
UNITED STATES MARINE CORPS
THE BASIC SCHOOL
MARINE CORPS TRAINING COMMAND
CAMP BARRETT, VIRGINIA 22134-5019

**INTRODUCTION TO
COMBAT ENGINEERING
B3L3998
STUDENT HANDOUT**

Introduction to Combat Engineering

Introduction

Combat engineering, simply put, is the means by which a unit commander can increase the mobility of friendly forces, inhibit the movement of enemy forces, provide effective cover and concealment for friendly forces, and be able to possess some limited general construction capabilities in order to facilitate operations of an expeditionary nature.

Importance

Understanding and properly integrating engineering capabilities into your scheme of maneuver will act as a force multiplier that greatly enhances your combat effectiveness.

In This Lesson

You will learn engineer unit organization, basic engineering tasks, and mine types and employment.

This lesson covers the following topics:

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Learning ObjectiveEnabling Learning Objective

0302-OFF-1201h Without the aid of references, describe the four functional areas of combat engineering without error.

Engineering Mission

Introduction. Engineering provides a unit commander with the tactical ability to manipulate the existing terrain and/ or structure within an area of responsibility thereby increasing the combat effectiveness of the fighting force. The mission of the combat engineering field of the MAGTF is accomplished through the following four functions:

- **Mobility operations.** Mobility is the quality or capability of military forces that permits them to move from place to place while retaining the ability to fulfill their primary mission. The objective of mobility operations is to maintain freedom of movement for maneuver units.

 - **Counter-mobility operations.** Counter-mobility is the reinforcement of the terrain through the construction of obstacles to disrupt, delay, or destroy the enemy. The primary objective of counter-mobility operations is to:
 - Slow or divert the enemy
 - Increase Time for target acquisition
 - Weapon effectiveness without impairment to the movement of friendly forces

 - **Survivability operations.** Survivability is the ability of personnel, equipment, and facilities to continue to operate within the wide range of conditions faced in a hostile environment. Survivability includes all aspects of:
 - Protecting personnel, weapons, and supplies
 - Employing good tactics, frequent unit moves, deception, camouflage, and emission security
 - Constructing fighting and protective positions

Survivability operations will *not* completely eliminate vulnerability to fires on the modern battlefield or the effects of weather. It can, however, limit losses by reducing exposure to enemy weapons and the weather.

 - **General engineer operations.** General engineering, the combat service support function, is characterized by:
 - High standards of design and construction
 - Detailed planning and preparation
 - Normally serves the whole MAGTF and is characterized as force sustainment.

 - **Summary.** As a combat multiplier, engineers focus on maintaining the ground combat element's (GCE's) freedom of maneuver and attacking the enemy's ability to maneuver on the battlefield.
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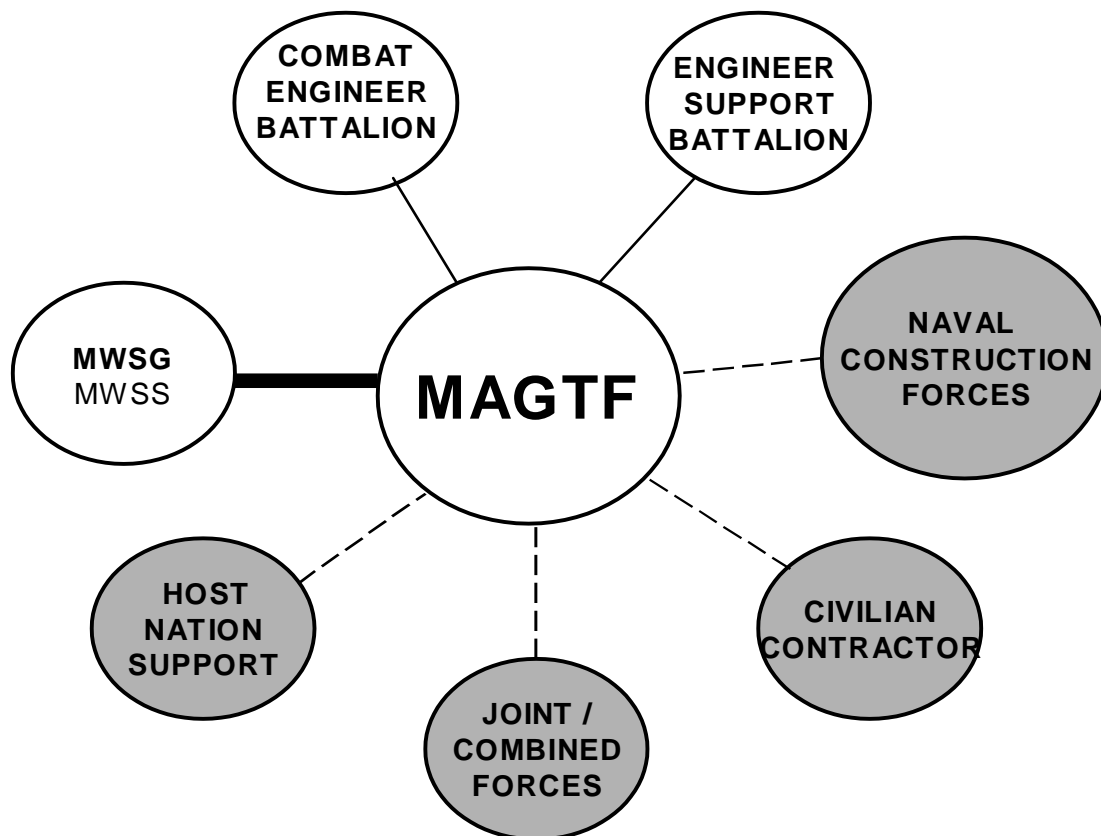
Engineer Organization

