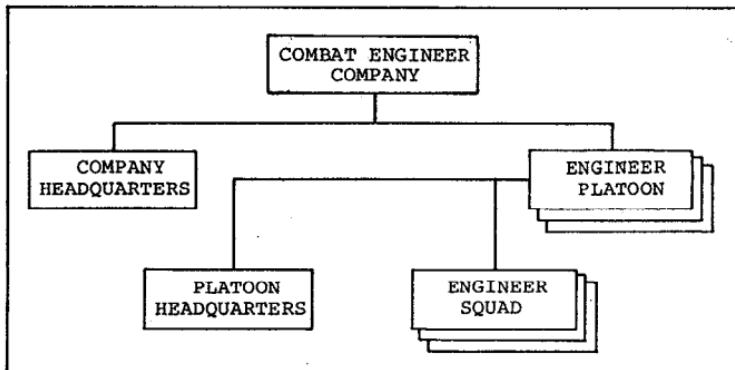


Figure 6.--Combat Engineer Company.

b. Organization.--As illustrated in figure 6, the combat engineer company consists of a company headquarters and three engineer platoons. Each platoon is composed of a platoon headquarters and three engineer squads. The company has the capability of being task organized rapidly to meet needs of an infantry regiment or task groupments.

(1) Command and Control.--The company commander with his company headquarters performs command and staff functions necessary for planning, direction, and supervision in accomplishing the assigned mission. There are no organic communications. The company is augmented with personnel and equipment from the communication platoon, H&S company, as required. When so augmented, the company is capable of providing reliable communications between company headquarters, subordinate units, and higher headquarters.

(2) Armament.--Firepower is provided by individual weapons, machineguns, and LAW's.

(3) Mobility.--The combat engineer company is helicopter transportable and is capable of supporting infantry task groupments in helicopter-borne assault operations. When augmented with vehicles from the engineer support company, or an external source, the combat engineer company may be task organized to provide mobility compatible with that of the supported unit.

(4) Logistics.--Maintenance, medical, transportation, and supply capabilities are as follows:

(a) Maintenance.--The company performs organizational (first echelon) maintenance of all materiel authorized.

(b) Medical.--The company has no organic medical personnel. Augmentation is provided from the medical section, H&S company, as required.

(c) Transportation.--Transportation means organic to the company consists of small, general purpose vehicles for command and combat service support. The company is augmented with vehicles and personnel to operate them from the engineer support company as required.

(d) Supply.--The company receives and internally distributes supplies provided by higher headquarters. It has no organic supply capability.

c. Concept of Employment.--The company provides direct combat engineer support to infantry task groupments for all type operations. It can provide one engineer platoon for close support of each infantry battalion and its task elements. The company may operate under centralized control of the company commander; however, platoons will frequently operate under decentralized control of their commanders when the supported units are widely separated. When under decentralized control, the company commander acts as advisor to the infantry regimental commander. Combat operations may require the company to be either attached to or in direct support of the infantry regiment. Conditions permitting, the company is employed under battalion control to contribute to the division general engineer support effort. Heavy equipment, vehicles, and operating personnel will be attached as necessary from the engineer support company.

d. Functions.--Subject to the criteria stated in subparagraph 302c, the following specific functions are performed by the combat engineer company:

- (1) Engineer reconnaissance.
- (2) Assisting in cross-country movement of tracked and light wheeled vehicles.
- (3) Erecting temporary, engineer type structures to assist in movement of light vehicles and personnel across dry and wet gaps, subject to availability of local materials.
- (4) Constructing and operating light rafts, subject to availability of materials.
- (5) Reinforcement and repair of existing bridges with local materials for the passage of light vehicles.
- (6) Improving existing terrain for use as terminal points for helicopters.
- (7) Furnishing technical assistance in fabrication and positioning of light obstacles.
- (8) Supervising placement of minefields and boobytraps.
- (9) Furnishing technical and mechanical assistance in the installation of temporary cut-and-cover type field fortifications.
- (10) Performing specialized demolition missions beyond the capability of the infantry.
- (11) Specialized assistance in breaching obstacles, including mines, from the high water mark inland.
- (12) Supervising extensive and sensitive minefield clearance.
- (13) When augmented by necessary elements of the engineer support company, the performance of any function for which the engineer battalion is responsible. (See subpar. 302d.)

#### 306. ENGINEER SECTION, DIVISION HEADQUARTERS

The engineer section is a special staff section of division headquarters (see fig. 7) and consists of the division engineer and a small supporting staff. The division engineer is normally the senior engineer officer of the division. He advises the division commander on employment of engineer forces. He is responsible for specific staff functions at division level as follows:

- a. Planning technical training of engineer and nonengineer personnel in engineer work.
- b. Preparing plans for engineer reconnaissance; collecting, evaluating, and disseminating engineer technical information based thereon.

- c. Preparing terrain studies, particularly from the engineer viewpoint.
- d. Providing advice and requirements pertaining to engineer intelligence.
- e. Accomplishing comprehensive analysis of all engineer tasks required to implement the division commander's plan.
- f. Preparation of the engineer portions of routine and combat orders.
- g. Liaison with corresponding staff sections of higher and adjacent units on engineer matters.
- h. Preparation of requests for engineer support from forces external to division.
- i. Preparation of breaching plans for division.
- j. Determining engineer units that can best accomplish required tasks.
- k. Planning and technically supervising construction of defensive works including field fortifications, demolitions, obstacles, minefields, and roadblocks.
- l. Maintaining detailed minefield, barrier, and obstacle records.
- m. Planning and coordinating engineer activities of division and attached units.
- n. Receiving, reviewing, and assigning priorities for engineer requests from division units.
- o. Recommending traffic regulations dictated by physical conditions of routes of communication.
- p. Providing advice and technical supervision on camouflage matters.

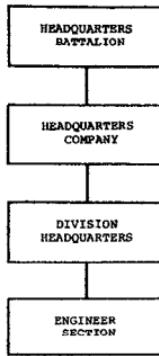


Figure 7.--Engineer Section, Division Headquarters.

q. Planning construction, repair, and maintenance of camps, expeditionary airfields, warehouses, hospitals, roads, bridges, piers, pipelines, and river-crossing sites.

r. Planning construction, repair, and maintenance of essential utilities.

s. Exercising staff and technical supervision over field maintenance and salvage of engineer materiel.

t. Exercising staff supervision and making recommendations concerning requirements for procurements, storage, and distribution of engineer equipment and supplies.

u. Supervising the production of maps, map revisions, and map substitutes; within limits of its facilities, collect and process information for preparation and revision of maps in coordination with G-2.

v. Exercising appropriate technical staff supervision and inspection of corresponding staff sections and activities of subordinate and attached units.





## SECTION 4

## WING ENGINEER CAPABILITY

## 401. GENERAL

The wing engineer squadron (WES), Marine wing support group (MWSG), is the primary provider of engineer support to the Marine aircraft wing (MAW). The WES is included in the MWSG to facilitate consolidation of the engineer personnel and equipment resources required for support of MAW operations. The squadron is organized along functional lines to permit efficient centralized control of functional support resources and to enhance the MAW capability to task organize engineer assets, as necessary, for the support of decentralized and/or deployed unit operations. Figure 8 shows the organization of the MWSG.

## 402. WING ENGINEER SQUADRON

- a. Mission.--The primary mission of the WES is to provide engineer (construction, facilities maintenance, utilities, and tactical airfield fuel dispensing system (TAFDS)) support of a deliberate nature for the Marine aircraft wing and assigned units.

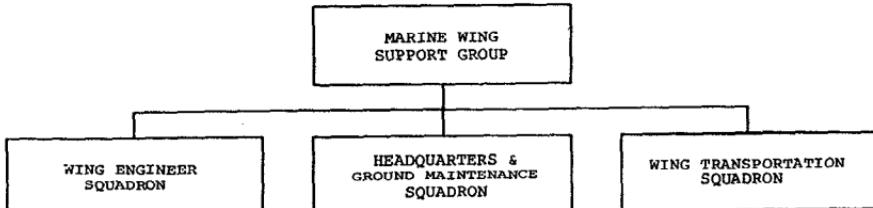


Figure 8.--Marine Wing Support Group.

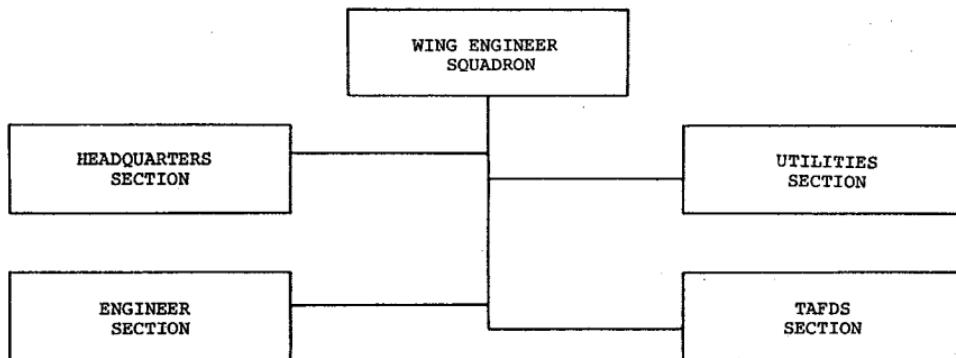


Figure 9.--Wing Engineer Squadron.

b. Organization.--As illustrated in figure 9, the squadron consists of a headquarters section, engineer section, utilities section, and a TAFDS section.

(1) Command and Control.--Engineer support requirements of the MAW will normally be provided under the centralized control of the engineer squadron. The functional support capabilities of the squadron parallel those of the division and force engineer battalions. Communications are provided by the headquarters and ground maintenance squadron of the MWSG.

(2) Armament.--Armament is provided by individual weapons.

(3) Mobility.--Adequate ground mobility means are organic to accomplish the primary mission. Wing transportation squadron will augment, as required, for specific requirements.

(4) Logistics.--The maintenance, medical, transportation, supply, and messing capabilities of the squadron are as follows:

(a) Maintenance.--The squadron is capable of organizational (first echelon) maintenance on all assigned equipment and organizational (second echelon) maintenance on assigned infantry weapons.

(b) Medical.--None organic; medical support is provided by headquarters and ground maintenance squadron of the MWSG.

(c) Transportation.--Transportation assets of the squadron are sufficient to perform assigned tasks.

(d) Supply.--None organic; supply support is provided by the headquarters and ground maintenance squadron of the MWSG.

(e) Messing.--None organic; the headquarters and ground maintenance squadron of the MWSG provides messing for all organic squadrons.

c. Concept of Employment.--The engineer squadron provides both tactical and combat service support to the MAW. This includes the construction, improvement, and maintenance of helicopter and light reconnaissance aircraft landing sites; TAFDS support; HERs support; the provision of essential utilities (potable water, bath, laundry facilities, and electric power). The squadron is organized to provide one engineer unit and one TAFDS unit for each tactical Marine aircraft group with an additional engineer unit(s) for the MAW headquarters elements and ground control group, and for augmentation/contingency purposes. The engineer unit is the basic engineer support unit for the squadron and is, therefore, the nucleus for structuring the engineer support organization of any element of the wing. The organization and equipment of the squadron is based upon the following criteria:

(1) The consolidation of numerous small elements organic to the MAW, that previously provided engineer type support, into a functionally organized squadron with enhanced capability and the subsequent elimination of decentralized engineer assets.

(2) Construction and equipment support requirements normally will be limited to essentials, expedient in nature, and designed to minimum standards to meet tactical aircraft requirements.

(3) The requirement to provide utilities support, including mobile electric power, water, and hygienic services.

d. Functions.--The following specific functions are considered to be both a responsibility and a capability of the engineer squadron:

(1) Engineer reconnaissance/survey within the landing force zone of action.

(2) Repair, improve, and maintain existing road nets within the MAW's area of responsibility.

(3) Construct and maintain expedient roads.

(4) Construct, improve, and maintain helicopter and light reconnaissance aircraft landing sites to meet minimum wing requirements.

(5) First echelon level maintenance of all assigned equipment and second echelon maintenance on assigned infantry weapons.

(6) Construct temporary camps to include the provision of technical and equipment assistance for the erection of shelters.

(7) Provide essential utilities support in the area of electrical power.

(8) Provide essential water and hygienic support in the area of potable water, bath, and laundry facilities.

(9) Repair existing warehouses and facilities.

(10) Develop, improve, and maintain drainage systems.

(11) Provide survey and drafting support as required.

(12) Supervise special camouflage and mine clearance tasks.

(13) Provide expeditionary class III/III(A) storage and dispensing support.

(14) Locate quarries, sand, gravel pits, and other sources of construction material in the objective area.

(15) Construct turnouts and parking areas.

(16) Expedient repair and maintenance of existing airfield runways/taxiways.

#### 403. HEADQUARTERS SECTION, ENGINEER SQUADRON

a. The headquarters section consists of a command unit, administrative units, and an operations unit to provide the command, control and administration elements necessary to support, coordinate, and supervise the operations of the squadron. (See fig. 10.)

(1) The command unit is responsible for directing and supervising accomplishment of the WES mission of increasing the effectiveness of the MAW, by providing direct engineer support of a deliberate nature.

(2) The administrative unit provides centralized personnel administration for the squadron. The unit also provides administrative support required for internal and external squadron operations.

(3) The operations unit provides the staff planning, coordination, and supervision capabilities required for management of the squadron support operations. The operations unit operations parallel S-3 and S-4 staff functioning respectively. The operations officer of the unit is responsible to the commanding officer for implementation of squadron support plans, and staff coordination and supervision of operations conducted in accomplishing the WES mission.

b. Elements of the section will normally operate from a central location. The section is intended to have the potential of detaching personnel as required to support deployed wing unit operations of aircraft group size or larger.

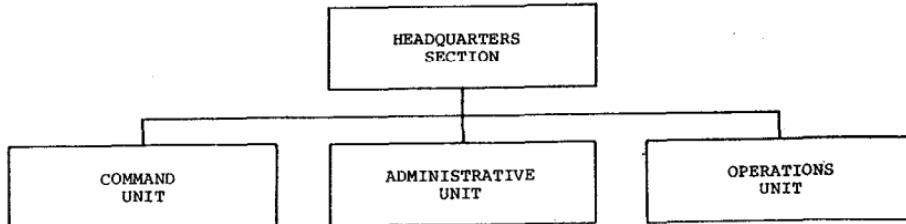


Figure 10.--Headquarters Section.

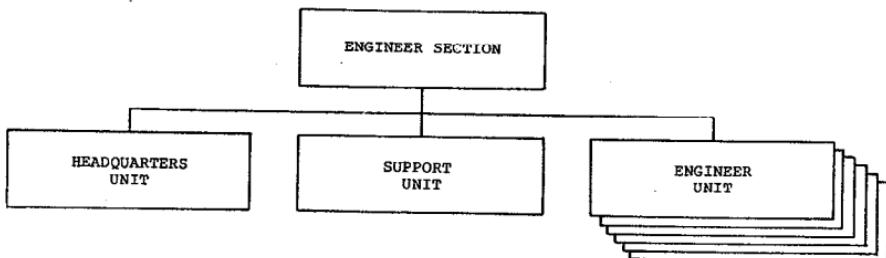


Figure 11.--Engineer Section.

#### 404. ENGINEER SECTION, ENGINEER SQUADRON

a. The engineer section consists of a headquarters unit, support unit, and six engineer units to provide essential engineer support to the MAW and assigned units. The organizational structure is indicated in figure 11. The engineer unit is the basic engineer support unit for the engineer squadron; therefore, it is the nucleus for building an engineer support organization for any element of the wing.

(1) The headquarters unit provides the personnel required for the command and control of the engineer section. The section commander is responsible for directing, coordinating, and supervising the accomplishment of tasks assigned to support the units of the MAW.

(2) The support unit consists of a headquarters element, engineer equipment element, and a transportation element. The unit commander is responsible for providing engineer equipment and transportation equipment, as required within capabilities, to support engineer construction tasks assigned to the section. It contains personnel and equipment assets identical to those of the engineer units, in addition to being the repository for low density items that have specific use application. The support unit equipment is used to augment the engineer unit. Personnel and equipment can be shifted from one task/project to another to ensure coordination with project deadlines.

(3) Each engineer unit consists of a headquarters element, equipment element, and two construction elements. The headquarters element functions as the engineer support operations office for support of a designated MAG and assigned units. The unit commander acts in the capacity of a MAG engineer officer, providing staff planning and coordination assistance concerning engineer support operations for the MAG. The headquarters element directs, coordinates, and supervises the employment of the engineer element equipment and construction teams and all augmentation personnel and equipment assigned or attached from other sections of the engineer squadrons.

(a) The equipment element consists of engineer and motor transport personnel and equipment considered essential to the normal support requirements of the MAG. The equipment element commander is responsible for providing engineer and transportation equipment (within capabilities) support to accomplish tasks assigned/directed by the unit commander. He is

also responsible for providing the expertise, assistance, and supervision required for efficient and proper employment of equipment.

(b) The two construction elements are primarily responsible for the accomplishment of vertical construction tasks assigned to the engineer unit. Each element is capable of efficiently committing two construction detachments to separate tasks or projects. Both construction elements can also be effectively combined for employment on large construction tasks/projects.

b. Use of the engineer section as a nucleus or basic support element of the engineer squadron is ideal for support of MAW operations. The dissimilar size of MAW's and fluid movements of aircraft squadrons and groups are factors that require a support organization capable of task organization to provide varying degrees of support requirements.

#### 405. UTILITIES SECTION, ENGINEER SQUADRON

a. The utilities section (see fig. 12) consists of a headquarters unit, three water and hygiene units, three mobile electric power units, and three environmental control units. The section will normally provide general utilities support to units/groups of the MAW. This permits centralized control of the utilities equipment and personnel resources by the engineer squadron, allowing for flexibility and management of the overall support capability. Support of deployed wing elements will be provided by augmenting the engineer unit supporting the unit/group with utilities detachments as required. Administrative and operational control will pass to the engineer unit commander. When operating under centralized or decentralized control, the section supports all wing requirements for utilities functions with teams or task groupments from the water and hygiene units, mobile electric power units, and the environmental control units.

(1) The headquarters unit provides the command and control for the section. The section commander is responsible for providing the essential water, hygiene, electric power, and air conditioning/refrigeration equipment and personnel necessary to support normal wing unit operations.

(2) The water and hygiene units are responsible for furnishing potable water and functional support personnel and equipment to operate bath and laundry, decontamination, and fumigation facilities for MAW units.

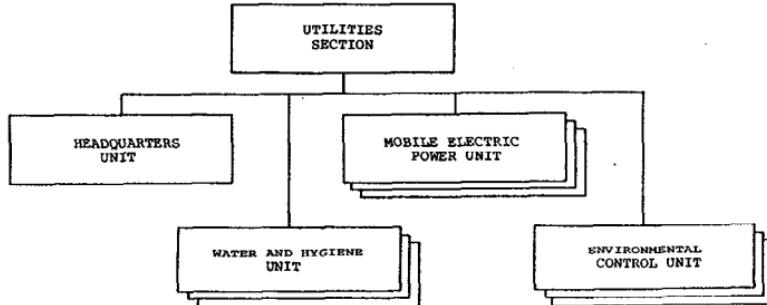


Figure 12.--Utilities Section.

(3) The mobile electric power (MEP) units are responsible for installing electrical distribution systems to using equipment/facilities, including overhead distribution and internal building electrical wiring. The units also provide electrical power distribution support to wing units having generator allowances. The units are equipped to provide centralized utility-type electrical power equipment to units of the wing, as well as providing generator operator training to using units and frequently checking and/or monitoring the operation and maintenance of all wing generators.

(4) The environmental control units are responsible for providing support type refrigeration equipment and the personnel required to install the equipment for using units of the wing. The units furnish training for equipment operated by using units, conducts inspections of the equipment, and is responsible for the service, maintenance, and repair of wing refrigeration/air conditioning equipment. The units will generally be under centralized control of the engineer squadron, but elements can be attached to engineer units when required for support of deployed wing units.

b. The utilities section is capable of providing all of the normal functional support required by wing units in expeditionary operational situations. Support of wing requirements will be limited by the types and quantities of utilities equipment included in the section's table of equipment. The section will require external construction and equipment support to increase utilities standards to that of advance base development. Once provided, the utilities section is capable of operation and maintenance of base utilities facilities.

#### 406. TAFDS SECTION, ENGINEER SQUADRON

a. The TAFDS section provides expeditionary class III and class III(A) storage and dispensing support for wing units at tactical airfields. The section consists of a headquarters unit and five TAFDS units. The section contains 20 (60,000-gallon) TAFDS's and 9 (6,000-gallon) HER'S's. The organizational structure is indicated in figure 13.

(1) The headquarters unit provides the command and control of the TAFDS section. The section commander is responsible for directing, coordinating, and supervising the installation and operation of the TAFDS section.

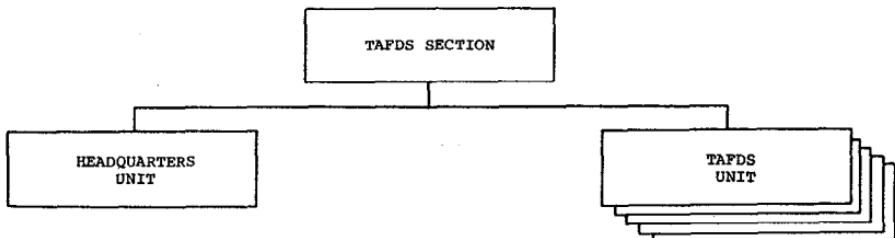


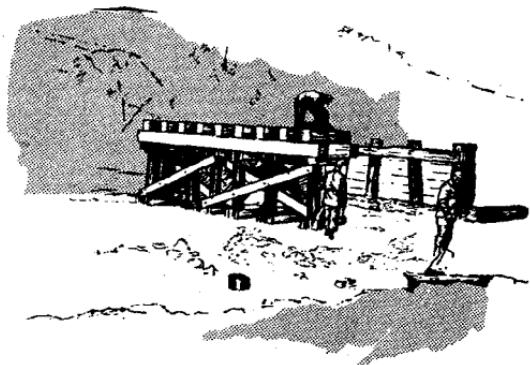
Figure 13.--TAFDS Section, Engineer Squadron.

(2) The TAFDS unit provides bulk fuel storage and dispensing facilities at airfields not having permanently installed fuel systems. For this reason, the support of a TAFDS unit is necessary for wing group operations.

b. Units of the TAFDS section are organized and adequately staffed to function in accordance with planned concepts of employment and intended support capabilities. Each unit is equipped with four TAFDS's.

#### 407. ENGINEER SECTION, MARINE AIRCRAFT WING HEADQUARTERS

The engineer section is a special staff section of Marine wing headquarters and consists of the wing engineer officer and a small supporting staff. The wing engineer officer is normally the senior engineer officer of the wing. He advises the commander on employment of engineer forces. His specific functions are basically the same as the division engineer officer. (See par. 306.)



## SECTION 5

## FORCE ENGINEER CAPABILITY

## 501. GENERAL

The engineer support battalion, force service support group (FSSG) is the primary organization that provides the general engineer support requirements of a MAGTF and the internal engineer support requirements of the FSSG. (See fig. 14.)

## 502. ENGINEER SUPPORT BATTALION

a. Mission.--The primary mission is to increase the effectiveness of the landing force by accomplishing general engineer missions of a deliberate nature.

b. Organization.--As illustrated by figure 15, the battalion consists of an H&S company, a support company, three engineer companies, a bridge company, and two bulk fuel companies.

(1) Command and Control.--The staff is organized to administer, direct, and supervise operations of the battalion and any additional engineer reinforcing elements. The battalion is capable of providing communications between all echelons of command. There is no organic intelligence agency; but, by virtue of its mission, organic engineer intelligence requirements are limited and are provided by the battalion S-2/S-3 section. The battalion is also capable of self-administration.

(2) Armament.--Armament is provided by individual weapons, machineguns, and LAW's.

(3) Mobility.--Adequate ground mobility for command, medical, and combat service support purposes is organic to the battalion to provide for accomplishment of assigned missions.

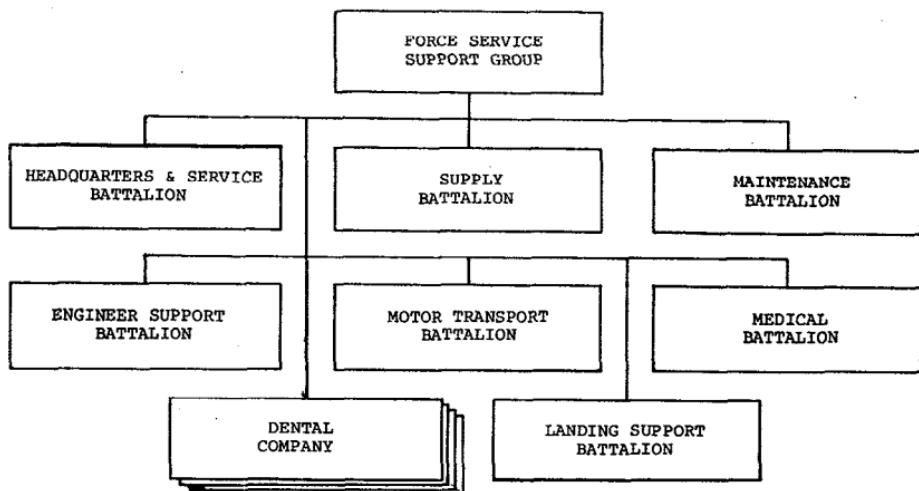


Figure 14.--Force Service Support Group.

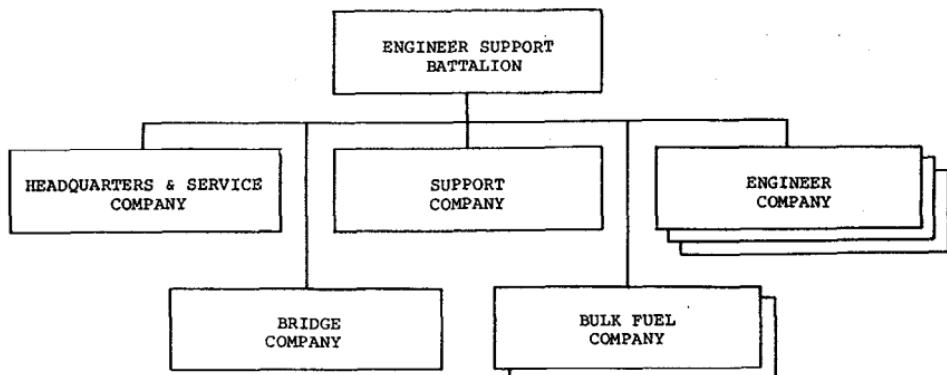


Figure 15.--Engineer Support Battalion.

(4) Logistics.--The maintenance, medical, transportation, supply, and messing capabilities of the battalion are as follows:

(a) Maintenance.--The battalion performs organizational maintenance for all materiel authorized.

(b) Medical.--Medical support is provided from the medical section, H&S company, decentralized as necessary to meet the requirements of tactical disposition of battalion elements.

(c) Transportation.--Transportation means organic to the battalion consists of command, communication, medical, and combat service support vehicles. These include the heavy trucks and prime movers required by the battalion.

(d) Supply.--The battalion is capable of requisitioning, receiving, storing, and distributing all classes of supply for the battalion.

(e) Messing.--The H&S company provides the messing facilities for the entire battalion both in garrison and in the field.

c. Concept of Employment.--The engineer support battalion provides general support to the landing force. It gives depth to the engineer effort by furnishing assistance to the combat engineer battalion and assuming responsibility for engineer support to the rear of the division. It may also furnish assistance to naval construction units supporting the MAGTF. Although elements of the engineer support battalion may be attached to or placed in direct support of either a division or wing or subordinate units thereof, the battalion is most effectively employed when operating as a unit under centralized control.

d. Functions.--The following functions are performed by the engineer support battalion:

(1) Development of routes of communication to include:

(a) Construction, repair, and maintenance of roads and trails. Improvement and extension of routes of communication initiated by division engineer forces.

(b) Erection of prefabricated (fixed and floating) bridges and rafts.

