# Human and Organizational Factors in the U.S. Naval Construction Force

## *A Qualitative Analysis of the U.S. Naval Mobile Construction Battalion Peacetime Deployment Construction Program*

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The U.S. Navy has had its own internal combat construction engineer force for over 60 years: the Navy Seabees. The motto of this cadre of engineering professionals is elegantly simple: *With compassion for others; We build - We fight; For peace with freedom.* The centerpiece unit of the Naval Construction Force is the U.S. Naval Mobile Construction Battalion: an entirely self-sufficient sustainable combat service support team trained to conduct contingency construction operations and defensive infantry combat operations. NMCBs cycle through a continuous training program designed to maintain their combat readiness and prepare them for rapid deployment in response to emergencies around the world. They must be ready to go into austere forward combat zones worldwide to provide direct combat service support of the US Marine Corps and other military forces as directed by the National Command Authority.

In peacetime, these eight active duty battalions execute a complex program of construction projects all over the world as a training platform to maintain their combat readiness by sharpening their technical expertise and construction skills. However, their two-fold "Build and Fight" mission statement has significant consequences for the Naval Construction Force as a construction organization. As with most other engineered systems and organizations, Human and Organizational Factors (HOFs) are a primary element that determines system quality. Considerations such as training and selection of personnel, task-organization, command culture and incentives all work together and affect the reliability of this system just as much as technical considerations such as design development and site conditions.

This work will perform an in-depth analysis of the HOFs that determine system quality of the U.S. Naval Mobile Construction Battalion as they execute their Deployment Construction Program by:

1. Describing the HOFs embedded in this system and how these factors impact quality.

2. Describing the approaches that the NCF takes to ensure quality.

These system components and approaches will be analyzed to determine how HOFs impact quality and impact system operators to ensure quality. This qualitative analysis draws upon existing Navy and

# Report Documentation Page

| Report Date | Report Type | Dates Covered (from... to) |
|---|---|---|
| 00092002 | N/A | - |

| | |
|---|---|
| **Title and Subtitle**<br>Human and Organizational Factors in the U.S. Naval Construction Force A Qualitative Analysis of the U.S. Naval Mobile Construction Battalion Peacetime Deployment Construction Program | **Contract Number** |
| | **Grant Number** |
| | **Program Element Number** |
| **Author(s)** | **Project Number** |
| | **Task Number** |
| | **Work Unit Number** |
| **Performing Organization Name(s) and Address(es)**<br>Civil Engineer Corps, United States Navy | **Performing Organization Report Number** |
| **Sponsoring/Monitoring Agency Name(s) and Address(es)** | **Sponsor/Monitor's Acronym(s)** |
| | **Sponsor/Monitor's Report Number(s)** |

**Distribution/Availability Statement**
Approved for public release, distribution unlimited

**Supplementary Notes**
The original document contains color images.

**Abstract**

**Subject Terms**

| | |
|---|---|
| **Report Classification**<br>unclassified | **Classification of this page**<br>unclassified |
| **Classification of Abstract**<br>unclassified | **Limitation of Abstract**<br>UU |

**Number of Pages**
152

Department of Defense policy and doctrine, construction industry literature and research files from recent Seabee deployments. It also draws upon individual interviews with Seabees from both the Atlantic and the Pacific Fleet operating areas.

This work will conclude with recommendations to improve the system to raise the level of quality in the Deployment Construction Program, a sample instruction module to guide system operators in properly assessing HOFs and discussion regarding new force structures and deployment schedules.



# HUMAN AND ORGANIZATIONAL FACTORS IN THE U.S. NAVAL CONSTRUCTION FORCE

## *A Qualitative Analysis of the U.S. Naval Mobile Construction Battalion Peacetime Deployment Construction Program*

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A Major Report submitted in partial satisfaction of the requirements for the degree of

Master of Science in Civil and Environmental Engineering

in the Graduate Division of the
UNIVERSITY OF CALIFORNIA, BERKELEY

Advisor: Professor Robert G. Bea
Fall 2002

Cover photos

Left: Seabees from U.S. Naval Mobile Construction Battalion SEVENTY-FOUR preparing formwork and underslab utilities for the concrete foundation of a new Veterinary Clinic at U.S. Naval Station Roosevelt Roads, Puerto Rico 

Right: Seabees from U.S. Naval Mobile Construction Battalion SEVENTY-FOUR studying tactical land navigation in Sasebo, Japan 

The major report of Roland Victor Jimenez de Guzman is approved:

December 14, 2002

Professor Robert Bea Date

University of California, Berkeley
Fall 2002

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# Executive Summary

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# 1 Naval Construction Force: Background and Overview

## *1.1 Introduction*

The Naval Construction Force is the engineer force of choice for the United States armed forces. Since their birth in 1942, the Navy Seabees have lived by their motto: "*We Build, We Fight. For Peace With Freedom*". The mission of the Seabees is as follows:

> *With compassion for others – we build, we fight – for peace with freedom. We provide the Navy, Marine Corps, Unified CINCs, and other customers with rapid contingency response, quality construction, disaster recovery support, and humanitarian assistance.*
>
> *We accomplish this through expeditionary units, which are rapidly deployable, interoperable, self-sustaining, and capable of conducting defensive military operations*.[1]

Put simply, Navy Seabees build expeditionary shore based facilities for Marines and are prepared to conduct defensive combat operations to defend what they build. The Naval Construction Force is comprised of a wide variety of construction units capable of a whole spectrum of contingency construction and defensive combat operations.

## *1.2 Naval Construction Force History*

Navies around the world have had organic construction capability for almost as long as they have put ships out to sea to sail into harm's way. The U.S. Navy itself began using sailors to build its shore facilities as far back as the War of 1812; when they did so under fire.

But the U.S. Navy Seabees as we know them today were born during World War II. One of the critical keys to victory in this global conflict- in both the Pacific and European theaters- was the development of robust forward logistic support infrastructure (as it is in any combat operation). The troops out on the front lines needed shore-based infrastructure to properly prosecute campaigns including (but not limited to): main supply roads, forward expeditionary airfields, port facilities, command and control structures and troop housing. The Navy used the same system for building this infrastructure that they used for building any overseas Navy shore base: American civilian general contractors. However, there were two major inter-connected problems with this system. These civilian contractors were expert builders, but were not trained for combat. Their building capability severely degraded under fire and they were not

[1] pg 5, *Naval Construction Force Policy*, OPNAVINST 5450.46K, Enclosure (1)

trained to defend themselves. Worse yet, civilian contractors were not afforded the same protection under international laws of armed conflict as uniformed military service-members. Essentially, when these civilians took up arms to defend themselves and their work, they became spies: combatants who were not formally assigned to their country's armed forces. This meant that these construction workers became a glaring weakness in the overall logistics support of the combat operation.

To put this concept another way, the civilian general contractor system as a construction delivery vehicle was not robust when placed into a combat zone; it was not able to operate after sustaining damage. And if any construction delivery vehicle needs to operate after sustaining damage, it is one placed in a combat zone. This is where Rear Admiral Ben Morrell came into the picture. At the time, he was the head officer of the Civil Engineer Corps in his job as the Chief of the Bureau of Yards and Docks. This bureau was the Navy organization charged with the construction of the Navy's shore establishment; it was the forerunner to the Naval Facilities Engineering Command of today. RADM Morrell and the members of his staff were visionaries who created the Naval Construction Force as we know it today. On 05 January 1942, RADM Morrell received specific authority from the Navy Bureau of Navigation to recruit men from construction trades to form a three Naval Construction Battalions and one Naval Construction Regiment. After about 3-6 weeks of boot camp and recruit training, the first Seabees started reporting for duty in the European and Pacific theaters. [2]

These Seabees proved themselves time and again during World War II with their courage under fire, their ingenuity and their technical expertise. In the Atlantic theater, Seabee operations ranged from the construction of overseas bases in the Caribbean, to the first Seabees in combat building military facilities in northern Africa. In fact, it was during the buildup of forces in Tunisia that the Seabees invented one of their most significant and lasting contributions to modern naval warfare: the pontoon. In order to rapidly move equipment and material ashore, the Seabees took standard steel shipping crates and fitted them with special tackle so they could be hooked together to form causeways, piers and other structures. This dramatically reduced onload and offload cycles, which was the main stumbling block in most amphibious landings. Thanks to these "magic boxes", beachheads such as Sicily that were previously thought unassailable became legitimate places for amphibious operations. This put the Allies on the road to the D-Day assault at Normandy and eventually on to victory in the European theater. In the Pacific Theater, Seabees were equally critical to the Allied war effort. As the Allies embarked on the "island-hopping campaign" westward across the Pacific, Seabees marched side-by-side with their comrades in the Marine Corps. Of particular note here was the birth of the Seabee mission of rapid runway repair and

[2] http://www.history.navy.mil/faqs/faq67-3.htm

expeditionary airfield construction. One of the crucial tactical aspects of the island hopping campaign was the ability to use the islands as intermediate logistics bases. This meant there was a strong requirement to be able to create infrastructure at these islands: refueling points, supply roads, berthing facilities, airfields and runways. During combat operations, the airfields and runways became absolutely critical, so the Seabees became adept at repairing them under fire and in short timeframes. After enemy bombing runs, the Seabees had to be able to get the airfields back up to operational status before the enemy aircraft had time to depart, re-arm and return for the next bombing run. Many of today's tactics for rapid runway repair were born in this crucible of combat: both technical tactics (selection of repair material and methods for rolling it onto the airfield for compaction) and operational tactics (clearing unexploded ordnance and selecting operating airstrips).

World War II was the cradle of the Seabees where they were born, but they have distinguished themselves in every major conflict since then as well. Their ingenuity, work ethic and courage under fire have made them indispensable parts of the Navy's operational plans. As General MacArthur once said, "The only problem with Seabees is I don't have enough of them." [3]

## *1.3 Civil Engineer Corps and Naval Facilities Engineering Command*

The Naval Construction Force is led by naval officers from the U.S. Navy Civil Engineer Corps (CEC). The CEC is a subset of the Navy's officer community whose primary focus is the life-cycle management of the Navy's shore establishment. Therefore, one of the core competencies (besides engineering) of the CEC is leadership. This has dramatic influence on the role of CEC Officers as Project Engineers in the NCF.

### 1.3.1 The US Navy Civil Engineer Corps

As background, the US Navy divides its officer corps into two distinct communities: the Line community and the Staff Corps. Officers of the Line are assigned duty "on the tip of the spear" in the Navy's operating forces: they drive the surface warships, dive deep under the seas in Navy submarines and fly high over the seas in Naval aircraft. The officers of the Staff Corps provide direct support to the operating forces as warrior/logisticians in the Supply Officers, doctors in the Medical Corps, nurses in the Nurse Corps and other diverse communities. There are certain specific statutory and cultural/ historical implications of membership in the Line community or the Staff Corps, but all officers serve in equal rank structures.

[3] http://www.hnn.navy.mil/archives/020322/a-5_032202.pdf

## Core Competencies

The Civil Engineer Corps stands as one of these Staff Corps communities and is tasked with the life-cycle management of the Navy's shore establishment, as mentioned above. The Civil Engineer Corps has articulated three deeply inter-related core competencies for its officers in order to successfully manage the shore establishment. These competencies are listed in the CEC Career Planning Guide:

**Naval Officer** competency is defined as your commission and the associated military knowledge and experience.

**Engineer/Technical Professional** competency is your engineering or architecture degree, professional registration and the associated technical knowledge and experience.

**Acquisition/Business Professional** competency is your acquisition certification and warranting as well as the knowledge and experience in business practices.[4]

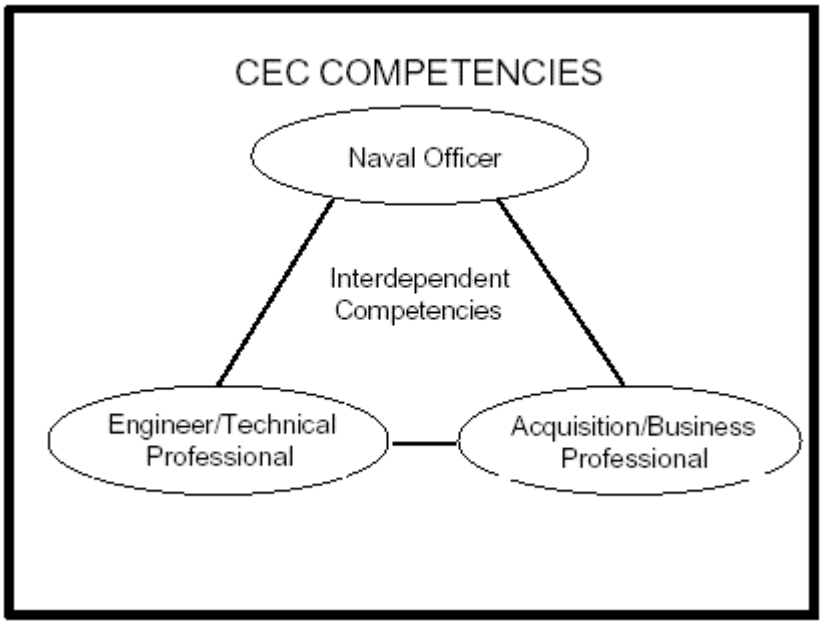


**Figure 1: CEC Competencies**

## CEC Duty

Duty in the CEC primarily falls into three categories: Public Works, Construction Contract Management and duty in the Seabees. Each CEC officer is encouraged to serve in all three mission areas during their

[4] pg 7, Career Planning Guide, Navy Civil Engineer Corps October 2001

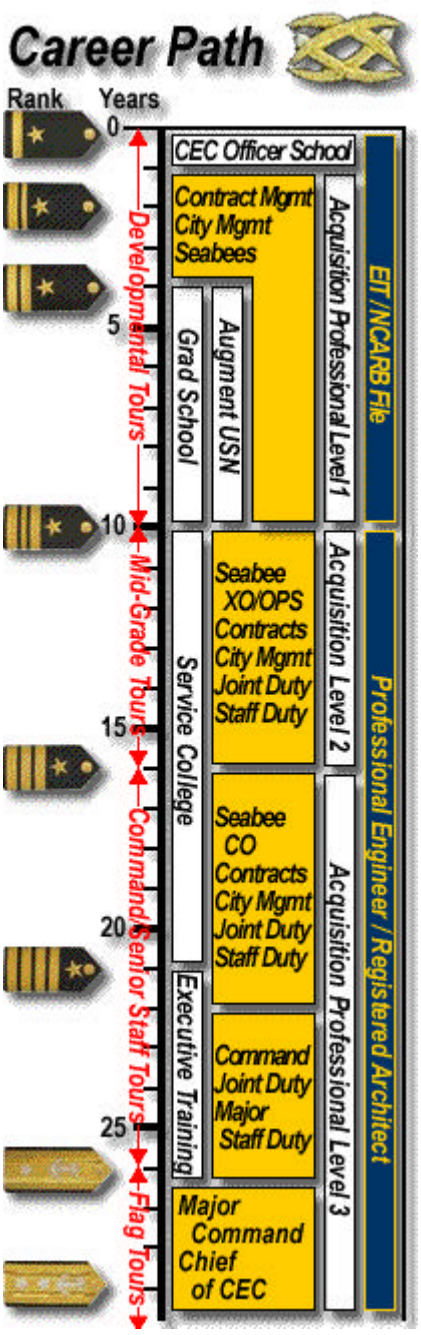


**Figure 2: CEC Career Path**

careers. Promotion to more senior ranks is highly dependent on performance in all three areas as shown in Figure 2.[5]

Public Works: The day to day operation and maintenance of the Navy's shore facilities. The Navy has shore installations of various sizes all over the world. Each one of them requires a public works force of some sort to maintain the buildings, roads, utilities and land. CEC Officers manage this public works activity, whether it is performed in-house by Navy civil service employees or by civilian contractors.

Construction Contract Management: The construction of the Navy's shore establishment is primarily completed via contract with civilian general contractors. For the most part, these complex construction contracts are managed by CEC Officers who are called *Resident Officers in Charge of Construction* (ROICC). [They] are the Navy's project managers and construction contract managers…[whose] basic task is to ensure that Navy construction projects are built safely, as designed, on time, and within budget.[6]

Project managers are responsible for their projects from beginning to end. This includes supervision of the initial design, awarding the contract, overseeing the construction, monitoring progress, negotiating changes, and accepting the completed project. Tasks may include resolving design problems, coordinating construction schedules with Navy operations, ensuring that payments correctly reflect progress, and managing the project budget.

Seabees: A small percent of the Navy's CEC officers are fortunate enough to serve in the NCF. Generally around 12% of the CEC dons the camouflage uniforms of the Seabees and leads the brave men and women of the NCF. Their role- as leaders and as engineers- will be discussed in greater detail later in this work.

[5] http://www.cec.navy.mil/ceccareer.html
[6] http://www.cec.navy.mil/contracting.html

As stated earlier, promotion to more senior ranks in the CEC is dependent upon service in all three mission areas. This is because each senior CEC officer- especially those in command- must have personal first-hand experience in every mission area because they are all inter-related. Since the Seabees are a small numerical part of the CEC billet structure, competition for billets in Seabee battalions is very tight. This will be discussed in further detail later on in this work.

### 1.3.2 Naval Facilities Engineering Command

The Naval Facilities Engineering Command (NAVFAC) is the Navy's prime agent for the management of shore facilities. Its mission statement is listed in the NAVFAC Strategic Plan:

> *We are the Navy's facilities, installation, and contingency engineers.*
>
> *We serve the Navy and Marine Corps team, Unified Commanders, Department of Defense and other federal agencies.*
>
> *We plan and deliver innovative, technology-leveraged solutions and alternatives to meet our clients' needs.*[7]

NAVFAC is a "systems command" which means that it is responsible for the entire life-cycle of the program it manages: the shore establishment. (In like manner, the Naval Air System Command manages the life-cycle management of Naval Aviation assets; the Naval Sea Systems Command manages the same for surface ships, etc.). As such, it is the Navy's single management agency for shore facilities. Obviously the Civil Engineer Corps and NAVFAC share a very close relationship; the CEC is the Navy's main cadre of uniformed facilities engineers so they are a crucial part of NAVFAC's leadership. In fact, the commander of NAVFAC is also assigned duty as the Chief of the Civil Engineer Corps.

While NAVFAC does not exercise direct operational or administrative control over the Naval Construction Force, there is a deep inter-relation between the leadership of NAVFAC and the NCF. NAVFAC is the NCF's primary technical advisor, providing most of the guidance for all phases of NCF operations.

## *1.4 U.S. Naval Mobile Construction Battalions*

The centerpiece of the Naval Construction Force is the U.S. Naval Mobile Construction Battalion (NMCB). There are 8 active duty battalions and 12 reserve battalions who maintain a continuous

[7] pg 3, NAVFAC Strategic Plan

developmental training cycle so they can maintain their military readiness to deploy world-wide. Each battalion is its own self-sufficient construction organization complete with a vertical construction component (a full suite of heavy equipment and the requisite operators and mechanics), a horizontal construction component (builders and steelworkers) and a utilities component (electricians and plumbers). There is also a whole host of support personnel including (but not limited to) engineering technicians, quality control inspectors, project engineers and safety inspectors. In order to ensure self-sufficiency, each active NMCB is assigned all of the tools and equipment required to go into the field.

## *1.5 NMCB Readiness and Training Cycle*

In order to train for their wartime "build and fight" mission, NMCBs embark on a cyclic peacetime construction program as a training "proving ground" to keep their technical skills sharp. As each battalion goes around this cycle, their military readiness ranges from low (unable to deploy without considerable effort) to high (currently deployed and ready to respond to any contingency). This is graphically represented in Figure 3 below.