Organization. Engineer units are:

- Organic to each of the subordinate elements of the MAGTF
- Uniquely manned and equipped to provide required engineer support
- Able to reinforce one another when one unit is tasked beyond its means

Additionally, engineer officers are assigned as special staff officers to the MAGTF commander as well as to division, wing, and group general staffs. If the command element (CE) or any element of a MAGTF does not have a dedicated engineer officer, the senior Marine engineer commander normally assumes this as a collateral duty.

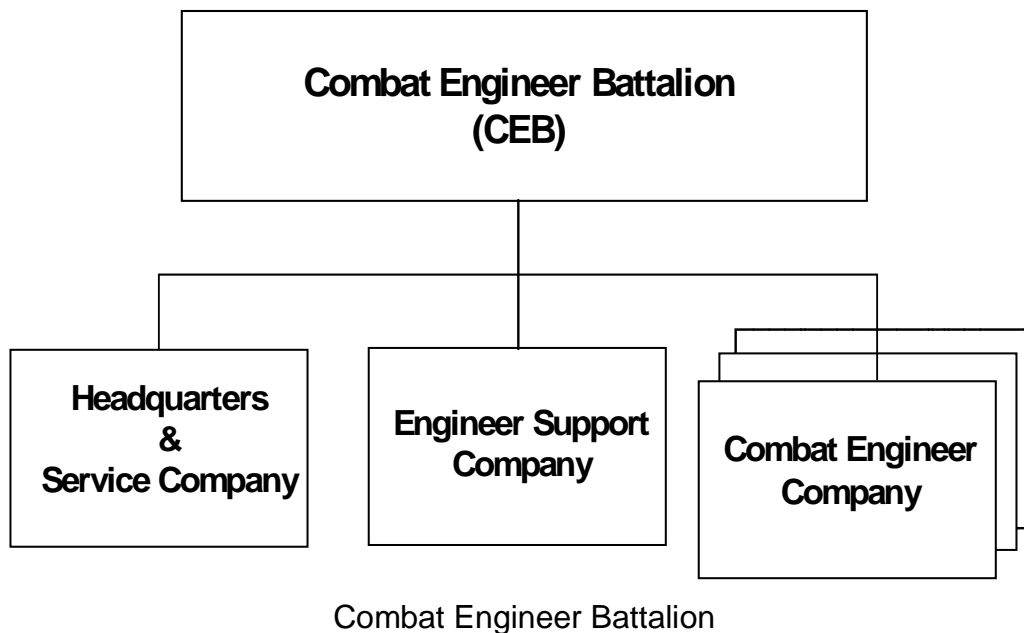
External engineer support is available to the MAGTF commander from various sources. The diagram below is a composite diagram of all engineer assets available to the MAGTF commander. The MAGTF commander employs these assets to create a combined arms effect in deep, close, and rear operations. Engineers are employed throughout the depth of the battlefield and are essential to each element of the MAGTF's combined arms team.



Primary MAGTF Engineer Assets (in white) and External Assets (in gray)

Engineer Organization (Continued)

Combat Engineer Battalion (CEB). (See diagram below.)