(c) Replacement of prefabricated bridges with semipermanent bridging.

(d) Reinforcement, repair, and maintenance of existing bridges.

(2) Installation and operation of bulk fuel systems in support of MAGTF operations.

(3) Construction of temporary camps with minimum utilities and essential storage and maintenance structures.

(4) Installation and removal of minefields.

(5) Conducting engineer reconnaissance.

(6) Production of potable water. This may be accomplished by employment of water purification units, water distillation units, rehabilitation of existing water supply systems and well drilling where required.

(7) Helicopter landing site improvement and construction.

(8) Construction, repair, and maintenance of expeditionary air-fields for Marine aviation elements operating in the objective area in support of the landing force. See paragraph 208 for additional details.

(9) Provide hygiene services as required.

(10) Provide technical and equipment assistance in the development of combat service support areas or installations.

(11) Technical assistance in camouflage matters and construction of field fortifications if needed.

(12) Coordination of the above listed functions with the civil engineer support construction plans.

#### 503. H&S COMPANY, ENGINEER SUPPORT BATTALION

a. Mission.--The primary mission of H&S company is to provide the means by which the commander administers, directs, and coordinates operations of his engineer support battalion.

b. Organization.--As illustrated by figure 16, H&S company consists of a battalion headquarters, a company headquarters, a communication platoon, a supply platoon, a medical section, and the battalion mess section.

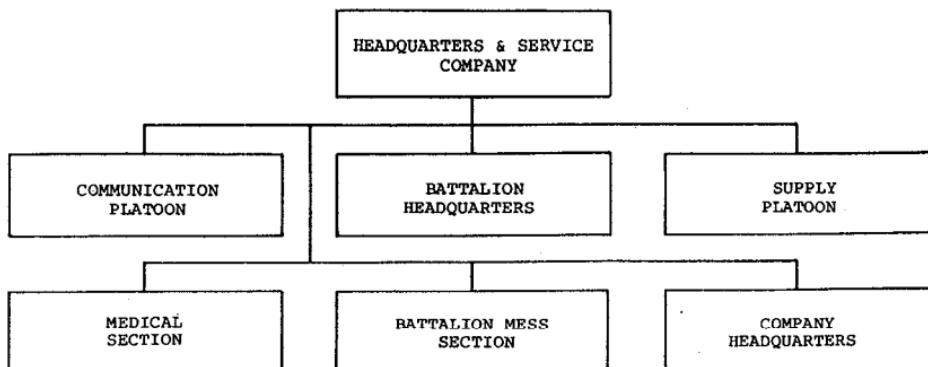


Figure 16.--H&S Company, Engineer Support Battalion.

(1) Command and Control.--The company commander, with his company headquarters, directs and controls all matters pertaining to administration, logistics, and security of the company. Internal communications are provided by the communication platoon. The company is capable of self-administration.

(2) Armament.--For local protection of battalion headquarters, there are individual weapons, machineguns, and LAW's.

(3) Mobility.--Augmentation is provided from support company with command and combat service support vehicles.

(4) Logistics.--The maintenance, medical, transportation, supply, and messing capabilities of the company are as follows:

(a) Maintenance.--All elements of the company perform organizational (first echelon) maintenance of all materiel authorized.

(b) Medical.--The medical section provides for emergency treatment and preparation for evacuation of casualties within the battalion and is capable of operating a field dispensary for treatment of minor illnesses and injuries. The section can be deployed to support deployed units. It also exercises technical supervision of measures for prevention and control of disease.

(c) Transportation.--The transportation means required for command and combat service support are provided by motor transport platoon, support company. Vehicular mounted communication equipment is organic to the communication platoon. One 1 1/4-ton, 4x4 ambulance is organic to the medical section.

(d) Supply.--The supply platoon requisitions, receives, stores, and issues all classes of supply for the battalion.

(e) Messing.--The company provides the messing capability for the entire battalion.

c. Concept of Employment.--The company provides the necessary command and control and support assets to provide for the efficient operation of the battalion. The company headquarters is employed to direct and control all internal administration, logistics, and security matters of the company.

#### 504. SUPPORT COMPANY, ENGINEER SUPPORT BATTALION

a. Mission.--The primary mission of the support company is to provide motor transport and engineer equipment maintenance support, utilities, and motor transportation and heavy engineer equipment to the other elements of the engineer support battalion.

b. Organization.--As illustrated in figure 17, the support company is functionally organized, consisting of a company headquarters, engineer equipment platoon, motor transport platoon, water supply platoon, utilities platoon, and maintenance platoon. It has the capability of being task organized to meet needs of the battalion and is capable of self-administration.

(1) Command and Control.--The company commander with his headquarters performs command and staff functions necessary for planning,

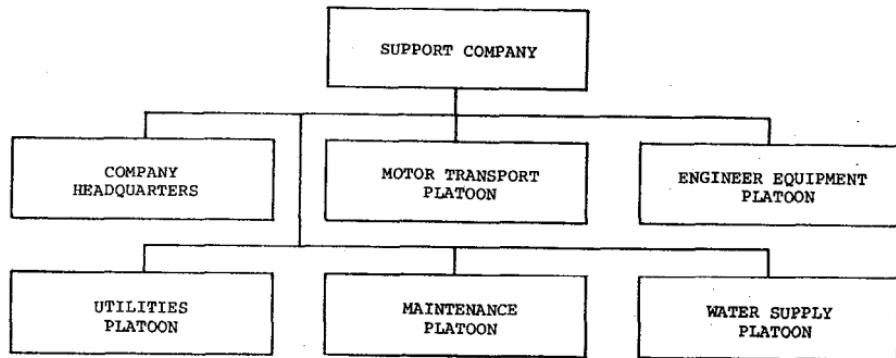


Figure 17.--Support Company, Engineer Support Battalion.

direction, and supervision in execution of assigned missions. The company must be reinforced with personnel and equipment from the communication platoon, headquarters company, to provide radio and wire communications between subordinate units, the company, and higher headquarters.

(2) Armament.--Firepower is provided by individual weapons, machineguns, and LAW's.

(3) Mobility.--Command and combat service support vehicles are provided to support all organic elements of the battalion as may be required by assigned missions.

(4) Logistics.--Maintenance, medical, transportation, and supply capabilities of the company are as follows:

(a) Maintenance.--Elements of the company perform organizational (first echelon) maintenance of all materiel authorized, organizational (second echelon) maintenance of engineer and motor transport materiel authorized the battalion.

(b) Medical.--The company has no organic medical personnel; medical support is provided by the medical section, H&S company.

(c) Transportation.--Transportation means organic to the company consists of vehicles for command and combat service support, including heavy trucks. The company furnishes motor transportation for all units of the battalion, including augmentation of organic motor transport of engineer companies.

(d) Supply.--The company contains no organic supply capability; supply support is provided by supply platoon, H&S company.

(e) Messing.--The company contains no organic messing capability.

c. Concept of Employment.--The support company is organized and equipped to augment and render general engineer service support to all

elements of the battalion. It contains the battalion pool of engineer equipment, motor transport, water supply, and utilities equipment and operators; and drivers and maintenance personnel to provide these services.

d. Functions.--The company performs the following functions:

(1) Provides engineer equipment for all units of the battalion to include augmenting the engineer companies' equipment means.

(2) Provides motor transportation for all units of the battalion to include augmenting the engineer companies' motor transportation means.

(3) Provides utilities support for the battalion and FSSG, with a limited capability of providing assistance to the division and wing service elements.

(4) Furnishes potable drinking water for FSSG and units of the landing force as required.

(5) Provides water supply equipment and personnel to augment the division and wing engineer elements as required.

(6) Accomplishes second echelon maintenance on the battalion motor transport vehicles and engineer equipment.

#### 505. ENGINEER COMPANY, ENGINEER SUPPORT BATTALION

a. Mission.--The primary mission of the engineer company is to increase the effectiveness of the landing force by providing engineer support of a deliberate nature.

b. Organization.--As illustrated in figure 18, the engineer company consists of a company headquarters, equipment platoon, and two engineer platoons, with each platoon composed of a platoon headquarters and three squads. The company is capable of self-administration.

(1) Command and Control.--The company commander with his company headquarters performs staff and command functions required for planning, direction, and supervision in accomplishing assigned missions. Communications are provided by communication platoon, H&S company.

(2) Armament.--Firepower is provided by individual weapons, machineguns, and LAW's.

(3) Mobility.--The engineer company has organic motor transport to provide the ground mobility normally required. Depending on the mission assigned, the company may be augmented with additional transportation from the motor transport platoon, support company.

(4) Logistics.--Maintenance, medical, transportation, supply, and messing capabilities are as follows:

(a) Maintenance.--The company performs organizational (first echelon) maintenance of all materiel authorized.

(b) Medical.--The company has no medical personnel. Medical support, when required, is provided from the medical section of H&S company.

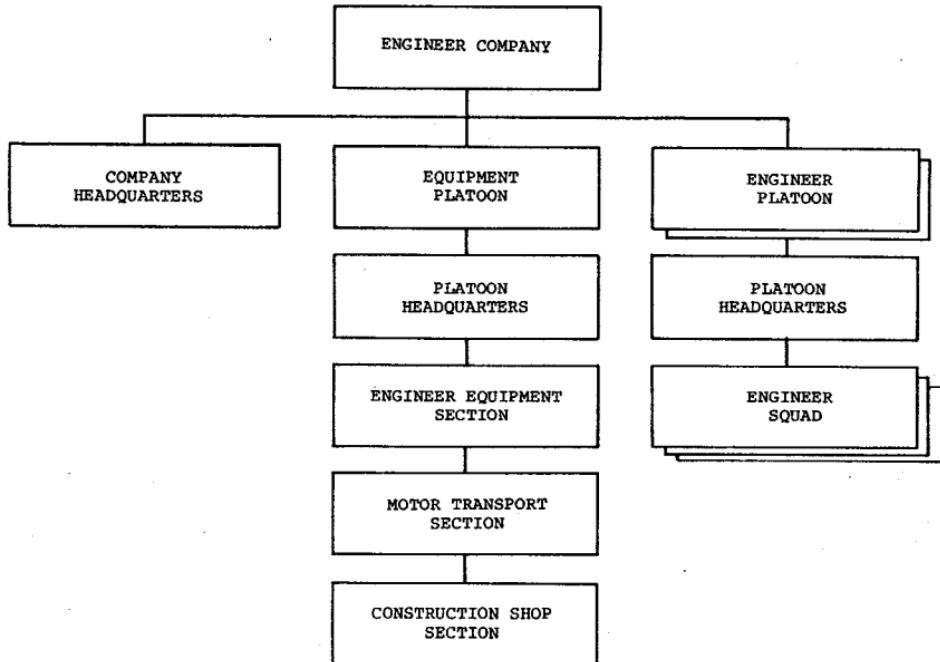


Figure 18.--Engineer Company, Engineer Support Battalion.

(c) Transportation.--Transportation means organic to the company consist of command and combat service support vehicles including heavy dump trucks and low-bed semitrailers. The company is augmented with additional vehicles and operating personnel from support company as required.

(d) Supply.--The company has no supply capability. It receives and internally distributes supplies provided by the supply platoon, H&S company.

(e) Messing.--The company has no messing capability.

c. Concept of Employment.--It will normally be under centralized control of battalion and be assigned general engineer tasks in the landing force zone of action. As such, it will relieve the division of engineer tasks in rear areas. The company has organic personnel and equipment to accomplish normal engineer tasks. It can operate separately from battalion for extended periods provided it is augmented with adequate communication, supply, maintenance, messing, utilities, and medical personnel and equipment. It may be attached under certain circumstances to elements of the division or wing. The company can accomplish the heaviest engineer tasks performed by the FMF.

d. Functions.--When suitably augmented by elements from H&S company and support company, the engineer company is capable of performing any type function for which the battalion is responsible. For a complete listing of the specific functions, see subparagraph 402d.

## 506. BRIDGE COMPANY

a. Mission.--The primary mission of the bridge company is to provide and maintain fixed panel bridge equipage and floating bridge equipage to support the heaviest loads of the Fleet Marine Force, and to provide technical supervision for the construction of these bridges.

b. Organization.--As illustrated in figure 19, the bridge company consists of a company headquarters and three bridge platoons. It has the inherent capability of being task organized to meet the needs of the landing force. Each bridge platoon consists of a platoon headquarters and two bridge sections and is equipped with one floating 60-ton bridge, one fixed aluminum highway bridge, and two footbridges. The company is capable of self-administration.

(1) Command and Control.--The company commander with his company headquarters performs staff functions required for planning, direction, and supervision in accomplishing the primary mission. Communications are provided by the communication platoon, H&S company.

(2) Armament.--Firepower is provided by individual weapons, machineguns, and LAW's.

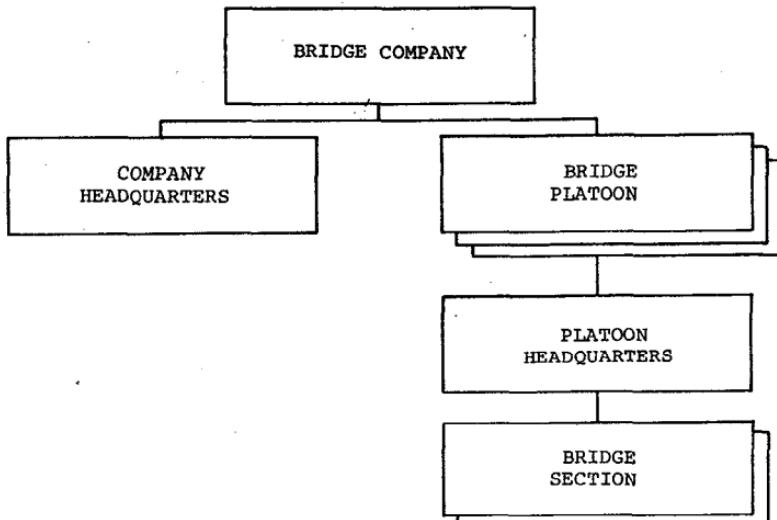


Figure 19.--Bridge Company.

(3) Mobility.--The company has only the bridge trailers required to move approximately one-half of its bridging.

(4) Logistics.--Maintenance, medical, transportation, supply, and messing capabilities are as follows:

(a) Maintenance.--Capable of organizational (first echelon) on all materiel authorized.

(b) Medical.--Provided by medical section, H&S company.

(c) Transportation.--Transportation means organic to the company consists of command and combat service support vehicles. These combat service support vehicles are only sufficient to accomplish the administrative functions of the company and for mobile loading of approximately 50 percent of the organic bridging on trailers. Therefore, motor transport vehicles must be provided from external sources to pull the trailers and to carry the balance of organic bridging.

(d) Supply.--Provided by H&S company.

(e) Messing.--Provided by H&S company.

c. Concept of Employment.--The bridge company provides standard bridging assets as required for operations within the objective area. The bridge company personnel provide technical assistance and supervision during the erection of bridges or ferries. The engineer companies normally provide the necessary forces for the construction. Transportation requirements in excess of the engineer support battalion assets will normally be provided by the motor transport battalion, FSSG.

d. Functions.--The bridge company can perform the following functions:

(1) Provide bridging within the limits of its table of equipment.

(2) Maintain and have available three floating bridges, three fixed aluminum highway bridges, and six footbridges.

(a) With one complete floating bridge it is possible to construct two 60-ton capacity rafts or erect one 60-ton floating bridge with a maximum length of about 276 feet or erect short fixed-spans using components of the bridge set. These short fixed-spans can be rapidly erected in variable lengths and capacities. Under some conditions, short fixed-spans may be partially assembled, transported, and placed in position by helicopter with assembly completed in place.

(b) The aluminum fixed-panel bridge contains components to construct 210 lineal feet of single truss bridging and ramp equipage for three separate bridges. (See fig. 20.) Maximum span for this bridge to handle class 60 loads for normal crossings is 135 feet for single truss and 195 feet for double truss construction.

(c) The aluminum footbridge set contains components to erect 315 lineal feet of single treadway floating footbridge or to construct a light vehicle floating bridge with adequate capacity to handle 1½-ton vehicles with trailers.



Figure 20.--Aluminum Fixed Panel Bridge.

(3) Provide technical assistance and supervision for the installation of all prefabricated bridging.

(4) Maintain prefabricated bridges after their erection and operate and maintain ferries.

(5) Provide sufficient trailers to transport 50 percent of the organic bridging.

#### 507. BULK FUEL COMPANY

a. Mission.--The primary mission of the bulk fuel company is to perform all functions incident to the supply of class III and class III(A) to elements of a Marine air-ground task force, to include distribution to, but not within air bases during an amphibious assault and subsequent operations ashore; to assure that class III(A) products distributed to supported air elements are of the required type, quality, and purity.

b. Organization.--As illustrated by figure 21, the bulk fuel company consists of a company headquarters and four bulk fuel platoons. It is capable of self-administration.

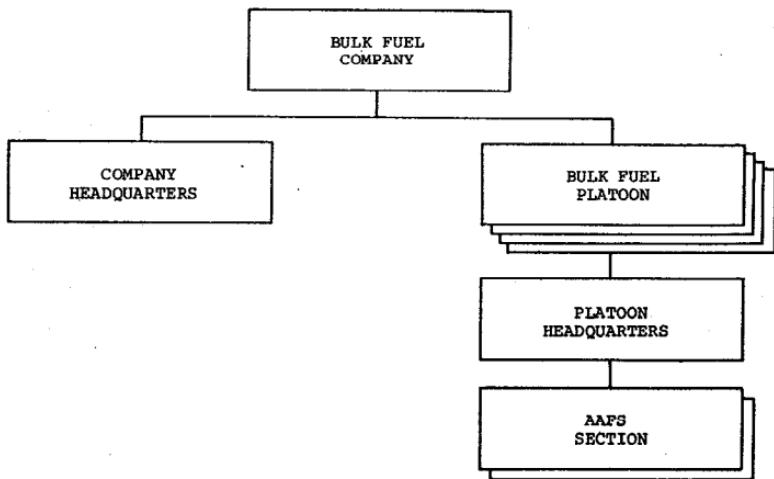


Figure 21.--Bulk Fuel Company.

(1) Command and Control.--The company commander, with his company headquarters, performs staff and command functions required for planning, direction, and supervision in accomplishing assigned missions. The company must be reinforced with personnel and equipment from the communications platoon, H&S company, to provide radio and wire communications between subordinate units, the company, and higher headquarters.

(2) Armament.--Firepower is provided by individual weapons and organizational machineguns.

(3) Mobility.--The bulk fuel company has limited organic motor transport and must be augmented with additional combat service support vehicles.

(4) Logistics.--Maintenance, medical, transportation, supply, and messing capabilities are as follows:

(a) Maintenance.--Capable of organizational and intermediate (fourth echelon) maintenance on all bulk fuel equipment except pumps; capable of organizational (first echelon) maintenance on pumps.

(b) Medical.--The company contains no organic medical personnel; medical support is provided by the medical section, H&S company.

(c) Transportation.--Transportation means organic to the company consist of light vehicles and firefighting vehicles.

(d) Supply.--The company has no organic supply capability; capable of providing external supply support as indicated in primary mission.

(e) Messing.--The company has no organic messing capability; messing is provided by H&S company.

c. Concept of Employment.--The bulk fuel company provides a detachment to the force landing support party for initial class III support of bulk fuel. It may provide detachments to the aircraft wing or groups deployed in the objective area for classes III and III(A) supply support. Size of detachments is determined primarily by the amount and type of fuel requirements. Elements of the bulk fuel platoons and company headquarters may be task organized and employed to provide nearly any combination of the basic AAFFS to meet specific requirements; e.g., 40,000, 60,000, 80,000, 120,000, 240,000, 360,000, or 600,000 gallon capacity.

d. Functions.--The company is capable of:

(1) Providing six AAFFS's to support the landing force. (See fig. 22.) Installation assistance by operators and equipment must be provided by other engineer support battalion elements; e.g., land clearance, construction of berms, revetments, road crossings, and drainage systems. Each AAFFS contains equipment (hose, pumps, filters, tanks, etc.) to transfer fuel a maximum distance of 3 miles with an elevation differential not exceeding 260 feet. The primary purpose of the AAFFS is to receive fuel at the high waterline and store it in dispersed tank farms immediately inland from the beach. Except under unusual conditions, bulk fuel is not transferred for extended distances within the objective area by hose line methods.

(2) Providing an operations and quality control section from the company headquarters to ensure adherence to prescribed fuel quality control operational measures and delivery of usable fuel to the consumer. The section's capability to test fuel quality is generally limited to visual examination of sedimentation and water droplets in emulsion. To ensure the specified type and quality of class III(A) products, a more detailed analysis than the company is able to perform is required. The TAFDS section of the engineer squadron is responsible for the quality of class III(A) fuel delivered to aircraft wing units.

## 508. FORCE TOPOGRAPHIC PLATOON

a. Mission.--The primary mission of the force topographic platoon is to supplement normal mapping sources by preparing map substitutes to include photomaps; limited quantities of mosaic overprints, overlays, and sketches; to correct existing maps; to conduct third order ground control surveys and establish ground control points for artillery, missile, and air units; to provide survey teams, during peace or limited mobilization, for the collection of coastal and landing beach data.

b. Organization.--As illustrated in figure 23, the topographic platoon consists of a headquarters/operations section, a map compiling section, and two survey sections consisting of two survey teams each. The platoon is not capable of self-administration.

(1) Command and Control.--The platoon commander, acting as a special staff officer, provides expertise to the supported commander concerning employment and operation of the platoon and provides for planning, direction, and supervision of the platoon in accomplishing assigned missions. Communications must be provided by higher headquarters or by the supported unit.

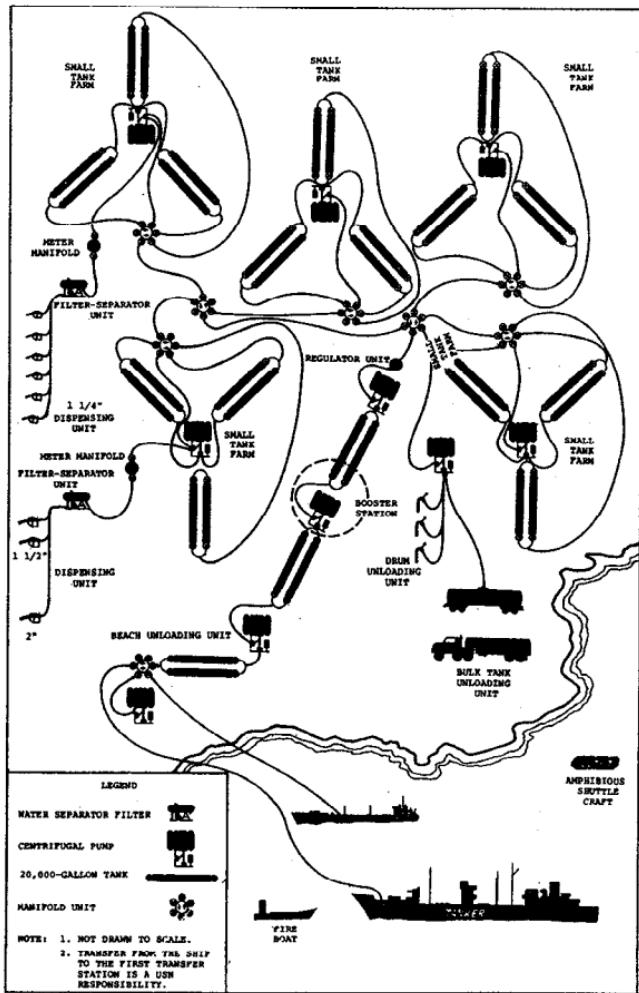


Figure 22.--Amphibious Assault Fuel System.

(2) Firepower.--The platoon possesses only individual weapons for local security and protection of its installation against infiltration. Reinforcement is required from supported units to provide protection to survey teams in the execution of their mission.

(3) Mobility.--The platoon has only the motor transport required for command, internal supply, and movement of the survey teams. Heavy motor

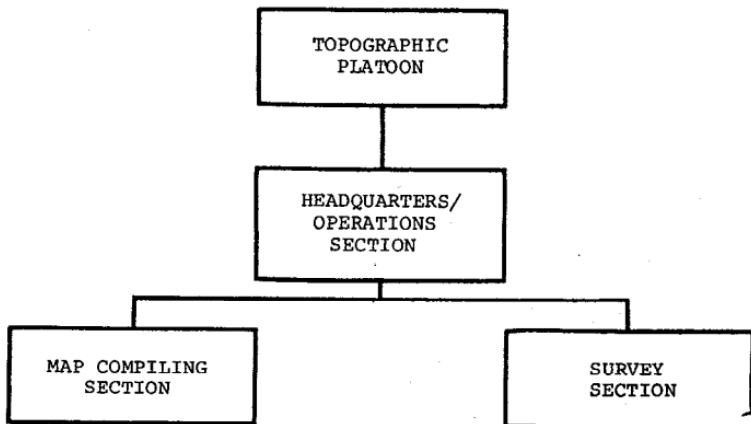


Figure 23.--Force Topographic Platoon.

transport support is required from an external source to move the platoon's topographic vans and map compiling equipment and personnel.

(4) Logistics.--The platoon is capable of first echelon maintenance on equipment assigned to the unit, except for organizational second echelon maintenance on organic topographic peculiar items, motor transport equipment, and generators. It has no medical or messing capability. External supply support is required when employed in support of the landing forces.

c. Concept of Employment.--The platoon is normally employed with, and can support, the MAF or larger unit. It is normally attached to the landing force and operates as a unit under the control of the commander landing force (CLF). Survey teams may be detached to support smaller contingency units or, during peacetime or limited mobilization, may be employed separately as coastal/beach data collecting teams or in conjunction with joint Navy-Marine Corps survey teams. The platoon is most effectively employed when it operates with and is supported by the reproduction unit of the FMF or division headquarters. This allows reproduction in volume and good quality of the product of the platoon effort.

d. Functions.--The platoon is organized to provide:

(1) A map compiling section containing cartographers and map compilers. The section is normally employed as a unit, but personnel may, under some circumstances, be detached to perform small mapping functions. This section is organized and equipped to:

(a) Prepare map substitutes consisting primarily of controlled mosaics with necessary grid and marginal information.

(b) Construct aerial mosaics, either controlled, semicontrolled, or uncontrolled.

- (c) Compile hasty planimetric maps from aerial photography with or without ground control and without actual occupation of the ground.
- (d) Correct existing maps to emphasize amphibious operation aspects.

(2) Two survey sections consisting of two survey teams each. The survey teams are employed as a unit and consist of a team leader/cartographer and topographic/hydrographic surveyors. The section is organized and equipped to:

- (a) Conduct third order ground control surveys. (Third order ground control is a degree of accuracy which allows a limit of error of 1/5,000 in triangulation and traverse and 0.050 in leveling.)
- (b) Provide coastal survey teams for participation in collecting coast and landing beach information.
- (c) Provide surveying assistance to landing force engineers.
- (d) Accomplish surveys for topographic mapping.
- (e) Provide geodetic control for artillery units.

#### 509. ENGINEER SUPPORT UNIT, FSSG

The engineer support unit is a special staff section of the force service support group headquarters (see fig. 24) and consists of the engineer support officer and a small supporting staff. The engineer support officer is normally the senior engineer officer in the FSSG. He advises the commander on engineer matters. His functions are similar to those performed by the division engineer officer (see par. 306).

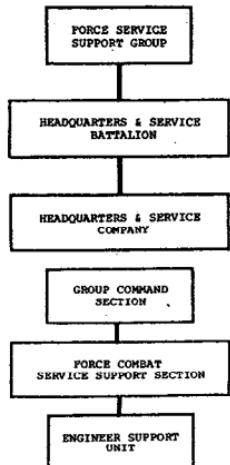
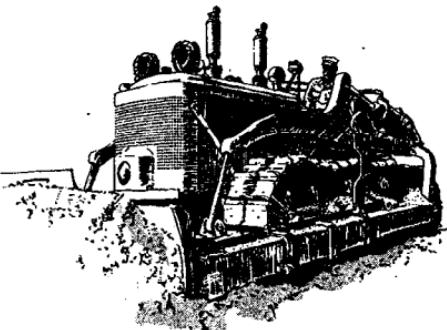


Figure 24.--Engineer Support Unit, FSSG.