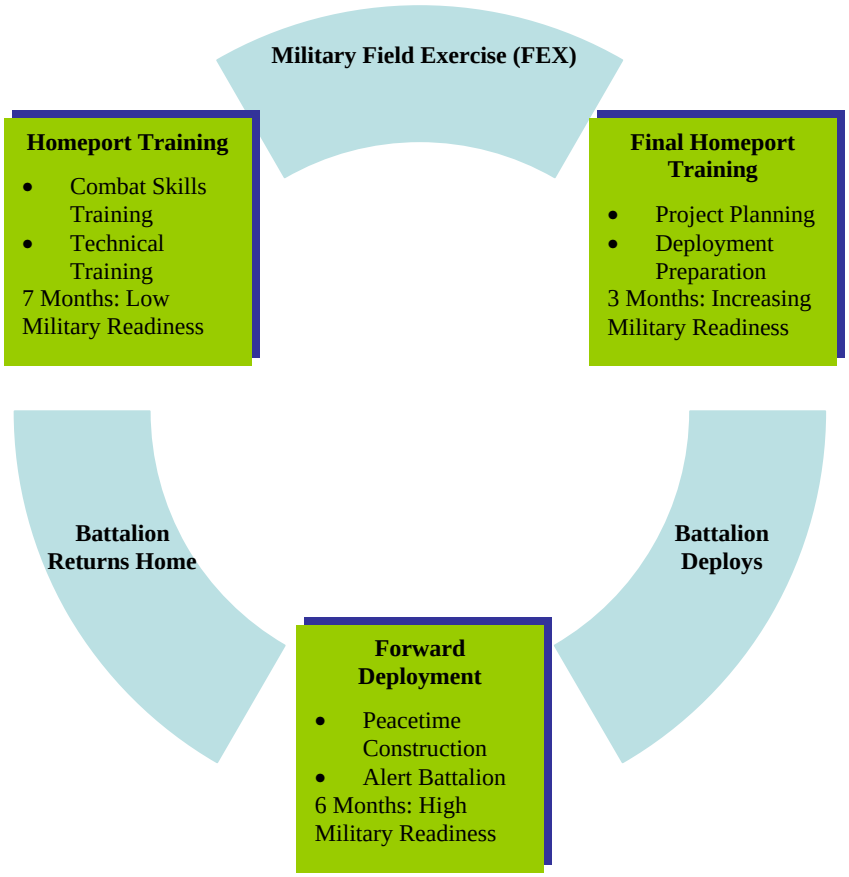


**Figure 3: NMCB Deployment Cycle**

Military readiness in any deployable military unit in the United States armed forces is defined by two concepts:

- the unit's ability to accomplish the list of tasks they are required to be capable of (Required Operational Capabilities- ROCs)
- the unit's ability to accomplish ROC tasks in the expected environments they will have to execute them (Projected Operating Environments- POEs).

This standardized format is reported up the chain of command on a monthly basis by every deployable operational military unit in the US Armed Forces. Combat readiness is measured according to a standardized formula used throughout the Armed Forces and takes three quantities into account:

- Manning levels- Does the unit have enough people at the right pay-grade?
- Training attainment- Does the unit have teams and individuals who have had the requisite training for their assigned tasks?
- Material readiness- Does the unit have enough tools, equipment and material to execute a given mission?

These quantities are compared against nominal quantities that a battalion is supposed to achieve for a given level of readiness. This comparison forms the basis for a mixed quantitative-qualitative measure of the unit's military readiness and is one of a Seabee battalion's most important "report cards". A list of ROCs and POEs for a U.S. Naval Mobile Construction Battalion is included in Appendix 1 for review.

## *1.6 NMCB Deployment Cycle*

The culmination of a battalion's training cycle is a six-month overseas deployment. During these deployments, the entire battalion moves- as a unit- to its deployment site: an overseas Seabee Camp that is located at an overseas Naval Station. The three forward Seabee Camps are:

- Camp Covington located at U.S. Naval Activities, Guam
- Camp Mitchell located at U.S. Naval Support Activity, Rota Spain
- Camp Shields located at Camp Butler, Okinawa, Japan

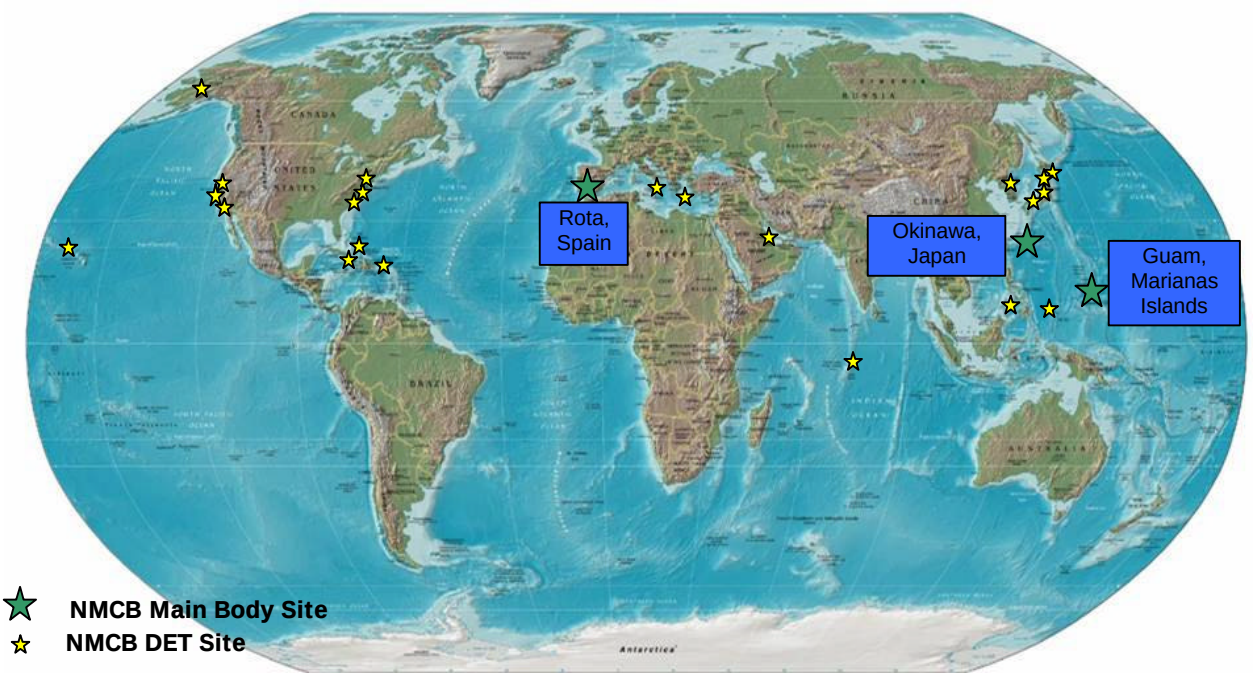


**Figure 4: Seabee Forward Deployment Sites**[8]

The main purpose for these deployments to forward, overseas camps is to facilitate the mobilization of the deployed battalion to world-wide emergencies (referred to as contingencies) as the National Command Authority may assign. Each deployed battalion is designated as the "alert battalion" for the geographical region of their forward camp. As an example, if there were a contingency operation in northern Europe that required Seabee support, the alert battalion from Rota Spain would redeploy whatever engineer forces were required to support the operation. Deployed Seabees have participated in every major conflict since World War II including recent operations such as Operation Enduring Freedom, Joint Task Force Eagle (Bosnia), Operation Restore Hope (Somalia) and Operations Desert Shield and Desert Storm.

While the alert battalion is waiting to be called upon, they execute a pre-determined set of construction projects at their camp's host Naval Station. It is important to note that this construction program is put on hold in the event of a large scale operation requiring the re-deployment of the battalion. To again cite the previous example, if Rota's alert battalion were to be redeployed to northern Europe, the construction projects they were working on at Naval Station Rota, Spain would be put on hold until the battalion's return.

[8] FIRST Naval Construction Division/ Naval Construction Forces Command Introduction Brief, (2002) FIRST Naval Construction Division, Little Creek VA

A battalion will execute thousands of man-days of construction effort over a wide spectrum of projects during a normal deployment. These projects build quality shore facilities for the host Naval Station in a proven, win-win relationship. The NMCB receives valuable technical training and the host Naval Station receives quality shore facilities. Since there are three battalions deployed at any given time, projects are being developed on a continual basis.

# 2 Background Theory

This work began as a term project for a graduate class at the Masters' level in civil engineering at the University of California at Berkeley. This course was called *Human and Organizational Factors: Risk Assessment and Management*. The analysis that follows is deeply rooted in the material from this course, so it is therefore appropriate to provide some of this background.

## *1.1 System Theory*

Most analyses of engineered systems focus on the tangible infrastructure that is designed and built by a team of engineering professionals. However, this academic work's analysis is a variation on this theme: it is an in-depth look at the U.S. Naval Mobile Construction Battalion as an engineered system. This author's premise is that the team of engineering professionals is itself the core system and is therefore the appropriate focus of analysis, not the end product of their labor. Bea says that engineered systems have seven components that are highly interactive and interrelated as shown in Figure 5[9]:

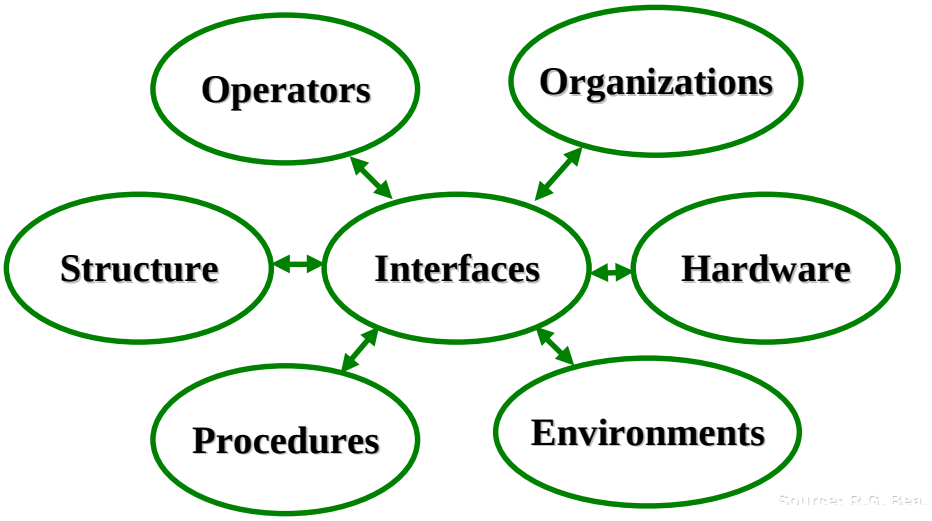


**Figure 5: System Components**

[9] Slide 17, CE290A Introduction Presentation http://construction.berkeley.edu/~bea/290A_intro.ppt

For many systems, most of the focus is typically directed towards the end product of this system: the built facilities. However, the Navy Seabees recognize that the end product of this system is really two-fold, the built facilities and the trained cadre of Seabees that build those facilities. This work will focus on both of these end products and how the system's characteristics impact the quality of those products.

### 1.1.1 System Performance

Now that we have explained how systems are composed, it is important to explain how they operate. To simplify the analysis and organize this explanation, there two aspects of the performance of any engineered system: operator performance and organizational performance.

#### 1.1.1.1 Operator Performance

Rasmussen proposed in 1982 a simple, yet powerful taxonomy for classifying human performance into three levels: skill-based, rule-based and knowledge-based. Knowledge-based performance is the most cognitively demanding level: the activity is new to the operator so he or she must individually analyze sensory input and use stored knowledge to determine the appropriate course of action. Rule-based performance requires less cognitive resources from the operator because it involves responding to familiar problems to which stored, standardized rules can be applied. The operator must simply choose which rule applies which then dictates the appropriate course of action. The final level of performance is skill-based performance. This least cognitively demanding level is based somewhat on repetition: the triggering conditions have been called so frequently that the selection of the course of action and its execution are virtually automatic. In fact, for skill-based behavior such as walking or driving, the introduction of cognitive effort by the operator often increases the likelihood of error.[10]

This taxonomy implies a focus area for any leader, but especially one in the Naval Construction Force. Because of the nature of Seabee operations, the best way for a leader to accomplish a given mission with even a modicum of complexity, that leader must exert cognitive effort so as to determine the proper distribution of tasks to different team members to maximize the use of skill-based behavior throughout the team. Therefore, the leader must have detailed knowledge of both the tasks of that operation and the knowledge level/ experience/ performance levels of the team members.

[10] pg 74, Bea, Human and Organizational Factors: *Risk Assessment and Management of Engineered Systems CE-OE 290A*

#### 1.1.1.2 Organizational Performance

By definition, the goal of any engineered system is reliability. An overarching goal of engineers must be to improve reliability. However, interestingly enough, there is no single universally accepted cookbook recipe for achieving reliability despite years of research on the topic. This work is rooted heavily in the research done by Professors Robert Bea and Karlene Roberts of UC Berkeley, so it is appropriate to touch briefly on their work regarding high reliability organizations since it provides much of the background for later analysis of Seabee operations. Bea and Roberts define High Reliability Organizations (HRO) as those organizations that have operated nearly error free over long periods of time.[11] These studies have compiled several common traits of HROs that are particularly relevant for this study. Bea tells us that these common traits HROs that help reduce errors are:

1. Command by exception or negation: HRO management typically pushes authority to the lower levels of the organization and constantly monitors the behavior of subordinates. The U.S. Navy refers to this as decentralizing authority to the lowest competent level of the hierarchy.

2. Redundancy: HROs generally create backup systems of people, procedures and hardware that permit the main system to function when one of the components fails.

3. Procedures and rules: HROs develop and implement procedures that are correct, accurate, complete, well organized, well documented and are not excessively complex.

4. Training: While no two HROs have identical training programs, they all generally have programs that improve performance over a range: from normal to abnormal and on to "unbelievable" operations.

5. Appropriate rewards and punishments: HROs develop and implement systems of reward and punishment that are consistent with organization goals and create strong incentives to reduce errors.[12]

Ability of management "to see the big picture": HRO management is able to focus on big picture trends and situations and develop high reliability responses. It is the author's experience that much of this ability to see the big picture is created and enhanced by management's migration of authority to lower levels of the hierarchy. This allows upper management to focus limited cognitive resources on big picture trends and responses by leaving detailed decision-making to the system operators "on the deckplates" with the most expertise who are closest to the situation.[13]

[11] ibid, pg 80
[12] ibid, pg 80
[13] ibid, pg 80

Bea cites the 1998 work of Weick Sutcliffe and Obstfeld when he tells us that HROs organizing in effective HROs is characterized by:

1. Preoccupation with failure
2. Reluctance to simplify interpretations
3. Sensitivity to operations
4. Commitment to resilience
5. Under-specification of structures

Roberts and Liguser (1993) analyzed five prominent failures including the Chrenobyl nuclear power plant, the grounding of the Exxon Valdez, the Bhopal chemical plant gas leak, the mis-grinding of the Hubble Telescope mirror, and the explosion of the space shuttle Challenger. This research yielded the following five hypotheses:

1. Extensive process auditing procedures
2. Reward systems that encourage risk mitigating behavior
3. Quality standards that meet or exceed the referent standard
4. Will correctly assess the risk associated with the given problem or situation
5. Strong command and control system (as listed above)
    a. migrating decision making
    b. redundancy
    c. rules and procedures
    d. training
    e. Senior management has the big picture[14]

[14] ibid, pg 80-82

## *2.1 Quality and Reliability Approaches*

While this academic work's focus is to analyze the Human and Organizational Factors that influence Seabee construction, it is important to provide some background and definitions of terms. One important aspect of this study is the modeling of a Naval Mobile Construction Battalion as an "input/ output" system. This model necessarily requires a crisp definition of this system, its input and output; which will be provided later in Chapter 5. But prior to that, it is important to define these terms.

### 2.1.1 Quality

The term "quality" is so commonly used, that it remains poorly defined most of the time in everyday conversation. However, this analysis requires an explicit definition of system quality. We use the definition of quality that Bea provides: [Quality is] freedom from unanticipated defects. Quality is fitness for purpose. Quality is meeting the requirements of those that own, operate, design, construct and regulate engineered systems. These requirements include those of serviceability, safety, compatibility and durability

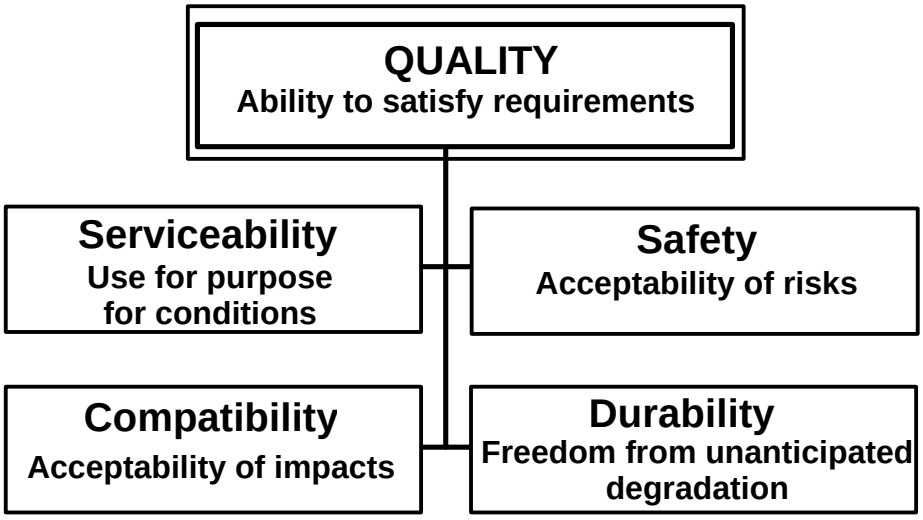


**Figure 6: Quality Components of Engineered Systems**

As shown in the figure above[15], quality has four sub-categories, which Bea defines in his work as well. Serviceability refers to the system's suitability for the proposed purposes; the ability of the system's use for its agreed purpose under the agreed conditions of use. Safety is the freedom from excessive danger to human life, the environment, and property damage; the state of being free of undesirable and hazardous situations. Compatibility assures that the system does not have unnecessary or excessive negative impacts on the environment and society during its life-cycle; the ability of the system to meet economic,

time and aesthetic requirements. Durability assures that serviceability, safety and environmental compatibility are maintained during the intended life of the system.[16] Durability adds the requisite dimension of time to the assessment of a system's quality.

### 2.1.2 Reliability and Robustness

Now that we have a working definition of quality, we note that quality varies over time. While durability defines the system's degradation over time, it is not a complete description of the system's performance over time. Bea defines reliability as the probability (likelihood) that a given level of quality will be achieved during the design, construction and operating life-cycle phases of an engineered system. Reliability is the likelihood that the system will perform in an acceptable manner.[17] This provides a somewhat more complete definition of quality.

However, engineered systems do not operate in a vacuum. Most systems operate in dynamic environments with unpredictable loading situations and damaging environments. Therefore, the system operators must know how the system will respond to loading and damage. Robustness is defined as a system's ability to tolerate HOF originated defects and damage. Bea and Aviguetero state that robustness relies upon three design strategies:

- Configuration- the topology of the system elements, components and system provides back-ups in the primary load carrying paths
- Ductility- the strain or deformation characteristics of the system elements, components and system are such that large inelastic deformations can be sustained without substantial losses in demand, load or stress carrying capacities.
- Excess capacity- the demand, load or stress characteristics of the system elements, components, and system are such that when excessive demands are experienced due to unanticipated overloadings or redistribution of demands from other elements and components in the system, the systems is able to sustain these loadings and demands without undue distress.[18]

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[15] ibid, pg 7
[16] ibid, pg 7
[17] ibid, pg 12
[18] ibid, pg 17,18

# 3 Literature Review

There is a significant body of knowledge regarding human and organizational factors. There is also a whole host of instructions, directives, writing and academic research regarding construction in the Navy Seabees. However, there is not a lot of direct intersection between the two. Taken in total, all of this literature points to the same inevitable conclusion as this paper: human and organizational factors are the major controlling factor that determines quality in the construction effort of the Seabees. Specifically, it can be concluded from this literature that the U.S. Navy puts a heavy premium on leadership. As an organization, the Navy in general - and the Seabees in particular – values leadership as the primary pathway to ensuring quality in all of its systems.