- **Mission.** The CEB mission is to:
 - Enhance the mobility, counter-mobility, and survivability of the Marine division through close combat engineer support
 - Provide *limited* general engineering support to the Marine division
- **Concept of Employment.** The combat engineer battalion is organized to provide one combat engineer company in support of an infantry regiment and associated task elements. For smaller MAGTF operations, the combat engineer battalion will provide reinforced units to the GCE. Normally, a reinforced combat engineer platoon will support a battalion landing team.

Combat engineer units are most effective when employed in direct support because the capability of the whole unit is higher than that of its component parts. Dividing a combat engineer unit, especially below the platoon level, significantly degrades the platoon's capability and forfeits much of the laborsaving support that engineers provide. Individual squads do not perform the command and control, training, and other functions performed by the platoon headquarters. Individual maneuver companies within the GCE can still have the benefit of combat engineer advice and assistance by assigning a combat engineer NCO to serve as an advisor to the maneuver company commander.

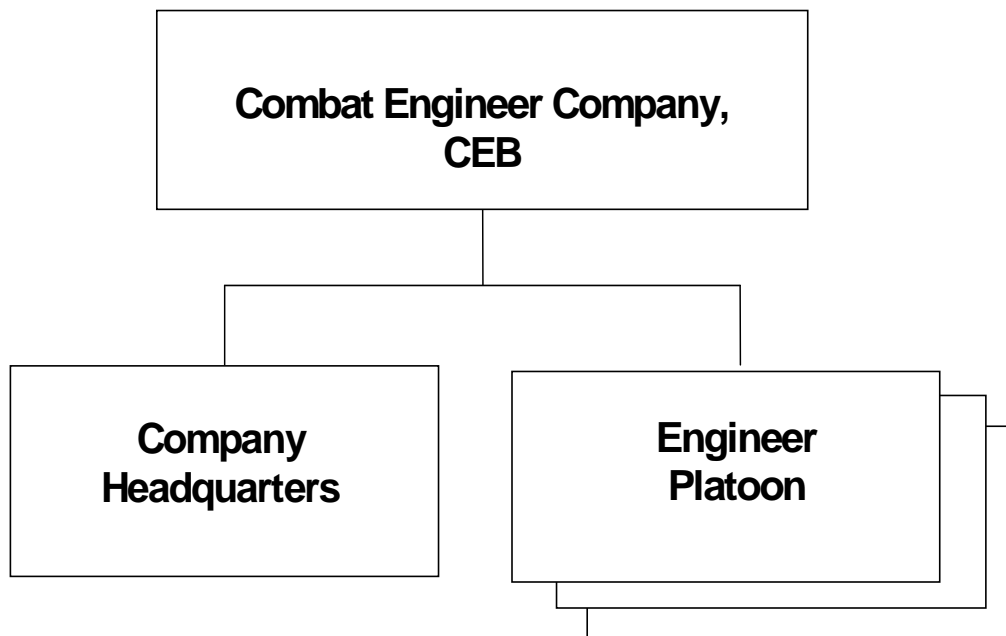
- **Tasks and Capabilities.** Engineer functions accomplished by the CEB encompass both combat support and minimal combat service support tasks. The primary task is in the combat support role--to ensure the mobility, counter-mobility, and survivability of the GCE. CEB training and equipment capabilities are focused on these

Engineer Organization (Continued)

missions. Their work is of a very rough and expeditious nature to ensure the momentum of the fluid battlefield is retained in our favor. The CEB is responsible for the following mission essential task list (METL):

- Conducting engineer reconnaissance
- Obstacle breaching from the high-water mark inland
- Providing expedient repair and reinforcement of existing bridges
- Constructing expedient, short-span bridges from local materials
- Providing temporary repair of existing roads, limited new construction, and maintenance of combat roads and trails to support combat operations
- Planning, organizing, and coordinating construction of simple and complex explosive and non-explosive obstacle systems
- Performing demolition missions beyond the ability of other division units