## SECTION 6

## NAVAL CONSTRUCTION FORCE

## 601. GENERAL

The naval construction force (NCF) is a general term applied to that group of deployable naval military organizational components which have the common characteristic of possessing the capability to construct, maintain, and/or operate shore, in-shore, and/or deep ocean facilities in support of the U.S. Navy and U.S. Marine Corps and, when directed, other agencies of the U.S. Government. The naval construction force may be assigned tasks in support of the landing forces when construction requirements exceed the capabilities of the landing force engineer units. Of the various elements of the NCF described below, the three most commonly employed in support of the Marine Corps are the naval mobile construction battalion (NMCB), the amphibious construction battalion (PHIBCB), and the construction battalion maintenance unit (CBMU). For additional details, see OPNAVINST's of the 5440 and 5450 series; NAVFAC P-315, Naval Construction Force Manual; and NWP 22-5, The Naval Beach Group.

## 602. COMMANDER NAVAL CONSTRUCTION BATTALIONS

Commander Naval Construction Battalions, U.S. Pacific Fleet (COMCBPAC) and Commander Naval Construction Battalions, U.S. Atlantic Fleet (COMCBLANT) provide command and administrative control of assigned NCF units (less PHIBCB's and other selected units) and are under the command of Commander-in-Chief, U.S. Pacific Fleet and the Commander-in-Chief, U.S. Atlantic Fleet, respectively.

a. Mission.--The commander naval construction battalions provides directive policy guidance in such areas as leadership and discipline; administration; contingency planning and readiness; military and technical training; unit employment, deployment, and scheduling; operators effectiveness; development of operational doctrines, tactics, and procedures; and logistics support.

b. Organization.--The organization of the commander naval construction battalions resembles that of a Marine Corps staff with the general and special staff function required to accomplish its assigned mission.

c. Employment.--Commander naval construction battalions is not normally physically deployed in direct support of Marine Corps amphibious operations.

#### 603. NAVAL CONSTRUCTION BRIGADE (NCB)

A naval construction brigade provides command, administrative, and operational control of two or more naval construction regiments operating in a special geographic area, or in support of a specific military operation. A brigade organization is not normally maintained in the active force in peacetime because deployments to one geographic area are not large enough to warrant a brigade structure. However, a brigade organization is maintained in the reserve NCF.

a. Mission.--The mission of the naval construction brigade is to provide initial review of plans, programs, and construction capabilities; assign priorities and deadlines; and direct distribution of units, materials, and equipment.

b. Organization.--The organization of a naval construction brigade resembles that of a Marine Corps staff with the general and special staff functions required to accomplish its assigned mission.

c. Employment.--A naval construction brigade may be employed when the size of the NCF in a geographic area and/or military operations warrant.

#### 604. NAVAL CONSTRUCTION REGIMENT (NCR)

A naval construction regiment provides command, administrative, and operational control of two or more naval mobile construction battalions operating in a geographic area; or in support of a specific military operation. Naval construction regiments are also used at NMCB homeports for administration, command and control, material support, and training. For additional information on NCR homeport functions, see NAVFAC P-315, Naval Construction Force Manual.

a. Mission.--The mission of the naval construction regiment is to develop construction execution plans; assign construction projects to battalions; monitor program and adherences to quality standards; direct redistribution of units, equipment, and materials; and review plans and operations reports to determine specialized training and equipment requirements. The NCR possesses a planning, estimating, and engineering capability over and above that contained in the battalions.

b. Organization.--The organization of a naval construction regiment resembles that of a Marine Corps staff with the general and special staff functions required to accomplish its assigned mission.

c. Employment.--A naval construction regiment will normally be employed when two or more naval mobile construction battalions are assigned to a geographic area or when specific military operations warrant.

## 605. NAVAL CONSTRUCTION FORCE SUPPORT UNIT (NCFSU)

A naval construction force support unit provides logistics support for a naval construction regiment and other supported NCF units. Although no NCFSU is in the active NCF, the NCFSU equipment is maintained in the active force and in the reserve or prepositioned war reserve stocks (PWRS).

a. Mission.--The mission of the naval construction force support unit is to perform inventory management of construction material including requisitioning, expediting, receipt, control, issue, delivery, and other supply support functions. The NCFSU maintains inventory control of or operates and performs maintenance, repair, and upkeep of NCF auxiliary construction and transportation equipment. It performs specialized repair and overhaul of equipment components when conditions warrant. The NCFSU also provides operation and maintenance capability for plants (rock crusher, asphalt and concrete batch plants, etc.), large paving machines, long haul transportation, and the like.

b. Organization.--The naval construction force support unit is task organized to meet assigned functions.

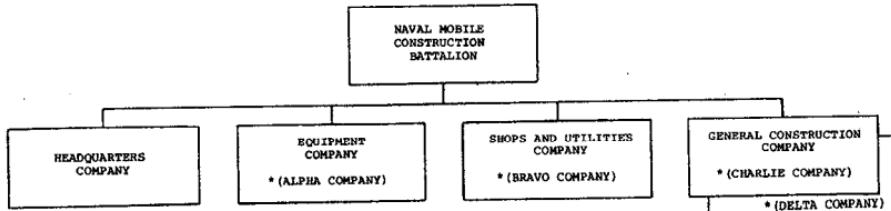
c. Employment.--The naval construction force support unit is employed in support of the naval construction regiment as conditions warrant.

## 606. NAVAL MOBILE CONSTRUCTION BATTALION (NMCB)

A naval mobile construction battalion provides shore and inshore facilities construction support to the operating forces of the Navy and Marine Corps and to other services and government agencies when authorized.

a. Mission.--The mission of the naval mobile construction battalion is to provide responsible military construction support to naval, Marine Corps, and other forces in military operations; to construct base facilities; and to conduct defensive operations as required by the circumstances of the deployment situation. In time of emergency or disaster, NMCB's shall conduct disaster control and recovery operations, including emergency public works operating functions as directed.

b. Organization.--As illustrated in figure 25, the naval mobile construction battalion consists of a headquarters company, equipment company, shop and utilities company, and two general construction companies.



\* USN COMMON USAGE NAMES

Figure 25.--Naval Mobile Construction Battalion.

c. Employment.--Naval mobile construction battalions may be deployed in support of naval operations or Marine Corps amphibious operations for construction support. Although the NMCB's are organized for construction, they maintain the capability to provide defensive operations. Firepower is provided by individual weapons, machineguns, and 81mm mortars. The battalions are trained to construct and maintain roads, airfields, waterfront structures, tank farms, buildings, personnel camps, utilities and communications systems, and other public works and utilities. Command and control of NMCB's will be exercised through the designated NCF commander. When NCF units are assigned to the MAGTF, these units shall normally be attached to the combat service support element. If an engineer group is formed, the NCF units will normally become a part of the engineer group.

#### 607. AMPHIBIOUS CONSTRUCTION BATTALION (PHIBCB)

The amphibious construction battalions are established Navy units of the naval beach group. They normally perform functions of a temporary nature only. The naval beach group provides for training, administration, supervision, and planning coordination for amphibious operations. For additional information, see NWP 22-5, The Naval Beach Group.

a. Mission.--The amphibious construction battalion provides designated elements to the commander amphibious task (CATF), supports the naval beach party during the initial assault and early phases of an amphibious landing operation, and assists the shore party in operations that do not interfere with the primary mission. The amphibious construction battalion is not intended for prolonged field employment. During an amphibious landing, the amphibious construction battalion, or elements thereof, are specifically responsible for:

(1) Assembly of pontoon causeways at the base of departure and subsequent installation, operation, and maintenance of the causeways at the beachhead for the offloading of LST's over shallow gradient beaches.

(2) Installation and operation of the amphibious assault bulk fuel system, both buoyant and bottom laid hose.

(3) Rigging and operation of self-propelled pontoon barges, barge ferries, causeways, and tender boats for lighterage and transfer operations.

(4) Assembly and operation of warping tugs in conjunction with causeways, fuel systems, and salvage work.

(5) Assembly and operation of pontoon floating drydocks.

(6) Development and improvement of beach facilities and providing for beach salvage, including limited underwater construction and salvage.

b. Organization.--As illustrated in figure 26, the amphibious construction battalion is organized administratively into a headquarters company, equipment company, limited construction company, and two pontoon companies. For employment, they are task organized according to the operational tasks assigned.

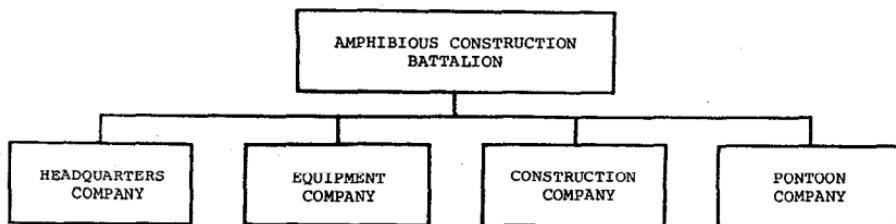


Figure 26.--Amphibious Construction Battalion.

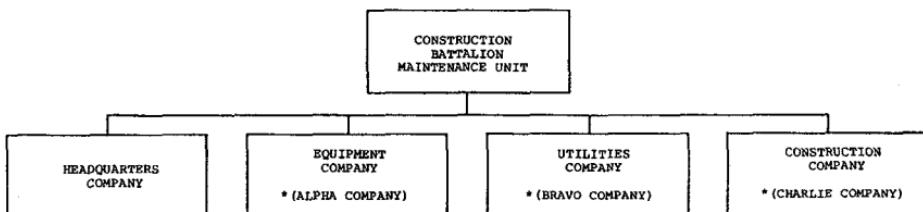
c. Employment.--The administrative organization of the amphibious construction battalion provides a high degree of flexibility for task organization. These battalions are always task organized for employment in the amphibious assault and maintain the capability for deployment and redeployment, either in whole or in part as task elements, as directed by the Commander-in-Chief, U.S. Atlantic Fleet or Commander-in-Chief, U.S. Pacific Fleet. They become a part of the naval beach party, the naval component of the shore party. Amphibious construction battalions maintain organizational command integrity under all assignments.

#### 608. CONSTRUCTION BATTALION MAINTENANCE UNIT

Construction battalion maintenance units are established Navy units and are self-sustaining. For additional information, see NAVFAC P-315, Naval Construction Force Manual.

a. Mission.--The mission of the construction battalion maintenance unit is to operate and maintain public works and public utilities at overseas and forward area bases after construction has been completed. It can also accomplish limited construction tasks.

b. Organization.--As illustrated by figure 27, the construction battalion maintenance unit consists of a headquarters company, equipment company, utilities company, and construction company.



\*USN COMMON USAGE NAMES

Figure 27.--Construction Battalion Maintenance Unit.

c. Employment.--When employed, these units carry out their assigned function under the advance base commander.

#### 609. OTHER NAVAL CONSTRUCTION FORCE UNITS

Other naval construction force units are listed below:

a. Construction Battalion Unit (CBU).--A construction battalion unit provides engineering (maintenance, operation, and construction) support which is of a nature that does not lend itself to efficient accomplishment by other NCF components. A CBU may be formed to fulfill a specific requirement at a specific location, and be disestablished when that requirement has been satisfied. Personnel/equipment composition and organizational structure are individually determined on the basis of the specific support the CBU will be required to provide.

b. SEABEE Team.--A SEABEE team is a small, highly mobile, air transportable component established to provide a construction and construction training capability to support counterinsurgency, civic action, rural development, and similar operations, usually in underdeveloped areas of the world.

c. SEABEE Underwater Construction Team (UCT).--The SEABEE underwater construction team provides underwater engineering, construction, and repair capability to meet the requirements of the Navy, Marine Corps, and to other services and government agencies as directed. These teams are capable of accomplishing both in-shore and deep ocean underwater construction tasks of some complexity either as independent units or as augmentation to other units of the NCF.

d. Naval Support Unit, State Department.--The Naval Support Unit, State Department, provides construction support to the U.S. Department of State. The duty involves the inspection of foreign contract construction and the accomplishment of minor construction and repairs within secure areas of foreign service buildings overseas.

e. Naval Nuclear Power Unit (NNPU).--The naval nuclear power unit provides field services in the acquisition, operation, and support of shore nuclear power plants. NNPU provides technical advice and assistance on nuclear power plants at field activities and performs special maintenance on and modifications to the plants.



## SECTION 7

### ENGINEER PLANNING

#### 701. GENERAL

This section discusses engineer aspects of planning from the amphibious task force level down to the engineer unit level, in both air and ground components of the landing force. Engineer planning helps ensure landing force mobility by providing the landing force with road nets, bridges, and landing fields and sites. This planning also helps to ensure the immobilization and restriction of the enemy's movements with obstacles and other devices.

#### 702. PRELIMINARY ENGINEER PLANNING

a. Amphibious Task Force.--In determining basic decisions at the amphibious task force level, certain information having engineer implications must be provided. This information includes studies of the type of terrain, coastline configurations, routes of communication, availability of airfields, climate, weather, and engineer resources available. Basic decisions from the amphibious task force level that are of particular importance to engineers are:

- (1) Designation of landing sites.
- (2) Selection of beachheads.
- (3) Selection of landing areas.
- (4) Selection of landing beaches, landing zones, and drop zones.
- (5) Selection of tentative date and hour of landing.

b. Landing Force.--Landing force planning guidance stems from the initiating directive and basic decisions. This planning guidance may entail some initial staff orientation in the form of brief studies to provide information to the commander and other staff members. Following the issuance of the commander's planning guidance, detailed staff estimates, including an engineer estimate, are prepared. Based on these estimates, the commander prepares his estimate, which culminates in a decision. His decision as to the course of action is then translated into the various combat plans by the staff. The influence of engineer considerations is taken into account from the inception of planning and continually thereafter. For more information, see FMFM 4-1, Combat Service Support for Marine Air-Ground Task Forces.

(1) Landing Force Engineer.--As a special staff officer, the landing force engineer will ensure concurrent, parallel, and detailed planning of engineer tasks for the commander landing force. He is responsible for the following staff planning functions:

- (a) Accomplishing comprehensive analyses of all engineer factors affecting the landing force plan.
- (b) Preparation of engineer portions of combat service support and operation plans.
- (c) Liaison with appropriate staff sections of higher, adjacent, and lower echelons on engineer matters.
- (d) Requesting assistance for engineer support from forces external to the landing force.
- (e) Planning activities of all engineer units.
- (f) Planning construction, repair, and maintenance of landing force installations such as expeditionary airfields, hospitals, routes of communication, and utilities.
- (g) Supervising the production of maps, map revisions, and map substitutes; collecting and processing information for preparation and revision of maps in coordination with the landing force intelligence officer.
- (h) Exercising appropriate technical, tactical, and logistics coordination with general and special staff sections, and with staffs of interested units.
- (i) Providing advice and assistance pertaining to engineer intelligence.
- (j) Preparing terrain studies, particularly from the engineer viewpoint.
- (k) Preparing plans for engineer reconnaissance and collecting, evaluating, and disseminating engineer intelligence information obtained from reconnaissance.
- (l) Planning technical training of engineer units.
- (m) Receiving, reviewing, and assigning priorities for engineer requests from landing force units.

(n) Technical supervision over maintenance and salvage of engineer equipment.

(o) Recommending timing for consolidation of engineer units/assets.

(2) Division Engineer.--The division engineer officer is a special staff officer within the division. He ensures concurrent, parallel, and detailed planning of all engineer tasks for the division. He is responsible for specific staff functions as outlined in paragraph 306.

(3) FSSG Engineer.--The engineer support officer located in the force combat service support section, H&S company, H&S battalion, plans engineer tasks for the FSSG. He is responsible for specific staff functions generally the same as those outlined in paragraph 306. If an engineer group is formed, he and his staff may become part of the group headquarters.

(4) Wing Engineer.--The wing engineer is a special staff officer within the wing headquarters. With the planned employment of expeditionary airfields and the early phasing of wing units ashore in the objective area, engineer planning must be closely coordinated among all elements of the landing force. The wing engineer's staff planning functions will be generally the same as set forth for the division engineer officer in paragraph 306, and he assumes special staff cognizance over all engineer functions within the wing, including engineer equipment, water supply, power supply, TAFDS, HERs, SATS, refrigeration, and the establishment and maintenance of camps/landing sites. In garrison, the wing engineer maintains liaison with the supporting station in matters concerning military construction and public works functions in support of the wing.

### 703. ENGINEER INTELLIGENCE

a. Engineer Intelligence Requirement.--The basic principles on which engineer intelligence is based are continuous liaison, brevity, accuracy, and timeliness. The amount of detailed intelligence required by engineers will vary with the size of the landing force, staff level, engineer unit, and the assigned mission; however, the type of information required will be the same. Engineer intelligence requirements normally include information on:

- (1) Enemy engineer capability.
- (2) Battlefield intelligence.
- (3) Hydrographic information.
- (4) Meteorological conditions.
- (5) Topographic information.
  - (a) Beaches and coastlines.
  - (b) Terrain.
  - (c) Trafficability.
  - (d) Geology.

- (e) Foliage.
- (f) Waterways.
- (g) Flooding.
- (h) Roads and railways.
- (i) Bridges.
- (j) Airfields.
- (k) Engineer resources.
- (l) Towns.
- (m) Ports.
- (n) Harbors.

b. Sources of Information for Engineer Intelligence.--Engineer intelligence information sources are generally the same as those used by other units. The primary sources are:

- (1) Maps.
- (2) Aerial photographs.
- (3) Operational intelligence.
- (4) Local technical information.
- (5) Ground photographs.
- (6) Captured documents and materiel.
- (7) Prisoners of war.
- (8) National intelligence studies.
- (9) Amphibious objective studies.
- (10) Naval Intelligence Processing System (NIPS).

#### 704. ENGINEER RECONNAISSANCE

a. Purpose.--Engineer reconnaissance is used to keep the engineers and staff completely aware of matters of present or potential concern from the engineer viewpoint. It is used to obtain technical information not otherwise available, to verify information obtained from other sources, and to determine the availability of local resources.

b. Procedure.--Engineer reconnaissance is performed either upon request by the unit engineer officer or by a staff section. Engineer reconnaissance is preplanned, organized, and continuing. The procedures usually are prescribed in standing operating procedures (SOP's).

(1) The engineer officer requesting a reconnaissance must specify the type of information needed. This should be expressed in the form of questions requiring definite answers and listed in order of priority. Standard forms covering the usual types of engineer reconnaissance are usually issued in advance to engineer personnel. The requesting officer should specify to whom and when the reconnaissance report is to be made. Some of the usual types of engineer reconnaissance are:

- (a) Route.
- (b) Construction materials and equipment.
- (c) Beaches.
- (d) Airfield sites.
- (e) Bridges and bridge sites.
- (f) Roads and road sites.
- (g) Water sources.
- (h) Barrier zones.

(2) Normally, a written order will not be issued for an engineer reconnaissance due to limitations of time. The engineers making the reconnaissance should clarify any questions they may have to make certain they know exactly the information desired. In a reconnaissance conducted by more than one party, definite tasks and areas of responsibility are assigned.

(3) The officer initiating the engineer reconnaissance must clear and coordinate the reconnaissance routes and timing with frontline and adjacent units through which the reconnaissance is to be accomplished.

(4) All engineer officers and NCO's must be capable of conducting an engineer reconnaissance. Future engineer planning and operations depend on the information obtained; therefore, every reconnaissance is as thorough and accurate as time permits.

(5) The reconnaissance officer plans the reconnaissance as follows:

- (a) Study maps and aerial photographs.
- (b) Verify the latest tactical situation with the unit responsible for the area in which the reconnaissance is to be conducted.
- (c) Plan the reconnaissance route carefully so it can be completed as planned.
- (d) Determine the organization of his party and their materiel requirements.

c. Reports.--The engineer reconnaissance report is the basic medium for recording and transmitting engineer intelligence. If an engineer reconnaissance mission is performed by special request, the report is forwarded

without delay to the requesting agency with a copy to the next higher unit. If a reconnaissance is routine, a copy of each such report is attached to the daily engineer situation report. If a routine engineer reconnaissance uncovers information of immediate concern, a copy of the report is transmitted immediately to G-2, G-3, or G-4, as appropriate. See appendix E for a sample engineer road reconnaissance report. See FM 5-36, Route Reconnaissance and Classification, for additional information on reconnaissance reports.

(1) Engineer reconnaissance reports may be either verbal or written. Brief notes taken while on reconnaissance may need to be amplified in the report. Verbal reports should be made directly to the requesting officer. Time permitting, all reports should be written.

(2) All information provided in a reconnaissance should be stated as facts. Where opinions are expressed, they must be labeled as such. Sketches, drawings, and photographs are good methods of recording information and should be used to the maximum in preference to descriptive writing.

## 705. ENGINEER PLANNING

a. General.--Nearly all decisions made by a commander involving employment of all or a major portion of his command will result in some kind of engineer activity. Consequently, engineer planning must be coordinated at all levels of command and must reflect both tactical and combat service support engineer requirements of the supported forces. Engineer planning must be conducted in such a manner that it contributes to both tactical and combat service support requirements. The unit engineer must ensure that the general or executive staff and commanders of tactical units keep him fully informed of the details of planning.

(1) Engineer planning is based upon the concept of operations of the supported unit or forces, the engineer missions assigned, the engineer estimate of the situation, the engineer forces available at each echelon, and the assault shipping available for engineer troops and materiel. Significant engineer resources may be required to be in the assault follow-on echelon.

(2) Where a requirement for naval construction forces is anticipated, a request for their allocation should be submitted as far in advance as practicable to facilitate the timely formation of a representative planning group.

b. Sequence of Engineer Planning.--When a unit commences preparation for an amphibious operation, the unit engineer officer performs the following planning actions, as they apply to his level, in approximately the sequence listed:

(1) Provides assistance to the G-2 by preparing, or acting as a consultant in, the preparation of portions of the topographic and hydrographic studies.

(2) Prepares an engineer estimate of the situation. (See app. A.)

(3) The landing force engineer officer designates the landing force survey control points (SCP's) when adequate control can be provided

from trig lists (list of geodetic data) provided by the intelligence (G-2) section.

(4) Prepares requests for special or additional engineer units, equipment, and supplies required to support the operation.

(5) Recommends engineer task organization to G-3 and G-4.

(6) Recommends to G-4 the amount and types of shipping required for engineers.

(7) If necessary, prepares a request to transfer engineers from current work projects to a training status and specifies the latest date for such transfer.

(8) Recommends to G-4 the quantities and phasing of engineer supply and resupply.

(9) Recommends allowances of engineer supplies and equipment for units landing in the assault.

(10) Prepares engineer training schedules for specific conditions of the planned operation.

(11) Recommends engineer training for nonengineer troops and units to meet engineer problems expected to be encountered.

(12) Recommends engineer participation in combined arms training.

(13) Prepares engineer portions of the tactical and combat service support plans. If he is an engineer troop commander, he prepares the necessary plans and orders for the engineer unit.

c. Engineer Planning in Nuclear Warfare.--Nuclear warfare planning requires normal planning procedures to be more detailed and exact. Increased emphasis is also placed on engineer intelligence and reconnaissance. The unit engineer officer must keep abreast of plans for employment of nuclear weapons and give advice on engineer implications of such employment. To rapidly determine requirements for engineer units, equipment, supplies, priority of work, and assignment of engineer missions, he must be thoroughly familiar with the objective area and the tactical and combat service support plans. He must make alternate plans to ensure accomplishment of top priority missions. He also provides technical assistance and recommends issuance of engineer tools to supported troops so they can accomplish limited engineer missions of a pioneer nature.

d. Staff Planning.--The staffs at all levels of command are provided with engineer advice throughout their planning. The advice given by the appropriate engineer should be:

(1) Timely.--Staff decisions and priorities are influenced by engineer advice on topography and availability of engineer resources. This advice must be provided in time to ensure early initiation of staff planning and to prevent the adoption of an unsound course of action.

(2) Flexible.--All engineer planning must be capable of being modified. Changes in the commander's concept which affect the engineer

plan are analyzed in a new engineer estimate and brought to the attention of the commander.

(3) Realistic.--All engineer proposals must be practical and attainable. The advice given must indicate that all reasonable alternatives have been considered.

e. Coordination.--Engineer planning is initiated and proceeds concurrently with tactical and combat service support planning; thus, it depends upon and supports those plans. The unit engineer officer must be prepared to state early in the planning phase whether or not the proposed tactical and combat service support plans are feasible from the engineer point of view. For example, among the many facets of engineer planning which are coordinated with other tactical planning are details of obstacle breaching during the initial landing. These plans must include provision of necessary equipment, personnel, and coordination with appropriate supporting arms. In addition to coordination between the unit engineer officer and other activities of the organization, there is concurrent planning and continued liaison between higher, lower, and adjacent engineer units.

#### 706. ENGINEER TASK PLANNING

a. General.--To ensure that assigned engineer tasks can be accomplished after arrival in the objective area, a considerable amount of detailed planning is accomplished during the planning phase of the amphibious operation. Anticipated requirements for the amount, type, and quality of construction materials, equipment, troops, and shipping space are planned for. With recent technological developments, changes in concepts, and complex support installations required by the landing force, greater emphasis must be placed on engineer task planning than has been required for past amphibious operations. For example, the installation of expeditionary airfields in the objective area early in the operation is a complex and comprehensive task, requiring considerable coordination and planning.

b. Intelligence.--During the initial planning for an assigned engineer task to be accomplished in the objective area, it is essential that certain facts and information be available. The major source of information will be from normal intelligence sources. (See subparagraph 703b.)

c. Reconnaissance.--It may be essential to collect additional facts and information and verify available intelligence information by reconnaissance. For additional information, see paragraph 704.

d. Engineer Task Estimate.--The estimate is the tool used to plan assigned tasks to be accomplished within the time available. Adequate intelligence will seldom, if ever, be available to provide the engineer with all the information required. Any lack of information must necessarily be overcome by planning that is based on sound judgment and prior experience. The format for an engineer estimate is essentially the same as that used for a combat service support estimate. The substance will be different because many of the factors will be technical. The engineer task estimate should include the following information:

(1) Statement of the task to be accomplished.

(2) A consideration of pertinent factors affecting the accomplishment of the task.

(3) Alternate methods of approach, stating the advantages and disadvantages of each.

(4) Selected course of action.

e. Engineer Task Plan.--The amount of detailed planning required in the task plan will be directly related to the complexity of work to be performed. A detailed plan required to accomplish a major engineer task may include:

(1) A brief summary of the plan, including the utilization of resources available.

(2) A site plan where the work is to be performed.

(3) Design calculations.

(4) Drawings and sketches.

(5) Work programs.

(6) Various schedules for materials, equipment, motor transport, phasing, and completion.

f. Organization.--The phases of work required to accomplish an engineer task must be planned in detail. To preclude any chance of misunderstanding and confusion, definite responsibility must be assigned for each phase. The accomplishment of any engineer task requires the use of troops, material, equipment, vehicles, and time. The secret in accomplishing any engineer task is the successful blending of all these to accomplish the task within the time and resources available.

#### 707. ENGINEER PLAN

a. General.--Instructions contained in the engineer plan pertain to both engineer and nonengineer units of the landing force. The staff engineer officer of a command prepares the engineer portions of tactical and combat service support plans.

(1) When a tactical unit contains an engineer component, the operation order of the unit embodies the necessary engineer instructions.

(2) In order to implement the tactical commander's decision, the commander of an organic or attached engineer unit will issue a separate unit order when required by the nature or complexity of the operation, to amplify the parent unit's instructions, and to ensure coordinated action by engineer troops.

(3) Usually, the engineers have a dual role to execute both combat support and combat service support missions. Engineer instructions are usually disseminated as an engineer appendix to the combat service support annex. In addition, an engineer appendix may be a part of the operations annex if it contains matter vital to a clear understanding of the details of the tactical scheme. For examples, see appendixes B and D.