## *3.1 Existing Navy Instructions and Directives*

A thorough review of existing Navy instructions yields a whole host of guidance regarding leadership, training, billet selection, command culture and organization. However, there are no doctrinal discussions specifically regarding HOF concepts. In the early 1980s, the Navy had a program in its weapons systems acquisition program known as HARDMAN (Hardware/ Manpower Comparability Analysis Methodology) which combined analytical models to analyze: manpower, personnel, training, human factors engineering, system, safety, and health.[19] However, in a recent Navy professional journal, former Secretary of the Navy Robert Pirie states that this program- while well intentioned and high-profile- did not accomplish much. The design elements that this program created- total life-cycle cost savings, manpower reduction, system availability- all fell victim to cost cutting.[20] The lesson learned here is that while the Navy as an organization values many of the human and organizational concepts introduced in this work, this value does not always "trickle down" to the operator level. This work will attempt to alleviate this problem.

Training: The US Navy view training as central to its success as a modern combat force. There is an entire high echelon command organization whose sole focus is to run the Navy's training program: the Chief of Naval Education and Training (CNET). As a central repository for training of all sorts, there are many instructions that CNET issues that document and govern the way that Seabees train. All of the Navy's central training manuals are issued by CNET, so the basis of much of the NCF's leadership training is developed by CNET. This leadership training focuses much attention on human and

[19] pg 14, "Instructional Decision Support Systems Applied to Aircrew and Biomedical Training" Journal of Courseware Engineering, Volume 1

[20] Pirie, "Really Put Humans First", U.S. Naval Institute Proceedings, July 2002

organizational factors and is geared towards operations through all types of environments and situations: from peacetime to combat.

## *3.2 Masters Theses*

This work is the latest in a long line of graduate research conducted by Navy Civil Engineer Corps officers at UC Berkeley. The author finds himself "standing on the shoulders of giants" such as Commander Brant Pickrell, Lieutenant Commander Michael Saum, Lieutenant Shawn Cullen and Lieutenant Tim Liberatore; all of whom completed academic work on the impact of human and organizational factors on naval operations. Their work focused on the HOFs that impact the Navy diving community and provided great insight to this work's focus on the Seabee community.

There has also been a fair amount of indirect discussion regarding HOFs written over the years by student officers at other universities. Over the past 15 years, officers such as Commander Edouard Gonzales, Commander Mark Libonate, Lieutenant Robert Carr and others have all written academic theses/ major reports about Seabee operations during their tours at graduate school. Recurring themes of this research are TQM, motivation and operational analysis. This research has taken several different forms: from wide, sweeping generalist analyses to specific process improvement topics. For example, Commander Mark Libonate wrote a well articulated piece of research regarding manpower availability factors when he was a Lieutenant studying at the University of Texas. His detailed analysis of the way that Seabees calculated availability factors (in the project planning phase) resulted in a re-write of the two "bibles" for Seabee construction operations: The Operations Officer's Handbook (COMTHIRDNCBINST 5200.2B) and The Seabee Planner and Estimators' Handbook (NAVFAC P-405).

# 4 System Analysis Methods

This work's analysis of the NMCB Deployment Construction Program as an engineered system follows the process listed here:

- Describe and define the NMCB system and its components. The HOFs that manifest themselves in each component will also be described.
- Literature review
- System Description
    - Component analysis
    - Analysis of system approaches
- Mixed Quantitative Analysis of NMCB Construction Operations

This analysis will be used to help operators more fully understand the system and the HOFs that govern its quality output. The analysis will also be used to recommend improvements to this engineered system.

## *4.1 Analysis Guiding Principles*

It is important to note that there are several guiding principles that are fundamental to this analysis. They are listed here:

1. This project's central premise is that Human and Organizational Factors have a major controlling influence on the readiness of the Seabees in a NMCB and on the quality of construction projects executed by the Naval Construction Force.

2. As mentioned previously, a NMCB's main mission is readiness. Each battalion must be ready to perform its build/fight mission whenever called upon by the National Command Authority. The "primary" way that battalions maintain their readiness is by executing this peacetime deployment construction program. But in the "drudgery" of the daily routine, most of the system operators think that this construction program is the battalion's main mission. It is NOT the main mission; it is merely a means to accomplish the mission.

3. The main frame of reference of this analysis is the viewpoint of the Project Supervisor. As mentioned earlier, this Seabee is the hinge pin around which the whole construction process revolves. As such, this is an appropriate point of view from which to conduct this analysis.

4. An underlying principle of the Navy's career progression system is that the ultimate goal of any Seabee is command of troops. As a result of this, the Naval Construction Force generalists who must see every aspect of Seabee operations from project management including supply chain management, construction inspection, safety program implementation, etc. Another result of this principle is the military's "up and out" promotion scheme which dictates that unless our Seabees get promoted (i.e. unless they do well in the pursuit of command) they are required to retire/ resign. This combines to create a tremendous bias towards generalists. This is not necessarily a bad thing, but it does have impacts on the quality and reliability of the end-products of the system that this work is analyzing.

5. This study's recommendations are all formed with an eye towards searching for leverage points to take advantage of existing procedures and processes to enact change. As a long-standing well-rooted organization which values culture and its rich heritage and traditions, change almost always happens in an evolutionary manner, not a revolutionary manner. This analysis searches for leverage points to point this evolution in the right direction. Thus, these recommendations are formulated based on existing definitions of procedures, interfaces, job assignments, etc.

# 5 Definition of System

The system to be analyzed by this work is the U.S. Naval Mobile Construction Battalion Peacetime Deployment Construction Program. The first step in this analysis is one of the most important: the development of a crisp, concise definition of this system. It is equally important to define the quality attributes that describe this system and its end-products. And finally, this system definition will list and describe the system's output and its components. Throughout this system definition, this work will highlight the HOFs that influence quality and performance.

## *5.1 System Output: Ready Seabees and Shore Facilities.*

The most important product is a team of Seabees who are ready to build and fight in support of the US Marine Corps and other combat units as directed by the National Command Authority. A by-product of this process is shore facilities for use by the US Navy and other federal government entities. The system under analysis here is the NMCB's peacetime construction training program as a readiness tool as shown in Figure 7.

### 5.1.1 System Output Quality: Ready Seabees

The first and most important output of this system is a team of Seabees who are ready to respond to emergencies and contingencies world-wide. This quality output can be measured by examining the quality attributes of each system component as they relate to this system output:

- Serviceability- Suitability of purpose means that the end product of this system is a cadre of Seabees who can build and fight. Since the construction training program is the main tool used to improve their construction skills, it is important to ensure that this training does NOT degrade their military readiness - that is, we must not train solely for construction expertise at the expense of military readiness.

- Durability- Personal health and welfare is the key to preventing unforeseen degradation.

- Safety- This is the most important facet of quality as it relates to the creation of ready Seabees. As custodians of our nation's youth, it is incumbent upon the military to keep the safety of its sailors ever at the forefront.

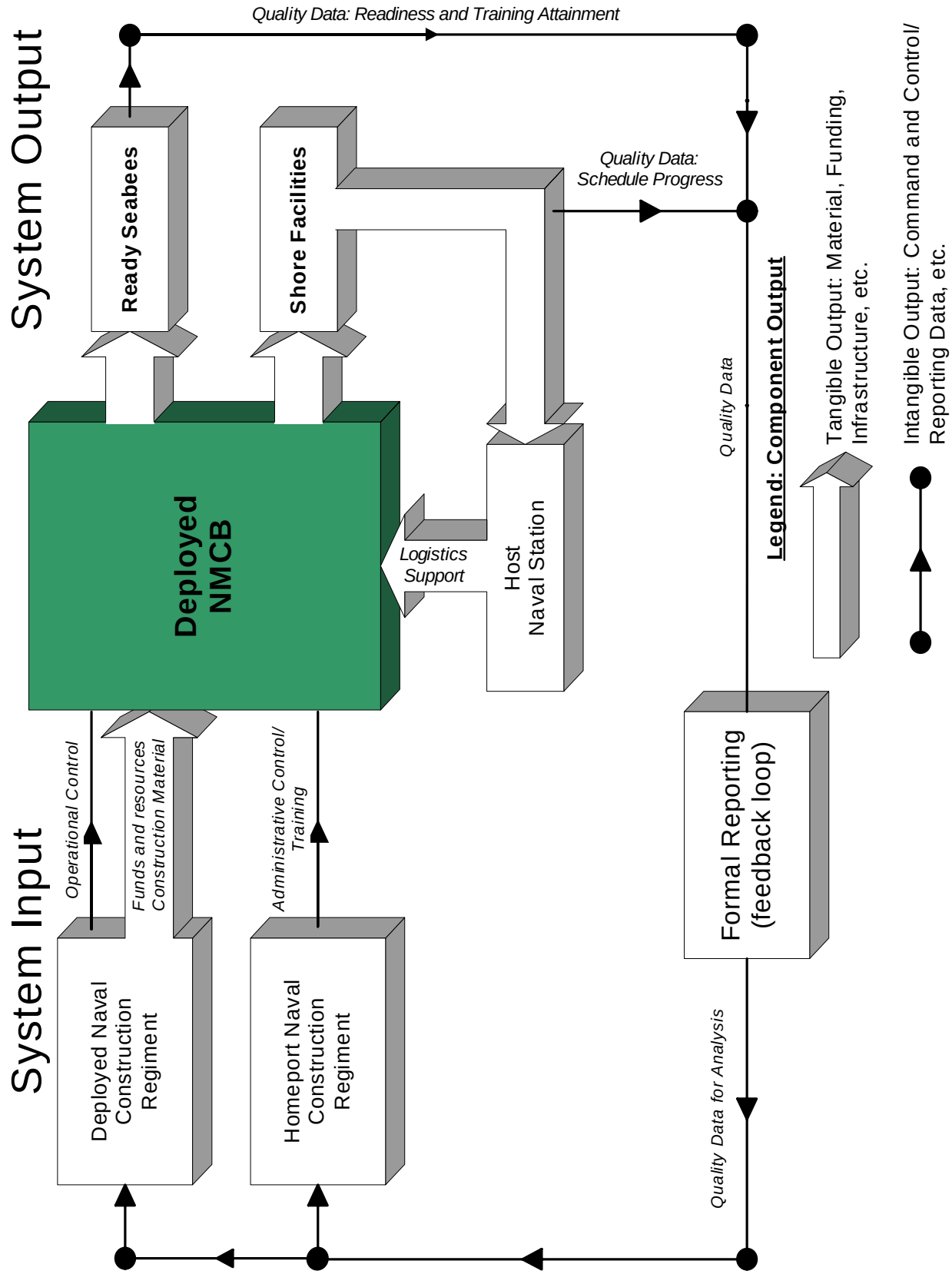


**Figure 7: NMCB System Input/ Output Diagram**

- Compatibility- One primary focus area that most battalions adopt is the push to further the legacy of the Seabees by ensuring the satisfaction of their customers. Seabee battalions are remarkably flexible construction organizations who can change to adapt to the ever-changing requirements of customers. There are also other secondary compatibility issues regarding impact on host command's fleet support mission. Construction of quality construction support facilities does not make a happy customer if that customer cannot execute their primary fleet support mission because of construction impacts. As operators, Seabees know full well the impact that their work can have on things like ship deployment schedules and flight operations. They always take these issues into account because it is more important that a ship properly gets underway than it is to save a day's worth of construction schedule.

As with any other engineered system, an important aspect of its output quality is its robustness, its damage tolerance. A Naval Mobile Construction Battalion, as a military combat unit, is designed to be a highly robust system. A battalion has a whole host of support personnel and assigned equipment in order to ensure that they are self-sufficient: they have their own administrative staff, engineering staff, supply staff, heavy earth-moving equipment, small arms and ammunition, etc. They also continuously train with an emphasis on mobility, flexibility, ability to gather and analyze intelligence and ability to exercise command and control.

### 5.1.2 System Output Quality: Shore Facilities

The other end product of the NMCB Construction Program is the shore facilities that are created by the construction projects. The construction of these facilities is the training ground that develops the aforementioned ready Seabees, but these facilities are built for use by the host command. These facilities share similar quality characteristics for construction in the private sector:

- Serviceability- NMCBs ensure that the shore facilities they build are fit for the purpose that the host command intends for their use.

- Durability- NMCBs have a comprehensive inspection program to ensure that the shore facilities they build do not degrade in unanticipated ways.

- Safety- NMCBs ensure that the shore facilities they build are safe for their eventual owners and operators.

- Compatibility- NMCBs work closely with the host station's environmental engineering staff to ensure that the shore facilities they build fully comply with all applicable environmental and land use regulations.

The shore facilities that Seabees build during overseas also share similar robustness characteristics with construction in the private sector. However, as explained further below, the robustness of Seabee construction probably suffers slightly because of the level of construction experience of the typical junior enlisted Seabee in various specialties, most notably paving and concrete block.

However, this output is much more complex than the types of structures that Seabees build out in the field in combat conditions. Under a concept known as the Advanced Base Functional Component System, standardized flexible modular infrastructure elements are pre-planned and pre-staged to simplify construction. A large two volume database contains all of the information (including National Stock Number data for ordering) required to conduct planning of all levels of detail. Within minutes, a team of two Seabees can create an order of magnitude estimate of material requirements, shipping requirements, manpower requirements and costs involved with creating complex facilities such as large tent camps and expeditionary airfields. In fact, individual Seabees are required to go through this planning process as part of the qualification process to earn the title of Seabee Combat Warfare Specialist (as described later).

## *5.2 System Components*

The NMCB Deployment Construction Program is a multi-faceted system with numerous components. The following description is a simplified model of this system that allows us to highlight the HOFs that operate in each component.

### 5.2.1 System Input

**Host Naval Station**: The host Naval Station is not really a specific component of the system per se, but the end user (as part of the host station) is an integral part of the construction process. All NMCB construction is coordinated on behalf of the station by the station's Public Works Officer (PWO). The PWO is typically a senior Civil Engineer Corps Officer who serves as the "owner's representative" for the station by working closely with the battalion to ensure things like job site traffic control and access, and liaison with final end user. The other key player at the Host station is the Station Commanding Officer. As the Station Commanding Officer, he or she is responsible for providing logistic support for the NMCB. Most of this is coordinated by the station PWO. This all shows that the PWO is just as important a factor in ensuring the Compatibility attribute of quality as the direct system operators.

**Engineering Field Division (EFD)**: The Navy's prime agent for the management of all of its shore facilities is the Naval Facilities Engineering Command (NAVFAC). NAVFAC is a global command that employs thousands of federal service employees and military officers. It is divided into four Divisions: Atlantic Division, Pacific Division, Southwest Division and South Division. The geographical responsibility for each of these components of NAVFAC is listed in Appendix 2. Within the framework of this system, they provide several key elements:

- Design- Perform and/ or acquire designs, plans and specifications for all of the NMCB's major tasked construction projects. The cognizant EFD is responsible for proactive QA in the form of design QA/ QC that they conduct internally. The EFD's engineers also act as consultants on interactive and reactive QC measures taken by the NMCB construction crews and engineers.

- A subordinate element of the EFD is the Resident Officer in Charge of Construction (ROICC). These offices are located at every NMCB deployment site and act as external objective construction inspectors. They are responsible for Quality Assurance and Quality Control.

EFDs are a critical component of this system because they are managed and led by Civil Engineer Corps (CEC) Officers who also manage and lead the Naval Construction Force. Most senior EFD leaders have been assigned to NCF units at least one time in their career. In fact, assignment to the NCF is an important milestone in the professional development of all CEC officers for just this reason; it is crucial for EFD leadership to be able to "speak the Seabee language".

**Chain of Command:** The final input to the NMCB Deployment Construction program is represented by their direct military chain of command. There are two levels of the chain of command above a NMCB: the Naval Construction Division (NCD) and the Naval Construction Regiment (NCR). This is shown in the following figure:

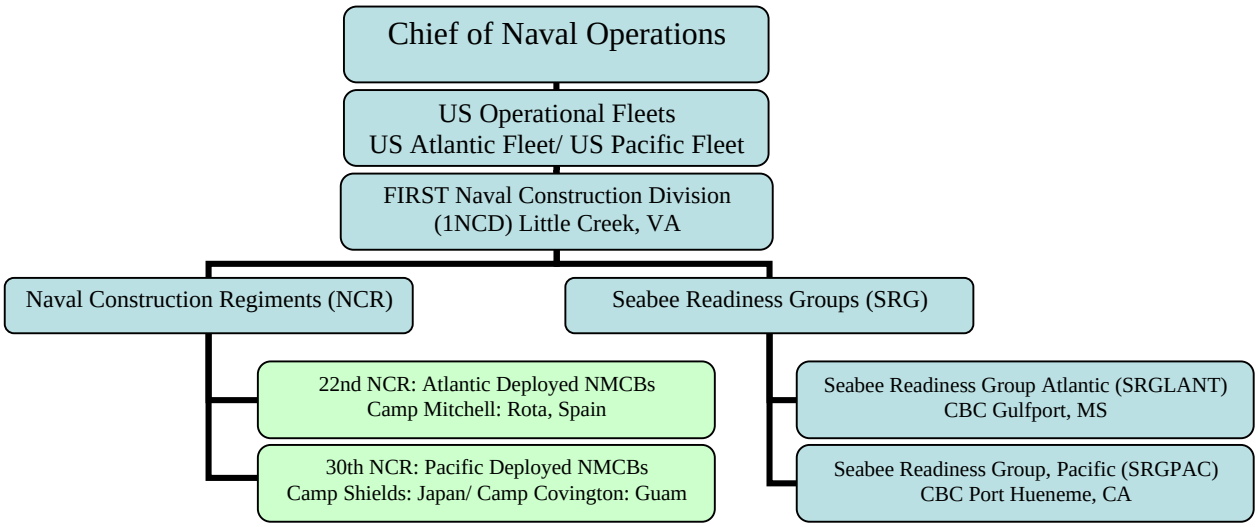


**Figure 8: Naval Construction Force Chain of Command**

These two entities provide command and control (as defined below), logistics and training support as well as funding for material, equipment.

FIRST Naval Construction Division: The Naval Construction Division's job is to provide administrative and operational command and control for NCF units within their purview. It is important to note that this is not just limited to NMCBs. The Division is also responsible for other NCF units such as Underwater Construction Teams (Seabee Divers), reserve Seabee units, Construction Battalion Units, etc. Operational Control is defined as: *authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the missions assigned to the command.*[21] Administrative Control is defined as: *control over subordinate or other organizations with respect to administration and support, including organization of naval forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, and discipline and other matters not included in the operational missions of the subordinate or other organizations.* ***Specifically included in [Administrative Control] are command of peacetime support and employment of NCF forces.***[22] 1NCD's mission then is to organize, train, operate and maintain the Naval Construction Force, to command and control echelon IV Naval Construction Force Commands, and to develop, coordinate and implement policy and requirements to man, equip and train Seabees. In exercising this mission, FIRST Naval Construction Division (1NCD) and Naval Construction Forces

[21] pg 6, "Naval Construction Force Policy" OPNAVINST 5450.46K, Enclosure (1)
[22] pg 7, "Naval Construction Force Policy" OPNAVINST 5450.46K, Enclosure (1)

Command (NCFC) will provide combat construction forces to fulfill operational and forward engagement requirements of a Combatant or Component Commander; contingency and deliberate planning in support of OPLANs, training for Naval Construction Force units, and contributory construction support to Naval Shore Activities.[23]

Naval Construction Regiment: The NCR's job is to provide administrative and operational command and control for NMCBs within their chain of command. These regiments have an extensive staff that performs periodic review of NMCB operations; the staff is therefore loosely based around the same functions that the NMCBs accomplish. These reviews take generally place during a battalion's deployment and cover the entire range of operations including (but not limited to): project planning, equipment maintenance, financial and material management and administrative functions. Deployed regiments also manage the initial stages of project development. They receive project designs from the EFDs and do preliminary planning and estimating in order to effectively assign projects to the battalions

Seabee Readiness Group: These two commands (one on the East Coast and one on the West Coast) fulfill the NCD's mandate of providing training, material and equipment to NMCBs to maintain their required levels of combat readiness. They provide technical training and tactical training with their extensive classroom and laboratory facilities.

### 5.2.2 System Components

The Naval Mobile Construction Battalion Deployment Construction Program is a complex system. This work admittedly greatly simplifies this system in order to analyze its quality attributes. The following discussion describes the system components most critical to construction operations. Figure 9 below shows a diagram of the different system components in a Seabee battalion and the significant sub-components that govern quality.