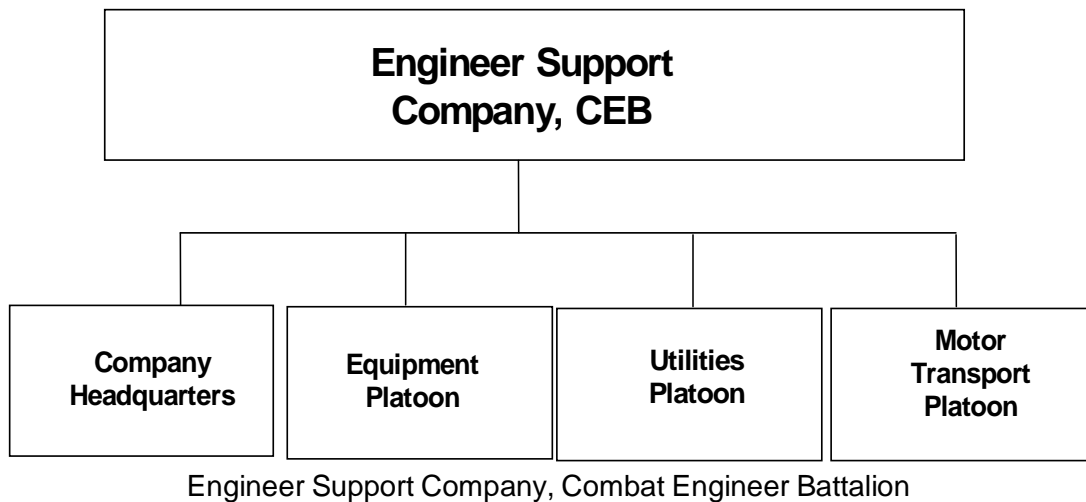
Combat Engineer Company. (See diagram below) Each of the combat engineer companies consists of a company headquarters and three combat engineer platoons. Each platoon consists of (1) platoon commander, (1) platoon sergeant, (1) platoon guide, and (3) nine-man squads.



Combat Engineer Company, Combat Engineer Battalion

Engineer Organization (Continued)

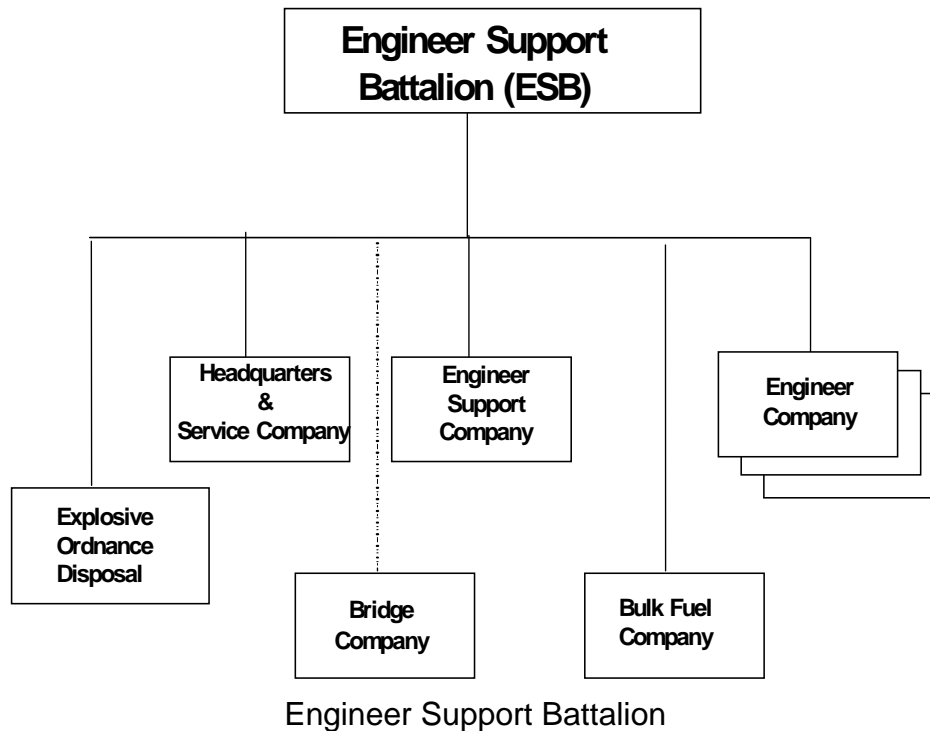
Engineer Support Company. (See diagram below.)



- The engineer support company consists of
 - A company headquarters
 - An engineer equipment platoon, which has all the heavy equipment such as bulldozers, graders, forklifts, and armored combat earthmovers
 - A utilities platoon, which provides the bulk of the combat service support functions of the battalion, including the provision of potable water, mobile electric power, and hygiene services
 - A motor transport platoon

Engineer Organization (Continued)

Engineer Support Battalion (ESB). (See diagram below.)