(4) Although it may be effective immediately for planning purposes or for specified preparatory action, the engineer plan is not put

into execution until directed by the commander. When its execution is directed, the engineer plan becomes an engineer order.

b. Purpose and Scope.--The engineer plan may list the engineer units available and describe in detail the manner in which engineer support is to be provided during the amphibious operation. This plan represents the operation plan for the engineer units.

c. Planning Considerations.--Engineer planning encompasses three separate yet closely related areas: operational support, administrative matters, and civil engineer support requirements.

(1) Operational planning is based on the tactical plan of the supported unit, the specific engineer missions assigned, and the engineer forces available to meet these requirements. Considerations include:

(a) Specific engineer tasks (such as the breaching of beach obstacles and preparation of beach exits) which are anticipated on D-day.

(b) Priorities for work to be undertaken in the zone of the supported unit with detailed assignment of missions to engineer units to accomplish these tasks.

(2) Administrative planning deals with the planning related to engineer supply and resupply, evacuation routes, utilities, and hospital facilities. These matters are all viewed, initially, in terms of meeting the requirements of initial combat operations; subsequently, to meet anticipated requirements for the continuation of the attack; and finally, to meet combat service support construction needs. These plans must reflect the engineer supply requirement of the entire landing force.

(3) Overall civil engineer support planning is usually undertaken at fleet or theater level. Based on overall plans, the commander landing force is assigned specific responsibilities for initiating base development construction. In implementation of these responsibilities, landing force engineer plans will include necessary instructions regarding initial civil engineer support.

d. Responsibility for Preparation.--The engineer plan is prepared by the staff engineer officer and is coordinated with all general staff sections.

e. Content.--The engineer plan is written in the form of a standard five-paragraph order. A sample engineer plan complete with tabs and enclosures is shown in appendix D.

(1) The task organization may be reflected by reference to the operation plan, or it may be extracted from that document and included in the engineer plan or in a tab thereto.

(2) Paragraph 1 sets forth the situation with particular emphasis on those aspects of immediate concern to engineer units. This is accomplished by reference to paragraph 1 of the basic plan together with such amplification as is necessary.

(3) Paragraph 2 contains the overall mission of engineer forces.

(4) Paragraph 3 reflects the concept of engineer operations and details specific tasks to major subordinate engineer units. It further provides for the coordination of effort among these units in the accomplishment of assigned missions.

(5) Paragraph 4 contains combat service support instructions peculiar to engineer operations. As a minimum, it will contain instructions relative to initial combat supplies to be landed and provision for their replenishment. When appropriate, reference is made to portions of the combat service support plan.

(6) Paragraph 5 contains those command and signal instructions necessary to ensure proper execution of engineer missions. Normally, this will be accomplished by reference to the communication-electronics annex of the operation plan. As a minimum, this paragraph will list the locations of the command posts afloat and ashore of all major engineer units.

(7) At the higher engineer echelons, much of the material to be included in this plan is so voluminous and specialized that it does not lend itself to inclusion in the parent document. In such instances, these matters should be included in tabs to the plan. Construction priorities, road plans, and appropriate extracts from the civil engineer support plan are examples of tabs at the force level.

## 708. BREACHING PLAN

a. General.--The breaching plan is a specific, detailed plan for one portion of the amphibious assault operation. Since it has a direct influence on the operation and is primarily tactical in nature, the breaching plan is incorporated in the operation plan as an appendix to the operations annex. The breaching plan is a directive to engineer breaching elements to ensure rapid breaching of vehicle lanes for the prompt passage of assault vehicles (LVT's, tanks, trucks). Infantry on foot must be prepared to effect their own dispersed passage of beach obstacles. For information on beach obstacles, see subparagraph 205b. A sample breaching plan is shown in appendix C.

b. Basis for Planning.--The basis for planning the breaching operation is a detailed analysis of available information to determine:

(1) Depth of the obstacle/barrier system.

(2) Depth, number, and location of obstacle bands within the system.

(3) Type and pattern of obstacles in each band, including nature of construction and manner of installation of structural obstacles and types of mines employed.

(4) Pertinent characteristics of mines such as weight of main charge, type of container, functioning principle, depth of emplacement, and incidence of antilifting or boobytrapping devices.

(5) Beach area soil characteristics.

(6) Location of enemy weapons and defensive installations covering the obstacle/barrier.

c. Selection of Lane Sites.--The foregoing information and the operational requirements for landing and employing tanks, LVT's, and other vehicles ashore are used as a basis for selecting sites for the required number of breached lanes. These sites are selected as early as possible to coordinate planning. Other matters of importance in such planning are the means available for obstacle breaching, the complexity of the breaching problem, and provision for access to a road net or other trafficable area. It is extremely important that selected sites be easily identified from seaward and from the air. Ease of identification may be determined by a study of maps and oblique and vertical aerial photographs. If the area is such that identification by terrain features is impracticable, other provisions are made for designating the seaward end of the lane. Smoke or dyeloaded projectiles may be used for this purpose. In any case, a positive means of designating and identifying lanes to be initially breached is essential to take full advantage of prelanding and beach assault countermeasures.

d. Prelanding Obstacle Countermeasures.--The types of obstacles in areas selected for the passage of assault vehicles will indicate prelanding obstacle countermeasures appropriate to the breaching task. The plan for breaching beach obstacles is based on maximum exploitation of all means which can be applied prior to the actual landing of assault troops. In view of the obvious vulnerability of obstacle breaching teams operating on a defended beach, teams should be employed only to supplement prelanding obstacle countermeasures. Prelanding obstacle countermeasures may include any or all of the following:

- (1) Air bombardment.
- (2) Naval gunfire.
- (3) Special explosive devices.
- (4) Clandestine operations ashore prior to the assault.

e. Affect on Commander Landing Force's Decision.--The estimated success of the breaching effort directly affects the commander's decision as to the time to commit his armor. If the beach obstacles are of limited extent and it is estimated that removal measures will be effective before H-hour, the commander may decide to land his armor early. However, if the reverse is true, he delays landing his armor until the necessary breaching operations are accomplished.

f. Beach Assault Countermeasures

(1) Engineer breaching teams are generally required to breach lanes through the beach barrier regardless of the effectiveness of prelanding obstacle countermeasures. The organization and equipment of these teams are based on an analysis of specific tasks including such factors as:

- (a) Types and numbers of obstacles.
- (b) Available breaching equipment.
- (c) Width of initial lane required.
- (d) Time available.

## (e) Anticipated difficulties in landing equipment.

(2) In determining equipment requirements for breaching teams, it must be remembered that prelanding obstacle countermeasures may cause extensive cratering of the beach. The tank dozer is useful in filling these craters.

(3) Normally, a breaching team is assigned to breach a single lane. The organization for breaching lanes on the beaches over which a regimental landing team (RLT) lands consists of a breaching group containing a breaching team for each lane and a command team to coordinate breaching operations. The command team consists of command and communication elements. Contingent on the nature of difficulties anticipated, the breaching group may include breaching teams held in reserve, or under some conditions, a reserve breaching group may be organized for use as required. In the event of widely separated landings, a breaching group may be necessary for each landing beach.

g. Fire Support.--Breaching teams must be provided with covering fires as they land. Breaching usually involves extensive use of demolitions; therefore, infantry landed with breaching teams must move off the beach to avoid casualties from demolitions. In addition to covering and supporting fires provided by infantry units, air, and naval gunfire support, including smoke, is highly desirable when feasible.

h. Coordination With Naval Elements.--Coordination with naval underwater demolition teams is essential to ensure that all clearance efforts from the 3-fathom line across the landing beaches will be directed efficiently. Although the primary breaching responsibility of the landing force begins at the high waterline, the breaching of obstacles within the tidal range is a matter of coordinated action by both landing force and naval elements. (See par. 205.) Coordination is essential among all elements participating in the breaching operation, especially those furnishing external fire support.

## 709. OBSTACLE/BARRIER PLANNING

a. General.--Barriers are planned initially at division or higher headquarters and are progressively refined in detail at lower echelons. Commanders at all echelons make maximum use of existing obstacles in order to minimize the extreme burden required in executing.

b. Responsibility.--The G-3 has the primary general staff responsibility for denial and obstacle/barrier planning. The staff engineer has primary special staff responsibility for obstacle/barrier planning. He advises the G-3 of means whereby and the extent to which reinforcing obstacles may augment existing obstacles. The engineer also plans and supervises the technical aspects of obstacle employment and assists the G-3 by preparing the obstacle/barrier plan.

c. Planning Considerations.--Major principles and considerations used in obstacle/barrier planning include:

(1) Wide scope of coordination with the fire support plan, countermechanized plan, counterattack plan, and combat service support plan.

(2) Maximum use of existing obstacles.

(3) Requirement to cover obstacles by observation and fire when possible.

(4) Considerations concerning detailed authority and responsibility relative to execution of obstacle/barrier plans.

d. Obstacle/Barrier Plan.--The obstacle/barrier plan is an appendix to the operations annex to the operation plan. The obstacle/barrier plan contains:

- (1) Locations and types of obstacles.
- (2) Priorities and target completion dates.
- (3) Materials required.
- (4) Workloads.
- (5) Unit task assignments.
- (6) Coordinating instructions as necessary.

e. Execution.--Each tactical unit commander is responsible for the construction of those obstacles which lie within his area. Engineer supervision and/or effort is furnished when required and available. Engineers are assigned responsibility for construction of obstacles which:

- (1) Require special skill and equipment.
- (2) Protect exposed flanks or rear.
- (3) Benefit the command as a whole.
- (4) Lie outside the area of any particular subordinate commander.

## 710. CIVIL ENGINEER SUPPORT PLANNING

a. General.--When one mission of an amphibious task force is to seize an area for advanced base use in support of continued operations, a secondary mission may include the responsibility for initiation of civil engineer support. In the event the commander amphibious task force is not assigned responsibility for civil engineer support, it may still be necessary to coordinate engineer operations with the construction plans for any prospective civil engineer support to prevent duplication of effort.

b. Planning Responsibility.--Civil engineer support planning may be delegated to any major headquarters possessing the capability; however, it will normally be conducted by a command above the amphibious task force level. Civil engineer support plans will usually be prepared by a fleet, area, or unified commander. The plans will generally be issued separately from the plans for an amphibious operation. Extracts may be included in the amphibious task force plan in which the commander landing force is assigned specific responsibilities. To implement these responsibilities, landing force engineer plans will include necessary instructions relative to initiating civil engineer support. The commander landing force is responsible during planning for:

(1) Plans to initiate civil engineer support ashore.

(2) Plans to coordinate, control, and support garrison operations ashore.

c. Planning Considerations.--Due to the progressive nature of civil engineer support, which may commence during the assault phase and continue after the operation is completed, a high degree of planning coordination must be achieved between the amphibious task force, landing force, and other major commanders. Temporary installations developed for support of assault phase operations should be so positioned as to complement later civil engineer support. Where civil engineer support is initiated early in the operation, priority is given to facilities that can temporarily serve the requirements of the amphibious task force in attaining its assault objectives. When the commander amphibious task force is responsible for initiating civil engineer support, his assigned construction missions should allow adequate flexibility to balance tactical and base construction requirements. Liaison may be established with the command scheduled to occupy the base.

#### 711. STANDING OPERATING PROCEDURES

SOP's set forth procedures of routine and may be required to amplify or standardize tactical and administrative procedures not covered in doctrinal publications. These standardizations should only be made where variations are not permissible. SOP's are also useful in simplifying orders (by referring to the appropriate SOP) and in training (to list essential training and source material and to clarify methods). SOP's usually conform to the format of those issued by higher headquarters and may include procedures listed in SOP's of higher headquarters.

#### 712. TRAINING

a. General.--In addition to training in engineer skills and techniques, engineers must be trained in infantry unit tactics and techniques. Engineer units are generally committed to construction and maintenance projects regardless of their operational status, and it is very unusual that an engineer unit will find itself in reserve. Because of this, and because the demand for engineers always exceeds their availability, engineers must be released from a work status before they can profitably begin intensive training.

b. Engineer Officer (Special Staff).--The special staff engineer officer at each echelon analyzes the engineer tasks to be performed in the objective area. Based on this analysis, he establishes specific engineer training requirements for both engineer and nonengineer units. He recommends the engineer training syllabus for the training of all hands in preparation for the anticipated engineer tasks. He assures assignments of adequate engineer personnel and equipment for technical assistance.

c. Training With Tactical Units.--Training of division and wing engineers includes training with units they will be supporting. It includes the simulating of anticipated tasks to ensure that methods and procedures are perfected. To ensure adequate training, the unit engineer officer makes appropriate recommendations to the G-3.

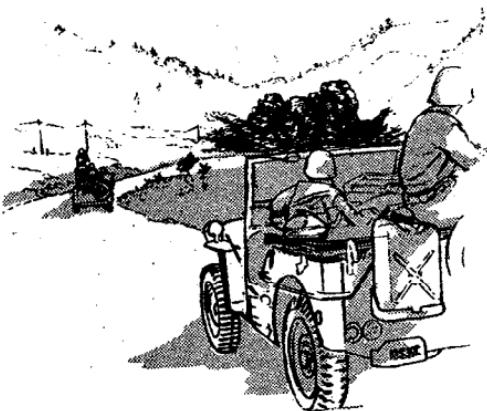
d. Engineer Training for Other Troops.--All troops and units require special training in certain engineer subjects. The unit engineer officer

provides assistance in preparation of training schedules and arranges for engineer assistance. Examples of special training for such troops and units are:

- (1) Mine warfare.
- (2) Demolitions.
- (3) Cut-and-cover type field fortifications.
- (4) Obstacle breaching.
- (5) Fabrication and positioning of light obstacles.
- (6) Camouflage.

e. Training of Naval Construction Units.--When naval construction forces are attached, the special staff engineer officer recommends appropriate training to render these units capable of performing their assigned missions.

f. Exercises.--During advanced training, command post exercises and field exercises should be conducted by engineer units with other units. It is particularly important that engineer units of less than battalion/squadron size participate in command post exercises and field exercises conducted by the units they are supporting.



## SECTION 8

### METHODS OF EMPLOYMENT AND CONTROL

#### 801. GENERAL

The methods of employment, methods of control, control of specific engineer units, and various types of engineer reports are covered in detail in this section.

#### 802. METHODS OF EMPLOYMENT

a. General.--The types and numbers of specialist personnel and equipment necessary for accomplishing essential engineer tasks are many and varied. For this reason, it is infeasible to provide each subordinate engineer unit of the battalion/squadron with every skill and item of equipment available, and no single subordinate unit is capable of performing comprehensive engineer missions in support of independent operations. Detached engineer units are, therefore, reinforced specifically for the assigned mission. The employment of engineer troops on tasks not requiring any technical skill or special equipment should generally be avoided. Engineer units employ three methods to assign responsibility for accomplishment of engineer work to subordinate elements: task assignment, area assignment, and a combination of both.

b. Engineer Battalions.--In performance of a mission, platoons may be assigned special equipment and men from company headquarters, and in turn, the companies depend upon battalion headquarters for certain services, equipment, and personnel. In view of this, it is highly desirable that the battalions be retained intact and employed under centralized control whenever tactical conditions permit.

c. Engineer Squadrons.--In performance of a mission, engineer units of the engineer section may be assigned special equipment and men from other sections of the engineer squadron, and in turn, the sections depend

upon the squadron headquarters for certain services, equipment, and personnel. The squadrons should be retained intact and employed under centralized control whenever tactical conditions permit.

d. Task Assignment.--The task assignment method gives the assigned unit responsibility for performance of one or more specifically defined tasks, such as erection of a particular bridge or construction of a road between two definite points. Task assignment is the most desirable form of work assignment because it defines clearly the job to be done and permits maximum centralized control.

e. Area Assignment.--The area assignment method makes one unit responsible for performing all engineer work in a designated area. For example, a reinforced combat engineer company may be given the responsibility for all engineer work in the zone of action of an infantry regiment with the rear limit being designated by an arbitrarily established line. The designated area does not necessarily have to bear any relationship to an infantry zone of action or sector of defense; topographical features such as streams or roads may be used to delineate the area of responsibility. The limits of the designated area are based upon the capability of the unit assigned after consideration of the estimated engineer requirements. Tactical boundary lines may be convenient for area assignment when the area so designated requires work appropriate to the capability of the assigned engineer unit.

f. Combination Assignment.--Combinations of task and area assignment methods are utilized quite frequently and very effectively. An engineer unit may receive an area assignment and in addition receive a task assignment outside of the assigned area. Conversely another engineer unit might receive a task assignment that is within an area assigned to still another engineer unit.

### 803. METHODS OF CONTROL

a. General.--Engineer units employ three methods of control: general support, direct support, and attachment. The engineer definitions of these terms parallel the common definitions, but some differences are introduced by the nature of engineer missions.

b. General Support.--An engineer unit in general support provides tactical or combat service support assistance, and the engineer unit commander retains complete control and command of organic and attached engineer elements and employs them in the most beneficial manner for the command as a whole. The term engineer commander means the commanding officer of the major engineer command.

#### (1) Procedure

(a) Request for engineer work is submitted to the appropriate staff engineer.

(b) Relative priority is assigned each request by the staff engineer, based on requirements for engineer work of the entire command.

(c) Subsequent to appropriate staff planning by the staff engineer and approval by the division, wing, (landing force) commander, the responsibility for accomplishment of the work is assigned to a subordinate

engineer unit in accordance with one of the methods described in paragraph 802.

(d) The engineer unit commander is in direct control of all elements of his command. He is familiar with the capabilities and limitations of his subordinate units and bases work assignments within his command on priorities established by the staff engineer.

(2) Advantages and Disadvantages

(a) The concentration of personnel and equipment on critical engineer work can be based on established priorities for the command as a whole.

(b) The loss of working time of critical equipment and personnel is reduced by coordinated planning at the highest level.

(c) With all elements of his command under his direct control, the commander of the engineer unit can employ his elements to provide maximum engineer support, if the tactical situation is such that he can effectively exercise such control.

(d) The supply and maintenance problems are reduced when all subordinate units operate directly under the parent unit. Subordinate units have direct access to the services of supply and maintenance available within parent headquarters, support, and service elements.

(e) The application of this control method is restricted to those situations in which tactical and other considerations permit effective centralized control. Tactical considerations will frequently dictate some degree of decentralization of control.

c. Direct Support.--An engineer unit in direct support provides specific tactical or combat service support assistance to other type units. The parent headquarters of the engineer unit providing such assistance retains administrative control of the supporting unit.

(1) Procedure

(a) The commander of an engineer unit in direct support reports to the commander of the supported unit and provides a liaison representative at the headquarters of the supported unit.

(b) Direct communication by radio and telephone is established between the engineer unit and the supported unit.

(c) The parent headquarters of the direct support engineer unit retains administrative control and provides combat service support; however, the application of such control must not interfere with the tactical operations of the supported unit.

(d) Unless the supported unit contains an organic engineer component, all requests for engineer work for the supported unit are routed via the liaison representative direct to the headquarters of the supporting unit, along with a relative priority established by the supported unit. When the requested work is beyond the capabilities of the direct support unit, it is the responsibility of such unit to request required assistance from the parent engineer headquarters.

(e) Except when the supported unit has an organic engineer component, or unless otherwise specified, the direct support engineer unit is responsible for accomplishing all engineer tasks in the zone of action or sector of defense of the supported unit.

(f) The parent engineer headquarters of the direct support unit is responsible for providing adequate support and for ensuring that the engineer work accomplished is consistent with the established plans and policies of higher echelons.

(2) Advantages and Disadvantages

(a) The supported unit has immediately available the means for accomplishing urgent, unpredictable tasks.

(b) Many of the advantages of complete centralization of engineer control (general support) pertain; however, some flexibility and the advantage of deliberate staff planning for all tasks are lost.

(c) The supported unit is provided direct liaison, communications, and a priority for the services of a specific supporting engineer unit.

(d) This method of control is particularly applicable for close engineer support of infantry units. It may be used in either offensive or defensive situations where speed of execution of urgent tasks, even at the expense of overall operational efficiency, is essential.

d. Attachment.--When an engineer unit is placed temporarily under the command of another unit, it is then attached to that unit.

(1) Procedure

(a) The command to which the engineer unit is attached assumes complete operational and administrative control, unless the attachment order provides otherwise in specific terms.

(b) The commanding officer of the attached engineer unit serves in the capacity of engineer officer for the unit to which attached.

(c) The size and composition of engineer elements to be attached is determined by the nature and magnitude of foreseeable requirements for engineer support, regardless of the size of the unit to which attached.

(d) As a general rule, engineer elements are attached only when the tactical situation or mission makes it infeasible for the parent engineer unit commander to exercise effective control for the accomplishment of assigned missions. For example, during the early stages of an amphibious assault, engineer units are attached to the larger tactical units. When the engineer battalion commander can effectively control his units, attachments cease and subordinate units are given direct support or general support assignments. Attachment is the proper method of control when engineer units form a part of a larger unit that is an outpost, advance, flank or rear guard, helicopterborne assault force, or performing other semi-independent missions.

(2) Advantages and Disadvantages

(a) The unit to which attached has immediately available the means for accomplishing urgent, unpredictable engineer tasks.

(b) This method of control reduces effective coordination of engineer effort within the parent engineer unit.

(c) The combat service support responsibilities of the supported unit to which attached are increased considerably.

(d) The overall engineer potential of the command is dispersed. The loss of reinforcing elements to the attached unit may affect significantly the capability of the parent engineer unit.

## 804. CONTROL OF ENGINEER UNITS

a. General.--Control methods used by the landing force to direct engineer operations have a major effect upon the productive efficiency of the engineer troops participating. The capacity of an entire engineer command for useful output is usually greater than the sum of the independent capacities of its component parts. For this reason, engineer units are broken up for attachment only when distances or the nature of the operation prevent the senior engineer commander from exercising adequate centralized control. As a general rule, control is decentralized only to the extent necessary to meet requirements of the situation.

b. Engineer Group.--To control engineer operations within the objective area, it may be necessary to form an engineer group within the landing force. An engineer group may be formed for engineer operations involving elements of various units capable of performing engineer tasks such as the division, wing, or FSSG engineer units and/or naval construction battalions. When a group is formed at the MAF level, the force engineer will normally become the group commander. Representatives of the units within the group form the group staff and assist in coordinating, planning, and the operations of the group. Centralized control of a group is not normally used until after the landing and initial stages of an operation. The group headquarters, however, must be activated early enough to ensure sufficient time to coordinate and plan for the accomplishment of its mission.

c. Combat Engineer Battalion.--The methods of employment described in paragraph 803 are usual in the employment of the combat engineer battalion. Some factors considered in determining the proper method of control are described here.

(1) Offensive Operations.--Some decentralization of control is almost invariably required to provide necessary close engineer support for forward elements in offensive operations. In most situations, this support can be provided effectively by assigning appropriate subordinate engineer units in direct support, with the remainder of the battalion operating in general support of the division. However, in some situations, terrain conditions, lack of communications, decentralization of control in the assault phase, or other aspects of the mission of the supported unit may dictate attachment of appropriate engineer elements. In any event, detached engineer elements should revert to centralized control as early as possible.

(2) Defensive Operations.--In defensive operations where the division is occupying linear defensive positions, ideal conditions may permit the employment of the engineers in a general support role, particularly for engineer support within the main battle position. However, there will normally be a requirement to assign direct support engineer units when major defensive units are separated, poor roads and communications exist, or time is limited for the preparation of adequate defenses. For engineer support of widely separated units or semidetached elements such as outposts or advance and flank guards, attachment of appropriate engineer elements may be necessary.

d. Engineer Support Battalion.--The engineer support battalion is normally employed under force control and operates in general support of the landing force. When so employed, the battalion may be assigned areas of responsibility and/or specific tasks to meet force requirements and to relieve the division of engineer work in rear areas. Under some circumstances, the battalion or designated subordinate units may be placed in direct support or attached to the division or wing. When subordinate elements of an engineer support battalion are attached, they should be further attached to the organic engineer unit (combat engineer battalion or engineer squadron) for ease of control and centralized combat service support.

e. Engineer Squadron.--The engineer squadron is normally employed under centralized control and operates in general support of the MAW. When aircraft groups are located at dispersed locations, the engineer squadron will provide task organized units in direct support or attached to the aircraft groups. Engineer units (engineer squadron and engineer support battalion elements) at airfield complexes should be centralized for maximum output and ease of control/combat service support.

## 805. ENGINEER REPORTS

a. General.--Engineer reports provide various staffs and interested organizations with the status of engineer matters and include technical, tactical, intelligence, and administrative matters. Engineer units generally submit the same reports to higher headquarters as those required of other units. In addition to these reports which are submitted through the chain of command, engineer units submit various technical reports to the next higher engineer headquarters. Reports commonly used by engineer units include the unit report, reconnaissance reports, minefield reports, situation reports, and fragmentary reports.

b. Reconnaissance Report.--For information on engineer reconnaissance reports, see subparagraph 704c.

c. Situation Report.--The engineer situation report is made daily by the engineer commander within each command echelon and is forwarded to the headquarters of the organization for which he is unit engineer officer. A copy for information is also forwarded to the unit engineer officer of the next higher command echelon. The MAGTF engineer officer consolidates all reports and submits a consolidated report to the commander landing force. This report summarizes the daily engineer situation. (See app. F.)

d. Fragmentary Reports.--The fragmentary engineer situation report format is designed to reduce the amount of information that must be transmitted, to ensure complete information reaches higher headquarters, and to

decrease the possibility of misunderstanding. This method is also applicable to all other types of reports normally used by engineers. See appendix G for a sample fragmentary engineer situation report.

e. Minefield Reports

(1) Friendly Minefields.--All minefields are recorded and reported immediately by the laying unit with no exceptions in the reporting system. Recorded data should be only as complete as necessary so as not to hamper tactical flexibility. The reporting system is applicable both to laying and removing minefields. Engineers, if available, may render assistance to other units in the execution of this work. The following reports are mandatory: Report of Intention to Lay, Report of Initiation of laying, Report of Completion, Report of Change (as necessary), Report of Removal, and Progress Reports (for large fields). It is mandatory that Report of Transfer be in writing, signed by both commanders, and forwarded to the next higher echelon. All other reports may be verbal. Minefields are recorded on the standard DA Form 1355, "Minefield Record". Instruction for the preparation and forwarding of minefield records and reports are contained in FM 20-32, Mine/Countermine Operations at the Company Level.

(2) Enemy Minefields.--Located enemy minefields are reported in the same manner as above. A detailed record generally is not available unless one is captured from the enemy. Such records must be treated with caution. Because of lack of records or possible inaccuracies of records, abandoned friendly minefields are considered as enemy fields. Engineers usually supervise major enemy minefield reconnaissance and clearance projects and are responsible for reports of such activities. A progress report of enemy minefield clearance is included in the daily engineer situation report.

(3) Minefield Records.--The landing force engineer officer maintains the office of record for all minefield records and reports and assists in disseminating minefield information.

f. STANAG Reporting Systems.--Engineer information will be reported in accordance with the format(s) contained in appendix H.

g. Other Reports.--Other reports are submitted as required.





## SECTION 9

## ENGINEER OPERATIONS

## 901. GENERAL

This section covers principal aspects of landing force engineer operations including embarkation, rehearsal, movement to the objective area, ship-to-shore movement, operations ashore, special operations, and civil engineer support.

## 902. EMBARKATION, REHEARSALS, AND MOVEMENT TO OBJECTIVE AREA

a. Embarkation

(1) General.--Engineer units are normally embarked in the following manner: engineer platoons and companies in the embarkation teams of the infantry battalions and regiments they will support upon landing; H&S company and support company of the combat engineer battalion with division headquarters and other division troops; and wing and force engineers with the embarkation groups they will support upon landing. Detailed procedures for embarkation are contained in FMFM 4-2, Amphibious Embarkation. Some aspects of importance to engineers are covered in the following paragraphs.

(2) Loading Priorities.--Embarkation team commanders are responsible for establishing their own loading priorities. These loading priorities are the reverse of landing priorities so materiel can be unloaded in accordance with the planned sequence of operations ashore. Loading priorities are of particular importance to engineer units because of the quantity and variety of equipment and vehicles employed in engineer operations.