[23] pg 6, "Establishment Of First Naval Construction Division (1NCD)/ Naval Construction Forces Command (NCFC) and Modification of Atlantic And Pacific Naval Construction Forces (NCF)", OPNAV Notice 3111

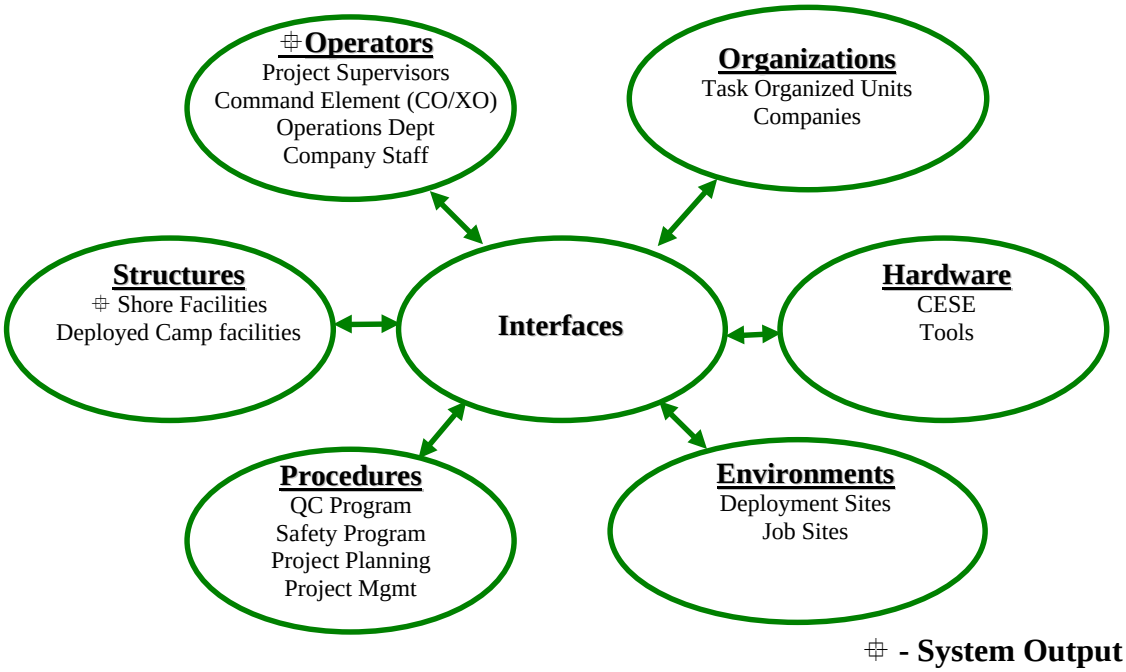


**Figure 9: System Components: NMCB Deployment Construction Program**

#### 1.1.1.1 Structures

There are several important structures that make up the NMCB Deployment Construction Program. The most obvious of these structures is the tasked construction projects; i.e. the shore facilities that represent this system's output. This component will be examined in more detail later on in this work.

Another system structure that has an influence on eventual system output quality is the battalion's deployment site itself: the Seabee Camp. As mentioned previously, there are three of these Camps: Camp Covington in Guam, Camp Mitchell in Spain and Camp Shields in Okinawa. There is some variation in these camps, but overall, they are very similar. Their operation and maintenance is assigned to the resident NMCB. Bravo Company (staffed primarily with electricians and plumbers) are the main work force for camp maintenance. The governing concepts of quality for these structures are similar to those for the projects. As a matter of fact, there is often cross-assignment for Builders and Steelworkers between Bravo Company (tasked with ensuring quality of Camp structures) and Charlie Company (tasked with ensuring quality of system output- Construction Projects).

#### 5.2.2.1 Hardware

Seabees make great efforts to ensure they are properly equipped to safely accomplish their construction projects. As mentioned previously, material readiness is an important aspect of the battalion's "readiness report card". Two main types of hardware that are managed carefully are Civil Engineer Support Equipment (CESE) and tools. CESE is a resource-intensive component of hardware (from a funding standpoint as well as a personnel standpoint) so CESE management receives much attention from the chain of command. The governing instruction is titled Management of Civil Engineer Support Equipment (COMSECONDNCB/ COMTHIRDNCBINST 11200.1A, 09 June 1998) which outlines a rigorous maintenance and inspection program. CESE Maintenance is such a big and complex program that it could be analyzed as its own sub-system. The other main type of hardware in this system is tools. The NCF has an involved system of tool inventory and maintenance that is governed by the Seabee Supply Manual (COMSECONDNCB/ COMTHIRDNCBINST 4400.3, 11 November 1998).

#### 5.2.2.2 Interfaces

In a system as complex and flexible as a Naval Mobile Construction Battalion, there are countless interfaces between components. This work will not attempt to list them all but will describe how the system manages these interfaces. The cultural dichotomy between the officer community and the enlisted community forms a split between the operators of this system and how they focus their cognitive efforts. Enlisted Seabees- as the hands-on operators of this system- focus their attention and their efforts on their own component and their own activity. Officers- and to some extent senior enlisted Chief Petty Officers- are the forward-thinking big picture operators of this system. As such, officers focus as much of their attention on the interfaces of this system as they do on the individual components.

#### 5.2.2.3 Organizations

Each NMCB has the same nominal organizational structure. This structure is shown in the figure below and is based on the structure of a typical US Marine Corps infantry unit. NMCBs tend to task organize in order to properly match resources (people) with missions. These task-specific organizations are addressed later under the heading of **Procedures**.

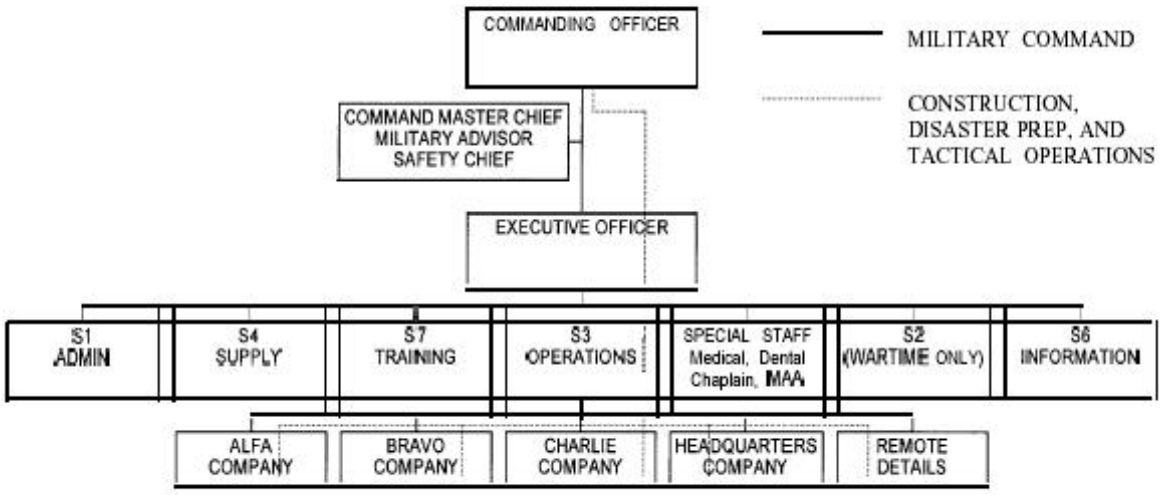


**Figure 10: Nominal Naval Mobile Construction Battalion Organization**

### 5.2.2.4 Operators

Note: A list of Navy ranks and pay-grades is included in Appendix 3 as a reference

The operators of this system are the individual sailors of the battalion. This is the most important component of this system and is graphically shown above[24]. Every member of the command is involved in this system in some way, but this work will list certain important groups of these operators:

- Command Element- The command element is composed of the Commanding Officer (CO), Executive Officer (XO) and the Staff Officers (S-codes as listed above). The Commanding Officer and the Executive Officer are senior officers in the Civil Engineer Corps (Commander and Lieutenant Commander respectively) and are the two top members of the battalion's internal chain of command. The Commanding Officer is solely responsible for the quality and reliability of the system's output and allocates the resources and point the battalion in the right direction to ensure quality output. The Executive Officer is the second in command and acts as the Chief Staff Officer. He or she makes sure the battalion's staff is functioning properly and pointed

[24] pg I-10, *Operations Officer Handbook* COMSECONDNCB/ COMTHRIDNCBINST 5200.2B Enclosure (1)

towards mission accomplishment and quality output. The Staff Officers accept the guidance of the CO and the XO and make it happen.

- Operations Department. The Operations Department could easily be renamed the Quality Department in light of the concepts presented in this work. According to doctrine, the Operations Officer (as head of this department) has functional authority over the construction and disaster preparedness programs in the battalion.[25] In practice, this department is really responsible for all aspects of quality for the battalion: they exercise this functional authority to ensure quality of all system output. There are several important system operators in this department:

    - Operations Officer and Operations Chief: These two Seabees lead and manage this diverse organization. The Operations Officer is typically a CEC Lieutenant Commander and often has had a previous tour in the Seabees. The Operations Chief is typically a Master Chief Petty Officer in the Navy with more than 20 years of experience in the Seabees.

    - Assistant Operations Officer: This Seabee is typically a junior officer in the CEC whose primary task is to report the battalion's readiness to higher headquarters. He or she gathers information from the entire system, analyzes it for trends and cues, and translates it into the correct message format to formally report on the battalion's readiness.

    - Quality Control Chief: This Seabee is typically a Navy Chief Petty Officer with at least between 8 and 15 years of experience who is in charge of managing the battalion's QC program. In light of the material presented in this work, this program is as much a Quality Assurance effort as it is Quality Control. This program will be discussed in further detail later on in this work. The QC Chief also has a team of three QC inspectors to act as the "eyes, ears and nose" of the QC Division. These QC inspectors represent each of the functional vertical construction trades (structural, electrical and mechanical) and are normally "front-runners" in the battalion with proven technical expertise.

    - Safety Officer: This Seabee is typically a Navy Chief Petty Officer with at least between 12 and 17 years of experience who manages and leads the battalion's Safety Program. This program will also be discussed in further detail later on in this work.

    - Engineering Officer: This Seabee is typically a junior officer in the CEC who is in charge of the system's internal engineering analysis team. The Engineering Officer leads a team of

Engineering Aides (technicians) as they conduct materials testing, surveying and limited design work in support of construction projects. This team is an important part of the system to ensure durability and serviceability of the final construction products.

- Prime Company Project Management- Project management organization is overlaid on top of the nominal battalion "infantry company" organization. A visual representation of this organization is shown below[26]:

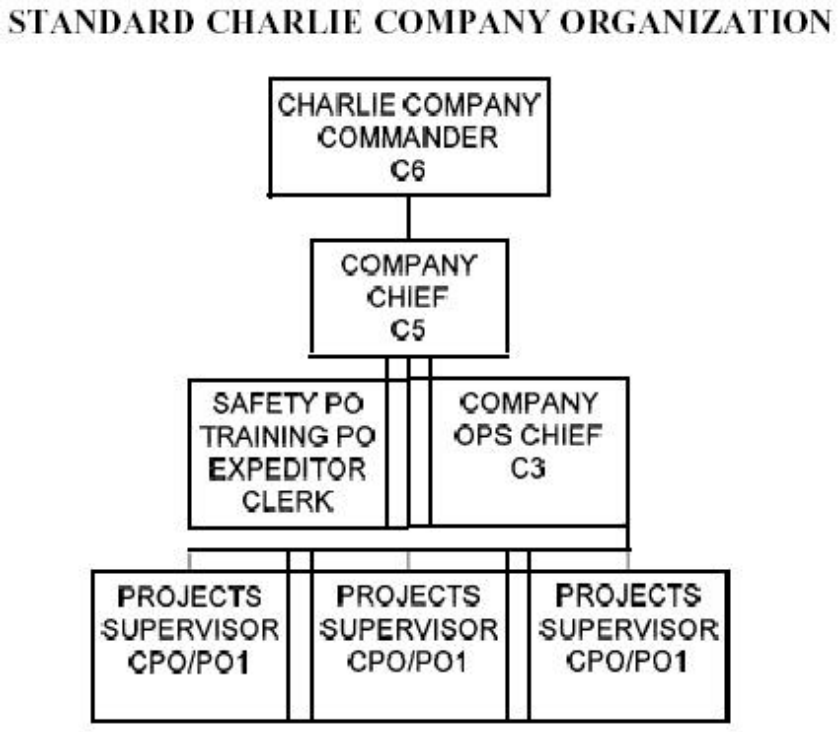


**Figure 11: Nominal Company Project Organization**

This task-organization contains the most critical operators of this system:

- Project Supervisor- This Seabee is the prime operator in this analysis. He or she is generally a First Class Petty Officer with between 4-10 years of experience who is individually responsible for all quality attributes of a given construction project. The Project Supervisor is senior enough in the chain of command to exert a wide range of authority throughout the unit, but is junior enough to have close, detailed knowledge of day to day site operations.

[25] pg 2-2, NAVEDTRA 12543: Naval Construction Force 1 & C
[26] pg I-13, *Operations Officer Handbook* COMSECONDNCB/ COMTHRIDNCBINST 5200.2B Enclosure (1)

- Project Crew Leader- Site operations are directed by the Project Crew Leader who is the Supervisor's principle subordinate. This Seabees is typically a Second Class Petty Officer with 2-5 years of experience and does exactly what the title implies: leads and manages the project crew.

- Project Safety Supervisor- The principal subordinate of the Crew Leader is the Project Safety Supervisor. This Seabee has anywhere between 1 – 5 years of experience and is responsible for planning and implementing the project's Safety Plan.

- Company Commander- This Seabee is a CEC junior officer who is the singularly responsible for all quality attributes of both system outputs as they apply to his or her company. The Company Commander is responsible for the readiness of the Seabees of the company and is the primary "project engineer" for all construction projects assigned to the company. As such, the Company Commander analyzes project progress to see big picture trends in the construction quality and the readiness of the project crews. An unfortunate by-product of the professional development process in the Navy's Civil Engineer Corps is the wide range of experience and training levels of company commanders. They range from newly commissioned Ensigns with less than a year of active duty service to older, limited duty officers who have risen up through the enlisted ranks and have up to 15 years of experience. Additionally, Company Commanders have a wide range of academic backgrounds: some are trained civil engineers, some are engineers in other disciplines, and some (LDOs) have no baccalaureate engineering education at all. This variance puts a real premium on the selection and training of the company commander's direct supervisor and direct subordinate: the Operations Officer and the Company Chief.

- Company Chief- This Seabees is typically a Senior Chief Petty Officer or Chief Petty Officer who has anywhere between 10 and 20 years of experience. As the principal assistant to the Company Commander, this Seabee is responsible for the primary output of this system: to ensure that the Seabees of the company maintain their readiness. As such, this Seabee generally focuses on the "people programs" of the system.

- Company Operations Chief- This Seabee is typically a Chief Petty Officer or Senior Chief Petty Officer with anywhere between 8 and 17 years of experience. The Ops Chief is singularly responsible for the quality and reliability of the other system output: the construction projects.

- Projects Chief- This Seabee is typically a Chief Petty Officer with between 8 and 14 years of experience. He or she is the primary advisor for the Project Supervisor and brings experience and authority to the table.

- Project Support Operators- There is a whole host of other system operators in the battalion who play an important role in construction quality. Some of the key ones are listed below:

  - Alfa Company – Alfa Company Seabees operate and maintain the battalion's entire suite of Civil Engineer Support Equipment (CESE…heavy equipment). They schedule and operate all CESE resources to maximize support to all ongoing projects. Equipment readiness is the single largest financial investment of the battalion so Alfa Company's performance is an important factor in the battalion's material readiness. Incidentally, Alfa Company is also assigned projects that are primarily horizontal construction jobs so they also task-organize in a project management structure as mentioned above. There are some potential training and selection issues here because the Equipment Operators and Construction Mechanics do not typically manage projects as part of their normal career progression in the CESE support aspect of NCF operations. So occasionally, their experience in project management is limited.

  - Bravo Company – Bravo Company Seabees are responsible for the utilities maintenance and Seabee Camp maintenance for the battalion. They are responsible for operating and maintaining the system structures as listed above. Since they have most of the battalion's Construction Electricians and Utilitiesman (plumbers), they are an important source of technical experience for all project crews. As with Alfa Company, they are also assigned project management duties for projects that are utilities intensive (underground pipe installation, etc.). They have the same types of training and selection issues that Alfa Company project managers have.

  - Supply Department- The Supply Department is a multi-faceted team of Seabees who are tasked with the management of all material resources of the battalion. As such, their management effort is a crucial factor in the battalion's material readiness. An important part of the Supply Department is the Material Liaison Office (MLO). This team is t typically comprised of Seabees from construction trades who are responsible for ordering, inventory, storing and issuing construction material for all of the system's construction projects. As construction trade Seabees, they have intimate knowledge of the material as it travels through

their area of responsibility. But sometimes they do not have the same skill in managing and inventorying material that other sailors who are trained as storekeepers might have.

- Training Department- The Training Department is another team of Seabees who have an important mission that directly supports the battalion's readiness. They are responsible for managing the battalion's Training Program which identifies required skills and ensures that the battalion has the correct amount of Seabees and teams who have these skills. This is training attainment is an important criteria in measuring the battalion's overall readiness. Additionally, as a result of the Seabees' "Build and Fight" mission, the Training Department must arrange both tactical combat training and technical training for all system operators. There are numerous tradeoffs between that they must address between conducting these two types of training because of limited resources of time, classroom space and instructors.

#### 5.2.2.5 Environments

Seabees have to be able to operate in a wide range of environments- known as Projected Operating Environments- as mentioned above and listed in Appendix 1. This wide range requires Seabees and their equipment to be remarkably flexible. To cite a specific example, this is why a NMCB Table of Allowance does not contain any sheep's-foot rollers. While such rollers are extremely effective for compaction of clayey soil, they are a real liability in a combat contingency operation because of the difficulty involved in transporting them. If such a piece of equipment is absolutely required, the end user is forced to rent it (which has compatibility impacts on the project budget). This is just one example of how POEs impact the quality of construction projects.

#### 5.2.2.6 Procedures

There are countless processes and procedures that govern quality and reliability in the NMCB Deployment Construction Program. This work will list several of the important ones:

1. Safety and Risk Management (ORM and NAVOSH)
2. Project Management (Planning and Execution)
3. Quality Assurance and Quality Control

### *Procedure 1) Safety and Risk Management*

As with any military organization, safety is the first and foremost consideration of all hands. This falls right in line with this system's primary output: a team of ready Seabees. Therefore, **Safety is the primary quality attribute of this system**. Safety in the Naval Construction Force is guided by two general Navy instructions: Operational Risk Management OPNAVINST 3500.39 and the Navy Occupational Safety and Health (NAVOSH) Manual OPNAVINST 5100.23E.

#### Operational Risk Management

The formalized process that the Naval Construction Force follows to ensure safety is known as Operational Risk Management (ORM). It is defined as a program that:

1. [is] a decision making tool used by people at all levels to increase operational effectiveness-by anticipating hazards and reducing the potential for loss, thereby increasing the probability of a successful mission.

2. increases our ability to make informed decisions by providing the best baseline of knowledge and experience available.

3. minimizes risks to acceptable levels, commensurate with mission accomplishment. The amount of risk we will take in war is much greater than that we should be willing to take in peace, but the process is the same. Applying the Operational Risk Management process will reduce mishaps, lower costs, and provide for more efficient use of resources.[27]

This comprehensive RAM approach has been the Navy's standard since 1996 when OPNAVINST 3500.39 was released. ORM was actually a program that was developed by the U.S. Army who has operated by this system for years. ORM is primarily a proactive approach, but the implementation of the program demands reactive and interactive approaches.

#### NCF implementation of ORM

Construction is one of the most hazardous routine activities in Navy operations, so safety has been a primary focus of the NCF since its inception in 1942. One of the most important parts of project planning is the development of a comprehensive Project Safety Plans. This plan is fully integrated into the project execution plan: as each construction activity is developed, ORM concepts are applied to identify potential

[27] pg 1, OPNAVINST 3500.39 Enclosure (1)

hazards involved with the activity, determine the likelihoods and severity of those hazards, and find ways to minimize those risks. So each construction activity has an ORM worksheet associated with it. This program is managed on a job site by the Project Safety Supervisor. This proactive approach is a good way to encourage the Project Crew Leader and Project Supervisor to look ahead to prevent safety hazards and remain focused on safety.