- **Mission.** The mission of the ESB is to increase the combat effectiveness of the MAGTF by accomplishing general engineering missions of a deliberate nature. The ESB:
 - Improves on the hasty engineer work performed by the GCE to enhance the mobility, survivability, and sustainability of the MAGTF
 - Is particularly strong in construction of roads, buildings, airfields, and fortifications
 - Is the only source of fixed and floating bridge assets in the MEF
- **Concept of Employment.** The ESB initially provides general support to the landing force by providing composite engineer units/detachments to the combat service support element (CSSE) of the MAGTF. Upon consolidation of the Marine Logistics Group (MLG) within the amphibious objective area (AOA), the battalion would regain operational control of most of its committed engineer assets (except fuel and water). Under centralized control, the battalion gives depth to the overall engineering effort.
- **Tasks and Capabilities.** The general engineering tasks performed by the ESB are
 - Vertical and horizontal construction
 - Facilities maintenance
 - Utilities support

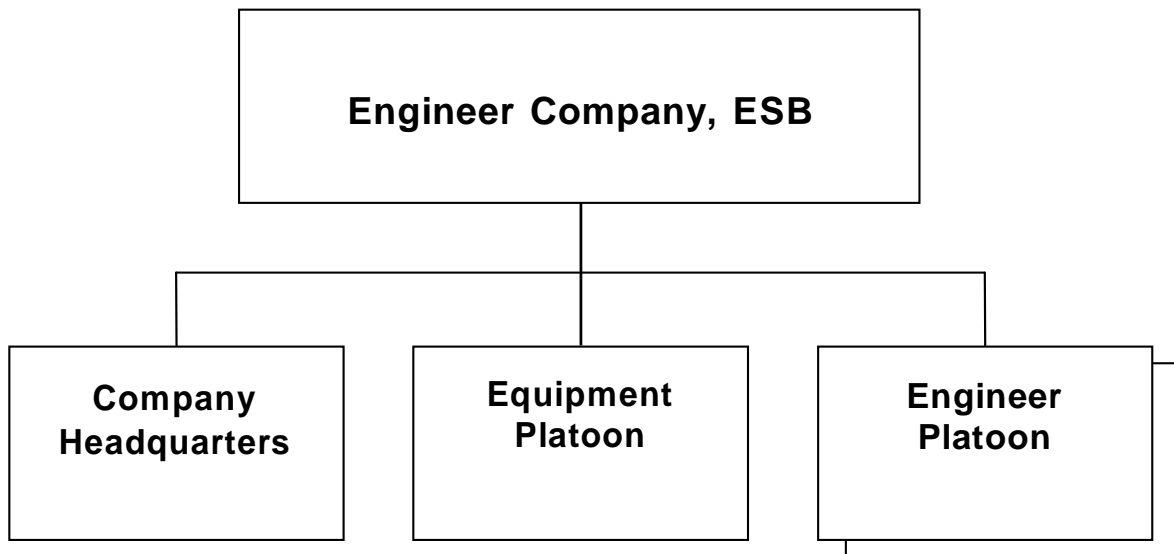
Engineer Organization (Continued)

- Bulk fuel support

The battalion also provides CSS and lends depth and flexibility to the overall engineer effort by performing general engineering tasks for the entire MAGTF.

The battalion possesses a heavy capability to provide water purification, electrical power production, and bulk fuel storage. The ESB or any of its detachments have the additional mission of reinforcing the CEB or Marine wing support squadron (MWSS.) The ESB must be capable of combat support as well as CSS tasks to execute this mission.

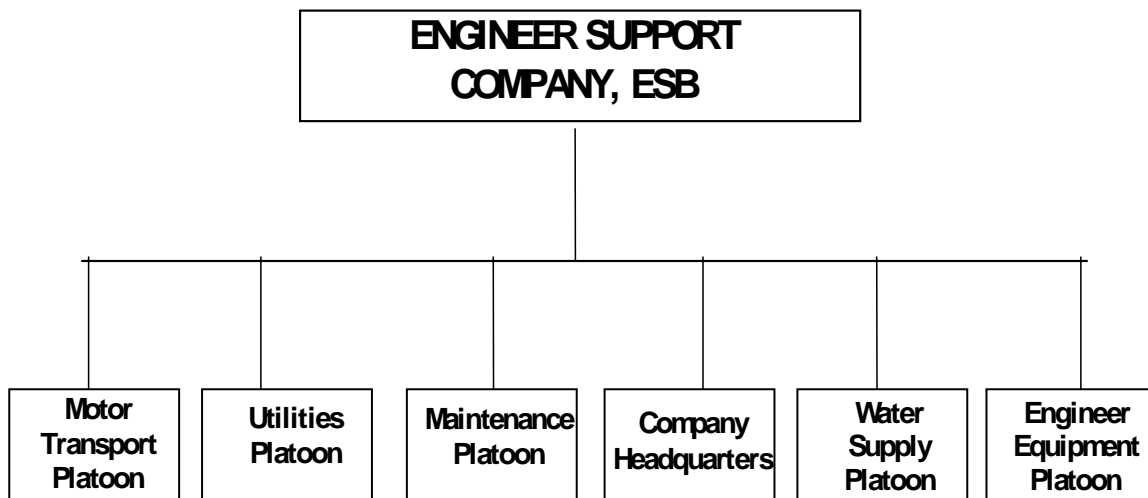
Engineer Company. (See diagram below) The engineer company provides general engineering support of a deliberate nature to the MAGTF. When suitably augmented by elements from other companies in the battalion, the engineer company is capable of performing engineer tasks for the battalion, except installation of bulk fuel systems.