(3) Preparation of Equipment.--The landing plan, types of amphibious shipping and landing craft being employed, and hydrographic conditions in the objective area determine the requirement for preparing equipment for deep water fording. Equipment landed early is normally prepared for deep

water fording. All equipment is carefully serviced and put in the best possible mechanical condition. All organic equipment is marked for ease of identification after landing; unit SOP's normally specify the type and location of these markings. Equipment that has been partially disassembled for embarkation is marked, loaded, and landed together to facilitate re-assembly. Certain critical items such as mines, handtools, fortification materials, and explosives are loaded on vehicles to aid rapid movement ashore. Due to limited transportation means available, considerable care must be exercised in determining the critical priority items that must be mobile loaded.

(4) Embarkation Assistance.--During the embarkation phase, engineer units provide assistance for the preparation of staging areas, loading areas, and related facilities; the palletization and crating of heavy materiel for other units; the improvement of access routes to the loading area; and under some circumstances, the operation of loading equipment during the loading operation.

(5) Loading Plans.--Engineer unit commanders examine loading plans of subordinate engineer units to determine the adequacy and correctness of equipment embarked for accomplishing their missions. The landing force engineer ensures that changes in loading plans are consistent with the overall engineer plan for the operation.

b. Rehearsals.--Engineer units rarely participate fully in amphibious assault rehearsals. The lack of time and facilities prior to arriving at the objective for maintenance, replacement, and rewaterproofing for deep water fording of heavy equipment used in the rehearsal, normally makes such participation impracticable. However, some engineer elements must participate in the amphibious assault rehearsal to ensure proper timing, teamwork, communications, and to verify any special techniques required. For example, it is essential that those engineer elements scheduled to take part in the initial beach obstacle breaching participate in all rehearsals conducted. Other engineer units should participate, provided undue hazard to equipment does not exist. Engineer units not participating in the rehearsal will monitor radio communication nets which enable them to follow the conduct of the rehearsal and increase their understanding of the landing plan.

c. Movement to Objective Area.--While en route to the objective area, engineer troops participate in all ship emergency drills, and units conduct physical training and troop indoctrination, and perform final preparation of heavy equipment, vehicles, and materiel. Training and preparation of materiel is limited to those activities which do not interfere with the ship's operating procedure. All activities must be coordinated with the ship's commanding officer to prevent conflict with other shipboard activities.

#### 903. SHIP-TO-SHORE MOVEMENT

a. General.--Engineer units should not be landed until they can be employed effectively without undue loss from hostile fire. Special situations and conditions may arise that dictate early landing of heavy engineer equipment, but this unarmored equipment is vulnerable to any type of fire. Much of the engineer equipment is not capable of being landed by helicopter, and some is difficult to discharge from landing craft.

(1) Organization for Landing.--Engineer elements are organized for landing into groups, according to the functions they will perform ashore.

This grouping must be flexible to allow specific engineer support tasks to be performed when required and to ensure that elements not required initially are not landed prematurely.

(a) Division Engineers.--The combat engineer battalion is the engineer unit within the division that provides combat engineer support for the infantry units. A reinforced engineer company is normally attached to each assault RLT. The company is organized into beach obstacle breaching teams (one team for each lane) with supporting teams as appropriate, an equipment element (consisting of attached equipment operators, mechanics, and equipment), and a small property element. Engineer platoons may be attached to BLT's when their employment will require detailed integration with the fire and movement of the BLT, and when the combat engineer company commander is unable to properly exercise centralized control of his engineer platoons. The engineer battalion less units attached to RLT's or force landing support party, is landed as a unit in general support of the division. Attachment of engineer units should be discontinued as soon as centralized control can be established. See paragraph 803 for information on methods of control.

(b) Force Engineers.--The organization for landing force engineer units and elements is normally the same as the basic administrative organization of those units. They normally land when enemy interference is not significant.

(c) Wing Engineers.--Elements of the engineer squadron will land with aviation units which they are to support. Other elements of the engineer squadron may be included in the force landing support party to support aviation requirements, such as providing TAFDS/HERS, that may be required during the assault. As the MAW is established ashore, elements of the squadron are returned to centralized control as soon as control can effectively be established.

## (2) Landing Categories

(a) Scheduled Waves.--Engineer elements included in the scheduled waves consist only of the men and equipment necessary to meet foreseeable requirements for engineer support at a specific time and place. The combat engineer battalion will normally satisfy these requirements. Engineer elements from other sources will not be used except under unusual circumstances. Engineer elements that may land in scheduled waves are obstacle breaching teams, selected elements of engineer companies attached to assault RLT's to provide combat engineer support, and engineer reconnaissance elements. Heavy equipment is landed in scheduled waves only when its employment is mandatory to ensure success of the landing.

(b) On-Call Waves.--There are many engineer tasks to be accomplished ashore as soon as the tactical situation allows. Since the time and place of landing cannot be accurately predicted, engineer elements assigned to accomplish these tasks are landed in on-call waves. Engineer troops landed in on-call waves are usually of the following types: remaining elements of combat engineer companies attached to assault RLT's; men and equipment for preparation of beach exits for wheeled and tracked vehicles (force landing support party); and additional reconnaissance personnel. If it is anticipated that bridging will be required very early in the landing, bridge units or elements may be landed in an on-call wave. On-call waves should be limited to elements required to rapidly accomplish immediate emergency work that is anticipated early in the landing.

(c) Nonscheduled Waves.--When required ashore prior to general unloading, remaining engineer units with their equipment and initial combat supplies are brought ashore as nonscheduled waves.

b. Waterborne Assault

(1) General.--Amphibious operations normally require the landing force to make a waterborne assault within the objective area. This is the most critical phase of the landing operation. The engineers assist tactical units in the waterborne assault by accomplishing priority combat support engineer tasks. Priority engineer tasks that must be accomplished rapidly include: beach reconnaissance to determine beach exits, breaching of vehicle lanes through all types of existing and reinforcing obstacles, and clearing obstacles immediately inland from the beach to facilitate the landing and rapid movement inland of tactical units. After completing breaching of lanes for the passage of assault troops and vehicles, beach obstacle clearance beyond the capability of the shore party is initiated by engineer troops when essential for beach support operations. During the waterborne assault, engineer companies are attached to assault RLT's to assist in beach assault support. Engineer platoons are attached or placed in direct support of the battalion landing teams (BLT's). When the engineer battalion is ashore and the battalion commander can effectively control the engineer companies, these units normally revert to centralized battalion control.

(2) Example of Engineer Support for the BLT in the Waterborne Assault.--The BLT lands with its assault elements transported in LVTP's. Initial breaching operations are performed by engineer obstacle breaching teams which are landed early in the assault. Engineer equipment and motor transport augmentation of the reinforced combat engineer platoon attached to the BLT has been tailored to support the concept of operations, beach conditions anticipated, and engineer tasks to be accomplished. Engineers with mine detection and demolition equipment are landed initially in LVTP's. The balance of the men in the combat engineer platoon land in scheduled or on-call waves. Engineer breaching groups, together with assault infantry in LVTP's, land in the initial waves. Engineers proceed with breaching operations to open lanes of sufficient width to permit passage of mechanized assault elements. Obstacle breaching is accomplished rapidly by employing demolition and mechanical means and such assistance as may accrue from supporting fires. Manual breaching will be the exception but may be required under some conditions. Engineer breaching operations will be required to be completed prior to landing armor elements or significant LVTP's in order to reduce unnecessary exposure of these valuable assets to enemy fires.

c. Helicopterborne Assault

(1) General.--The employment of the helicopterborne assault as a part of the amphibious assault has changed the magnitude of engineer operations and the echelon at which such operations are conducted. The missions and functions associated with engineers have remained unchanged. The engineer units providing support for helicopterborne assault forces are characterized by lightly equipped units which render engineer support to the highly mobile helicopterborne assault force. Although the magnitude of engineer support requirements of the helicopter assault force is significantly reduced by the reduction in size and quantity of vehicles and equipment, the engineer effort is still given to routes of communication, bridging, barrier problems, and construction of small air facilities. Engineer

platoons are normally attached to the BLT for helicopterborne assault operations and remain in that status as long as the BLT is separately deployed. When the BLT reverts to parent unit control, the engineer platoon reverts to control of the engineer company commander. Engineer platoons are normally equipped with demolitions, handtools, chain saws, and other hand-carried equipment to accomplish anticipated combat engineer support requirements. Under conditions that justify utilization of helicopter transport, items of heavy equipment may be transported to the landing site to accomplish critical engineer requirements. For additional information, see subparagraph 904c and FMFM 3-3, Helicopterborne Operations.

(2) Concept of Operations.--In a helicopterborne assault, a combat engineer platoon, reinforced as required, is attached to the BLT. When the BLT is lifted to a landing zone near its objective, initial engineer efforts are to improve the landing area and remove or breach obstacles impeding tactical operations of the BLT. As soon as the initial objective is seized, engineer elements initiate execution of the obstacle/barrier plan by deploying to the flanks or to possible avenues of enemy mechanized approach where they commence installation of planned obstacles, including minefields. These operations assist in providing flank security for the BLT. During this time, the balance of the platoon attempts to search out the weakest links in the enemy obstacle system and initiate clearing of wire, mines, and other obstacles, and accomplishes other engineer tasks to facilitate movement of the BLT and to impede enemy movement.

(3) Limitations.--Engineer units supporting helicopterborne assault operations are limited to the performance of hasty, field expedient type tasks. The equipment is lightweight, small in size, and of minimum quantity. A requirement for heavier mechanical equipment may exist but this is limited by the lift capabilities of helicopters. Primary reliance is placed on handtools, small gasoline powered tools, small tractor dozers, and demolitions. Mechanical equipment which exceeds the helicopter lift capability will normally not be available to the helicopterborne force until contact has been made with the waterborne force. Engineer tasks involving a considerable amount of labor must be accomplished by troops other than engineers attached. These "all hands" undertakings might include construction of extensive field fortifications, cut-and-cover shelters, obstacles, installation of minefields and camouflage, and clearing of enemy obstacles and minefields.

#### 904. OPERATIONS ASHORE

a. General.--The primary role of engineers in operations ashore is to perform such construction and destruction operations as are necessary to facilitate movement of friendly forces and to impede enemy movement. The mobility provided by the helicopter assists the engineers in their tasks. Obstacles, both existing and reinforcing, lose their significance when they can be bypassed. Major engineering tasks in minefield breaching and in river-crossing operations for tactical units are also significantly reduced in scope. Although it reduces significantly some combat engineer support tasks for tactical units, the helicopter does not reduce the overall engineer support requirements for the landing force. The requirement for construction and maintenance of routes of communication, expeditionary airfields, and other general support engineer tasks has been significantly increased.

b. Engineers in the Offensive.--In offensive operations, the combat engineer companies satisfy the engineer support needs of the infantry

regiments. The method of control will depend primarily on the mission of the tactical unit. (See par. 803.) In the offense, the combat engineer platoon may operate as a part of the combat engineer company in support of an infantry regiment, or during rapidly moving situations, may be attached to advance or separated units. In supporting the infantry battalion in the offense, the platoon commander maintains close coordination with the leading infantry elements to make sure the advance is not held up by obstacles which can be reduced, bypassed, or otherwise overcome by the platoon. Engineer reconnaissance is conducted continuously to determine tasks and facilitate their accomplishment or to allow time for obtaining assistance from the engineer company. The engineer platoon is the normal engineer support unit employed with the advance guard of an infantry regiment in the approach march. In the attack, an engineer company generally provides platoons in direct support of the attacking infantry battalions with the balance of the company in general support of the regiment. Typical engineer platoon tasks in the offense include: engineer reconnaissance; removal or breaching of obstacles; expedient, hasty road repair, constructing, strengthening, and repairing small bridges; improving fords and installation and operation of ferries; placing demolitions; and laying minefields and constructing obstacles on the flanks. During offensive operations where the combat engineer platoons normally support the infantry battalions, the engineer company commander acts as an advisor to the infantry regimental commander on engineer matters. Available engineer support units follow the tactical units closely in the offense and accomplish such tasks as construction, maintenance, and repair of roads, bridges, fords, ferries, expeditionary airfields, and camp sites; and initiate the obstacle/barrier plan as appropriate, and other essential engineer tasks.

c. Mechanized Columns

(1) General.--Engineers provide support to mechanized columns in much the same manner as engineer support is provided to tank-infantry-engineer teams when securing an objective. Engineer companies will normally provide this support. The column normally consists of tanks, engineers, and infantry with its supporting arms and combat service support. Engineer elements should be readily available near the head of a mechanized column so they can eliminate hostile antitank obstacles such as mines, structural obstacles, roadblocks, and tank traps. They also assist in effecting passage of existing obstacles by constructing bypasses, fords, bridges, ferries, and by improving the route to support the mechanized column and to permit combat-service support. Since the engineers will be committed to removing obstacles, they will not be in a position to defend themselves against enemy forces. Therefore, the infantry must provide close-in protection to permit the engineers to accomplish their tasks. Infantry should effect rapid passage of the obstacle in order to neutralize enemy direct fire weapons covering the obstacle. Once this is done, engineers can move in and remove the obstacle for the mechanized column. The accomplishment of engineer tasks in support of a mechanized column requires detailed coordinated planning between the tanks, infantry, and engineers. Each must fully understand the capabilities and limitations of the others. The engineer will need to know the route of the column and any planned schemes of maneuver. Good communications are essential to ensure prompt actions to cope with unforeseen problems. Engineers must be as mobile as the elements they support.

(2) Example of Engineers Supporting a Mechanized Column.--An example of engineer support for a mechanized column of RLT size may conform to the following general pattern:

(a) One reinforced combat engineer company is attached to the RLT. One platoon is normally assigned to the advance party. Rubber-tired engineer equipment is assigned to the advance party for construction of bypasses and fords for the passage of tanks. A mine detection team is also included in the point.

(b) An engineer reconnaissance officer moves with the point. His primary purpose is to inspect bridges and culverts and to verify bridge classes to ensure safe passage of tanks.

(c) In the event that a bridge or a culvert will not support the passage of tanks or other heavy loads, the tanks are halted and the rubber-tired dozer constructs a bypass. If this is impossible, then short-span bridging is transported forward and emplaced. An alternate and more rapid procedure if plans so provide is to transport and emplace the span by helicopter. Bridging operations are held to a minimum. However, when their requirement is anticipated, planning must provide for timely delivery of bridging components by truck, amphibious vehicle, helicopter, or airdrop.

(d) The reconnaissance officer and the platoon commander of the forward engineer platoon determine engineer tasks required along the route of advance, such as reinforcing of culverts, improvement of weak road shoulders, and clearance of obstacles. The forward engineer platoon performs these tasks as the column advances.

(e) A mine-detection team is called forward by the advance party commander whenever a minefield is detected. This team is equipped with demolitions, ropes, and other materiel for the removal of mines. When extensive minefields are encountered, demolition line charges and mechanical means (i.e., truck, LVT, tank, dozer) are employed for breaching.

(f) Employment of an engineer unit in this general manner provides effective support to a mobile column and ensures prompt engineer assistance at any point in a moving situation.

d. Engineer Employment of Helicopters.--There are many advantages afforded engineers by the employment of helicopters. In this paragraph, specific engineer tasks where helicopters can be employed advantageously and some advantages provided to engineer elements supporting tactical units are discussed.

(1) Advantageous Employment of Helicopters on Engineer Tasks.--There are many engineer tasks where the helicopter can provide valuable assistance resulting in savings of time, equipment, and manhours. Such operations include:

(a) River Crossings.--Transporting bridge components from dispersed dumps to assembly sites; carrying anchor cables to far shore; transporting and placing raft parts, substituting for cranes in far shore operations until ground equipment can be crossed; transporting far shore troops and equipment across the river so work can progress simultaneously on both shores.

(b) Obstacle Passage.--Transporting and placing of demolition line charges for clearance of obstacles, to include minefields, reconnaissance of minefields and other obstacles, and of routes through them.

(c) Minefield Laying Operations.--Transporting antipersonnel and antitank mines and providing assistance in recording of minefield locations by photography.

(d) Survey Operations.--Providing an airborne survey target in expediting survey operations in rough terrain and over extended distances.

(e) Fixed Bridge Construction.--Serving as a flying crane for placing of long beams and other bridge components and emplacing pre-fabricated fixed spans that utilize standard prefabricated bridging components.

(2) General Advantages Afforded Combat Engineer Support Units.--Employment of helicopters for the lift of engineer elements supporting tactical units affords the following advantages:

(a) Reduces travel time required to reach work sites over rough terrain or heavily traveled roads.

(b) Extends and accelerates the engineer reconnaissance capability.

(c) Provides a lifting capability where cranes cannot be used or are not available.

(d) Extends the effectiveness of command and staff supervision of engineer activities.

(e) Accelerates the breaching of minefields and other obstacles by permitting such breaching operations to be conducted from the enemy side.

e. General Engineer Support.--The combat engineer battalion has a limited capability to meet division requirements for general engineer support. The engineer support battalion releases the division engineer battalion from general engineer support tasks in the beach support area and provides engineer assistance required by those units of the landing force not organic to the division. The force engineer units and naval construction forces provide an element of balance and depth to help meet the overall engineer support requirements of the division, wing, and force units of the landing force. With the limited engineer potential of division units, the provision of augmentation support to division forces by force engineer units will be normal practice. Reinforcement of the division engineer capability will be required to meet requirements generated by unusual conditions of climate, weather, and terrain, and to provide adequate support of all division units for sustained operations. Engineer support needed by the wing for construction, major repair, and rehabilitation of expeditionary airfields and attendant facilities will be provided by the engineer squadron, reinforced as necessary by force engineers and naval construction forces.

f. Engineers in the Defense.--The primary role of engineers in defensive operations is to impede the mobility of the enemy. In the defense, engineers provide general engineer support to the landing force. This support is normally limited to those tasks requiring technical skill or which are beyond the capabilities of the supported unit. Engineers provide technical supervision and assistance in establishing defensive positions, and

they initiate installation of obstacles in accordance with the obstacle/barrier plan. For a sample obstacle/barrier plan, see FM 90-7, Obstacles. Engineer tasks accomplished for the landing force in defensive operations may include:

- (1) Aiding in the preparation of defensive positions and weapons emplacements.
- (2) Strengthening and constructing major obstacles in accordance with the obstacle/barrier plan.
- (3) Assisting in the installation and recording of minefields for tactical units. In addition, to install and record minefields at other locations as directed.
- (4) Maintaining and repairing main supply routes.
- (5) Preparing counterattack routes.
- (6) Constructing expeditionary airfields.
- (7) Providing technical assistance and supervising erection of wire entanglements, roadblocks, and other obstacles for tactical units.
- (8) Providing technical assistance in camouflage matters.
- (9) Preparing demolition charges at critical sites.
- (10) Providing potable water.
- (11) Providing class IV engineer materials (primarily fortification materials) as required.

g. Retrograde Movement.--A retrograde movement is any movement of a command to the rear or away from the enemy. Regardless of the circumstances, a rearguard action may be required to reduce enemy interference and allow time for the withdrawing unit to deploy in a new area. Planning must provide for the major engineer task--keeping the withdrawal route open. This is accomplished by providing men, equipment, and materials at strategic locations where the enemy may attempt to destroy bridges or otherwise block the route of withdrawal. Engineer elements with the rearguard must be highly mobile to reconnoiter; to prepare demolitions and minefields; to destroy bridges, roads, and railroads; to cut embankments; and to prepare other obstacles to impede the mobility of the enemy. Infantry support must be provided to the engineer elements, to allow them to accomplish these tasks rapidly.

h. Amphibious Withdrawal.--Since the amphibious withdrawal is a type of retrograde, the engineer role is similar to that in other retrograde movements; however, it is complicated by the conflict of the support requirement, created by the requirement for early embarkation of heavy equipment. The controlled destruction of supplies and equipment not evacuated will require close coordination of engineer demolitions sections with combat service support elements. For a detailed discussion of amphibious withdrawal, see LFM 02, Doctrine for Landing Forces.

## 905. SPECIAL OPERATIONS

There are operations applicable to Marine landing forces that require special training, techniques, tactics, or materiel support. Those of particular importance to engineers include desert operations, guerrilla operations, jungle operations, mountain operations, cold weather operations, combat in built-up areas, assault of a fortified position, and airborne operations. For detailed information, see FMFM 8-1, Special Operations.

### a. Desert Operations

(1) General.--Desert areas are not uniform in character. They may be described as mountain deserts, rocky plateau deserts, and sandy deserts. Although desert areas vary in surface configurations, they have certain common physical characteristics such as lack of water, lack of vegetation, extreme temperatures, bright sunshine and moonlight, dust storms, mirages, and dry river channels. For detailed information refer to FM 90-3, Desert Operations.

### (2) Engineer Considerations

(a) General.--Engineer operations in the desert are complicated by difficulty in supply of water, increased requirements for camouflage activity, special problems in field fortifications, and difficulties in operation of engineer equipment in extreme temperatures and dust. Engineer operations are simplified as far as road, airfield, and bridge construction are concerned.

(b) Potable Water.--Water supply is most important and it presents difficult problems for engineers in desert warfare. Control of water sources is of utmost importance in defeating the enemy. Water reconnaissance must be intensive and continuous, and established water supply points must be adequately defended. They are especially susceptible to armor and air raids. Dispersion of troops, necessitated by lack of concealment, compounds the problem of water supply distribution causing extremely long hauls and increasing the number of water supply points required. Special well drilling and pumping equipment are required to supplement normal water supply equipment (distillation and purification).

(c) Camouflage.--In most types of desert terrain, lack of vegetation presents a considerable problem in the task of camouflage. Because enemy air and ground reconnaissance is limited only by friendly resistance and darkness, camouflage measures in the desert consist primarily of deception of the nature of objects rather than concealment. To be effective, deception plans must be elaborate, carefully planned, and coordinated with all other activities of the landing force.

(d) Field Fortifications.--Desert operations are characterized by an extreme lack of local material for construction purposes. This results in complicating the problem of engineer supply, which even under ideal conditions involves tremendous volume and weight. Due to the speed with which mechanized operations may be launched in desert terrain, the use of mines to prevent surprise assumes considerable importance. Minefields may be the only obstacle that can be constructed in the path of the enemy. Minefields in the desert are characterized by a considerable quantity of mines emplaced over vast areas through an "all hands" effort. Due to lack of convenient landmarks, recording the location and layout of minefields is

a complicated problem. The effect of wind on desert sand may result in either exposing or burying emplaced mines rendering them ineffective. Gaps and lanes through minefields are easily detected by the track pattern unless carefully camouflaged.

(e) Vehicles and Equipment.--Heat, dust, and cross-country movement impose special maintenance problems. Sand and dust are particularly hard on carburetors, fuel lines, and lubricating systems. Life of tires, springs, axles, and engines is shortened by the heat and operation over rough, stony, and sandy terrain. The incidence of extreme heat, characteristic of so many desert operations, imposes problems in engineer construction equipment, particularly in the cooling systems. On the other hand, monsoon conditions will cause rapid wear of brake components, wheel bearings, wheel seals, and constant velocity (CV) joints.

(f) Construction.--Road construction in desert warfare is practically nonexistent due to almost unrestricted mobility of vehicles, especially tracked vehicles. Tractor-drawn drags usually suffice except in loose sand or stony ground, and matting usually proves satisfactory over loose sand. Mud is a special problem during the rainy season. Road blocks are generally useless since they can be readily bypassed. Bridges are rarely required except for crossing wadies and during the rainy season. Expeditionary airfield construction is primarily a matter of surfacing and dust reduction. Earth moving is usually insignificant.

#### b. Counterinsurgency Operations

(1) General.--In counterinsurgency operations, engineer support will be rendered in connection with civil action and counterguerrilla operations.

(2) Engineer Support of Civil Action.--Civil action is the assistance rendered by a military force in cooperation with the civil authority to restore or improve the social and economic status of a civilian community. This action is aimed at providing local support for the counterguerrilla effort. The engineer effort will be directed toward assisting in the construction or rehabilitation of transportation and communication means, schools, hospitals, churches, and utility systems.

(3) Engineer Support of Counterguerrilla Operations.--Counterguerrilla forces will vary in size and are characterized by a high degree of mobility. They may be task organized to include engineer units, but most often, engineer support will be provided under centralized control. Engineer tasks include neutralization of mines, boobytraps, and other obstacles; clearing vegetation along potential ambush sites; destruction of facilities or areas of value only to the guerrilla force; construction, rehabilitation and maintenance of roads; operation of ferries at river crossings; and rendering assistance in the construction of secure settlements for the civil population. While accomplishing these tasks, field expedients should be emphasized. All units should be proficient in simple engineer tasks, and make maximum use of civilian labor.

#### c. Jungle Operations

(1) General.--The primary engineer tasks of particular concern in jungle operations are road construction, stream crossing, expeditionary

airfield construction, water treatment, mine warfare, and mapping. Additional information on jungle operations is provided in FM 31-35, Jungle Operations.

(2) Road Construction.--In normal operations, enemy resistance usually determines the rate of advance, but in jungle operations, the ability of the engineers to construct and maintain roads and trails may determine the rate of advance. In most jungle areas, roads are relatively undeveloped or nonexistent. Those that exist are generally narrow, winding, and not capable of handling landing force vehicles. Heavy rainfall and lack of drainage, making construction difficult, places the majority of the engineer effort on constructing and maintaining minimum essential roads and trails required.

(3) Stream Crossing.--Current standard prefabricated bridging and various expedient methods for crossing streams are employed. The heavy rainfall and flooding conditions are carefully considered when selecting stream crossing sites. Flash flooding is characteristic of most jungle areas.

(4) Expeditionary Airfield.--The clearing and drainage problems encountered in road construction are magnified in constructing expeditionary airfields. Expeditionary airfield construction in jungle areas will normally be limited to rehabilitating old abandoned airfields, small liaison type strips, helicopter landing sites, and new construction in the vicinity of beaches.

(5) Potable Water.--Water sources are abnormally abundant; however, water treatment is essential due to the presence of harmful organisms.

(6) Mine Warfare.--The jungle forms a very effective obstacle against all vehicles; therefore, mines and other manmade obstacles are generally confined to roads, trails, and patches of cleared ground. Anti-personnel mines are employed as a part of local defense plans to serve as warning devices and to delay and divert the enemy.

(7) Mapping.--Because of the inaccessibility and rapidly changing features in the jungle, maps cannot be depended upon except for location of coastlines and principal rivers. Swamps, streams, inlets, and lagoons are seldom shown, and any contours shown are seldom accurate. Engineer reconnaissance to supplement the data shown is of prime importance.

(8) Construction Material.--The jungle provides an abundant supply of timber; however, there will usually be a requirement to establish sawmills to provide lumber. Sandbags disintegrate rapidly, and when used, must be replaced periodically.

#### d. Mountain Operations

(1) General.--Mountainous terrain is usually characterized by one or more of the following: exaggerated terrain features, heavy woods, rocky crags, glacial peaks, compartmentation, routes of communication which are limited in extent and of poor quality, extreme weather conditions, and high altitudes. Mountain weather is characterized both in winter and summer by inclemency, wide temperature range between day and night, and sudden localized atmospheric disturbances such as violent rain and snowstorms. Additional information on mountain operations is provided in FM 31-72, Mountain Operations.

(2) Engineer Considerations

(a) General.--Operations in mountain warfare require a large proportion of the force to be engineers. Considerable emphasis is placed on routes of communication. Roads and trails in the mountains require an extensive amount of effort in construction, improvement, maintenance, and repair to withstand traffic and severe weather. Construction operations are extremely slow, time-consuming, and complicated by lack of local material and heavy equipment operating difficulties. These problems are further compounded by enemy defensive activity such as destruction of bridges and installation of obstacles. Employment of demolitions and use of mines are particularly profitable. Defensive positions constructed in mountain areas are generally poorly mapped and geodetic control is a major problem. To efficiently accomplish essential engineer tasks, engineers must utilize mechanical assistance such as air compressors, power saws, heavy construction equipment, large quantities of explosives, and sufficient transportation. The helicopter can be an invaluable asset to engineers in mountain operations. Training emphasis should be placed on rigging, demolitions (rock formations), tramway and cableway construction, physical conditioning, mountain climbing, mountain road construction, employment of helicopters (engineer employment), stream-crossing expedients, bridge construction, obstacles, and field fortifications.