**NMCB Safety Program: NAVOSH**

The NMCB Safety Program is set up as instructed in the NAVOSH Manual mentioned above. It is a multi-faceted RAM program that uses all three approaches to ensure operator safety: Proactive, Reactive and Interactive. There are several aspects of this program that are important to discuss.

Safety Inspections- the Safety Officer and the Assistant Safety Officer conduct daily inspections of every job site. Using a specific inspection form (shown in Appendix 4) they monitor each job site with an eye towards compliance with the project's own safety plan.

Mishap Investigations- the Safety Chief oversees all mishap investigations. Mishaps are conducted on all mishaps- whether or not they took place on duty or on liberty. Each battalion uses its own mishap investigations form, but these forms are all collected and analyzed by the Safety Chief.

An important part of the NMCB Safety Program is its two tiered implementation and management system: There are two command-wide safety teams: the *NAVOSH Policy Council* and the *NAVOSH Committee*. The NAVOSH Policy Council is chaired by the XO and is composed of the Safety Officer (as a non-voting recorder), all Company Commanders and all Department Heads. This upper echelon team analyzes safety data gathered by the Safety Officer to enact policy changes in all aspects of battalion operations to ensure that safety remains a constant focus. The NAVOSH Committee consists of Project Safety Supervisors from each ongoing construction project and Safety Representatives from each department. This working level team takes a close look at each reported mishap as well as the daily safety inspection forms to try to find trends. This team also determines the best way to implement the guidance and policy directives that are issued by the NAVOSH Safety Policy Council. The advantage that both of these teams have is that they are attended by representatives from the entire battalion so they take an inter-disciplinary approach.

***Procedure 2) Project Management***

Seabee Project Management takes place in much the same way as it does in the private sector. This process is focused primarily on quality of the end product (construction). Before projects get to the battalion, they follow a generalized process:

- Develop requirements- End users determine the requirement for construction service. They start the process to acquire a design.

- Design development- End users work closely with their cognizant EFD and NCB to develop a design that meets their needs and provides good training for the Seabees. The EFD either completes the design in-house with their own engineers or they out-source and purchase a design from a civilian architect/ engineering (A/E) firm.

- NCB and NCR- After the design is complete, the NCB and the NCR evaluate the project and schedule it for NMCB accomplishment based primarily on the urgency expressed by the end user.

After the project is tasked to a battalion, there is a specific process that this system follows to get the project going. It can be split into two phases: project planning and project execution:

*Project Planning*

The NCF views project planning as an important tool to make groom young Seabees for future professional growth. The planning process helps young Seabees understand the big picture and develops their ability to manage complex processes. It represents an important proactive approach to reduce HOE. The planning process also creates an important (and under-utilized) project management tool: the three level project schedule.

Planning and Estimating (P&E) is the heart of this planning process. P&E is a proactive approach to prudent resource management. Project Supervisors and Crew Leaders sit down at least six months before the deployment to review the designs and come up with a plan to manage the project's resources. The main reference they use as they develop this plan is NAVFAC P-405: the Crewleaders' Handbook. This manual contains nominal tabular data that helps them predict usage of the various resources at their disposal:

- Time: The prime end product of the P&E process is a three-level project schedule. The P&E team uses the CPM approach to break up the project into discrete construction activities. Durations and sequences are developed for these activities, which determines the overall project

schedule. The P-405 lists numerous standard construction activities (much like the Means' Construction Data tables) as a reference for these durations.

- Crew size: The P&E team also manages the Seabees that they are assigned. Based on the construction activities developed (and data from the P-405) the P&E team determines how many Seabees they will need and what trades they must have.

- Material: The P&E team determines all the material and equipment they will need to complete the project on a construction activity basis. CESE, tools, and construction material estimates are all calculated for each activity.

- Safety Plan: The P&E team also develops the Project Safety Plan. As mentioned above, it is based on an individual construction activity basis.

The P&E team works on this plan throughout most of the homeport training period leading up to the deployment. There is a specific plan of action and milestones (POA&M) that the Crewleaders' Handbook lays out to help the P&E team develop their plan in time for the deployment. As the team hits each milestone, they submit their plan up the chain of command for review and approval. This is an effective interactive QA/QC approach but is unfortunately under-utilized. Because of busy schedules, this "review and approval" often becomes a "check-in-the-box" activity with little review. The Operations Department is required to report their progress on each project in relation to this POA&M on a monthly basis to higher headquarters at the NCR.

*Project Execution*

Once the plan is complete and approved, the schedule of construction activities becomes the primary project management tool that the Project Supervisor and Project Crew Leader use to manage and employ their resources. This schedule is visually displayed on a Gantt chart. The entire schedule is split into three levels:

- Level I: This is a battalion wide schedule that lists each project as a separate line item.

- Level II: This is a more detailed schedule used by the Operations Officer and the Company Commander. Each project has a Level II schedule associated with it and has Master Activities (that group individual construction activities) listed as individual line items.

- Level III: This is the most detailed schedule format and is used by the Project Supervisor and Project Crew Leader. Each project has a Level III schedule which lists each individual construction activity.

Samples of these schedules are included in Appendix 5.

***Procedure 3) Quality Assurance and Quality Control***

The Naval Construction Force's Quality Control Program is outlined in great detail in a lengthy instruction: Construction Quality Control Program (COMSECONDNCB/ COMTHIRDNCBINST 4355.1D, July 1998). The title is somewhat misleading because this program is really a QA/ QC program that takes proactive, reactive and interactive approaches to improve quality in NCF construction projects. The program focuses around two timeframes: Planning (prior to construction activity) and Inspection (during execution of construction activity). The Construction Quality Program refers to these phases as "control" and "inspection". "Control" in this reference is used to describe to preventive proactive measures and "Inspection" refers to interactive and reactive measures.

Quality Control Plans- NMCB QC Plans are two-sided. Each Planning and Estimating Team is required to develop a QC plan for their project that defines specific quality measures for each construction activity. The battalion QC staff also develops a QC Inspection Plan based on this QC plan to ensure that these quality measures are met. This proactive approach encourages both teams (Project Crews and QC inspectors) to use teamwork to work together to reduce HOE.

QC Inspections- NMCB QC Inspections are really a mix of interactive and reactive approaches to reduce errors. The general process is as follows:

- Pre-construction Conference- The QC staff meets with the Project Supervisor, Company Commander, Operations Officer, ROICC inspectors and end-users before construction begins. This meeting is designed to encourage communication and make sure that everyone is informed of the schedule and specific concerns. While this is not necessarily a phase of construction, it sets the stage for later interactive approaches by building relationships between the key players.

- Preparatory Phase- Project Crew Leaders and QC inspectors conduct meetings during the Preparatory Phase that occurs before the commencement of each construction activity. This meeting ensures that the crews and the inspectors all know what the relevant quality attributes and specifications are for that activity. This is the last proactive approach.

- Initial Phase- QC Inspectors observe the start of the construction activity to ensure that design plans and specifications as discussed during the preparatory phase are being followed.

- Follow-up Phase- QC Inspectors conduct daily inspections to observe construction progress to verify that all quality attributes were met. This phase is highly interactive as the QC Inspectors- as experienced construction technicians- work closely with project crews to reduce errors and ensure quality. A sample of the daily inspection form is included in Appendix 6.

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# 6 System Human and Organizational Factors

There are several overarching HOFs that manifest themselves in several of this system's components and approaches. These factors have deep and lasting effects on both the readiness of the Seabees and the quality of the facilities that they build.

## *6.1 NMCBs as High Reliability Organizations*

Dr. Robert Bea defines High Reliability Organizations as: *organizations that have operated nearly error free over long periods of time* (pg 80). Any analysis of a technical organization is complemented by a comparative look at High Reliability Organizations; especially an analysis of a dynamic organization like a Seabee battalion that routinely conducts hazardous operations in austere environments. Chapter 2 of this work provides some background regarding the existing research done on these organizations.

But how do these concepts apply to NMCBs? After all, the construction process is so complex, that it seems difficult to crisply classify a Seabee battalion as a High Reliability Organization (or any construction organization for that matter). But it is this author's opinion that Seabee battalions do exhibit many of the characteristics that distinguish HROs. Further, Seabee battalions often exhibit many of these characteristics that their civilian counterparts do not, thanks mostly to their military requirements. Here is a list of HRO characteristics (as listed above) that apply in particular to the US Naval Construction Force:

1. **Extensive process auditing procedures**: There are several process auditing procedures in every aspect of NMCB operations. While too numerous to list here, it is important to note that these procedures are not only published, but enforced by periodic inspections. Each NMCB gets inspected at least twice in a typical homeport-deployment cycle: once in homeport to determine their readiness to deploy and once at an early stage in the deployment to set the expectations for that deployment. These inspections are large evolutions where

2. **Reward systems that encourage risk mitigating behavior**: Each battalion has different individual reward systems, but most units informally reward risk mitigating behavior. As described earlier, personal professional reputation is the main currency by which Seabees are compensated; it is relatively easy to encourage risk mitigating behavior by simply valuing such behavior (which we do) and publishing congratulatory news about such behavior.

3. **Quality standards that meet or exceed the referent standard**: In everyday construction operations, there are reams of standards that must be followed for any given construction activity: no less

than 3 inches of spacing between reinforcing steel and concrete forms, 40 day maintenance cycles for construction equipment, etc. Seabees realize that their construction operations take place in vastly different situations than the "industry standard" (i.e. civilian construction practice). Therefore, most- if not all- Seabee instructions out in the field are written with safety factors above and beyond the "industry standard".

4. **Will correctly assess the risk associated with the given problem or situation**: Collected mishap data over fiscal year 2001 reveals that most battalions in the Pacific theater do a reasonably good job of assessing risk on the job sites. Most of the safety mishaps (between 65% - 75%) occur off duty. Further, most (78%) of the mishaps that do occur, result in either no lost time (51%) or in light duty (27% where the member returns to work but with diminished capacity).[28]

5. **Strong command and control system:** As a military combat unit, Seabees have tremendously strong command and control systems. They are able to draw upon the best practices of the US Marine Corps, the US Navy and other world class leadership outfits.

a. Migrating decision making. The US armed forces have long understood the requirement to push decision making authority down to the lowest level of the hierarchy capable of making good decisions. The reason why military discipline and unit esprit-de-corps is so valued in the US military is because these two qualities enable leaders to successfully delegate decisions to the lowest competent level.

b. Redundancy. Seabee doctrine and policy is designed to demand redundancy in manning levels, training attainment and equipment and material inventories as outlined explicitly in classified readiness documents. There are only a few quantities that are allowed to be unique in the battalion and those are either not mission-critical such as the lone Chaplain assigned to the battalion or are easily replaceable with other organic assets.

c. Rules and procedures. There are literally reams of rules and procedures that are followed in the complex day to day operations of a Naval Mobile Construction Battalion. These are complete and comprehensive, but also are flexible enough to afford individual system operators authority to make decisions. In order to make sense of these rules and procedures, they are codified and simplified into standard operating procedures that can be easily posted in work spaces for clarity.

d. Training. The entire deployment cycle is one large training evolution designed to exercise command and control in a dynamic environment and sharpen technical construction skills. This aspect of

[28] pg 3, 3NCB FY01 Safety Mishap Analysis, SWCS M. Widener

training- because it involves real construction that is much more complex than anything Seabees might have to build out in an expeditionary combat zone- goes through the entire spectrum from normal, to abnormal and on to unbelievable. Seabee battalions also conduct full scale battalion-wide real-time training exercises out in the field each homeport. These field exercises are driven by tactical scenarios that tax the full range of the battalion's command and control capability as well as the military field and combat skills of its individual Seabees and its subordinate task-organized units.

e. Senior management has the big picture. Again, military culture serves to re-enforce the requirement for senior management to keep hold of the big picture. By delegating decisions to the lowest competent level, senior management "conserves" cognitive resources to focus them on big picture issues.

## *6.2 Selection: Career Path (Promotion, selection and command)*

Training and Selection are crucial ingredients in the Naval Construction Force's recipe for quality. Battalions each take great pains to ensure it selects the right system operators to optimize quality. After selecting these operators, the NCF ensures they get as much training as they can to succeed in their respective job assignments.

### 6.2.1 Navy Accession and Promotion Policy

The Navy follows a very specific, regulated recruitment and promotion system for both officer and enlisted personnel. These two systems are a fundamental aspect of the Navy's organizational fabric, so any discussion about the Navy's leadership and organizational factors must take a close look at this system. In particular, the promotion system also has significant influences on the levels of technical expertise and experience that its operators have.

#### 6.2.1.1 Officer promotion

Officers in the US Navy serve at the pleasure of the Commander-in-Chief of the US Armed Forces; by earning a commission in the US Navy, they are accorded certain rights and privileges. Unlike enlisted personnel, officers in the US Navy with active duty commissions are not signed on for contracts of limited durations. Officers are signed on for permanent commissions and serve in the Navy until they voluntarily resign to return to civilian life (or are involuntarily removed for cause).

Promotion is a more complicated procedure. Promotion to each successive rank is determined by an officer's professional performance record. For the first promotion to Lieutenant (Junior Grade), the Navy currently promotes all qualified officers. For all other promotions, the Navy convenes a board of officers

each year to review records in order to determine which officers will be promoted that year. This board reviews the records of all officers who are eligible for promotion that year and are given a number of officers that they can select. This number is based on the current numbers of officers at the next higher rank and projects of attrition and retirement. This board is given a set of instructions called "precepts" that guide their decision-making process. It tells the board members what standards they should use when determining which officers are best qualified for promotion.

But upon what principles are these precepts based? The core determining factor is an officer's preparation for command of operational units. Officers are continually reminded throughout their careers that command at sea should be their ultimate goal. This policy is shown clearly in the following excerpt from the most recent precept for the promotion board for Civil Engineer Corps Lieutenant Commanders:

> Naval policy regarding application of the statutory best qualified standard is as follows: The needs of the navy dictate that our future leaders possess the qualities to excel in combat as commanders or in support of operational commanders or positions of leadership in direct support of fleet operations. Proven excellence in operational environments is an important measure of the qualities required. Performance while in command (for those who have been afforded the opportunity), as well as potential for command is the ultimate test of fitness for promotion. Officers may have also demonstrated leadership, skill, integrity, and resourcefulness in other difficult and challenging joint and in-service assignments.[29]

But fortunately for the Naval Construction Force, NMCBs are among the few opportunities for operational experience. Therefore, previous experience in Seabee battalions can have a strong bearing on a CEC officer's chances for promotion. This can only help the Naval Construction Force by helping to ensure that senior officers in the CEC can be strong advocates for Seabees because "they've been there and done that". This also helps the NCF because their clients are often senior CEC officers themselves: Public Works Officers at forward overseas naval installations, etc. These senior CEC officers have typically been in Seabee battalions themselves in the past so they know the operating methods, strengths and limitations of the NCF.

[29] Appendix B, Secretary of the Navy letter to RADM Charles R. Kubic, CEC, USN, 29 April 2002, PRECEPT CONVENING FY-03 PROMOTION SELECTION BOARD TO CONSIDER OFFICERS IN THE CIVIL ENGINEER CORPS ON THE ACTIVE-DUTY LIST OF THE NAVY FOR PROMOTION TO THE PERMANENT GRADE OF LIEUTENANT COMMANDER

#### 6.2.1.2 Enlisted promotion

Enlisted promotion follows the same general concepts as officer promotion, but is managed under separate, distinct processes. Enlisted troops- as discussed above- sign definitive, finite contracts of service ranging in length from 3-6 years. Therefore, each time an enlisted Seabee's contract ends, he or she is faced with a big decision: whether or not to re-enlist. These career milestones offer the Navy an opportunity to create powerful incentives such as re-enlistment bonuses and re-enlistment ceremonies (to recognize the service member's renewed commitment). However, this human resource management model also creates a much more complicated personnel accounting system because it is not connected to payroll or crew-lists. In fact, one of the biggest tasks for a company staff in a Seabee battalion is juggling and updating various disparate personnel accounting systems: battalion manning, jobsite crew lists, daily attendance sheets, and payroll.

Another feature of the enlisted promotion process is that it values generalists. In order to be a Project Supervisor, a QC Inspector or a Safety Inspector, a Seabee should serve as a Project Crew Leader. In order to serve as a Crew Leader, a Seabee should serve as a Crew Member. But in the NCF, the timeframes created by typical battalion tours and their deployment schedules demands a rapid advancement in job assignments. Therefore, Seabees typically only spend one deployment in a given job before they move up. In the civilian world, journeymen and craftsmen often spend years perfecting their trade. Seabees cannot match this experience, which means that their activity on the jobsite is almost always knowledge based behavior. Their civilian counterparts can often advance to the point where much of their activity is rule based or even skill based.

### 6.2.2 Company Commanders

Company structure in the NCF is based on the standard Marine Corps rifle company structure. This structure has been developed from years of combat infantry experience and expertly leverages talent, experience, authority and responsibility. However, there are some complications as this organizational template gets transferred to the Naval Construction Force. In the typical Marine Corps rifle company structure, there are more officers. Each Marine Corps platoon is commanded by a 2LT or a 1LT (equivalent to a Navy ENS or LTJG. See Appendix 3 for rank structure). The typical Marine Corps Company Commander is a Captain (equivalent to a Navy LT). However, in the Seabees, there are not enough junior officers to put one in command of each platoon. Therefore, Platoon Commanders in Seabee battalions are always Chief Petty Officers or even First Class Petty Officers. This puts a premium on enlisted leadership. It also pushes day to day management authority of the jobsite away from engineers (officers) and more towards technicians (Chief Petty Officers).

## *6.3 Training*

This work would not be complete without outlining the training processes that the system operators go through. It highlights some specific HOFs that come into play in NCF operations.

### 6.3.1 Enlisted training

There is a core training pipeline that all enlisted Seabees go through. It begins with Boot Camp and A-School which they go through in the same way that every other sailor in the US Navy does. After the enlisted Seabees report to their battalion, their training continues to prepare them for their specific duties for upcoming deployments.

- Boot Camp- Entry recruit training for all Seabees is the same as it is for every other Sailor in the US Navy. It is a rigorous eight week training program that introduces civilians to life in the military. It includes physical training, military bearing, and technical training all in an environment of intense discipline.

- A School. After Boot Camp, most Seabees move on to initial technical training for their specific military occupational specialty, which is known as A-school. The Department of Defense recently consolidated training for all construction related occupational specialties in all of the armed services. Now, Builders from the Navy, the Air Force and the Army all train together after completing boot camp.

- Special Construction Battalion Training (SCBT). The construction projects that a battalion accepts necessitate a whole host of specific technical training: welding, concrete finishing, block laying, etc. The Seabee Readiness Groups offer a wide range of these classes for battalions in homeport and they are collectively known as SCBT classes.

### 6.3.2 Officer training

Officer training starts at the baccalaureate level. All Civil Engineer Corps officers in the Seabees earn accredited engineering degrees (a pre-requisite to commissioning in the CEC). A small percentage of CEC officers are commissioned via Reserve Officer Training Corps programs or at the US Naval Academy. These officers receive up to four years of professional development training which includes introduction to all warfare communities of the Navy and the Marine Corps. The rest of the officers in the CEC receive initial officer training prior to receiving a commission at Naval Officer Candidate School (OCS) in Pensacola, Florida. This three month program is the officer equivalent to Boot Camp and is a rigorous, disciplined comprehensive training curriculum. After commissioning into the Civil Engineer

Corps, all officers report to CECOS: Civil Engineer Corps Officer School at CBC Port Hueneme, California. This is a 120 day training program that introduces newly minted officers to life in the CEC: training topics cover all aspects of CEC responsibility including Seabee operations. CECOS even includes a short field exercise to give the new CEC officers a brief glimpse of life in the field with the Seabees.