Engineer Company, Engineer Support Battalion

Engineer Organization (Continued)

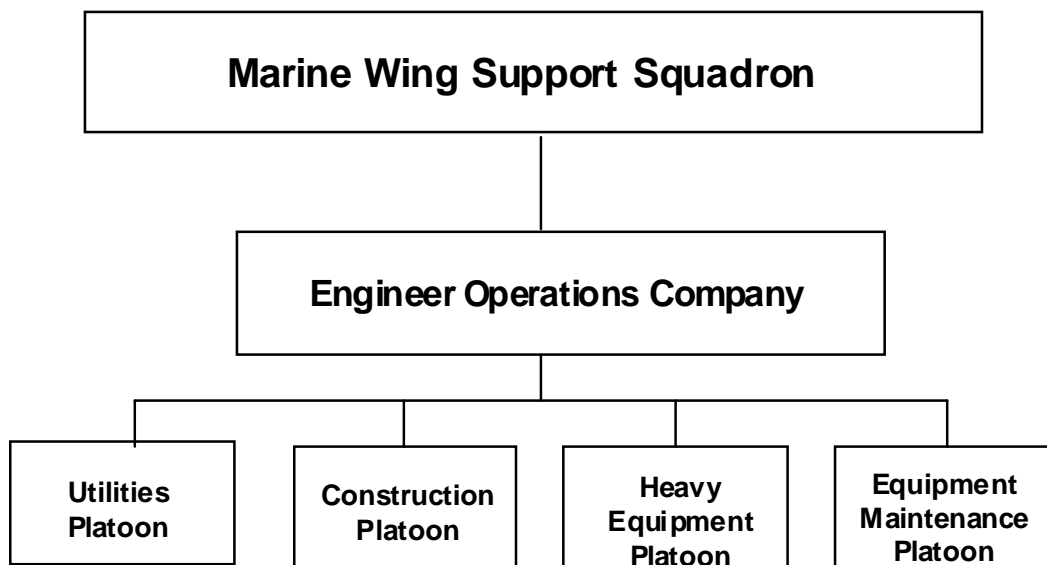
Engineer Support Company. (See diagram below.)



Engineer Support Company, Engineer Support Battalion

- The engineer support company is responsible for providing
 - Engineer equipment
 - Heavy equipment
 - Utilities support
 - Portable drinking water
 - Water supply and hygiene equipment
 - Augmentation personnel to the GCE and aviation combat element (ACE) engineer support elements

Marine Wing Support Squadron. (See diagram below.)



Marine Wing Support Squadron

Engineer Organization (Continued)

- **Mission.** The Marine wing support squadron is organized to provide the full range of engineer support to the aviation combat element.
- **Concept of Employment.** The engineer operations company operates under the staff cognizance of the operations department (S-3).
- **Tasks and Capabilities.** The engineers in support of the aviation combat element have the primary task and responsibility of providing special support to airfield operations. Their training and equipment are focused on the missions of survivability and general engineering. Their heavy capabilities are in the area of
 - Expedient runway construction and repair
 - Vertical construction
 - Fortification construction
 - Material handling

Additionally, they have a heavy capability in the utilities field such as

- Electrical generation
- Water production and storage
- Hygienic equipment operation
- Bulk fuel storage and distribution

However, unlike the CSSE engineer assets, these capabilities will be localized at the airfield rather than mobile throughout the area of operations (AO). The ACE engineers will perform very little work in the areas of mobility and counter-mobility once the airfield is established.