(b) Road Construction.--The construction of roads and trails in mountainous areas is one of the most important tasks of engineers. Development of an extensive road net in mountainous areas should be avoided as the availability of personnel, material, and time will probably preclude it. Initial work will be to improve existing roads and trails. Advantage must be taken of natural routes. The tremendous effort in terms of time, equipment, materiel, and personnel required to construct roads in mountain operations cannot be overemphasized. The road nets normally available near beaches will seldom be available in mountain operations. Various technical manuals provide additional information on road and trail construction.

(c) Stream Crossing.--Current standard prefabricated bridging is employed; however, expedients such as rope crossings, Swiss bent bridge, cableways, and ice are particularly useful in mountain operations. There are many technical manuals, such as TM 5-270, that provide useful information.

(d) Demolitions.--The basic principles of demolitions apply and are generally adequate. There are some variations in demolitions in rocks, rock soils, and blasting of trees that should be emphasized. A fougasse emplaced with rocks and explosives is very effective in various mountain passes and defiles.

e. Cold Weather Operations

(1) General.--The terms "arctic operations," "operations in the subarctic," "cold weather operations," "operations in the northern latitudes," "far northern operations," "operations in the north," and "northern operations" are synonymous. They include operations in both arctic regions and pertain to areas of both North America and Eurasia that lie north of the 50-degree isotherm (a line north of which the average temperature for the warmest 4-month period of the year is less than 50 degrees F.) For military purposes, the arctic can be defined as that portion of the

northern hemisphere lying north of the tree line. The arctic consists of polar sea areas, polar land areas, and pack ice areas. The subarctic is that area lying between the arctic and areas where a well established network of communications exist; i.e., the northern rocky mountains. The southern extremes of the subarctic are indefinite but generally coincide with the 50-degree isothermal line. The subarctic is an area of extremes. Summers are hot and winters extremely cold. In the arctic, vegetation is dwarf and scrubby and routes of communication consist of roads and trails and limited water travel. Air offers the most practical means of travel. The arctic is in reality a desert with an average annual rainfall of about 8 inches. Continental parts of the arctic have average winter temperatures from 22 degrees F. to 40 degrees F. below zero. For additional information, see FM 31-71, Northern Operations. Cold weather causes unpleasantness, complicates living, and has a pronounced effect on military operations but does not prevent their success. Highly trained, well disciplined troops with a clear understanding of the environment and use of cold weather materiel, effectively aid the successful accomplishment of cold weather operations.

## (2) Engineer Considerations

(a) General.--Engineer operations in cold weather are influenced by the amount of exposure troops can stand, the loss of work efficiency from reduced freedom of movement (use of hands, feet, etc.) caused from wearing essential cold weather clothing, reduction of overall efficiency of troops, psychological factors (pronounced fear of the cold), and increased equipment maintenance time and reduction of productive efficiency. These problem areas can be reduced by psychologically preparing the troops for cold weather operations, proper utilization of special and standard items of equipment and supplies, a high state of technical training, and aggressive leadership. Environmental factors increase the volume and scope of engineer operations and the difficulties attendant to their execution.

(b) Road Construction.--Rivers form water highways in the summer and ice roads in the winter. In the spring and fall, surface travel virtually ceases. Swamps, moraines, and poor drainage make summer travel difficult. Some tractor roads and trails exist but are elementary and limited. Road nets and railroads are practically nonexistent. In view of the foregoing, road and trail construction will be one of the major engineer efforts. Additional operators and mechanics must be provided; four operators for each major item of equipment are desirable. Due to the weather, operators rapidly become fatigued and must be relieved after short periods of operation. Equipment maintenance difficulties can be kept to a minimum by continuous operations except for short periodic stops for operator checks, thereby preventing equipment from "cooling off." Principles of construction are basically the same, but techniques may have to be modified according to the location. Cross-country movement of units without engineer support is extremely difficult.

(c) Stream Crossing.--Numerous lakes, swamps, and streams necessitate increased quantities of stream-crossing equipment to include ferries and fixed and floating bridges. As a result, there is an increased requirement for troops, bridge installation, and maintenance. Drainage throughout the subarctic is complicated and inefficient because rivers flow north and the ice starts to melt in the south, thus causing overflow and flooding until the river mouths are thawed.

(d) Construction.--Field construction of conventional engineer works is magnified. Environmental characteristics that complicate engineer tasks are permafrost; extreme and rapid changes in temperature; wind, snow, and ice storms; flooding; and alternate thawing and freezing.

(e) Potable Water.--The major sources of water supply in order of efficiency and economy are: drawing water from under river or lake ice, melting ice, melting snow, and well drilling. Melting of ice or snow in quantities required for unit needs is impractical and is primarily an emergency method. Heated shelters may be necessary for operation of water purification units. If water is not available under river or lake ice, special or improvised ice melting equipment can be used to melt the ice in place. For cutting holes through thick ice to prepare a water hole, shaped charges are far superior to handtools. For additional information on water supply, see FM 31-71, Northern Operations.

#### f. Combat in Built-up Areas

(1) General.--Built-up areas are groupings of buildings designed for habitation and commercial purposes, such as villages, towns, cities, or factories. Aside from factories and parks, built-up areas usually consist of three distinct building arrangements: on the outskirts, isolated houses or groups of houses surrounded by gardens, trees, fields, and vacant lots; farther in, closely spaced detached and semidetached houses usually flanked by streets on one side and small gardens or back areas on the other; and in the center, buildings of varying heights constructed on the block system with little or no space between them other than that essential for streets and alleys. It is of importance to note that nearly all buildings comprising this inner area normally have cellars or basements, which greatly assist the defender. The defender can turn each building and each block into a fort by reinforcing basements, rooms, and roofs with stones, brick, sandbags, and other available material. Cellars, sewers, subway tunnels, thick masonry walls and reinforced concrete floors, and roofs provide cover and concealment. Rubble and debris hinder advance through the town. Vehicular movement is canalized by streets and alleys. Avenues of approach are blocked by obstacles covered with weapons fire. The amount and type of obstacles are limited only by time, material, equipment, labor, and ingenuity. Barriers may be improvised by blowing craters, demolishing walls, overturning or derailing street or railroad cars, and by using steel rails, beams, and rubble. These barriers will normally be reinforced with mines, barbed wire, small arms fire, and antitank fire. Additional information is provided in FM 31-50, Combat in Fortified Areas and Towns.

(2) Engineer Considerations.--The major engineer tasks in the conduct of combat in built-up areas will normally be:

(a) Clearing of antitank mines, antipersonnel mines, and boobytraps from avenues of approach and other areas.

(b) Clearing barriers that are composed of various types of obstacles (see preceding paragraph for types normally encountered).

(c) Specialized demolition missions that are beyond the capability of the combat units.

(d) Prior to being employed in operations involving combat in built-up areas, engineers should provide additional demolitions and mine warfare training to all combat units.

#### g. Assault of a Fortified Position

(1) General.--Fortified positions are most generally classified as "permanent" and "field." Field fortifications, in turn, are classified as "deliberate" or "hasty." The distinction is a matter of degree.

(2) Engineer Considerations.--The assault of a fortified position is normally divided into four phases: reducing the outposts and developing the attack; breakthrough; extending the gap by isolating and reducing emplacements on the flanks; and moving reserves through the gap to encircle and isolate the remaining fortifications, while the attack continues. During the attack, engineers breach the larger obstacles which protect the major fortifications. Reduction of weapon emplacements, bunkers, and pillboxes, and the clearing of close-in and minor obstacles are the mission of specially organized and equipped infantry teams. After the fortified line has been breached, engineers create and maintain routes through the gap and assist in rendering captured emplacements unsuitable for reoccupation.

#### h. Tactical Air Landed Operations

(1) General.--Marine engineers must be prepared to support tactical air landed operations. For additional information, see FMFM 4-6, Movement of Units in Air Force Aircraft.

(2) Engineer Considerations.--The cargo aircraft lift capability and availability will normally curtail the employment of heavy weapons and vehicles such as tanks and amphibious tractors, and heavy support materiel. Therefore, the combat engineer support required by combat units will generally require a reduction of engineer equipment and an increased emphasis on field expedients using locally available material. Standard items of engineer equipment organic to the engineer units providing combat support are generally adequate to support these operations. Heavy engineer materiel required later in the operation is transported to the objective area by surface means or airlift.

### 906. CIVIL ENGINEER SUPPORT

Insofar as compatible with tactical and combat service support requirements of the landing force, all construction initiated ashore by engineers is consistent with the civil engineer support plan. Engineer commanders must be familiar with the major aspects of this plan. Landing force engineers will be primarily concerned with the initiation of such projects as the rehabilitation of existing airfields and utility systems, rehabilitation or construction of expeditionary airfields, and road and bridge construction. These installations are of direct concern to the commander amphibious task force. Landing force engineer units begin such tasks as soon as designated areas are uncovered. Most of this work is undertaken by force engineer units and naval mobile construction battalions. Review and continual reestablishment of a comprehensive set of construction priorities is undertaken as soon as the tactical mission of the landing force is accomplished. These priorities are made by paying close attention to details of the civil engineer support plan. Landing force engineers are relieved of civil engineer support responsibilities as soon as civil engineer forces are ashore. The transition is normally gradual and is facilitated by civil engineer support force liaison personnel landing with landing force engineers.

**APPENDIX A**

**SAMPLE ENGINEER ESTIMATE**

(The engineer estimate may be issued as part of the combat service support estimate or as a separate staff estimate.)

**CLASSIFICATION**

Copy no. \_\_\_ of \_\_\_ copies  
 Force Engineer Section  
 II MAF  
 AUGUSTA BAY, SICILY  
 061000 November 19 \_\_\_

**ENGINEER ESTIMATE**

Ref: (a) Map: CYPRUS, 1:250,000, Sheets NI 36-3, NI 36-6, NI 36-7

**1. MISSION**

- a. Basic Mission. II MAF lands on D-day in a surface and helicopter-borne assault; seizes the port of PAMAGUSTA and the airfield and communication center at NICOSIA; prepares to continue the attack to seize the remainder of the island.
- b. Previous Decisions
  - (1) Assault to be conducted prior to the third week in December.
  - (2) Landing Force (II MAF) comprised of 2d Marine Division, 2d Marine Aircraft Wing, Force Troops, and 2d FSSG.
  - (3) Nuclear weapons employed only on specific authority of SACEUR.
- c. Purpose of the Estimate. To determine the course of action which is most desirable and supportable from an engineer standpoint.

**2. SITUATION AND CONSIDERATIONS**

- a. Enemy
  - (1) Present Disposition of Major Elements. See Intelligence Estimate.
  - (2) Major Capabilities
    - (a) Destruction of bridges in area prior to our seizure.
    - (b) Mining of routes of communication.

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- (c) Cutting routes of communication in swampy areas where bypassing is difficult.
- (d) Empacing at beaches, where possible, extensive obstacles of all types, utilizing local civilian labor.
- (e) Cutting roads in mountainous areas where there are narrow defiles.
- (f) Boobytrapping of installations and existing utilities as the enemy is forced to evacuate present locations.

(3) Other Capabilities. Contaminating brewery at LIMMASSOL.

b. Own Forces

(1) Present Disposition of Major Elements. Augusta Bay, Sicily.

(2) Probable Tactical Developments

- (a) Air or naval gunfire strikes on existing cultural features will not hamper our mission.
- (b) Tactical bridging will be required to facilitate crossing several streams in area.

(3) Own Courses of Action

- (a) C/A #1. Land with two regiments in column at SALAMIS in a surface attack and one regiment (minus) at SALAMIS Airfield by helicopters; seize the FBH and the airfield, continue the attack to the south and west to seize FAMAGUSTA and NICOSIA.
- (b) C/A #2. Land with two regiments abreast in a surface assault north of LARNACA and one regiment (minus) by helicopters at NICOSIA; seize the FBH and the airfield, continue the attack to the northeast and east to seize the port of FAMAGUSTA.
- (c) C/A #3. Land with two regiments abreast in a surface assault southwest of Cape KITI and one regiment (minus) by helicopters on critical terrain inland; seize the FBH and LARNACA Airfield; continue the attack to the northeast and west to seize FAMAGUSTA and NICOSIA.
- (d) C/A #4. Land with two regiments abreast in a surface assault at MORPHOU BAY and one regiment (minus) by helicopters at NICOSIA; seize the FBH and airfield, continue the attack to the east to seize the port of FAMAGUSTA.

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c. Characteristics of the Area(1) Weather

- (a) Heavy showers during this rainy season will only temporarily halt any major engineer effort (24-hour period).
- (b) Gale force winds occurring 8 days per winter period would create turbulent surf conditions and would delay unloading heavy engineer equipment.

(2) Terrain

- (a) Relief. The flat MESAORIAN plain presents no unusual engineering problems. The mountainous areas of KYRENIA and OLYMPUS ranges do present some large engineering problems if this terrain is utilized. The present road system in the mountains is inadequate for sustained military traffic.

(b) Drainage

- 1 The drainage of the area generally runs East or West with the two rivers, PEDIEOS and YIALLAS, being the primary drainage features of the Eastern MESAORIA. The remainder of the streams are small and generally intermittent.
- 2 Marshy areas are prevalent in several areas along the coast: west of MORPHOU, south of LIMASSOL, the salt lake north of CAPE KITI, north of LARNACA, mouth of KAMBION River north of FAMAGUSTA.

(c) Obstacles

- 1 OLYMPUS and KYRENIA mountain ranges are the major obstacles to cross-country vehicular traffic.
- 2 Marshy areas and the salt lakes constitute obstacles to vehicular movement. The lakes are not fordable.
- 3 The bridges are generally too narrow and are not strong enough to support any but light vehicular traffic.
- 4 Irrigation ditches, steep-banked streams, small orchards, and tree areas in the plains present minor obstacles to vehicular movement.
- 5 The ancient city walls and deep moats surrounding the old section of NICOSIA and FAMAGUSTA are major obstacles to both foot and vehicular movement. Openings and gates are infrequent, generally narrow, and have limited overhead clearance. Causeways crossing moats have small load capacity.

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- 6 Older sections of major cities have narrow, winding streets and high stone walls which limit size of vehicles and traffic flow.
  - 7 Subsequent to rain, all areas off hard surfaced roads will present extremely poor going to wheeled vehicles.
- (d) Hydrography.--See Tab A (Beach Study) to Appendix 1 (Tactical Study of Weather, Terrain, and Hydrography) to Annex B (Intelligence).

d. Assumptions

- (1) That the enemy will not destroy the NICOSIA Airfield as this is his lifeline for logistic support.
- (2) That the port of FAMAGUSTA will be uncovered early in order to bring in heavy engineer equipment.

3. ENGINEER ANALYSISa. Course of Action #1

- (1) This course of action provides for early seizure of the island's only deep water port of FAMAGUSTA and the abandoned SALAMIS Airfield.
- (2) If the enemy employs extensive beach obstacles, breaching teams could be employed with the helicopterborne force for reverse breaching from the landside of the beach. For safety reasons, a time delay of at least 1 hour for the boated teams is required.
- (3) The marshy area at the mouth of KAMBION and YALIA Rivers poses a major obstacle to vehicular traffic should the three bridges over these rivers on the main N-S highway be destroyed. Rivers are approximately 125 feet wide at the road. Bridges are limited to single lane traffic and 10-ton capacity. The river is fordable except for a 24-hour period following rain.
- (4) The surfaced roads will support military traffic; however, since the secondary roads are little more than engineer roads, considerable engineer effort would be required to keep them in an adequate state of repair for any appreciable amount of military traffic.
- (5) Allows concentration of engineer effort in a relatively small area.
- (6) Will require considerable equipment and material to be brought in over the beach if bridges are blown before FAMAGUSTA is taken.

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- (7) If operations anticipate using the SALAMIS Airfield, additional extensive engineer effort will be required to bring it up to operational standards.

b. Course of Action #2

- (1) This course of action allows for early seizure of the primary airfield (NICOSIA) on the island.
- (2) The marshy terrain behind the beach from RJ 3246 will restrict wheeled vehicles to the road network. While this road network is good just outside of the beach area, enemy emplaced obstacles in addition to the existing obstacles would provide an exceptionally effective barrier system and would require considerable engineer effort to clear for vehicular movement.
- (3) Port at FAMAGUSTA would not be uncovered as rapidly as C/A #1 and thus would require bringing in engineer equipment over the beach.
- (4) As with C/A #1, the secondary roads will require considerable maintenance to support military traffic.
- (5) From RJ 3246 East, the beach would be much better in that no major existing obstacles such as the marshy area are present.

c. Course of Action #3

- (1) This course of action allows for the early seizure of the abandoned LARNACA Airfield.
- (2) The primary existing obstacle here is the TREMITHOIS River. While this river is fordable at several points, a requirement will exist for tactical bridging across this river where the secondary road crosses at KITI and also upstream where the main road crosses at coordinates 2038.
- (3) Port of FAMAGUSTA would not be uncovered as rapidly as C/A #1 and would require bringing ashore heavy engineer equipment and material over the beach.
- (4) There is not sufficient bridging in the bridge company to span the salt lake for the main road leading to the LARNACA Airfield.
- (5) If operations anticipate using the LARNACA Airfield, additional extensive engineer effort will be required to bring it up to operational standards.
- (6) There is an excellent (island standards) hard surfaced road from LARNACA to NICOSIA.

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d. Course of Action #4

- (1) This course of action allows for the early seizure of NICOSIA Airfield.
- (2) Maximum road distance is inherent in this plan, so that the road maintenance will be spread out, though the road network is good and favors us.
- (3) Marshy area behind beach restricts wheeled vehicles to the road network. Northern third of beach is good exit route. As in C/A #2 and #3, the late uncovering of FAMAGUSTA will necessitate landing heavy engineer equipment over the beach. Due to the surf conditions this may present an insurmountable problem.

4. EVALUATIONa. Course of Action #1

- (1) Advantages
  - (a) Provides for early seizure of FAMAGUSTA.
  - (b) Reverse breaching can be effected.
  - (c) Concentrates engineer effort.
  - (d) Good surfaced road network.
- (2) Disadvantages
  - (a) Marshy areas are major obstacles and have to be bypassed.
  - (b) SALAMIS Airfield requires major engineer rehabilitation.
  - (c) Bridges over KAMBION and YALIA Rivers will support only light vehicular traffic.

b. Course of Action #2

- (1) Advantages
  - (a) Provides for early seizure of NICOSIA Airfield.
  - (b) Good road network West of RJ 3246 to the NE.
- (2) Disadvantages
  - (a) Effective barrier West of RJ 3246 with minor improvement by enemy would pose severe handicap on our forces.

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- (b) West of RJ 3246 there are only secondary roads. These will require extensive maintenance.
  - (c) Requires heavy engineer equipment to be brought over the beach.
- c. Course of Action #3
- (1) Advantages
    - (a) Provides for early seizure of LARNACA Airfield.
    - (b) Excellent road from LARNACA to NICOSIA.
  - (2) Disadvantages
    - (a) Limited fording points for TREMITHOIS River plus a possible requirement for tactical bridging.
    - (b) Requires heavy engineer equipment and material to be brought over the beach.
    - (c) Insufficient tactical bridging available to span the salt lake in case present bridge destroyed.
    - (d) LARNACA Airfield requires major engineer rehabilitation.

d. Course of Action #4

- (1) Advantages
  - (a) Provides for early seizure of NICOSIA Airfield.
  - (b) Good egress from beach portion.
- (2) Disadvantages
  - (a) Engineer effort spread to maximum due to traveling length of island.
  - (b) Marshy areas are major obstacles and have to be bypassed.
  - (c) Requires landing heavy engineer equipment over the beach.
  - (d) If surf is heavy, landing heavy equipment would be impossible.

5. CONCLUSIONS

- a. All courses of action are supportable if no rain falls on D-1 through D+1. C/A #1 is the most desirable from an engineer standpoint.
- b. Principal disadvantages of the other courses of action are as follows:

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- (a) C/A #2. Ease by which the enemy could improve existing obstacles of marshland and the poor road network to the West.
  - (2) C/A #3. Delayed seizing of NICOSIA Airfield and FAMAGUSTA.
  - (3) C/A #4. Distance from objectives increases engineer effort required for road maintenance.
- c. The major engineer problems in this operation are the replacement or reinforcing of bridges over KAMBION and YALIA Rivers, or the building of fords to bypass the bridges and the road maintenance required.
- d. Because of these problems, an engineer company from the engineer support battalion, reinforced with bridging assets, has been attached to the division. The following recommendations are made regarding solution of these problems.
- (1) Floating bridges be mobile loaded in LST's for early arrival ashore.
  - (2) Heavy engineer equipment be scheduled in early waves.

N. G. NEER  
Colonel, U.S. Marine Corps  
Force Engineer Officer

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## APPENDIX B

## SAMPLE ENGINEER APPENDIX TO OPERATION ANNEX

(The engineer appendix may be issued as part of either the operations or combat service support annex.)

## CLASSIFICATION

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 2d Marine Division (Rein)  
 AUGUSTA BAY, SICILY  
 081000 November 19 \_\_\_\_  
 JPB-1

Appendix 13 (Engineer) to Annex C (Operations) to Operation Plan No. 1-7 \_\_\_\_

Ref: (a) Maps: KYTHREA, 1:50,000, Sheet 12, Series K711  
 FAMAGUSTA, 1:50,000, Sheet 15, Series K711  
 LARNACA, 1:50,000, Sheet 13, Series K711  
 (b) DO 4000.3 (SOP for Engineer Operations)

Time Zone: B

Task Organization: See Annex A (Task Organization) to Operation Plan No. 1-7 \_\_\_\_.

1. SITUATION

a. Enemy Forces. See Annex B (Intelligence) to Operation Plan No. 1-7 \_\_\_\_.

b. Friendly Forces. See Operation Plan No. 1-7 \_\_\_\_.

c. Attachments and Detachments

(1) Co A, 8th Engr Spt Bn attached effective 090800 November 19 \_\_\_\_.

(2) 1st Plt Bridge Co, 8th Engr Spt Bn reinforces Co A, 8th Engr Spt Bn.

d. Assumptions. That surface conditions will allow landing of heavy engineer equipment and material on D-day.

2. MISSION. 2d Mar Div (Rein) commencing at H-hour on D-day conducts a surface assault over Beach #4 of CYPRUS; commencing at L-hour on D-day conducts a helicopterborne assault of objective H; seizes objectives A through J in order to seize the port of FAMAGUSTA and the communication center at NICOSIA; prepares to continue the attack and seize the remainder of the island on order.

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3. EXECUTIONa. Concept of Operations

- (1) Reinforced combat engineer companies are attached to the surface assault RLT's to provide close combat engineer support in respective RLT zone of action. A combat engineer company (-) is attached to the helicopter and assault RLT to provide close combat engineer support for that unit. Attached companies will revert to control of 2d Cbt Engr Bn on order. 2d Cbt Engr Bn (-)(Rein) will land over beach #4 on D-day prepared to provide close combat engineer support to Div (Rein) as required. Elements of engineer company from FSSG, with adequate bridging assets, will land over beach #4 on D-day. The remainder of the engineer company from FSSG, with the remaining bridge assets, will land at FAMAGUSTA commencing late D+1. Attached companies will revert to parent control on order.
- (2) Maximum effort will be made to complete installation of bridges over TREMITHOS River on D-day. Highest priority assigned to engineer tasks relating to repair of critical routes of communication.
- (3) Clearance of enemy emplaced obstacles will be a continuing requirement.

b. RLT-2

- (1) Conduct breaching operations in accordance with Appendix 12 (Breaching Plan) to Annex C (Operations) to Operations Plan No. 1-7\_.
- (2) Within capabilities, initiate repair and reinforce bridges at (230327) and (199377) if required, or if bridges are beyond repair, commence preparation of crossing site until relieved by 2d Cbt Engr Bn (-)(Rein).

c. RLT-6

- (1) Conduct breaching operations in accordance with Appendix 12 (Breaching Plan) to Annex C (Operations) to Operation Plan No. 1-7\_.
- (2) Within capabilities, clear mines from and initiate repairs to MSR from BLUE BEACH to LARNACA.
- (3) Within capabilities, initiate repair and reinforce bridge at (275363) if required.

d. RLT-8. Within capabilities, initiate repair of main runways at NICOSIA Airfield.

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## CLASSIFICATION

**e. 2d Cbt Engr Bn (-) (Rein)**

- (1) Land on order and support the assault.
- (2) Repair or install, maintain, and operate bridging at coordinates (230327) and (275363) if required. Sites to be determined by reconnaissance.
- (3) Provide close combat engineer support to Div (Rein) as required.
- (4) Be prepared on order to assume missions assigned to engineer elements attached to RLT-2 and RLT-6.
- (5) Assume control detached elements of the Cbt Engr Bn on order.
- (6) Be prepared to repair and maintain the airfield at NICOSIA to accept air traffic by D+5.
- (7) Develop and maintain routes of communication in zone of action.

**f. Coordinating Instructions****(1) Mines and Obstacles**

- (a) Breaching and mine clearance operations: reference (b) and Appendix 12 (Breaching Plan) to Annex C (Operations) to Operation Plan No. 1-7.
- (b) Priority of clearance of mines and obstacles:
  - 1 Those limiting tactical operations.
  - 2 Those limiting combat service support operations.
- (c) Assistance of Explosive Ordnance Disposal personnel in clearance and handling of nonstandard enemy mines available on request of this headquarters.
- (d) Employment of mines and obstacles.
  - 1 Emplacement in accordance with reference (b).
  - 2 Reporting and recording in accordance with FM 20-32, Mine/Countermine Operations at the Company Level.
  - 3 Protective and tactical minefields to be emplaced only on order of BLT and Div commanders respectively.

**(2) Demolitions**

- (a) Be prepared to conduct demolition of the following types of installations on order: bridges, airfields, and combat service support installations.

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- (3) Roads and Bridges
- (a) Priority of maintenance and repair to main supply routes (MSR's).
  - (b) Provide fragmentary reports by most rapid means to this headquarters of capacity and condition of bridges uncovered.
- (4) Engineer Assistance. Provide equipment and technical assistance for tactical requirements to include:
- (a) Camouflage.
  - (b) Artillery and other weapons positions.
  - (c) Helicopter landing sites.
- (5) Engineer Reconnaissance
- (a) In accordance with reference (b).
  - (b) Highest priority to reconnaissance information requested in Annex B (Intelligence) to Operation Plan No. 1-7.
- (6) Reports. Submit in accordance with Appendix (Reports) to Annex P (Combat Service Support) to Operation Plan No. 1-7.

## 4. ADMINISTRATIVE AND LOGISTICS

- a. Classes I Through IX, Supplies Available. See Annex P (Combat Service Support) to Operation Plan No. 1-7.
- b. Class IV, Engineer Items Available
- (1) Fortification Material
- (a) Each vehicle 1½ ton and larger.
    - 1 2 concertina lashed to front bumper.
    - 2 4 bundles sandbags in cargo space.
  - (b) 2d Cbt Engr Bn (-) (Rein) load organic vehicles with barbed wire and pickets for minefield marking:

	Trk M561	Trk M51	Trk M54	Trlr M101
<u>1</u> Barbed Wire 350' reels	4	6	6	4
<u>2</u> Pickets, Long	4	10	4	4
<u>3</u> Pickets, Short	12	20	8	8

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## CLASSIFICATION

(c) Force Landing Support Party (FLSP)

- 1 5 tons concertina.
- 2 500 long pickets.
- 3 4 bags staples.
- 4 500,000 sandbags.

(2) Construction Material

(a) 2d Cbt Engr Bn (-) (Rein). See Appendix (Civil Engineer Support Plan) to Annex D (Logistics) to Operation Plan No. 1-7.

(b) 2d FSSG

- 1 50,000 BFM lumber, various sizes.
- 2 1000# nails, various sizes.

c. Distribution of Engineer Items

- (1) Engineer supplies to be drawn initially from FLSP.
- (2) Control of issue: See ref (b).

5. COMMAND AND SIGNAL

a. See Annex K (Comm-Elec) to Operation Plan No. 1-7.

b. Command Posts

- (1) Afloat: LKA-113, 2d Cbt Engr Bn (-) (Rein).
- (2) Ashore: 2d Cbt Engr Bn: Report when established.