### 6.3.3 Warfare Specialist Training

In today's Navy, there is a significant emphasis on individual military training as part of a sailor's overall professional development. The most obvious manifestation in this renewed focus is a program known as warfare specialist qualification. Most mainstream Americans know about the "Navy wings of gold" which represent a naval officer's qualification as a Naval Aviator. But what most Americans do not know is that similar warfare specialties exist in most communities of the Navy. Countless policies and regulations have been issued at all levels of the chain of command that demonstrate a renewed emphasis on warfare specialty qualification. Warfare specialty qualification has become a de facto requirement for promotion in the senior ranks of the enlisted community and the officer community. It has also become an important decision factor in a whole host of other areas varying from performance evaluations to selection for job assignments and extra privileges.

The Naval Construction Force has its own warfare specialty: the Seabee Combat Warfare Specialist (SCWS). By earning a SCWS designation, a Seabee proves that he or she has the requisite professional skills and knowledge to plan and execute operations in the whole range of Naval Construction Force missions. It requires demonstrated detailed knowledge about planning a wide range of operations including (but not limited to) mobility operations, defensive combat operations and contingency construction operations. It also requires execution of a wide range of military skills including (but not limited to) field-craft, small arms proficiency, communications equipment operation and camp construction. This emphasis came about because of two things:

1. The performance of the Seabees in Desert Shield/ Desert Storm demonstrated a critical need to talk the same language as the US Marine Corps and other units that we would be supporting. Among other things, this required the use the same methods and equipment, matching the mobility capabilities of the USMC, etc. This formed the groundwork for training requirements that would be the foundation of the SCWS program.

2. A few years later, the Navy as a whole began to focus on warfare specialty qualification as an integral part of professional development during Admiral Jay Johnson's tour as CNO in 1996. The Navy

recognized that sailors who were warfare specialists not only demonstrated more professional knowledge about their community, they also demonstrated more commitment to the organization and a bigger picture view about their individual role in the execution of their command's mission. In short, warfare specialists proved to be more valuable than sailors who had not gone through the qualification program.

So it appears as though SCWS qualification is here to stay. Therefore, it is important for this work to determine the impact that this program has on the NMCB Deployment Construction Program because it affects every operator in the system.

As stated at the outset, the Naval Construction Force has a two-fold mission statement: *We Build, We Fight.* This renewed focus on warfare specialties creates incentive issues for the Seabees as a construction organization. There are strong incentives for Seabees to earn their SCWS qualification. This comes at the expense of further technical training: time spent preparing for SCWS qualification might otherwise be spent further perfecting construction skills. While Seabees receive a strong baseline of technical training, they cannot match the expertise of their civilian counterparts who focus solely on their construction specialty.

### 6.3.4 Command Indoctrination Training

Since the military keeps rotating personnel, just about every military unit has some sort of "command indoctrination" program that introduces newly reporting personnel to its plans and policies. These programs are usually "welcome aboard" briefings that also include information about living in the area. Most NMCBs take advantage of command indoctrination to do several things:

- Introduce newly reporting Seabees to life in the battalion and life in the local area. Seabees are introduced to battalion standard operating procedures and locations of operations.
- Conduct annual refresher training on a wide variety of mandatory topics such as prevention of sexual harassment.
- Complete command-wide administrative requirements.

But another important concept that must be kept in mind with respect to this program is that it really creates a deep first impression for the newly reporting Seabees in two meaningful ways: they evaluate the command by how Command Indoctrination is run and they are introduced to the command culture at Command Indoctrination.

Command indoctrination therefore, represents an important leverage point to begin acclimating new Seabees to the command culture. So it is of crucial importance that battalions "get Command Indoctrination done right" so they get their new Seabees off to the correct start. Command indoctrination is run by the battalion's Training Department and is one of their most important training evolutions.

## *6.4 Seabee and Military Culture in NMCBs*

As military combat organizations, NMCBs share a rich organizational culture with the entire US armed forces. While a full description of this organizational culture is perhaps out of the scope of this work, it is instructive to examine those aspects of military culture that impact NMCB construction operations.

### 6.4.1 Interactive Approaches

The US armed forces have from their inception been focused on dealing with the unknown; famous warrior-philosopher Baron Carl Von Clausewitz refers to this as "the fog of war" in his seminal work, On War. That is the heart of interactive quality control approaches: the ability of system operators to deal with the unknown. Military construction technicians instinctively plan for the unknown because that is their legacy.

### 6.4.2 Strong, Flexible Command and Control

The discipline that has been the hallmark of the US military is rooted in strong command and control. However, this command and control does not necessarily mean a rigid, structured hierarchy. Always pushing all available communication media to the extreme, military command and control decentralizes authority by instilling a strong sense of duty and loyalty to their country, their unit and their comrades. This sense of duty allows the US military to solve the paradox of strong command and control coupled with decentralized authority. Seniors know that as long as they have promulgated the commander's intent, that their subordinates will do the right thing in the prosecution of their mission.

## *6.5 NMCB Organization Issues*

There are also Human and Organizational Factors that are specific to the Navy and to the Naval Construction Force that influence quality. Again, the list below is far from exhaustive, but it is intended to be a starting point for analysis.

### 6.5.1 "Command Culture" Teams

Navy tradition has produced several unit organizations that have Seabees have used as valuable leadership "force multipliers". Specifically, they are groups of like ranks from throughout a given battalion and they create powerful media for the exercise of leadership. The officers of a battalion are typically referred to collectively as "the Wardroom". Likewise, the Chief Petty Officers of a battalion are collectively known as "the Chiefs' Mess". And finally, the First Class Petty Officers of a battalion gather together to form the First Class Petty Officers' Association. These "command culture teams" allow the exercise of leadership across the battalion. Officers can gather in the Wardroom lounge to discuss leadership issues that affect the entire battalion and gain consensus before implementing concepts as final policy. Likewise, Chiefs can gather in their lounge to solve problems that are best addressed away from the jobsite. These groups foster mentoring, become an important forum for sharing resources and information, and become a platform for enhancing command unity and transmitting command culture. These groups all are steeped in Naval tradition and have various rituals and processes associated with them that serve to reinforce the group's cohesiveness and maintain professionalism.

### 6.5.2 Task Organized Functional Teams

NMCBs are self-sufficient operational combat units. A requisite result of this self-sufficiency is the creation of various task-organized functional teams. In order to assure combat mobility, sustainability and survivability, NMCBs have set up subordinate units to address combat issues. These teams are stood up on an ad hoc basis when their special tasks are required, but they periodically train to ensure their readiness. These teams are:

**Air Detachment**. A battalion's Air Detachment is a task-organized group of 91 Seabees whose mission is to maintain combat readiness to deploy anywhere world-wide in 48 hours. They can perform all of the functions that a full battalion can, just on a smaller scale. Their requirement to mount-out within 48 hours requires extensive mobility training and command and control exercise. Their 48 hour mount-out exercise is typically one of the most important parts of a battalion's homeport field exercise.

**Rapid Runway Repair Team (RRR team)**. A battalion must be able to keep an active expeditionary airfield in an operational status. Therefore, each battalion keeps a team of Seabees trained in the specific means and methods for rapid runway repair.

**Chemical, Biological Radiological Response Team (CBR team)**. All combat units in the US armed forces face threats of conventional weapons as well as non-conventional weapons such as chemical compound attacks, biological pathogen attacks and nuclear weapons. Each battalion trains a team of CBR

experts to conduct cleanup operations in the event of a CBR attack so that the battalion can keep construction operations going in CBR contaminated environments.

Sometimes people view these units as significant distracters from primary mission because they require extensive training. However, this training is the price that Seabee battalions pay for being self-sustainable in combat. It is a tradeoff that has always been understood: extra time for technical training or the ability to survive in combat. When viewed this way, the tradeoff analysis becomes simple.

### 6.5.3 Collateral Duties

Another requisite result of self-sufficiency is further demands on system operator's time. Companies and Battalions need Seabees to perform various duties and manage various programs so that they stay in compliance with Navy and NCF regulations. These duties are assigned in addition to a Seabee's primary job and include Command Managed Equal Opportunity Officer, Physical Fitness Leader, SCWS Coordinator, Command Retention Team, Public Affairs Officer, etc. Again, many people view these jobs as significant distracters from a Seabee's primary job, but they are required; battalions have little authority to leave these tasks and duties unfulfilled.

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# 7 System RAM Approaches

The second key definition of the U.S. Naval Mobile Construction Battalion Deployment Construction Program is to define the approaches this system uses to ensure quality. There are countless numbers of these approaches, and many of these approaches have been discussed previously. This analysis will examine many of the most critical approaches that the NCF uses to ensure quality in each system output: Ready Seabees and Shore Facilities.

## *7.1 Reactive Approaches*

Safety Investigations- Mishap investigations are an important reactive approach that NMCBs use to reduce safety errors and failures. A Seabee's chain of command is required to initiate a mishap investigation after any type of accident that either requires medical attention or will result in a lost work-day. The mishap report must be signed by the Seabee's Company Commander and submitted to the Safety Department within 3 working days. This investigation does several things:

- Informs the entire chain of command that a Seabee has been involved in a mishap
- Allows the Safety Chief to gather specific mishap information. This mishap information is compiled for various reports including battalion-wide Deployment Completion Reports. It is also used for analysis by the NAVOSH Policy Council and the NAVOSH Committee.

One potential problem with these investigations is that they currently do not cross-reference with any element of the project's safety plan. Each project develops its own safety plan; any mishap investigation should discuss the applicable project safety plan and what part of it failed to prevent the mishap. Battalions should add a field to the mishap investigation form that lists the specific construction activity the Seabee was working on when the mishap occurred. There is a field that requires the investigator to describe the cause of the mishap and what has been done to prevent the mishap in the future. There should also be a field that ties the mishap back to the Project Safety Plan to highlight the plan's deficiency that allowed the mishap to occur. Since this is an NCF specific form, it should tailored by the NCF to assist in reducing mishaps in construction effort.

Regular chain of command visits- Senior members of the chain of command always make it a point to visit job sites on a regular basis. The main reason for these visits is to build esprit de corps and remind project crews that their chain of command is concerned about them. But another reason- just as important in this author's opinion- is to let the visitor see quality attributes as they are addressed by the crews. This

is a reactive approach that reinforces the normal daily inspections by the QC Inspectors. In particular, visits by the CO, the Operations Officer and the Company Commander reflect direct concern about construction quality by the upper chain of command. During these visits, standard practice states that a senior member of the crew (either the Project Crew Leader or the Project Supervisor) will give the visitor a short tour and explain the construction activities that are in progress at the time. Senior members of the chain of command use these tours to get to know the Seabees on the job sites, but they also use them as a random spot-check of crew member level of knowledge and involvement in the QA/ QC process.

## *7.2 Proactive Approaches*

Chain of Command Safety Focus: All levels of the chain of command focus on safety in this system; it pervades every aspect of battalion operations. Seemingly small things such as safety decals on every hard hat reinforce this safety oriented culture. It starts with Command Indoctrination- a multi-day training program to introduce all incoming Seabees to command policies and procedures. During Command Indoctrination, the Safety Officer typically has an entire day allotted for introduction to the Battalion Safety Program. This proactive approach attempts to focus Seabees on safety during all their activities.

Project Planning and Estimating: The most important internal system process to ensure construction quality is the Planning and Estimating process. This proactive approach forces the Project Supervisor and Project Crew Leader to use a disciplined approach to address all quality attributes during the construction phase of their project. There is a high level of command interest in the progress and performance of this planning, which is beneficial. The product of this planning process is a schedule that can be a valuable project execution tool.

## *7.3 Interactive Approaches*

Feedback: The most important interactive approach that the Naval Construction Force uses to ensure overall system quality is continuous feedback. There are several feedback paths that are continually managed that allow system operators to examine system output and

Daily safety stand-downs: Project Crew Leaders and Safety Supervisors conduct a 5 minute safety lecture at the start of each day as required in the NCF NAVOSH Manual (COMSECONDNCB/ COMTHIRDNCBINST 5100.1A). This is a powerful interactive approach that allows the job site chain of command to address specific hazards that are applicable for that day's activities. For example, on the day of a big concrete pour, the morning safety lecture might be about the hazards of concrete lime burns.

Five minutes seems like a short amount of time, but it is remarkably effective since it can focus in on the relevant hazards.

QC inspections- The three phase QA/ QC inspection program that the NCF uses is a powerful interactive approach to ensuring quality and reliability in the shore facilities that Seabees build. The continual interaction between the QC Inspection staff, Project Supervisor, Project Crew Leader and the crew members brings a wide range of experience and backgrounds to bear on the common challenge of ensuring quality and reliability. Incidentally these inspections provide a fertile training ground for the QC Inspection staff and the Project Supervisor- as senior Petty Officers- to teach their subordinates about technical matters and about leadership.

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# 8 HOF Influences on System Quality

This section consists of a qualitative analysis of HOF impacts on a battalion's operations. The author conducted interviews and gave surveys to several key system operators from NMCB FOUR to see how HOFs influenced system quality during their recently completed deployment. This battalion is homeported in Port Hueneme, California and deployed to Camp Mitchell in Okinawa, Japan from December 2001 until June 2002. This was the battalion's second consecutive deployment to Okinawa, as they deployed there from October 2000 until May 2001. The surveys are contained in Appendix 7.

The author interviewed four members of NMCB FOUR. All interviewees were First Class Petty Officers during the Okinawa deployment and were selected because of their job assignments. Their names will not be published. The survey and the interviews were designed to gather thoughts and opinions about the deployment to Okinawa. It was decided that First Class Petty Officers were the logical candidates to interview: they are senior in the chain of command, so they have considerable authority in the prosecution of construction projects and have valuable experience to guide their efforts. But they are also close enough to the deckplates to see the day to day details out on the job sites.

## *8.1 Interviews*

The author interviewed four different Seabees from NMCB FOUR on Monday November 18, 2002. The author interviewed two of these Seabees individually while the other two were interviewed together. The interviews were generally informal conversations that sought to elicit comments from the interviewees about four general concepts: Quality Control, Project Planning, Junior Officers in NMCBs and Innovation. Their comments are summarized below with a focus on the concepts which received general agreement.

- Quality Control. All four interviewees felt that the new NCF Quality Control Instruction was a good addition to NMCB construction operations. Without exception, they believed that the more rigorous and structured meeting requirements enhanced communication and allowed beneficial communication to take place that helped catch potential system failures before they required rework. However, another unanimous opinion was that this their battalion was still adjusting to the new requirements. One Builder said that she believed that the added administrative burden was a big concern because the Project Supervisors are already over-tasked.

- Project Planning. The two Builders that were interviewed both believed that planning and estimating needs to be improved. They agreed that the best way to improve the process was to provide better

training about it: too many Seabees know how to do the math, but do not understand how the final schedules need to be used as a project management tool on the jobsite.

- Junior Officers. All four interviewees agreed that Junior Officers do not spend enough time in Seabee battalions. The felt (as do most of the enlisted Seabees that this author has spoken to) that by the time Junior Officers figure out how things work, it is time for them to leave the battalion.

- Innovation. The recurring theme that all four interviewees agreed upon was the impact that money has upon innovation. Most of the innovations that Seabees develop on the job sites require some sort of initial capital investment in order to fully implement. They all believed that scarce resources prevent the NCF from implementing many innovations because of this investment. Often, the interviewees believe, the money saved by the innovation far exceeds the initial investment. But unfortunately, the benefit is realized in Seabee work-days, which prevents the battalion from taking advantage of the cost savings. This is because the work-days are not connected to the battalion's operating budget.

## *8.2 Surveys*

The initial plan for this work was to conduct a detailed analysis using software known as QMAS © (Quality Management Assessment System). QMAS © is an add-in program for Microsoft Access © developed by LCDR Brant Pickrell, CEC, USN during his graduate school tour at UC Berkeley. However, because of schedule conflicts, the author decided to conduct a limited survey instead in order to save time. The survey questions were designed to elicit responses that measure the respondent's opinions about whether or not HOFs were having a beneficial impact on NMCB FOUR's operations during their Okinawa deployment. Every numerical answer ranged from 1 (which signified a positive HOF influence) to 7 (which signified a negative HOF influence).

Overall, the survey indicated that the respondents had a generally positive view of HOFs influence: that their battalion had a positive command culture and a satisfactory training program. However, selection of Seabees for critical assignments seemed to be lacking (score average = 4).

The survey indicated a slightly less positive view of Quality approaches. In particular, the survey respondents did not feel that planning and estimating (a proactive approach) was done as well as could be.

# 9 Improving the System: Recommendations for the Naval Construction Force

This section will provide recommendations based on the preceding analysis. The U.S. Naval Mobile Construction Battalion Deployment Construction Program is a quality system that produces high reliability products: ready Seabees and quality shore facilities. But there is always room for improvement in any system. As stated in the beginning, the recommendations listed below were developed to take advantage of "leverage points" in the system that could be changed slightly to achieve great gains. There are two general recommended methods of improving this system:

1. Improve System Components
2. Improve System Approaches
3. Improve Other System HOFs

## *9.1 Improve System Components*

### 9.1.1 System Component: Procedures

**Project Management -** The Project Management process is ripe for improvement. Specifically, the P&E process has much room for improvement. This process- as designed- is an effective interactive and proactive approach that creates a valuable management tool: the multi-level project schedule. However, in practice, this process is often under-utilized. The P&E milestone process is often circumvented because schedules are so busy. "Review and approve" often devolves into "skim and sign". There is considerable incentive for this "violation" because there is little direct consequence for failure to closely review planning. Many Seabees believe that "a plan is just a list of things that aren't going to happen" and view the P&E program as a rote process that they do just because their Company Chief told them to. This unfortunate state of affairs has a considerable negative impact on the interactive value of this P&E program. Additionally, it also has a negative impact on the project execution phase as well because it reduces the value of the project schedule as a project management tool. Since the P&E process that developed the multi-level project schedule is not always fully embraced, the value of the project schedule itself is reduced as well. Often the project Level III bar chart sits unused in the job site trailer instead of being the valuable leadership and management tool it should be.

But how can you fix this? One possible method involves taking advantage of existing training programs and sub-communities within the system. Project Supervisors and QC Inspectors are usually First Class

Petty Officers who are critical operators in this part (P&E phase) of the system. The long range importance of this P&E process must be driven home to these Seabees. There are two readily available opportunities to drive this point home. Project Supervisors and QC Inspectors both attend several training courses during the P&E process. All of these training courses would be a good opportunity to impress upon them the importance of following the P&E process and demanding thorough interactive review of their plans. Additionally, most battalions have an organization known as the "First Class Petty Officers' Association" which is a professional organization of all the First Class Petty Officers of the battalion. This group- which builds relationships across the entire command- is also a good opportunity to emphasize the importance of the P&E process.

### 9.1.2 System Component: Operators

Company Commanders: As stated above, there is a wide variety in the level of training and experience of NMCB Company Commanders. Out of all of the key system operators, Company Commanders display the most variation. While this brings valued diversity to the system, it also places additional burden on adjoining system operators.

This concern is more difficult to address because it involves many tradeoffs. One potential approach is to lengthen CEC junior officer tours in the NCF. Currently, junior officers only serve 24 month tours in a battalion. Depending on when these officers join the command, they may only see one full deployment. Lengthening junior officer tours to 28 months or longer will help by providing Company Commanders who are more experienced in battalion operations. This recommendation is not without tradeoffs: lengthening junior officer tours will decrease the amount of junior officers who can have tours in the NCF. This has a negative impact on the Civil Engineer Corps as a whole: the leadership and operational experience junior officers get in the NCF is so valuable that the concept is "more is better". By advocating short Seabee junior officer tours, Senior CEC leadership has stated that it is better to have more junior officers with NCF experience than to have better Company Commanders. This tradeoff is the subject of many a lively debate in Wardrooms across the world.

## *9.2 Improving Approaches*

The U.S. Naval Mobile Construction Battalion Deployment Construction Program is a complex system that incorporates reactive, proactive and interactive approaches to ensure quality and reliability. But there is also room for improvement in each of these approaches. Some recommendations are listed below.

### 9.2.1 Recommended Reactive Approach

A formalized near-miss reporting system would be a highly effective reactive approach to improving quality this system. History tells us that there are much greater numbers of near-misses than there are actual accidents and incidents, so there is a wealth of analysis material waiting to be discovered. This recommendation is not without challenges though. Gathering data regarding near-misses would entail considerable additional workload. But the real challenge would be finding time to analyze this data. There is already considerable activity going on during a Seabee deployment that demands the cognitive effort of all system operators.