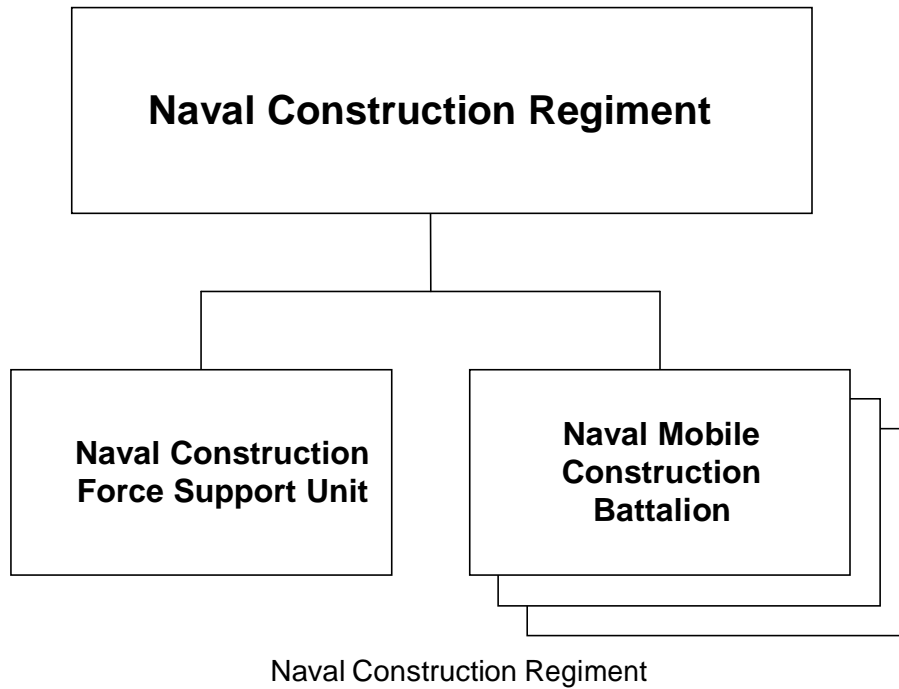
Naval Construction Forces (NCF). The mission of NCF units (more frequently referred to as SeaBees), when assigned to a MAGTF, is to ensure the sustainment of MAGTF operations by providing deliberate construction support, including major construction and repair to existing facilities. NCF equipment and training are strongly oriented toward the deliberate engineering role. They have little-to-no capability in the roles of mobility or counter-mobility as it applies to maneuver forces.

Both I and II MEF have access to a naval construction regiment (NCR) (see diagram on next page) that will more than double the amount of engineer personnel and equipment within the MEF. This NCR includes:

- One regimental headquarters
- Three naval mobile construction battalions
- One naval construction force support unit

Smaller, task organized elements of the NCR can be established to support different sized MAGTFs.

Engineer Organization (Continued)



The NCR's organizational relationship within the MAGTF is based on the mission and is established and initiated by the MAGTF commander. Roughly two-thirds of an NCR is composed of reservists, highly skilled in their mobilization billets.

NCR's also receive tactics and weapons instruction as part of their annual training. To accomplish this, a Marine gunnery sergeant is assigned to each construction battalion.

Engineer Organization (Continued)

Interrelation of Engineer Units and Missions. All unrestricted engineer officers receive the same MOS training at the basic engineer officer's course and may be assigned to any of the above Marine Corps engineer units. Task-organized elements of each are found within the organization of the MAGTF. While the specific efforts and equipment of each engineer unit differ slightly to accommodate their particular area of responsibility (GCE, ACE, or CSSE), all possess the skills necessary to support MAGTF units in mobility, counter-mobility, survivability, and general engineering efforts.

Interface between these units is common as they can and do support each other when the mission of one calls for particular skills and equipment inherent to another. Additionally, cross-training between engineer units and the augmentation of one by another are not at all uncommon.

Examples of this interaction between engineer units include:

- The augmentation of combat engineer battalions during Desert Shield/Storm with members of the engineer support battalions. This act was vital in the successful effort to field enough breaching detachments for the assault into Kuwait.
- The augmentation of an airfield engineer unit by members and heavy equipment of the engineer support battalion in order to successfully complete a large project such as the construction of a new runway.

Elements of the naval construction forces, or Seabees, can be found in larger MAGTF organizations. Although a naval engineer unit, they too can augment, support, and/or improve the efforts of Marine Corps engineers with their expertise in general engineering and abundance of heavy equipment.