ACKNOWLEDGE RECEIPT

BY COMMAND OF MAJOR GENERAL PICK:

A. B. ZEE  
Colonel, U.S. Marine Corps  
Chief of Staff

DISTRIBUTION: See Annex Z (Distribution)

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**APPENDIX C**  
**SAMPLE BREACHING PLAN**

(The breaching plan is normally found as an appendix to the operations annex.)

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Appendix 12 (Breaching Plan) to Annex C (Operations) to Operation Plan No. 1-7

Ref: (a) DO 3000.16 (SOP, Breaching Operations)

Time Zone: B

**Task Organization:**

(All attachments effective 010600)

**Breaching Group B**

Lt CLEAVER

Det Hq 1st Plat Co B 2d Cbt Engr Bn

**Assault Breaching Team No. 1**

Sgt SMITH

1st Sqd 1st Plat Co B 2d Cbt Engr Bn

**Assault Breaching Team No. 2**

Sgt CLOE

3d Sqd 2d Plat Co B 2d Cbt Engr Bn

**Support Breaching Team**

Sgt HOLDER

2d Sqd 3d Plat Co B 2d Cbt Engr Bn

**1. SITUATION**

- a. **Enemy Forces.** Beach obstacles consist of fixed tetrahedrons, barbed wire, AP&AT mines. Density of AT mines generally one per yard of front, minimum of three rows. Obstacles are covered by fire of MG or automatic rifle, recoilless rifle, and AT gun. The fixed tetrahedrons are at the waterline, barbed wire about 40 yards inland and the minefield commences immediately behind the wire.

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- b. Friendly Forces
- (1) Underwater demolition teams will clear boat lanes opposite selected breaching sites prior to D-day.
  - (2) Naval gunfire support ships, commencing at H-10 minutes, will fire barrages in selected breaching sites.
  - (3) 2d MAW, commencing at H-3 minutes, will conduct air strikes against selected breaching sites.
2. MISSION. Breaching teams breach obstacles in designated lanes across Beaches BLUE 1 and BLUE 2 to permit early passage of tanks and wheeled vehicles; prepare for further breaching operations inland.
3. EXECUTION
- a. Concept of Operations. Assault breaching teams 1 and 2 land on Beaches BLUE 1 and BLUE 2, respectively at H-hour. Breach a minimum of two lanes on each numbered beach by use of demolitions, mine detectors, and probes. Support breaching team be prepared to assist operations on either beach on order.
  - b. Breaching Group B. Supervise breaching effort on BLUE Beaches.
  - c. Assault Breaching Team No. 1. Breach and mark lanes at sites E and F. See Appendix 1 (Operation Overlay) to Annex C (Operations).
  - d. Assault Breaching Team No. 2. Breach and mark lanes at sites G and H. See Appendix 1 (Operation Overlay) to Annex C (Operations).
  - e. Support Breaching Team. Be prepared to reinforce breaching operations on BLUE Beaches on order.
  - f. Coordinating Instructions
    - (1) Breaching Group B will be organized as prescribed in reference (a).
    - (2) Initial breaching to provide lanes minimum of 8 yards wide.
    - (3) Report immediately completion of breaching each lane.
    - (4) Be prepared to perform breaching operations inland.
4. ADMINISTRATIVE AND LOGISTICS. The following equipment will be taken ashore with the breaching teams:

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Mine detectors, AN/PRS-7	3
Mine detectors, AN/PSS-11	3
Mine probes	9
Minefield marking tape	3 rolls
Wire cutters	9 prs
Mine markers	25
Demolition equipment (individual)	3 sets
Demolition equipment (squad)	1 set
Wire or rope	150 feet
Bangalore torpedo	8
Line charges, M125	3

5. COMMAND AND SIGNAL. All breaching teams and group headquarters enter regimental tactical net.

ACKNOWLEDGE RECEIPT

BY COMMAND OF COLONEL SIX:

SAM SPADE  
 Lieutenant Colonel, U.S. Marine Corps  
 Executive Officer

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## APPENDIX D

## SAMPLE ENGINEER APPENDIX TO COMBAT SERVICE SUPPORT ANNEX

This is a sample engineer appendix to a combat service support annex, with supporting tabs and enclosures that may be required by a Marine amphibious force (MAF).

Appendix D. Sample Engineer Appendix to Combat Service Support Annex (MAF).

TAB A. Sample Concept of Engineer Operations, Tab.

TAB B. Sample Major Engineer Tasks, Unit Assignments, and Priorities, Tab.

TAB C. Sample Road and Bridge Plan, Tab.

TAB D. Sample Bridge Criteria, Enclosure.

TAB E. Sample Airfield Development, Tab.

TAB F. Sample Controlled Class IV Engineer Materiel, Tab.

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Appendix 7 (Engineer) to Annex P (Combat Service Support) to Operation Plan No. 1-7

Ref: (a) Maps:---  
(b) ---

Time Zone: R

Task Organization: See Annex A (Task Organization) to Operation Plan 1-7.

1. SITUATION

- a. Enemy Forces. See Annex B (Intelligence) to Operation Plan 1-7.
- b. Friendly Forces. See Operation Plan 1-7 and Appendix 1 (Operation Overlay) to Annex C (Operations) thereto.

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2. **MISSION.** Landing Force Engineer Group (TG 136.6) supports Landing Force (TF 136) in landing; facilitates the forward movement of the landing force; provides construction, rehabilitation, and maintenance of the airfield facilities; be prepared to commence work on rehabilitation of ports; performs essential engineer tasks in the area as required.
3. **EXECUTION**
  - a. **Concept of Engineer Operations.** See Tab A (Concept of Engineer Operations).
  - b. **Landing Force Engineer Group**
    - (1) On order lands over beaches and/or ports to be designated and provides general engineer support to TF 136.
    - (2) Provide construction, rehabilitation, and maintenance of airfield facilities. Tab B (Major Engineer Tasks, Unit Assignments and Priorities).
    - (3) Be prepared to commence rehabilitation and maintenance of ports on order.
    - (4) Assigned construction projects and priority therefor. See Tab B (Major Engineer Tasks, Unit Assignments, and Priorities).
  - c. **Coordinating Instructions**
    - (1) Upon establishment ashore of the landing force engineer group, routine engineer support will be provided to the landing force on a mission basis; missions to be designated.
    - (2) Command of landing force engineer group will pass to Commanding Officer, 8th Engr Spt Bn in the event that the landing force engineer becomes a casualty.
    - (3) **Roads and Bridges**
      - (a) Development of roads initially, other than those of a combat support type, will be based on the master roads priorities as established by Tab B (Major Engineer Tasks, Unit Assignments, and Priorities) and Tab C (Road and Bridge Plan).
      - (b) Use of organic bridging will be made only on order of TG 136.6.
    - (4) **Mines and Unexploded Ordnance**
      - (a) Mines and unexploded ordnance will be removed in the following following order of priority:

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## CLASSIFICATION

- 1 Area for the advance of assault elements.
- 2 Airfields and sites for airfields.
- 3 Routes of communication.
- 4 Combat service support installations.
- 5 Command post areas.
- 6 Civilian areas.

- (b) Hasty protective minefields laid for temporary local defenses may be authorized by task group commanders. Such minefields will always be removed by the unit authorizing emplacement unless otherwise directed.
- (c) Minefields other than hasty protective will not be placed in task group areas of responsibility without approval of CTG 136.2 or CTG 136.3 respectively. Upon assumption of control ashore by CTF 136, approval will be by CTF 136 in all areas of responsibility of TF 136.
- (d) Reports and records of all minefields laid will be in accordance with FM 20-32, Mine/Countermine Operations at Company Level, and II MAF Order 03480.1.
- (5) Demolitions
- (a) Major installations and facilities will be prepared for demolition. Demolitions will not be placed, but will be kept available so that they may be rapidly employed when ordered.
- (b) Installations and facilities to be prepared for demolitions include the following:
- 1 Bridges.
  - 2 Cut and fill sections on major routes.
  - 3 Airfields.
  - 4 Railroads.
  - 5 Combat service support installations.
  - 6 Utilities and water supply installations.

(6) Water Supply

- (a) CTG 136.2 and CTG 136.3 will embark sufficient water supply equipment to provide water for all units in their respective areas.
- (b) Emphasis will be placed on the location of fresh water sources so that purification methods may be used.
- (c) Existing water supply facilities will be rehabilitated and expanded as soon as possible, and as determined by the landing force engineer.

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- (7) Airfield development will be of a temporary nature, but design and location will be planned to facilitate future development. Existing airfields will be developed, repaired, and maintained in accordance with Tab D (Airfield Development).
- (8) Building construction for troop use will be of the most temporary nature.
- (9) Port rehabilitation and construction, if required, will be of a temporary nature.
- (10) Railroads, rolling stock, and locomotives uncovered will be reported to CTF 136 for such future use as required.
- (11) Camouflage of all installations will be carried out to the fullest extent possible. Vehicles and equipment will be dispersed.
- (12) Bulk fuel will be under the control of FLSP (CTG 136.5) initially; Commander, 2d FSSG (CTG 136.4) on order. Engineer support will be provided as required. See Appendix 6 (Bulk Fuel) to Annex P (Combat Service Support) to Operation Plan 1-7\_.
- (13) Mapping and survey priorities will be announced by CTF 136. Landing force engineer will direct third order ground control survey and extension thereof as required.
- (14) Indigenous labor will be utilized to the fullest extent possible. See Annex G (Civil Affairs) to Operation Plan 1-7\_.
- (15) All native construction materials uncovered will be reported to CTF 136 who will provide security for control and release the same as organic class IV.
- (16) Reports: Reports will be submitted in accordance with II MAF Order 03480.1.

4. ADMINISTRATIVE AND LOGISTICS

- a. Class IV engineer construction materials listed in Tab E will be embarked by 2d FSSG (CTG 136.4) and will be controlled by CTF 136.
- b. Major class II engineer items to be embarked by CTG 136.2 and CTG 136.3 will be approved by CTF 136.

5. COMMAND AND SIGNAL

- a. See Annex K (Communication-Electronics) to Operation Plan 1-7\_.

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b. Command Posts

- (1) Afloat - Aboard LCC-20.
- (2) Ashore - To be announced.

BY COMMAND OF LIEUTENANT GENERAL THREESTAR:

A. B. SEE  
Colonel, U. S. Marine Corps  
Chief of Staff

TABS:

- A - Concept of Engineer Operations
- B - Major Engineer Tasks, Unit Assignments, and Priorities
- C - Road and Bridge Plan
- D - Airfield Development
- E - Controlled Class IV Engineer Items.

DISTRIBUTION: See Annex Z (Distribution) to  
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TAB A

SAMPLE CONCEPT OF ENGINEER OPERATIONS TAB TO ENGINEER APPENDIX

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Tab A (Concept of Engineer Operations) to Appendix 7 (Engineer) to Annex P (Combat Service Support) to Operation Plan No. 1-7.

Time Zone: R

1. SUPPORT FOR 2D MAR DIV

- a. 2d Cbt Engr Bn lands early D-day to perform normal combat and combat support tasks.
- b. 1st Plat (Rein), 2d Bridge Company and A Co, 8th Engr Spt Bn land D-day and install Class 60 floating bridge #3 in 2d Mar Div zone. Company A commences necessary repairs as feasible on permanent bridges #7 and #4 until elements of landing force engineer group are landed and are able to assume this task.
- c. 2d Cbt Engr Bn(-) commences maintenance on MSR in accordance with priorities established in Tab B (Major Engineer Tasks, Unit Assignments, and Priorities).

2. SUPPORT FOR LANDING FORCE AVIATION

- a. Wing Engineer Squadron 27 lands early to provide general engineer support to 2d Marine Aircraft Wing.
- b. Bestwick Field. Repair all existing runways utilizing C Co, 8th Engr Bn, attached to 2d Cbt Engr Bn. Field to be operational by D+4.
- c. Davenport Field. 8th Engr Spt Bn repair and maintain as required.
- d. Banner Field. NCR-1 install partial EAF consisting of two 500' feet x 72 feet impact areas on each end of the NE-SW runway. Field to be operational D+4.
- e. Norton Field. NCR-1 install complete EAF oriented NE-SW. EAF runway will be tied in with existing facilities.

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## CLASSIFICATION

- f. Oker Field. NCR-1 repair and maintain as required.
  - g. Helicopter Operating Area. Initial area will be located at BESTWICK and should require a minimum of engineer work. Tasks will be performed by 2d Cbt Engr Bn as required.
3. SUPPORT FOR LANDING FORCE

Landing force engineer group commences landing on D+3, and will perform general engineer support tasks. As soon as possible will assume responsibility for rear area engineer tasks in zone of 2d Mar Div.

BY COMMAND OF LIEUTENANT GENERAL THREESTAR:

A. B. SEE  
Colonel, U.S. Marine Corps  
Chief of Staff

DISTRIBUTION: See Annex Z (Distribution) to Operation Plan 1-7.

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TAB B

## SAMPLE MAJOR ENGINEER TASKS, UNIT ASSIGNMENTS, AND PRIORITIES TAB TO ENGINEER APPENDIX

## CLASSIFICATION

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Tab B (Major Tasks, Unit Assignments, and Priorities) to Appendix 7 (Engineer) to Annex P (Combat Service Support) to Operation Plan NO. 1-7

Time Zone: R

1. RECAPITULATION OF TASKS WITHIN FBH

- a. Roads. (Repair and maintain), see Tab C (Road and Bridge Plan).

<u>Priority</u>	<u>Road(s)</u>	<u>Estimated Task Size</u>	<u>Unit Assigned</u>
1	ABGC, BEKJ, AE	Bn(-)	2d Cbt Engr Bn
2	CDF	Co(+)	2d Cbt EngR Bn
3	AHI	Plat(+)	8th Engr Spt Bn
4	DN	Co(-)	8th Engr Spt Bn
5	CL	Plat(+)	8th Engr Spt Bn
6	FG (Secondary)	Co(-)	NCR-1
7	AB (Secondary)	Co(-)	NCR-1
8	HI (Secondary)	Co(-)	NCR-1
9	KLMN (Secondary)	Co	NCR-1

- b. Railroads. (Initiate repair of track between Highway 721 and Highway 22. NCR-1 on order Co(+).)

- c. Bridges. See Tab C (Road and Bridge Plan).

<u>Priority</u>	<u>Bridge</u>	<u>Estimated Task Size</u>	<u>Unit Assigned</u>
1	3, 7, 4	Co(+)	2d Cbt Engr Bn
2	8*	Co(+)	8th Engr Spt Bn
3	2, 1	Co(-)	8th Engr Spt Bn
4	18	Plat(+)	8th Engr Spt Bn
5	6	Co(-)	8th Engr Spt Bn

(\*Initially install and operate three ferries.)

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## CLASSIFICATION

d. Airfield and Helicopter Operating Areas

<u>Priority</u>	<u>Field</u>	<u>Estimated Task Size</u>	<u>Unit Assigned</u>
1	Banner (Install partial EAF Bestwick (Repair and maintain)	Co	NCR-1
2	Norton (Install EAF)	Bn	NCR-1
3	Oker (Repair and maintain)	Co (+)	NCR-1
4	Davenport (Repair and maintain)	Co	8th Engr Spt Bn

BY COMMAND OF LIEUTENANT GENERAL THREESTAR:

A. B. SEE  
 Colonel, U.S. Marine Corps  
 Chief of Staff

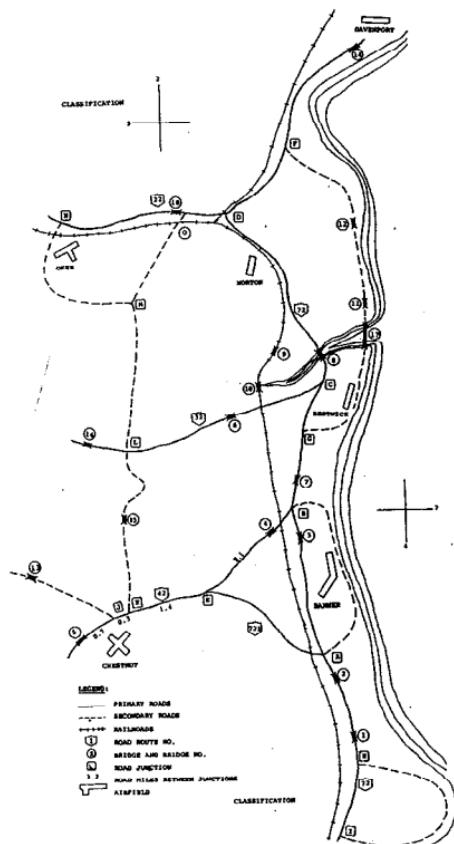
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TAB C

SAMPLE ROADS AND BRIDGE PLAN TAB TO ENGINEER APPENDIX



## CLASSIFICATION

II MAP (77 136)  
NORFOLK, VIRGINIA 23511  
169800 February 1971  
KB 923

Tab C (Roads and Bridge Plan) to Appendix 7 (Engineer Annex) to Annex P (Combat Service Support) to Operation Plan No. I-7.

MRI

Time zone: 8

- 1. ROADS**
    - a. All primary roads are all-weather asphalt surfaced with 24-foot travelway.
    - b. Secondary roads are generally restricted to use by wheeled vehicles to dry weather.
    - c. All HSR's will be rehabilitated on a priority one (1) basis with work on alternates to be accomplished on order of CTF 136.
  - 2. BRIDGES**
    - a. Bridges in the area are generally of class 35 plus; for details see Enclosure 1 to Tab C.
    - b. Local Materials will be utilized to the maximum in repair and reinforcement of bridges.

BY COMMAND OF LIEUTENANT GENERAL THREESTAR.

A. B. SEE  
Colonel, U.S. Marine Corps  
Chief of Staff

Enclosure 1 - Bridge Criteria

DISTRIBUTION: Annex Z (Distribution) to Operation Plan 1-7

Page number

## **CLASSIFICATION**

Tab C to App B

## CLASSIFICATION

II MAF  
NORFOLK, VIRGINIA 23511  
160800 February 197-  
LB 1156

Enclosure 1 (Bridge Criteria) to Tab C (Road and Bridge Plan) to Appendix 7 (Engineer) to Annex P (Combat Service Support) to Operation Plan No. 1-7

Map:

Time Zone: R

BRIDGE NUMBER	TYPE CONSTRUCTION	LENGTH	OVER	ROAD CLR	VERT CLR	DESIGN LOADING	CRITICAL SPAN	EST CLASS
1	K Deck & Girder	93'6"	Storm Crk	37'	UNLTD	H-20	31'6"	35 T
2	-do-	-do-	Wide Crk	37'	-do-	H-20	-do-	35 T
3	-do-	875'	Black Birch R (E Chnl)	28'	-do-	H-20	35'	36 T
4	-do-	735'	Black Birch R (W Chnl)	28'	-do-	H-20	35'	36 T
5	sb & K	350'6"	S.W. br	28'	-do-	H-20	35'	36 T
6	K Deck & Girder	350'	Norton River	37'	-do-	H-15	35'	27.5 T
7	Unknown	Unk	Jack's Crk	28' est	-do- est	H-15 est	Unk	Unk
8	sb w/st swing (172') span (estimated)	1610'	Norton River	28' est	15'2" est	H-15 est	Unk	Unk
9	K Deck & Girder	252'7"	Red Crk	26"	UNLTD	H-15	51'3"	29 T
10	-do-	770'	Norton River	37'	-do-	H-15	35'	27.5 T
11	-do-	127'	Candy Crk	26'	-do-	H-15	42'6"	28 T
12	-do-	97'	Lion Swamp	26'	-do-	H-15	32'6"	27 T
13	-do-	149'6"	S.W. br	26'	-do-	H-15	37'6"	27.5 T
14	K Deck & Girder	112'	Shallow Crk	26'	UNLTD	H-15	37'6"	27.5 T
15	-do-	112'	Black Birch	26'	-do-	H-15	37'6"	27.5 T
16	K Deck & Girder & st swing span	234'	Trout River	20'	-do-	H-15	125'	Unk
17	Cont. sb & st Swing span	540'	Pepper River	28'	15'2"	H-15	220'	Unk
18	-do-	176'	Trout River	28'	15'2"	H-15	220'	Unk

BY COMMAND OF LIEUTENANT GENERAL THREESTAR:

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Colonel, U.S. Marine Corps  
Chief of Staff

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Page number

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SAMPLE BRIDGE CRITERIA ENCLOSURE TO ROADS AND BRIDGE PLAN TAB  
TO ENGINEER APPENDIX

TAB D

APP. D

FMMFM 4-4

TAB E

SAMPLE AIRFIELD DEVELOPMENT TAB TO ENGINEER APPENDIX

CLASSIFICATION

Copy no.        of        copies  
II MAF (TF 136)  
NORFOLK, VIRGINIA 23511  
160800 February 19         
JB 1045

Tab D (Airfield Development) to Appendix 7 (Engineer) to Annex P (Combat Service Support) to Operation Plan No. 1-7       

Ref: (a) NAVDOCK TP-PD-5, Planning Advanced Naval Bases  
(b) NWP 11-23, Civil Engineer Support Planning

Time Zone: R

1. REPAIR OF EXISTING FIELDS

- a. All existing fields and facilities will be used to the maximum extent possible without major modification.
- b. Only emergency repairs or modifications to runways, taxiways, and hardstands will be made and then only airfield matting and/or local construction materials will be used.

2. CONSTRUCTION OF NEW FIELDS

- a. New airfield construction, if required and ordered, will be in accordance with criteria for advanced base airfields as established in reference (a), in general:
  - (1) Fields will be 9000 feet in length or extendible to 9000 feet by 150 feet width.
  - (2) Maximum grade will not exceed 1 percent.
  - (3) Changes in grade will not exceed 0.3 percent in 100 feet.
  - (4) End zones will be cleared to provide a 40:1 glide angle.
  - (5) The area 500 feet on each side of the runway centerline will be cleared and grubbed.

3. EAF

- a. Priority of construction and facilities planned, see Tab B (Major Engineer Tasks, Unit Assignments, and Priorities).

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## CLASSIFICATION

- b. Typical plan for finished EAF, see Enclosure 1. Minimum short airfield configuration, see Enclosure 2.

4. HELICOPTER FACILITIES

- a. Helicopter landing zones will be so constructed as to allow for maximum dispersion of aircraft.
- b. Landing pads on the basis of one per two aircraft will be constructed using matting, advance multipurpose surfacing system (AMSS), MOMAT, and/or local construction material.

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Colonel, U.S. Marine Corps  
Chief of Staff

DISTRIBUTION: See Annex Z (Distribution) to Operation Plan No. 1-7.

ENCLOSURES:

- 1 - EAF Diagram (omitted)  
2 - Minimum Short Airfield Configuration (omitted)

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TAB F

SAMPLE CONTROLLED CLASS IV ENGINEER MATERIEL TAB  
TO ENGINEER APPENDIX

CLASSIFICATION

III MAF (TF 136)  
NORFOLK, VIRGINIA 23511  
160800 February 19  
SF 1157

Tab E (Controlled Class IV Engineer Items) to Appendix 7 (Engineer) to  
Annex P (Combat Service Support) to Operation Plan No. 1-7

Time Zone: R

Airfield Matting, AM2, 15,525 cu. ft.; 1,522.5 S.T.; 602,500 sq. ft.

NOTE: Maximum use of all local construction materials available will be  
made.

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Colonel, U.S. Marine Corps  
Chief of Staff

DISTRIBUTION: See Annex Z (Distribution) to Operation Plan No. 1-7

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## APPENDIX E

## SAMPLE ROAD RECONNAISSANCE REPORT

ROAD RECONNAISSANCE REPORT  
(FM 3-5)

DATE 15 August, 78

TO: (Headquarters ordering reconnaissance)

S-2, 2d ENGINEER BN.

FROM (Name, grade and unit of officer or NCO making reconnaissance)  
1st Lt. Ted Martin, A Co, 2d Engr BN.

MAPS #. COUNTRY S. SCALE

YKCUTORAC 1:50,000

C. SHEET NUMBER OF MAPS  
Sheet 3456  
1 SE AMS V7892. DATE/TIME GROUP  
(Or signature)  
151830 R

## SECTION I - GENERAL ROAD INFORMATION

3. ROAD GRID REFERENCE FROM 298805	TO 260790	4. ROAD MARKING (Civilian or Military number of road) 42	5. LENGTH OF ROAD (Miles or kilometers, specify) 4.5 miles
6. WIDTH OF ROADWAY (Feet or meters, specify) 14 - 22 feet		7. WEATHER DURING RECONNAISSANCE (Include last rainfall, if known) Warm, humid, 80° Last rain 14 August, 78	
7. RECONNAISSANCE DATE 15 August, 78 TIME 1300 - 1600			

## SECTION II - DETAILED ROAD INFORMATION (When circumstances permit more detailed information will be shown in an overlay or on the mileage chart on the reverse side of this form. Standard symbols will be used.)

9. ALIGNMENT (Check one ONLY)	10. DRAINAGE (Check one ONLY)
<input checked="" type="checkbox"/> (1) FLAT GRADIENTS AND EASY CURVES	<input checked="" type="checkbox"/> (1) ADEQUATE DITCHES, CROWN/CAMBER WITH ADEQUATE CULVERTS IN GOOD CONDITION
<input type="checkbox"/> (2) STEEP GRADIENTS (Excess of 7 in 100)	<input type="checkbox"/> (2) INADEQUATE DITCHES, CROWN/CAMBER OR CULVERTS. ITS CULVERTS OR DITCHES ARE BLOCKED OR OTHERWISE IN POOR CONDITION
<input type="checkbox"/> (3) SHARP CURVES (Radius less than 100 ft (30m))	
<input type="checkbox"/> (4) STEEP GRADIENTS AND SHARP CURVES	
11. FOUNDATION (Check one ONLY)	
<input checked="" type="checkbox"/> (1) STABILIZED COMPACT MATERIAL OF GOOD QUALITY	<input checked="" type="checkbox"/> (1) UNSTABLE, LOOSE OR EASILY DISPLACED MATERIAL
12. SURFACE DESCRIPTION (Complete Items 12a and b)	
13. THE SURFACE IS (Check one ONLY)	
<input checked="" type="checkbox"/> (1) FREE OF POTHOLE, BUMPS, OR RUTS LIKELY TO REDUCE CONVOY SPEED	<input checked="" type="checkbox"/> (2) BUMPY, RUTTED OR POTHOLED TO AN EXTENT LIKELY TO REDUCE CONVOY SPEED
14. TYPE OF SURFACE (Check one ONLY)	
<input type="checkbox"/> (1) CONCRETE	<input type="checkbox"/> (6) WATERSBOUND MACADAM
<input type="checkbox"/> (2) BITUMINOUS (Specify type where known):	<input type="checkbox"/> (7) GRAVEL
<input type="checkbox"/> (3) BRICK (Pave)	<input checked="" type="checkbox"/> (8) LIGHTLY METALLIC
<input type="checkbox"/> (4) STONE (Pave)	<input type="checkbox"/> (9) NATURAL OR STABILIZED SOIL, SAND, CLAY, SHELL, CINDER, DISINTEGRATED GRANITE, OR OTHER SELECTED MATERIAL
<input type="checkbox"/> (5) CRUSHED ROCK OR CORAL	<input type="checkbox"/> (10) OTHER (Describe):

## SECTION III - OBSTRUCTIONS (List in the columns below particular obstacles which affect the traffic capacity of a road. If information of any factor cannot be ascertained, insert "NOT KNOWN".)