One way to implement a near-miss reporting system would be to assign it to Company Commanders. As Project Engineers, they are required to focus on big-picture analysis of trends. There are several "daily-routine" type events that they do that can add up to a near-miss reporting system. Company Commanders have to review and sign all daily QC Inspections and all daily Safety Inspections. These are effective story-based inspection reporting documents that have a wealth of information. They are included in Appendix 4 and Appendix 6 for review. Simply instructing Company Commanders to review these documents with an eye towards finding and analyzing near-misses (in both safety and construction quality) will create a new reactive approach for this system. Company Commanders are close enough to job site operations (thanks to their daily job site visits) to conduct an effective analysis but far enough so that the cognitive effort this analysis requires does not detract from direct management of operations.

### 9.2.2 Recommended Proactive Approach

**Quantitative/ Qualitative Analysis**- The U.S. Naval Mobile Construction Battalion Deployment Construction Program is a prime candidate for a thorough analysis using UC Berkeley's Quality Management Assessment System© (QMAS). Interestingly enough, this program was developed by a Civil Engineer Corps officer but never used to analyze a NMCB Construction Program.

### 9.2.3 Recommended Interactive Approach

**Safety Investigation Feedback**- As mentioned earlier, there is currently no feedback loop to tie the reactive mishap investigations back to the project's original proactive safety plan. Did the safety plan properly "forecast" this accident? Does the boilerplate safety plan need to be updated? There is no way to determine this. This is a relatively simple fix: all that is required is to add a few more data fields to existing mishap investigation forms to capture more data and analysis:

1. Construction Activity that was in progress during the mishap

2. Comparison of this Construction Activity's Safety Plan with the mishap to determine the plan's adequacy

This data would be a valuable interactive tool to continuously update Project Safety Plans. Currently they are often relegated to the status of static documents that are developed and then put on the shelf. Including Project Safety Plan information in mishap investigations would turn those plans into living dynamic documents.

## *9.3 Improving other HOFs*

There is also room for other improvements in the HOFs that act throughout the entire system. While not an exhaustive list, the potential improvements listed below are a start.

### 9.3.1 Training and Selection

While the NCF does a good job of selecting its system operators and training them, there are certain adjustments that can be made. Some of these improvements run contrary to current policy, but they are offered nonetheless.

**Junior Officers**. Assignments to NMCBs are the most important job assignment decisions for junior officers in the Civil Engineer Corps. Candidates are screened rigorously prior to receiving military orders to a NMCB. Given the important role they fill in the battalions and the importance of this job assignment to their future careers, these assignments must be paramount. This author has seen job assignments that were steered not by the requirements of the battalion, but by the requirements of other commands. While this cannot be avoided all the time, it should be the exception, not the rule. Our battalions deserve to be at the top of the priority list when decisions are being made regarding the rotation of junior officers.

**Project System Operators.** For the most part, NMCBs do a good job selecting key job assignments. However, there are certain things that should be kept in mind. Positions such as Project Supervisor, Quality Control Inspector and Safety Inspector are important jobs in the project management process, as described previously. Seabees in these jobs must enjoy the respect and esteem of their colleagues and their subordinates. The best way to assure this is to require all of these Seabees to have prior experience as Project Crew Leaders.

### 9.3.2 HOF and engineered systems training for all levels of the chain of command.

In the larger organizational structure of the Naval Construction Force, there are many leverage points that can be exploited to quickly influence the entire Force structure. One of the most important of these is the Naval Civil Engineer Corps Officer School (CECOS). CECOS is located at Naval Construction Battalion Center, Port Hueneme, CA and it is the centralized "schoolhouse" of the Civil Engineer Corps. CECOS runs a comprehensive curriculum for all levels of the chain of command in all facets of Civil Engineer Corps operations, which includes the Naval Construction Force.

It would be relatively easy to take advantage of this leverage point and insert valuable training about human and organizational factors and how they impact construction. Appendix 8 contains a sample instructor guide module that could be used to instruct various levels of the chain of command about this valuable topic. The author envisions that this module can be easily inserted into the existing course of instruction for the following courses offered by CECOS:

- Construction Battalion Operations
- Prospective Command Element Course
- Prospective Executive Officer Course
- Prospective Operations Officer Course

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# 10 NCF Realignment

Recently, the Naval Construction Force went through a comprehensive overhaul as a result of several synergistic factors. The most important factor was statutory: as part of the defense appropriations bill for fiscal year 2001, Congress mandated that the armed services start counting the amount of time each service member spent deployed away from home. This measurement is referred to as a service member's personnel tempo (Pers tempo). Further, this legislation created severe limitations to each service member's op tempo and how services could deploy forces. Seabees have historically spent long deployments since their inception. In fact, Seabees have operated under waivers for several years to conduct their 7 month deployments. These waivers were always justified by the fact that construction battalions needed 7 months to achieve enough progress on their construction projects. The second most important factor was a growing dissatisfaction between operating methods in the Pacific and Atlantic theaters. 3rd Brigade in the Pacific and 2nd Brigade in the Atlantic both had significantly different policies and procedures. Many of these can be attributed to the differing facilities, available material procurement vehicles and other regional differences. However, many operating differences between the Brigades seemed arbitrary. These created two significant overhauls: the deployment cycle and the upper echelon organizational structure.

## *10.1 Deployment Schedule*

But in the wake of congressional legislation 18 months ago, the Naval Construction Force was compelled to completely revamp the way its NMCBs deployed in order to fall within pers tempo limits. As a result, NMCBs had to go away from their traditional 7-month deployment/ 7-month homeport training cycle. Now, NMCBs deploy on a 6-month deployment/ 10-month homeport training cycle. This fundamental change in deployment operational tempo required a complete overhaul of every aspect of NMCB operations. This obviously changes many of the HOFs that govern quality. This change is an ongoing process: it is only recently that all eight battalions have completed an entire 6/10 cycle, so the bugs are still being worked out. The important thing to keep in mind is that the leadership of the NCF must keep in mind that- as with any other fundamental sea-change in any other organization- the policies, processes and precedents that they set today will have deep and lasting effects for a long time.

## *10.2 FIRST Naval Construction Division*

The other main overhaul was implemented in order to unify Seabee operations. In 2001, the senior leadership of the Civil Engineer Corps completed a study about NCF Alignment which concluded that the Atlantic and Pacific Naval Construction Forces should be unified under a single command element. The

structure is based on the template established by the Chief of Naval Operations to unify the Atlantic and Pacific Fleets. So while the West Coast Naval Construction Forces (as embodied by the 30th NCR) and the East Coast Naval Construction Forces (as embodied by the 22nd NCR) are two parallel, comparable units they are both subordinate to the FIRST Naval Construction Division. This was made official by OPNAV Note 3111 (included in Appendix 9) and was consummated on 09 April 2002 when 2nd and 3rd Naval Construction Brigades were formally disestablished and replaced by the commissioning of the FIRST Naval Construction Division in a ceremony at Naval Amphibious Base Little Creek, Virginia.

# 11 Validation and Future Work

This analysis is admittedly biased and incomplete. While the author has worked with Seabees from all eight active duty battalions, he recently completed a 26 month tour in U.S. Naval Mobile Construction Battalion SEVENTY-FOUR. Therefore many of the concepts were developed based on the operations of this battalion. There is a certain amount of variation between how different battalions operate, so the first item of future work would be to gather the perspectives of different battalions. This can be done through various means: formal and informal interviews with Seabees from other battalions and other NCF units, a review of policies, procedures and documents of different battalions and a review of NCR and NCB evaluation documents.

One main shortcoming of this analysis is its largely qualitative nature. There is a world of quantitative data that can be gathered that might further validate the hypotheses set forth in this work. The most immediate opportunity for future work was mentioned above: a thorough analysis of battalion operations using QMAS©. Such a project could be a valuable validation of the analyses and recommendations set forth in this work.

The Civil Engineer Corps sends several junior officers to graduate school every year all across the country. While many of these officers study other disciplines, it may be possible to convince some to conduct further study. Additional analytical resources could possibly be made available from other training commands such as the Naval Construction Training Centers that train enlisted Seabees in technical construction skills or the Civil Engineer Corps Officer School in Port Hueneme that runs a wide variety of training for the entire NAVFAC/ Civil Engineer Corps family.

Given the fundamental changes discussed in the previous chapter, it will definitely be worthwhile to revisit this work after the system reaches a steady state in the coming months. The Naval Construction Force is undergoing fundamental realignments and quantum changes in the way it does business, so a second look after the “bugs get worked out” is definitely appropriate.

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# 12 Conclusion

The U.S. Naval Mobile Construction Battalion Deployment Construction Program is a complex multi-faceted engineered system that represents a valuable win-win proposition for the battalions and for the host Naval Stations. The host station receives quality shore facilities and the battalions receive a fertile training ground to sharpen their military readiness.

This analysis defined this complex system: its inputs, its components and the approaches it uses to achieve quality and reliability. Throughout this system description, the HOFs that influence quality in each component were highlighted for emphasis. After fully describing this system, this work proposed two general methods to improve quality and reliability in this system: improvement of various system components and improvement of quality approaches. Specific leverage points for improvement were cited through examples.

As military combat units, there are several strengths that Naval Mobile Construction Battalions have that provide great benefits towards their construction efforts and their training efforts. Strong command and control, resourceful ingenuity and supportive leadership culture all work together to produce a valuable team of construction professionals. However, their two-fold "build and fight" mission statement means that necessarily some of their time must be spent training to fight: enhancing combat mobility, learning small unit infantry tactics, etc. This detracts from their ability to fully complete technical training that their counterparts in the civilian industry might. Further, the career paths, operational tempo and "up or out" promotion pattern all combine to reduce the time a Seabee spends actually on the job site perfecting his or her trade. This tradeoff results in Seabees who - while not quite as polished as their colleagues in the civilian world- are nonetheless remarkably flexible and innovative.

This is not to say that there is anything wrong with current operations. Time and time again Seabees of U.S. Naval Mobile Construction Battalions have distinguished themselves with their ingenuity and their work ethic to become the engineer force of choice in the U.S. Department of Defense. But as with any system, there is room for improvement. There are many available resources and leverage points to enact such improvement and growth.

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## Acknowledgements

There are many people the author wishes to acknowledge for the assistance, guidance and counsel during the development of this analysis. First and foremost, I would like to thank my family for being a continual source of inspiration and for enduring the long separations and other sacrifices that are part and parcel of service in the U.S. Navy.

Secondly, I would like to thank the hundreds troops I have had the distinct pleasure of working with over the past eight years. No other single group has taught me more about human and organizational factors (as they affect engineered systems AND social systems) than this gallant group of Seabees and sailors.

There are also several people and organizations I would like to thank individually for their help:

- Professor Robert Bea for providing guidance and insight crucial to the formation of this analysis and for providing the means to tell this side of the Seabee story.

- The Naval Facilities Engineering Command for sponsoring my education and the University of California for providing it. I only hope I have can use this education to improve both teams. As Thucydides once said: "That [state] which separates its scholars from its warriors will have its thinking done by cowards, and its fighting done by fools[30]."

- Lieutenant Nick Yamodis, Chief Builder (SCW) Regino Tuazon and the Seabees of U.S. Naval Mobile Construction Battalion FOUR for their time and expertise.

- Lieutenant Commander Michael R. Saum, Lieutenant Greg B. Ames, Lieutenant Phil Windust, Lieutenant Matthew Grant, Eric W. Green, Robert Dudley, and Patrick McCall for serving as valuable sounding boards and critical consultants to the formation of many of these hypotheses regarding human and organizational factors

- Commander Mark Libonate and Lieutenant James Watts from FIRST Naval Construction Division (Forward) for invaluable research information regarding deployed battalions in their command's purview.

- Lieutenant Commander Darius Banaji, Lieutenant Kemit Spears, Builder Chief (SCW) Bailey and Engineering Aide (SCW) Bass from CECOS for taking time to discuss the training of Seabee Project Supervisors and Crew Leaders and for providing research material.


[30] pg 12, Shipmate Magazine, *Commandant's Intent,* by Colonel John R. Allen, USMC

- Lieutenant Commander Patrick Garin, Lieutenant (Junior Grade) Angel Santiago, Lieutenant (Junior Grade) Marcus Rossi and the rest of the officers of U.S. Naval Mobile Construction Battalion SEVENTY FOUR for providing primary research material, endless humor and valued camaraderie.

- Chief Builder (SCW) Karl Nelson, Chief Builder (SCW) Todd Didonato, USN, Chief Equipment Operator (SCW) Mark Muth, EOCS (SCW) Jim Steady, Senior Chief Builder (SCW) Phil Fleming, USN, Chief Builder (SCW) Ray Roberts, Chief Builder (SCW) Jim Chasse, Chief Steelworker (SCW) Virgil Green and Chief Builder (SCW) Bobby Mabry for teaching a young junior officer about what it really means to be a Seabee, a naval officer and a leader.

- Lieutenant Commander (select) Augustus Z. Lim for providing valuable information from THIRD Naval Construction Brigade and for inspiring the author to join U.S. Naval Mobile Construction Battalion SEVENTY FOUR.

And last- but absolutely not least- the author would like to thank the community of UC Berkeley for opening their arms to a nomadic visitor for an incredible year of learning. The recurring theme of my stay here was definitely the warm welcome I received from everyone on campus. This- more than any other single factor- created an environment conducive to learning and growing. The list is too long to list here, but I would like to acknowledge the help and sense of family and community I received from the following people: Mari Cook, Susan Bolton, Elizabeth Shemaria and the rest of the helpful administrative staff of the Civil & Environmental Department and the Engineering & Project Management Group, Alex and Rex De Guia and the rest of Cal's Pilipino-American student and alumni community, Jun Cruzat, Jesse Ante, Tara Young and the mentorship staff at the California Alumni Association and Pilipino-American Alumni Chapter.

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# Appendices

# REQUIRED OPERATIONAL MISSION AREAS AND READINESS CONDITION DESCRIPTIONS FOR THE NAVAL CONSTRUCTION FORCE (NCF)

1. **Mission Areas**. The primary mission of the Naval Construction Force (NCF) is to support Marine Air-Ground Task Forces (MAGTFs) and Navy ashore forces as required by the OPLAN and to provide additional support to the CINC or JFC (JTF Commander) as required, including construction of advance bases and battle damage repair. Required Operational Capabilities range from expedient temporary construction to permanent construction and operation of advanced industrial facilities. The NCF supports other services during Military Operations Other Than War (MOOTW), and performs humanitarian aid and disaster relief operations. In accordance with reference (a), the following primary and secondary warfare mission areas for unit types comprising the NCF are assigned as follows:

a. **Naval Construction Brigades (NCB):** Provides forces to fulfill operational requirements of a combatant commander exercising command and control over Naval Construction Regiments, providing planning, training, and oversight.

| Naval Construction Brigade | | | | | | |
|---|---|---|---|---|---|---|
| CCC | $C^2W$ | CON | FSO | MOB | MOS | NCO |
| P | S | S | S | P | S | S |

b. **Naval Construction Regiments (NCR):** Exercises command and control over subordinate NCF units, providing planning, training, and oversight.

| Naval Construction Regiment | | | | | | | |
|---|---|---|---|---|---|---|---|
| AMW | CCC | $C^2W$ | CON | FSO | MOB | MOS | NCO |
| S | P | S | P | S | P | S | S |

c. **Naval Mobile Construction Battalions (NMCB):** Constructs advance base facilities in support of the Navy, Marine Corps and other armed services engaged in military operations and is capable of defensive combat operations. NMCBs also provide repair, maintenance and construction support during contingency, emergency or disaster recovery operations. The NMCB has an organic TOA capable of sustaining operational control, planned or envisioned under contingency or general war conditions for 60 days, requiring replenishment of consumables only.

| Naval Mobile Construction Battalion | | | | | | | |
|---|---|---|---|---|---|---|---|
| AMW | CCC | $C^2W$ | CON | FSO | MOB | MOS | NCO |
| S | P | S | P | P | P | S | S |

d. **Naval Construction Force Support Units (NCFSU):** Provides construction and engineering support for NCF units including specialized CESE, material, repair parts and technical expertise. NCFSU echelons are attached to other NCF units to manage, maintain and inventory material, transportation and construction equipment to augment the NMCB TOA.

| Naval Construction Force Support Unit | | | | | |
|---|---|---|---|---|---|
| CCC | CON | $C^2W$ | FSO | MOB | NCO |
| P | P | S | P | P | S |

e. **Construction Battalion Maintenance Units (CBMU):** Provide follow-on public works operations, maintenance and repair at existing advanced base shore facilities or facilities constructed by NMCBs in contingency operations.

| Construction Battalion Maintenance Units | | | | | | |
|---|---|---|---|---|---|---|
| CCC | CON | $C^2W$ | FSO | MOB | MOS | NCO |
| P | S | S | P | P | S | S |

f. **Underwater Construction Teams (UCT):** Provide underwater engineering, construction, repair and inspection support. UCTs perform complex inshore and deep ocean underwater construction tasks, including ocean bottom surveys for potential underwater facilities.

| Underwater Construction Teams | | | | | | |
|---|---|---|---|---|---|---|
| AMW | CCC | CON | $C^2W$ | FSO | MOB | NCO |
| P | P | P | S | S | S | S |

g. **Construction Battalion Units (CBU):** The Construction Battalion Unit (CBU) provides construction, operation and maintenance support to a Combat Zone (CBTZ) Fleet Hospital (FH) during military operations.

| Construction Battalion Units | | | | | | |
|---|---|---|---|---|---|---|
| CCC | CON | $C^2W$ | FSO | MOB | MOS | NCO |
| S | P | S | P | P | S | S |

2. **Readiness States (For NCBs and NCRs only)** Required Operational Capabilities (ROCs) are reported under Readiness States having major significance in determining the unit's total manpower requirements. The following summarize states covered.

**Readiness State I: Full Contingency Readiness**

Significant strategic and/or tactical indications of imminent hostilities. While in Readiness State I, the staff shall be capable of meeting the following criteria: able to perform general engineering support, oversight and construction planning functions for a supported command. This state supports war and operation plans executed at Defense Conditions (DEFCON) I and II, and major civil assistance operations. Transition to this maximum state of readiness begins with the declaration of DEFCON II (heightened tensions and/or indications that an enemy force is taking actions which increase its readiness for an attack) with an objective for full implementation prior to the onset of DEFCON I. All watch stations and vital positions will be manned to sustain operations in the designated command configuration indefinitely once implementation is complete. Attainment of this state includes providing plan-specified augmentation assets to various remote command centers, posts and units. The staff and supporting commands will take all measures necessary to ensure all

primary and battle-redundant systems are maintained in a maximum state of readiness. All personnel assets detailed in national, theater and unit mobilization plans shall be staffed by permanent personnel, earmarked reserves and augmentees.

**Readiness State II: Tailored Contingency Readiness**

Significant strategic and/or tactical indications of potential limited hostilities or regional, localized civil assistance operations. As directed by higher authority, partial augmentation is required to sustain a readiness posture tailored to a limited threat (Reserve augmentation is initiated for backfill of embedded NCR personnel within the NCB organizations). Since scenarios cannot be fixed in advance for all foreseeable combinations of circumstances other than full readiness, a Readiness State II column is not portrayed in the table of ROCs.

**Readiness State III: Current Operations Readiness**

Conducting current operations without mobilized/augmentation assets. Watch stations and vital positions sufficient to sustain theater and local operations at the DEFCON IV and III or minor civil assistance operations are manned and ready. The staff is able to initialize major war/operations plans in advance of augmentation support. This readiness state is the sum total of those watch stations and vital positions required to support routine operations in DEFCON IV (geopolitical instability exists in the area of operations which requires constant vigilance and monitoring for rapidly escalating, emergent developments) and the additional watch stations and vital positions required to immediately surge to a level to support DEFCON III (tensions exist which may have serious and adverse effects, and the possibility of force involvement exists). All personnel assets to support this readiness state shall be permanent staff assets. The staff and supporting commands will provide routine organizational level maintenance. (Action is carried out by embedded NCR personnel within the NCB organizations.)