This is a snapshot of what engineer organization would be responsible for constructing different stages of a road in a combat zone:

- **CEB** knocks down the trees, cuts through ditches, and gets the GCE to the fight.
- **ESB** thoroughly clears the land, grades the surface and installs drainage features, adds gravel and stabilizes the soil. Any bridges needed would be constructed. This road will resemble a two-lane application trail called a combat road.
- **Engineer Operations Division** in the MWSS travels down the road to assist in the preparation of forward operating bases.
- **NCR** adds gravel and fines, compacts and paves it, (puts up the guardrails, paints the lines, etc.)

Summary

As can be seen, the mission of combat engineering is a tremendous force multiplier. It is solely responsible for the effective movement and survivability of friendly forces while possessing the capability to manipulate and hinder enemy effects against friendly forces.

Appendix

Engineer Capabilities. The capabilities listed in the table on the next two pages are resident, to varying degrees, in every engineer unit within the MAGTF.

NOTE: The task priority and capability codes used in the table are

First letter

- P – Primary task and responsibility
- S – Secondary task
- N – Not a task

Second letter

- H – Heavy capability
- M – Medium capability
- L – Light capability
- N – No capability

Tasks	Task Priority and Capability Codes			
	CEB	ESB	MWSS Engineer Operations Division	Naval Construction Forces
Mobility Tasks (Combat Support)				
Conduct engineer reconnaissance	PM	PM	PL	NL
Breach obstacles	PH	SM	NL	NL
Construct pioneer roads	PH	SH	SL	SH
Assault bridging	PL	SL	NN	NN
Clear mines	PH	SH	SL	NN
Clear helicopter landing sites	PM	PH	SL	SH
Improve beaches	PH	SH	NN	NM
Employ specialized demolitions	PH	SH	NL	NL
Provide technical engineer advice	PH	NH	PH	NN
Fight as infantry	SM	NL	NN	NL
Counter-mobility Tasks (Combat Support)				
Conduct engineer reconnaissance	PM	PM	PL	NL
Place mines	PH	SH	SL	NN
Plan/install obstacles and barriers	PH	SH	SL	NM

Employ specialized demolitions	PH	SH	NL	NL
Provide technical engineer advice	PH	SH	PH	NN
Survivability Tasks (Combat Support)				
Construct field fortifications	PH	PH	PM	SH
Employ specialized demolitions	PH	PH	NL	NL
Provide technical engineer advice	PH	PH	PH	NL
General Engineering Tasks (Combat Service Support)				
General engineering				
Conduct engineer reconnaissance	SM	PM	PL	PM
Surveying and drafting	SL	PM	PL	PH
Improve beaches	SL	PH	NL	PH
Construct standard and nonstandard bridges	SL	PH	NN	PH
Improve unpaved roads, airstrips, and marshaling areas	SL	PH	SL	PH
Perform rapid runway repair	NN	SM	PM	SM
Build expedient airfields (matting)	NN	PH	SL	PH
Plan and estimate projects	PH	PH	PM	PH
Soil stabilization	SL	PH	PL	PH
Construct aircraft revetment/dispersal sites	NL	SH	PM	SH
Repair airfield damage	NL	PH	PM	PH
Construct semi-permanent camps	NL	PH	SL	PH
Perform vertical construction (including concrete)	NL	PM	PL	PH
Construct logistical support bases	NL	PH	NL	PH
Construct air bases	NN	PH	NN	PH
Construct and repair port/waterfront structures	NL	NM	NL	PH
Employ specialized demolitions	NH	PH	NL	PH
Conduct non-explosive demolition and debris removal	NL	PH	ML	PH
Provide technical engineer advice	NL	PH	PM	PH
Utilities support				
Provide tactical water/hygiene services	SL	PH	PM	NN
Provide tactical electrical supply	SL	PH	PM	NN
Develop sewage and water systems	NN	NL	NL	PM
Bulk fuel support				
Provide tactical bulk fuel storage and dispensing	NN	PH	PM	NN

References

Reference Number or Author	Reference Title
FM 5-100	Engineers in Combat Operations
FM 5-101	Mobility
FM 5-102	Counter-mobility
FM 5-103	Survivability
FM 5-34 (MCRP 3-17A)	Engineer Field Data
MCWP 3-17	Engineer Operations

Glossary of Terms and Acronyms

Term or Acronym	Definition or Identification
METL	Mission Essential Task List
M-Kill	Mobility Kill
K-Kill	Catastrophic Kill
SFF	Self-Forging Fragmentation.

Notes