- (a) Overhead obstructions, less than 14 feet or 4.35 meters, such as telephone, bridges, overhead wires and overhanging buildings.
- (b) Reductions in road widths which limit the traffic capacity, such as curves, narrow bridges, archways, and buildings.
- (c) Excessive gradients (Excess 7 in 100).
- (d) Curves less than 100 feet (30 meters) in radius.
- (e) Fords

SERIAL NUMBER	PARTICULARS	GRID REFERENCE	REMARKS
1	RR embankment needs repair	[B] to RR	no fill available
2	Bridge needs minor repair	RR to (4)	est. 15 T capacity
3	OK	(4) to [E]	
4	OK	[E] to [K]	
5	Bomb crater	[K] to [J]	fill material available
6	Bridge appears unsafe	[J] to (5)	major repair required

DA FORM 1 JUL 60 1248 PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

SAMPLE ROAD RECONNAISSANCE REPORT (Continued)

SECTION IV - MILEAGE CHART

FROM	ROUTE	SCALE	DATE
[B] INTERSECT 72 + 42	TO Bridge (5)	$\frac{3}{4}": 1 \text{ mile}$	15 August, 78
ROAD INFORMATION		ROAD INFORMATION	
		MILES 10	KILOMETERS
		10 9 8 7 6 5 4 3 2 1	
A 14/16 ft. A 16/18 ft. A 22 ft. A 18/22 ft. A 18/22 ft.		4.5 3.8 3.5 2.1 0.50 0.35	
		Bridge (5) 14 ft. Roadway Hwy 721 [E] Intersection Road [J] Intersection Road [K] Intersection	
		Hwy 72 [B] Intersection Bridge (4) 18 ft. Roadway RR Xing	

## APPENDIX F

## FORMAT OF AN ENGINEER SITUATION REPORT

## CLASSIFICATION

Copy no.        of        copies11th Engineer Support Battalion  
DateEngineer Situation Report No.        for Period                          to                          19            
Date/Time      Date/Time/Mo.      Yr.Ref:     (a) Map:  
          (b)  
          (c)1. Enemy Information.2. Engineer Personnel.3. Engineer Difficulties.4. Weather.5. Operations.

<u>Project Number</u>	<u>Description</u>	<u>Location</u>	<u>Starting Time/Date</u>	<u>Percent Completed</u>	<u>Estimated Time/Date Completion</u>
-----------------------	--------------------	-----------------	---------------------------	--------------------------	---------------------------------------

Page number

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## CLASSIFICATION

6. Equipment Status.

a. Items Deadlined	Reason	
b. Equipment attached and detached during last 24 hours		
c. POL Status		
<u>Item</u>	<u>Quantity on Hand</u>	<u>Quantity Required Next 24 Hours</u>

7. Construction Material.

<u>Project Number</u>	<u>Item &amp; Quantity on Hand</u>	<u>Required Next 24 Hours</u>	<u>Required for Completion By</u>
-----------------------	------------------------------------	-------------------------------	-----------------------------------

8. Engineer Intelligence Information.9. General Engineer Comments.10. Command Post Location if Changed from Last Report.

Signature  
Grade and Billet

Page number

CLASSIFICATION

INSTRUCTIONS FOR COMPLETION OF ENGINEER SITUATION REPORTHeading

Reports will be numbered consecutively by each unit during the calendar year, each covering the 24-hour period indicated.

The map reference will be included on all reports. Other references may be included as required.

1. Enemy Information

Report enemy information which is relevant to engineer operations. Information in this paragraph may be of intelligence and/or historical value.

2. Engineer Personnel

Report attachments and detachments effected during the reporting periods as well as casualties, noneffectives, and other personnel matters of importance. The term, engineer personnel, means personnel organic to the engineer unit, without regard to MOS.

3. Engineer Difficulties

Report all difficulties which have a bearing on engineer operations.

4. Weather

A general statement is desired as to weather conditions during the period of the report. An example would be "Showers with temperature in high 90's during day, slightly cooler during hours of darkness."

5. Operations

- a. Project Number. Projects assigned by battalion will be designated by number such as 10-70, indicating the 10th project assigned during 1970. Projects originated by a company will be designated in the same manner but prefixed with the company letter designation, such as A8-70, the 8th project initiated by Company A during 1970.
- b. Description. A short description of the project such as bridge construction, minefield clearance, road construction, etc.
- c. Location. Enter the coordinates of each project.
- d. Starting Time/Date. Enter the time and date that each project was initiated.
- e. Percent Completed. Enter an estimate of the percentage of the overall project completed.
- f. Estimated Time/Date of Completion. Include on each report the estimated time and date of completion for each project. This entry should be reevaluated for each reporting period to provide the best possible estimate.

- g. Continuation Sheet. When the operations block does not provide sufficient space, attach continuation sheets, 1-A, 1-B, etc., as required.

**6. Equipment Status**

- a. List all items of equipment--engineer, motor transport, and communication--which have been deadlined during the reporting period and indicate the reason for each item.
- b. List all items of equipment which have been attached or detached during the reporting period.
- c. List the status of POL's by item.

**7. Construction Materials**

List the status of critical construction materials as indicated by project number.

**8. Engineer Intelligence**

Report all items of engineer intelligence which have been collected during the reporting period.

**9. General Engineer Comments**

Report any items deemed appropriate, but not included in other paragraphs.

**10. Command Post**

Only report changes of command post locations to indicate the last location during the reporting period.

**11. Signature**

This report will be signed by the unit commander or his authorized representative. The signature block will include rank or rate and job title.

**12. Classification**

When this report contains classified information, the report will be appropriately classified.

**13. Appendices**

Appendices will be attached as required when sufficient space is not available on the form to report desired information.

## APPENDIX G

## SAMPLE FRAGMENTARY ENGINEER SITUATION REPORT

CLASSIFICATION	PRECEDENCE		<input type="checkbox"/> SEND MOD CLEAR	<input type="checkbox"/> SEND CLEAR
FROM:			TO:	
Co "C" CO TRAC ENGR Sit Report A Subject B Location C Time D Action Desired E Action Taken				
DAY 15	MONTH SEPT	YEAR 78	TIME SIGNED 1800	SIGNATURE AND RANK OF RELEASER C.C. DELOMBAG
COMMUNICATIONS CENTER USE ONLY		COMM CENTER OR RELEASER USE (INSTR-11)		
TIME FILED	COMM CEN NO.		HOW SENT	DATE-TIME GROUP

This format is prescribed to reduce the amount of information that must be transmitted, to ensure complete information reaching higher headquarters and to decrease the possibility of misunderstandings.

Line A will indicate the subject of the Frag Sit Report such as an enemy minefield, construction project, or demolition project.

Line B is the location of the subject if it needs to be reported to increase the understanding of the subject. When the subject is a construction project that has previously been reported or a location that is known, line B may read N/A.

Line C is the time which is germane to the subject, such as the time an enemy minefield is located or the time a project is completed. It is not the time that the message is sent.

Line D is the action that is desired or the support that is requested. As an example, fuel that is urgently needed.

Line E is the action that has been taken by the sender or sending unit. An example would be completion of a project.

Any line that does not apply to the report will read N/A.



## APPENDIX H

FORMAT TO BE USED FOR REPORTING ENGINEER INFORMATION IN THE FIELD  
(STANAG 2096)

Information as to originator, addressee, security classification, precedence, date, time, etc., as provided on a standard message form is to be provided in written reports as well as messages. Radio messages should commence with a word such as "ENGREP" (Engineer Report). Each written report or message commences with the identification of the map sheet(s) referred to in the reconnaissance and time of collection of information. Each location reported is to be followed by the respective UTM map coordinates.

A. FRIENDLY MINEFIELD(S) \*1. First Friendly Minefield in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. NATO classification of minefield - as detailed in STANAG No. 2036 (hasty protective, deliberate protective, tactical, point, interdiction, or phony).
- d. Type of minefield: antitank, antipersonnel, or mixed.
- e. Grid reference (GR) of minefield extremities.
- f. Number of strips laid.
- g. Depth of minefield.
- h., i., j., etc. Grid references of lanes (entry, exit) and width of lanes in meters.

2. Second Friendly Minefield

- a. through h., etc., same as above.

3., 4., etc. Additional Friendly Minefields. Reported as above.B. ENEMY MINEFIELD(S) AND/OR UNIDENTIFIED MINEFIELD(S) NOT LAID BY REPORTING UNIT1. First Enemy Minefield in Report

- a. Map sheet(s).
- b. Date and time of collection of information.

\* This report does not take the place of the detailed minefield record which is mandatory in accordance with STANAG No. 2036.

- c. Type of minefield: antitank, antipersonnel, or mixed.
- d. Grid references of minefield extremities.
- e. Depth of minefield.
- f. Enemy weapons or surveillance bearing on the minefield, if any.
- g. Estimated time required to clear the minefield.
- h. Estimated material and equipment required to clear the minefield.
- i. Routes of bypassing the minefield, if any.
- j., k., l., etc. Grid references of lanes (entry, exit) and width of lanes in meters.
- z. Any other information which could be provided, such as types of mines used, new mine or boobytrap types.

2. Second Enemy Minefield in Report

- a. through z. Same as above.

3., 4., etc. Additional Enemy Minefields. Reported as above.

C. ROAD(S) CLOSED \*

1. First Road in Report

- a. Map sheet(s).
- b. Data and time of collection of information.
- c. From grid references.....) or show on trace.
- d. To grid reference.....) or overlay.
- e. Reason for closing of road. \*\*
- f. Estimated duration.
- g. Detour from.....to.....including, if possible, class of road, or at least the following information: width of road, smooth or rough surface, gradual or sharp curves, gentle or steep grades.

---

\* Paragraphs C and D apply ONLY to major axial or lateral routes, classification of roads to be given in respect of weakest part of section of road under report; i.e., the class of the route may be restricted by low class of bridge.

\*\* The reason for closing of road should be the nature of the obstacle; i.e., bridge blown at grid reference, mines at grid reference, road made unusable through constant heavy traffic, etc.

- h. Cross-country bypass permitted....(wheeled or tracked vehicles and class).
- i. Any other information which could be provided, such as class of road after reopening and characteristics of the road, to include information on shoulders.

2., 3., etc. Additional Roads. Reported as above.

D. ROAD(S) OPENED \*

1. First Road in Report

- a. Map sheet(s).
- b. Date and time the road is opened.
- c. From grid reference.....) or show on trace.
- d. To grid reference.....) or overlay.
- e. Class of road and characteristics of the road, to include information on shoulders.
- f. Minimum widths.

2., 3., etc. Additional Roads. Reported as above.

E. ENEMY DEMOLITION(S)

1. First Enemy Demolition in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid reference or trace).
- d. Type of target destroyed.
- e. Size of the gap.
- f. Possible bypass routes, time, and facilities (personnel and materials) required for buildup of bypass (if possible).
- g. Any other information which could be provided, such as local availability of construction or repair materials, material requirements, work required in man-hours.
- h. Enemy weapons or surveillance bearing on the demolition, if any.

2., 3., etc. Additional Enemy Demolitions. Reported as above.

\* Paragraphs C and D apply ONLY to major axial or lateral routes, classification of roads to be given in respect of weakest part of section of road under report; i.e., the class of the route may be restricted by low class of bridge.

F. FRIENDLY DEMOLITION(S) (See STANAG No. 2017)1. First Friendly Prepared Demolition in Report

- a. Map sheet(s).
- b. Presumed date and time of demolition.
- c. Location (grid reference or trace). \*
- d. Type of target to be destroyed. \*
- e. Estimated size of the gap.
- f. Possibilities of bypassing.
- g. Time in man-hours, personnel, and facilities required to complete the preparation of the demolition.

2.-19. Additional Friendly Prepared Demolitions. Reported as above.

20. First Executed Demolition in Report

- a. Map sheet(s).
- b. Date and time of execution.
- c. Location (Grid references or trace). \*
- d. Type of target destroyed. \*
- e. Size of the gap.
- f. Possibilities of bypassing.
- g. Any other information which could be given, such as estimated time in man-hours required for buildup of bypass and facilities required for repair work.

21., etc. Additional Executed Demolitions. Reported as above.

G. BRIDGE(S) \*\*1. First Bridge in Report

- a. Map sheet(s).
- b. Date and time of collection of information.

---

\* Location and type of target destroyed are to be referred to by Bridge Demolition Schedule Code Number wherever possible.

\*\* Information is recorded in this part only when the bridge is first reconnoitered or when it has been altered by enemy or own action. Alterations may be either strengthening or weakening of the bridge(s).

- c. Location (grid references or trace).
- d. Type of bridge (number of spans, length, etc.).
- e. Class.....one-way traffic.
- f. Class.....two-way traffic.
- g. Condition.
- h. Clearance width for the passage of vehicles.
- i. Clearance height for the passage of vehicles.
- j. Possible bypass route.
- k. Any other information which could be given.

2., 3., etc. Additional Bridges. Reported as above.

H. FERRY SITE(S)

1. First Site in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Minimum class of approach.
- e. Possibilities for concealment or cover.
- f. Width of the river.
- g. Depth of water at the banks, including tidal information.
- h. Stream velocity.
- i. Maximum slope on bank approaches and bank conditions.
- j. Parking areas for road and water transport.
- k. Any other information which could be given, such as maximum number of rafts for which site is usable, work required in man-hours for preparation of approach routes, and present water gauge reading if available.

2., 3., etc. Additional Sites. Reported as above.

I. FORD(S)

1. First Ford in Report

- a. Map sheet(s).

- b. Date and time of collection of information.
  - c. Location (grid references or trace).
  - d. Minimum width.
  - e. Maximum depth.
  - f. Stream velocity.
  - g. Type of bottom.
  - h. Maximum slope of bank approaches and bank conditions.
  - i. Class of approach routes.
  - j. Rise and fall of water level.
  - k. Any other information which could be given, such as class of traffic for which ford is usable, and, if possible, seasonal limiting factors.
- 2., 3., etc. Additional Fords. Reported as above.

J. TUNNEL(S)

- 1. First Tunnel in Report
  - a. Map sheet(s).
  - b. Date and time of collection of information.
  - c. Location (grid references or trace).
  - d. Length.
  - e. Width.
  - f. Height.
  - g. Gradient.
  - h. Type of tunnel.
  - i. Condition.
  - j. Possible bypass routes including classification.
  - k. Any other information which could be given, if possible, cross-section.

2., 3., etc. Additional Tunnels. Reported as above.

K. INSTALLATION(S)

- 1. First Installation in Report
  - a. Map sheet(s).

- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Nature.
- e. Capacity, including capacity as shelter or storage.
- f. Condition.
- g. Any other information which could be given.

2., 3., etc. Additional Installations. Reported as above.

L. ROAD MAKING EQUIPMENT. (To cover static and mobile mechanical equipment)

1. First Road Making Equipment in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Type.
- e. Number.
- f. Condition.
- g. Any other information which could be given.

2., 3., etc. Additional Road Making Equipment. Reported as above.

M. LOCAL RESOURCES. (To include quarries, sawmills, brickworks, etc.)

1. First Item in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Type.
- e. Quantity of stock.
- f. Capacity and output per day.
- g. Any other information which could be given.

2., 3., etc. Additional Items. Reported as above.

N. ENEMY STORES AND EQUIPMENT. This part is only suitable for the initial reporting of significant items of equipment. Subsequent action should be taken in accordance with agreed procedures for handling of captured enemy equipment (STANAG No. 2084).

1. First Item in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Type.
- e. Quantity.
- f. Condition.
- g. Any other information which could be given.

2., 3., etc. Additional Items. Reported as above.

O. WATER SUPPLY POINTS

1. First Water Supply Point in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Type (well, spring, watercourse, lake or pond).
- e. Rate of delivery of water.
- f. Total quantity of water available in sources and description of water in source; i.e., brackish, clear, etc.
- g. Existing pump, storage, filtration, and distribution facilities.
- h. Accessibility (to include road network).
- i. Natural cover (vegetation) and concealment possibilities.
- j. Any other information which could be given.

2., 3., etc. Additional Water Supply Points. Reported as above.

P. AIRSTRIPO(S)

1. First Airstrip in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Dimensions.

- e. Type and condition of airstrip.
- f. Access by road.
- g. Feasibility of runway extension.
- h. Any other information which could be given, such as work required in man-hours to make the airstrip serviceable for sustained or limited operations.

2., 3., etc. Additional Airstrips. Reported as above.

Q. AIRFIELDS

1. First Airfield in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Number of runways (length and width).
- e. Orientation of the runways.
- f. Type and surface of runways.
- g. Condition of the runways.
- h. Hangars and bulk fuel storage facilities, including condition.
- i. Parking area for the aircraft.
- j. Maintenance facilities.
- k. Access by road.
- l. Any other information which could be given, such as type of aircraft admissible.

2., 3., etc. Additional Airfields. Reported as above.

R. DAMS and/or SLUICES

1. First Dam and/or Sluice in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Type of dam and/or sluice.
- e. Dimensions of dam and/or sluice.

- f. Condition.
- g. Any other information which could be given, such as possibility of inundation, work required in man-hours to bring about the inundation.

2., 3., etc. Additional Dams and/or Sluices. Reported as above.

S. OBSTACLES

1. First Obstacle in Report

- a. Map sheet(s).
- b. Date and time of collection of information.
- c. Location (grid references or trace).
- d. Type.
- e. Enemy weapons having action on the obstacle, if any.
- f. Any other information which could be given, such as work required in man-hours to take the obstacle away.

2., 3., etc. Additional Obstacles. Reported as above.

T. TERRAIN

1. First Area in Report

- a. Map sheet and grid reference.
- b. Shape of ground; i.e., flat, rolling, hilly, mountainous, etc.
- c. Cross-country movement.
- d. Vegetation.
- e. Concealment.
- f. Land use.
- g. Suitability of the soil for digging.

2., 3., etc. Additional Areas. Reported as above.

U. BRIDGE SITES

1. First Bridge Site in Report

- a. Map sheet.
- b. Date and time of collection of information.
- c. Location (grid references or trace).

- d. Width of gap at bankseats.
  - e. Width at water level.
  - f. Rise and fall of water level and change in wet gap width.
  - g. Velocity of current.
  - h. Nature of bottom.
  - i. Height of near bank above water level.
  - j. Height of far bank above water level.
  - k. Safe bearing pressure of soil.
  - l. Description of work required on approaches, near and far banks.
  - m. Possible local areas for concealing bridging equipment.
- 2., 3., etc. Additional Bridge Sites. Reported as above.

V. AIR LANDING SITES

- 1. First Air Landing Site in Report
  - a. Map sheet.
  - b. Date and time of collection of information.
  - c. Location (grid references or trace).
  - d. Runway:
    - (1) Bearing.
    - (2) Length and width.
    - (3) Gradients exceeding standards laid down.
    - (4) Rough appraisal of earth work.
    - (5) Feasibility of runway extension.
  - e. Drainage.
  - f. Major obstacles to flying:
    - (1) Within the approach zone.
    - (2) Outside the approach zone but within 5 miles.
  - g. Type of soil.
  - h. Whether suitable area for dispersals can be found.

- i. Local resources.
  - j. Approach roads.
- 2., 3., etc. Additional Air Landing Sites. Reported as above.

## APPENDIX I

## SAMPLE BARRIER PLAN

(Barrier plans are normally prepared at the MAF level.)

## CLASSIFICATION

Copy no. \_\_\_\_\_ of \_\_\_\_\_ Copies  
 2d MarDiv (Rein)  
 AUGUSTA BAY, SICILY  
 020600H November 19  
 ZKY-4

Appendix 11 (Barrier) to Annex C (Operations) to OPPLAN 1-7

Ref: (a) Maps: Kythrea, 1:50,000, Series K711  
 (b) DO 4000.3 (SOP For Engineer Operations)

Time Zone: H

1. SITUATION

a. Enemy Forces. See Annex B (Intelligence) to Operation Plan No. 1-7.

b. Friendly Forces

(1) See Operation Plan 1-7.

(2) 8th Engineer Support Battalion (-), Direct Support,  
 2d Marine Division.

c. Assumptions

(1) All streams generally are fordable, but only with difficulty.

(2) A labor force of approximately 500 civilians will be available to assist in the construction of barrier systems.

2. MISSION

Division prepares barrier system to impede enemy movement in assigned sector, to inflict casualties on enemy, and to stop enemy in zone.

3. EXECUTIONa. Concept of Operation

(1) Division employs barriers to facilitate accomplishment of assigned mission.

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- (2) The barrier system along the GOP and the existing friendly works are designed to disorganize, deceive, and delay the enemy.
- (3) Tab A, Division Barrier Location Concept, indicates the general trace of division-required barriers, including mine-fields, gaps, and lanes. Unless otherwise specified, barriers will be constructed in the following order of priority:
- (a) Covering barrier.
  - (b) Forward barrier.
  - (c) Intermediate barriers.
- (4) Flank barriers will be constructed by II MAF.
- (5) Rear barrier will be constructed by II MAF.

b. 2d Marines:

<u>BARRIER/TARGET</u>	<u>COORD</u>	<u>PRIORITY</u>	<u>REMARKS</u>
D-E-F			Forward Barrier
Tgt 1-XX-31MF	168015-180023	1	8th Engr Spt Bn
Tgt 1-XX-32MF	183028-193042	2	(D.S.) will site,
Tgt 1-XX-34MF	205044-225055	3	mark and record
E-J		4	minefields.
			Intermediate Barrier

c. 6th Marines:

<u>BARRIER/TARGET</u>	<u>COORD</u>	<u>PRIORITY</u>	<u>REMARKS</u>
F-G-H			Forward Barrier
Tgt 1-XX-35MF	235065-243066	1	8th Engr Spt Bn
Tgt 1-XX-36MF	261068-267073	2	(D.S.) will site,
Tgt 1-XX-39MF	295075-308072	3	mark, and record
Tgt 1-XX-42MF	307059-307052	4	minefields.
F-K			Intermediate Barrier
G-L			Intermediate Barrier

d. 2d Combat Engr Bn:

<u>BARRIER/TARGET</u>	<u>COORD</u>	<u>PRIORITY</u>	<u>REMARKS</u>
A-B		1	Integrate existing Barrier Targets #1 through #29 into covering barrier in coordination with GOP force.

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E-J	2	Provide assistance to 2d Mar.
F-K	3	Provide assistance to 6th Mar.
G-L	4	Provide assistance to 6th Mar.
Tgt 1-XX-80MF      304864-305838	5	Coord with Div Res.

e. Coordinating Instructions

- (1) 8th Engineer Support Battalion (-), is in direct support of 2d Marine Division. This support, at present, will encompass the installation of minefields along the FEBA as follows:

<u>BARRIER/TARGET</u>	<u>COORD</u>	<u>PRIORITY</u>	<u>REMARKS</u>
Tgt 1-XX-31MF		1	Coord with 2d Mar.
Tgt 1-XX-32MF		2	Coord with 2d Mar.
Tgt 1-XX-34MF		3	Coord with 2d Mar.
Tgt 1-XX-35MF		4	Coord with 6th Mar.
Tgt 1-XX-36MF		5	Coord with 6th Mar.
Tgt 1-XX-39MF		6	Coord with 6th Mar.
Tgt 1-XX-42MF		7	Coord with 6th Mar.

and LOC maintenance, as directed.

- (2) Request authority for additional lanes and gaps.
- (3) Close gaps and lanes on Division order.
- (4) Toxic chemical contaminants (except napalm) NOT authorized.
- (5) On order, upon withdrawal of GOP, GOP force commander execute barrier targets within Security Area.
- (6) One engineer will be at ALL unexecuted demolition targets AT ALL TIMES if demolitions are in place.
- (7) Barrier construction will begin on order. Improvement of barrier systems will continue during occupancy of the battle area.
- (8) Report change of status of targets to Division immediately.
- (9) Do NOT distribute complete barrier plans below Regiment; appropriate extracts are authorized as far forward as Bn CP's.
- (10) All BRIDGE targets will be dual primed electrically.
- (11) All CRATER targets will be dual primed nonelectrically.
- (12) Tab A, Barrier Location Concept.

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(13) Tab B, Demolitions.

4. ADMINISTRATIVE AND LOGISTICS

- a. Annex P (Combat Service Support) to Operation Plan No. 1-7\_.
- b. Exploit civilian labor to maximum. Labor force will be picked up daily and delivered to engineer units. See details on transportation, messing, and billeting of civilians in Annex P (Combat Service Support) to Operation Plan No. 1-7\_.
- c. Civilian laborers may handle explosives but will not arm mines, prime explosive charges, or be employed in any task involving potential danger. Upon the commencement of hostilities, civilians will be moved to the rear.

5. COMMAND AND SIGNAL

- a. Annex K (Communications-Electronics)

b. Reports

- (1) Minefields: report intent, initiation, and completion by fastest secure means available; follow with standard minefield reports.
- (2) Demolitions and other obstacles: report location, types, completion time, and execution (démolitions).

## ACKNOWLEDGE RECEIPT

BY COMMAND OF MAJOR GENERAL PICK

A. B. ZEE  
Colonel, U.S. Marine Corps  
Chief of Staff

TAB:

A - Overlay, Barrier Location Concept (omitted)  
B - Demolitions (omitted)

DISTRIBUTION: Annex Z (Distribution) (omitted)

Page number

CLASSIFICATION

## LIST OF REFERENCES

## 1. JOINT PUBLICATIONS

JCS Pub 1, Department of Defense Dictionary of Military and Associated Terms  
 FM 31-11/NWP 22( )/AFM 2-53/LFM 01, Doctrine for Amphibious Operations  
 FM \_\_/NWP \_\_/AFM \_\_/LFM 02, Doctrine for Landing Forces

## 2. FLEET MARINE FORCE MANUALS

FMFM 2-1, Intelligence  
 FMFM 3-1, Command and Staff Action  
 FMFM 3-3, Helicopterborne Operations  
 FMFM 4-1, Combat Service Support for Marine Air-Ground Task Forces  
 FMFM 4-2, Embarkation  
 FMFM 4-3, Landing Support Operations  
 FMFM 4-6, Movement of Units in Air Force Aircraft  
 FMFM 6-1, Marine Division  
 FMFM 8-1, Special Operations  
 FMFM 8-2, Counterinsurgency Operations  
 FMFM 8-4, Doctrine for Navy/Marine Corps Joint Riverine Operations  
 FMFM 9-1, Tank Employment/Antimechanized Operations  
 FMFM 9-2, Amphibious Vehicles  
 FMFM 10-1, Communications

## 3. U.S. NAVY PUBLICATIONS

NWP 10-3( ), Naval Warfare Terms  
 NWP 11-23( ), Civil Engineer Support Planning  
 NWP 22-5( ), The Naval Beach Group  
 NWP 39( ), Base Defense  
 NAVAIR 51-35-7  
 NAVFAC P-315, Naval Construction Force Manual

## 4. U.S. ARMY FIELD MANUALS

FM 5-30, Engineer Intelligence  
 FM 5-34, Engineer Field Data  
 FM 5-36, Route Reconnaissance and Classification  
 FM 5-100, Engineer Combat Operations  
 FM 20-32, Mine/Countermine Operations at the Company Level  
 FM 31-35, Jungle Operations  
 FM 31-50, Combat in Fortified Areas and Towns  
 FM 31-71, Northern Operations  
 FM 31-72, Mountain Operations  
 FM 90-3, Desert Operations  
 FM 90-7, Obstacles

## 5. STANDARDIZATION AGREEMENTS

STANAG 2014, Operation Orders, Annexes and Administrative/Logistics Orders  
 STANAG 2017, Orders to the Demolition Guard Commander and Demolition Firing Party Commander

5. STANDARDIZATION AGREEMENTS (continued)

STANAG 2036, Doctrine and Procedures in the Technique of Land  
Minefield Laying and Recording  
STANAG 2096, Reporting Engineer Information Collected In the Field

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DEPARTMENT OF THE NAVY  
HEADQUARTERS UNITED STATES MARINE CORPS  
WASHINGTON, D.C. 20380

15 March 1979

FOREWORD

1. PURPOSE

FMFM 4-4, Engineer Operations, sets forth the doctrine, tactics, and techniques to be employed in engineer operations and training within the Fleet Marine Forces.

2. SCOPE

This manual covers the mission, organization, and principles of employment of engineer units in support of the Fleet Marine Forces in amphibious operations and subsequent operations ashore.

3. SUPERSESSION

FMFM 4-4, Engineer Operations, dated 3 November 1972.

4. CHANGES

Recommendations for improving this manual are invited from commands as well as directly from individuals. The attached User Suggestion Form should be utilized by individuals and forwarded to the Commanding General, Marine Corps Development and Education Command (Code D 036), Quantico, Virginia 22134.

5. CERTIFICATION

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

*J. H. Miller*  
J. H. MILLER

Major General, U.S. Marine Corps  
Commanding General  
Marine Corps Development and Education Command  
Quantico, Virginia

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