**Readiness State IV: Training Readiness**

In a non-deployed environment monitoring the military/civil situations in the command's primary and contingency areas of responsibility (AOR) and routinely conducting or participating in exercises. The staff is updating and evaluating war/operations plans. Maximum advantage of training opportunities is to be taken. The staff and augmentees will frequently simulate surging Readiness States I, II and III during both live and command post exercises. The staff will be afforded the opportunity to take leave and liberty consistent with exercise and regular work requirements. The staff and supporting commands will perform routine organizational level maintenance.

3. **Readiness Conditions (For all units except NCBs and NCRs)** Required Operational Capabilities (ROCs) are reported under Readiness Conditions having major significance in determining the unit's total manpower requirements. The following summarize conditions covered.

**Readiness Condition I: Battle Readiness**

While in Condition I, the unit shall be capable of meeting the following criteria: able to perform all defensive functions simultaneously; able to keep all tactical systems manned and operating for maximum effectiveness. The maximum expected continuous endurance for Condition I is 24 hours. Construction operations are not appropriate unless deemed operationally critical by the commander.

**Readiness Condition II: Modified Battle Readiness**

Condition II is Condition I Battle Readiness modified to meet imminent threats that are situation-dependent. As such, Condition II is a subset of Condition I that stands up particular Condition I capabilities at the discretion of the commander. While in condition II, the unit shall be capable of meeting the following criteria: able to simultaneously perform defensive functions necessary to counter specific imminent, limited threats; able to keep construction crews and critical project sites fully manned and operating; able to perform command and control functions relevant to the threat; able to accomplish urgent planned maintenance and support functions. The maximum expected continuous duration for Condition II is 10 days, with a minimum of 4 to 6 hours of rest provided per man per day. Since scenarios cannot be fixed in advance for all foreseeable combinations of circumstances other than full general quarters, a Condition II column is not portrayed in the table of ROCs.

**Readiness Condition III: Wartime/Increased Tension/Forward Deployed Readiness**

Defensive posture is maintained to a level sufficient to counter possible threats. While in Condition III, the unit shall be capable of meeting the following criteria: able to keep construction crews and project sites fully manned and operating; able to accomplish all normal maintenance, support and administrative functions. The minimum expected crew endurance for Condition III is 60 consecutive days, with opportunity for 8 hours of rest provided per man per day. Condition III exists when deployed to a contingency area where hostilities exist or are anticipated.

**Readiness Condition IV: Peacetime Deployed Readiness**

While in condition IV, the unit shall be capable of meeting the following criteria: maintain and utilize tactical systems to the extent necessary to ensure operational proficiency. Maximum advantage is taken of training opportunities. Expected endurance is not constrained by personnel. Able to immediately change readiness posture to Condition I, II or III.

**Readiness Condition V: Homeport Readiness**

Designated planning and training period in unit's homeport. While in condition V, the unit shall be capable of meeting the following criteria: able to accomplish all required maintenance, support, and administrative functions. Priority of effort is to maximize training to attain/maintain readiness capabilities. Subject to the foregoing requirements, the crew will be provided opportunity for leave and liberty.

4. ROC symbols are used to specify the desired level of achievement of readiness or other work for or during a particular readiness condition. Readiness normally applies to watches, evolutions or both, while other work refers to non-watch activity such as performing maintenance or running the galley.

**Capabilities**:

"F" = **"Full"** The capability is to be fully achieved. For operational functions, this means that tactical/operational systems will be fully manned to design capability. The achievement is to be sustained for the duration of the condition unless modified by an "A" or "E".

"L" = **"Limited"** The capability is to be only partially realized. Even though only limited capability is realized, it is to be sustained for the duration of the condition unless modified by

an "A" or "E". **Every** "L" must be supported by a limiting statement specifying the limitation.

**Modifiers**:

"A" = **"Augmentation"** The capability is to be either fully or partially achieved for a **limited time** during the condition. The capability is achieved by using off-watch personnel and is always associated with an "F" or "L".

"E" = **"Special Team"** The capability is to be either fully or partially achieved for a **limited time** during the condition. The capability is achieved by using off-watch special teams or details and is always associated with an "F" or "L".

**Unit's Company and External Personnel Resources**. Normally, using an "A" or "E" requires no embellishing statement as their meanings are predefined. However, in the case of a unit embarking external resources, the meaning may not be clear as to whether the augmentation should be provided by the unit's personnel or the external resource.

This ROC/POE instruction shows:

- If the resource is unit's company, no elaboration or statement is provided.
- If the resource is external for "F", a Note is added to the ROC stating the resource.
- If the resource is external for "L", the resource is added to the capability limiting statement.

| MODIFIER | | CAPABILITY | |
|---|---|---|---|
| | | FULL | LIMITED |
| None | ⇒ | Indefinitely manned to design capacity | Indefinitely manned to less than designed capacity |
| A | ⇒ | Temporarily manned to design capacity using off-watch personnel | Temporarily manned to less than design capacity using off-watch personnel |
| E | ⇒ | Temporarily manned to design capacity using a special team | Temporarily manned to less than design capacity using a special team |

## PROJECTED OPERATIONAL ENVIRONMENT FOR NAVAL MOBILE CONSTRUCTION BATTALION (NMCB)

1. The Naval Mobile Construction Battalion (NMCB) constructs advanced base facilities in support of the Navy, Marine Corps and other armed services engaged in military operations and is capable of defensive combat operations.

2. The most demanding operating environment anticipated for the NMCB is in a foreign country during wartime, performing engineering combat service support for the Marine Air-Ground Task Force (MAGTF) operating in climates ranging from extreme cold to tropical to desert environments. The NMCB is capable of limited operations in a CBR-contaminated environment.

3. An NMCB may operate in small task organized units (with a range of command and control options) throughout the theater within the full spectrum of threat environments. NMCBs may encounter organized battalion-sized ground combat units, special operations forces, guerrilla and terrorist activities. A substantial percentage of operations will be prosecuted in joint/combined scenarios.

4. In Operations Other Than War (OOTW), NMCBs are involved in the full spectrum of operations including peacekeeping, humanitarian assistance, civic action, disaster recovery and routine base facility operations and maintenance. These operations are frequently characterized by confined and congested areas occupied by friends, adversaries, and neutrals, making identification and coordination difficult. Well armed adversaries and unstable geopolitical environments require increased defensive measures, making the prosecution of public works, construction, operations, maintenance and repair functions more difficult. NMCBs are capable of performing construction in a low threat environment which requires a defensive posture in unsecured and isolated locations without the direct protection of supported forces. A substantial percentage of operations will be prosecuted in joint/combined scenarios.

5. An NMCB may operate as part of an NCR or as the single NCF element in support of the Area or Force Commander.

6. Capable of performing assigned primary mission areas simultaneously while performing defensive functions to protect NMCB personnel, camps, job sites, and convoys against ground troops and light armored vehicles to include: perimeter defense; security patrols; opportune ambush; site/engineering reconnoitering; observation and listening posts; defensive reaction force; and other measures that enhance the defense of the unit. Construction and maintenance capabilities decrease as defensive requirements/combat situations increase.

7. The NMCB has an organic TOA capable of sustaining operational control, planned or envisioned under contingency or general war conditions for 60 days without resupply except ammunition is limited to 15 days, subsistence rations are limited to 5 days, and fuel is limited to 3 days. The NMCB Air Detachment TOA is capable of sustaining operational control, planned or envisioned under contingency or general war conditions for 30 days without resupply except ammunition, fuel and rations are limited to the days stated above. Resupply past these time frames is the responsibility of the supported command.

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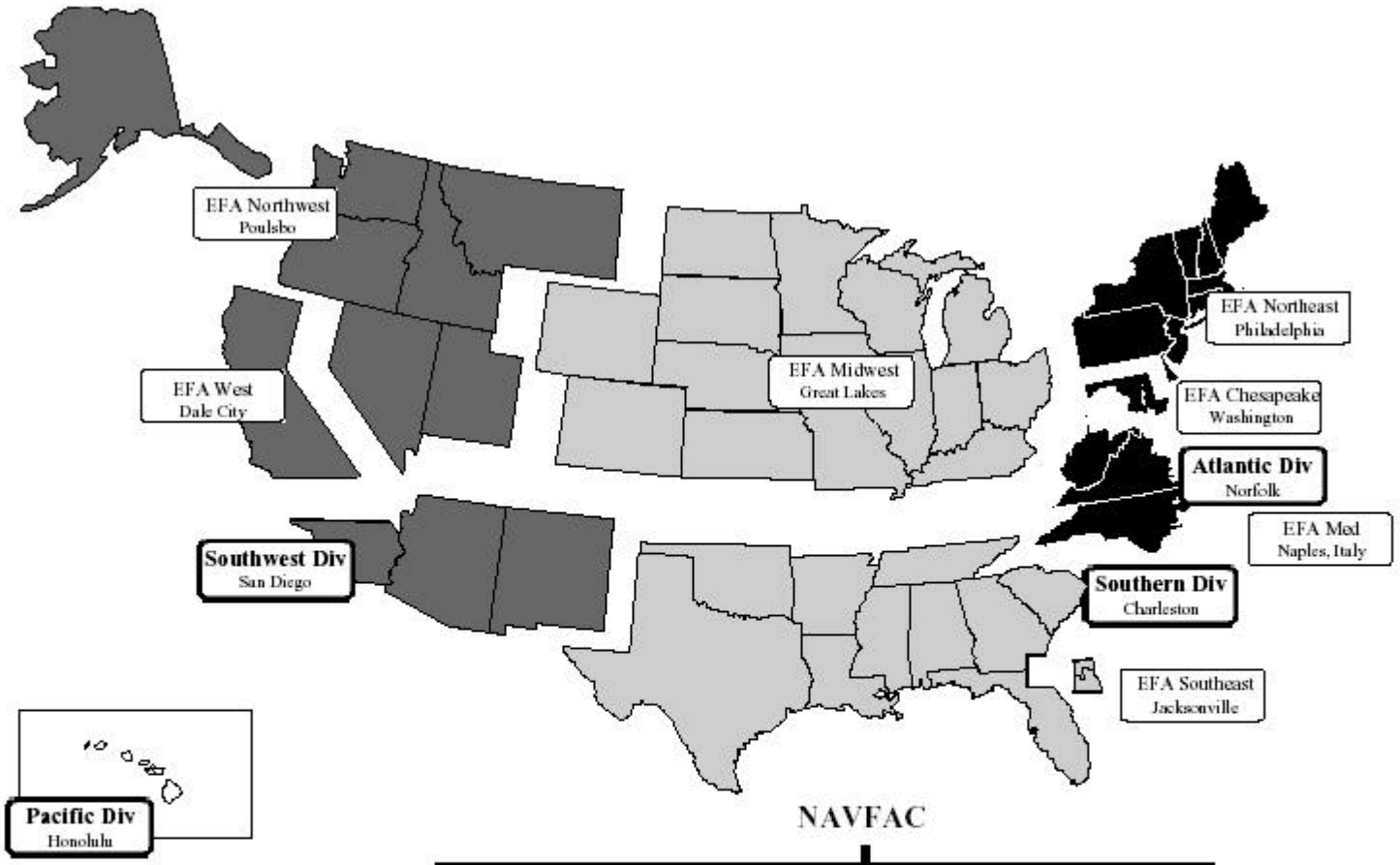
EFA Northwest
Poulsbo
EFA West
Dale City
EFA Midwest
Great Lakes
EFA Northeast
Philadelphia
EFA Chesapeake
Washington
Atlantic Div
Norfolk
EFA Med
Naples, Italy
Southwest Div
San Diego
Southern Div
Charleston
EFA Southeast
Jacksonville
Pacific Div
Honolulu
NAVFAC
Pacific Division
Southwest Division
EFA West
EFA Northwest
Atlantic Division
EFA Med
EFA Chesapeake
EFA Northeast
Southern Division
EFA Midwest
EFA Southeast

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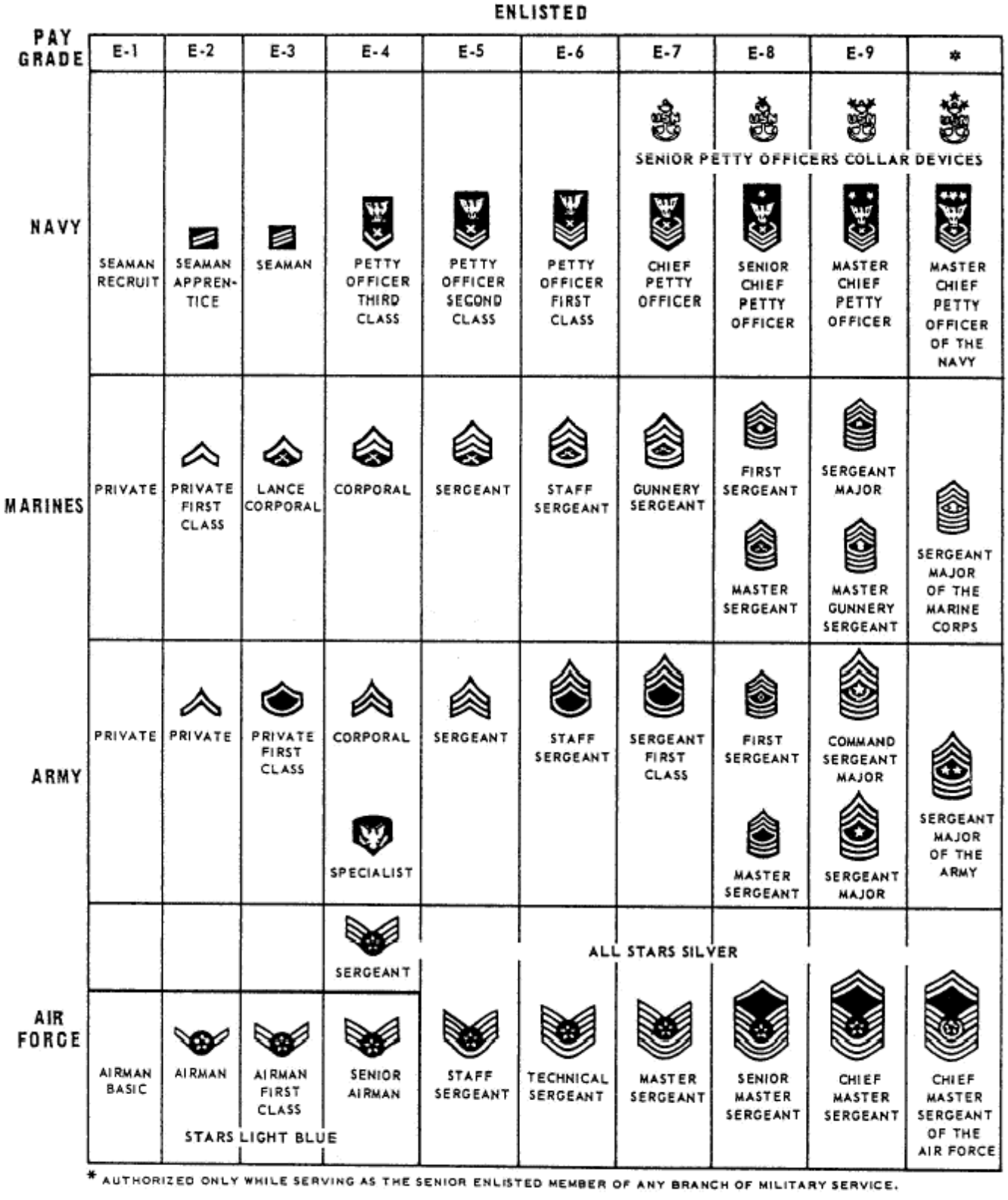


**Figure 9-10.—Insignia of U.S. armed forces enlisted personnel.**

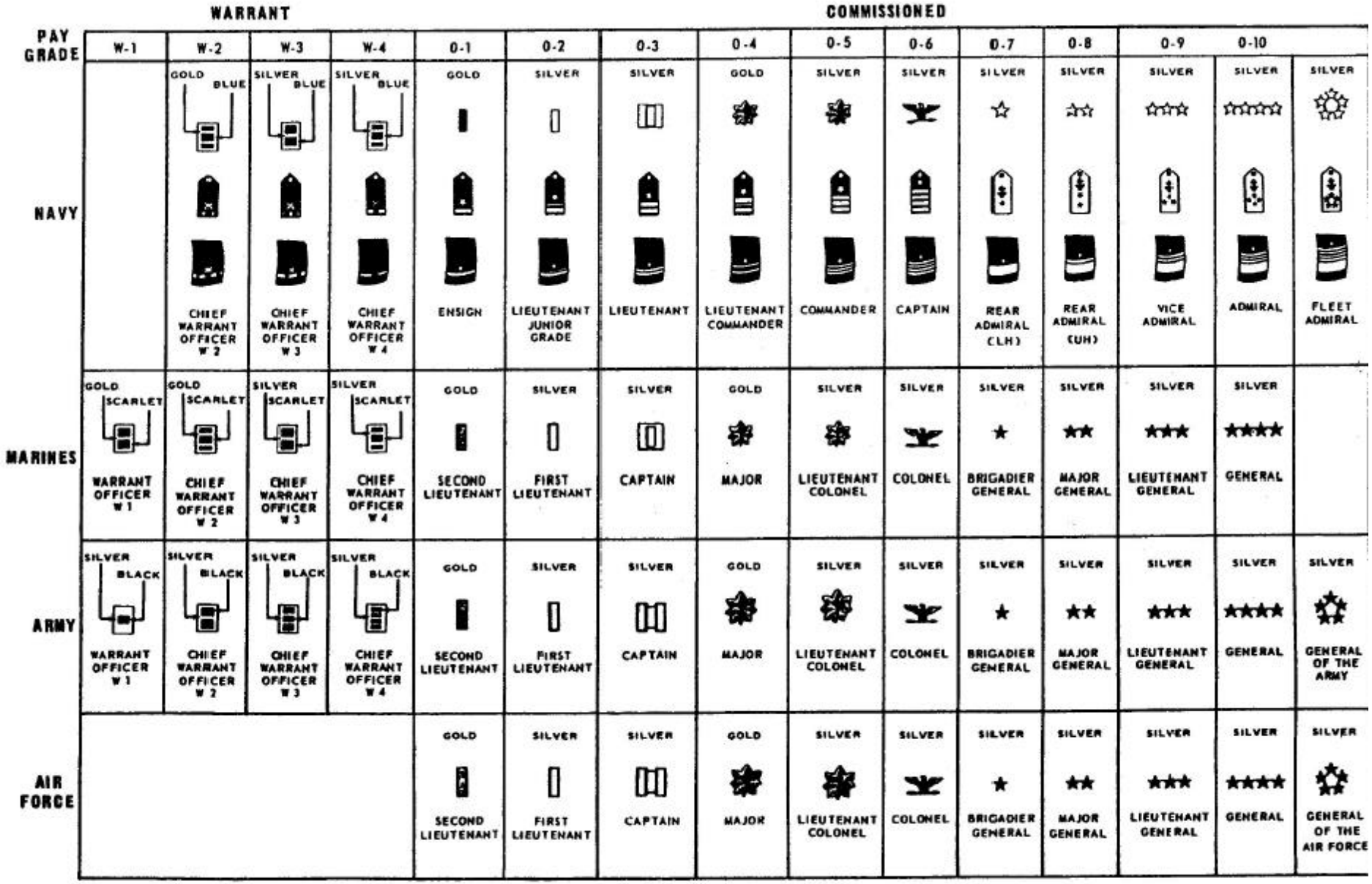


**Figure 9-6.—Insignia of officers of the armed forces of the United States.**

25 FEB 1998

# DAILY INSPECTOR'S REPORT

| Route To | Initials | Date |
|---|---|---|
| CO Cdrs | | |
| S3C | | |
| S3A | | |
| S3 | | |
| 00S | | |
| Folder 7 | | |

**INSTRUCTIONS**

Form must be returned within 3 working days with the "Action Taken" section filled out correcting the hazards/deficiencies. Company Commanders will initial "Route To" prior to returning to S3C.

| Date | Time | Project Number | Project Title |
|---|---|---|---|
| | | | |

| Prime Contractor | Subcontractor | Weather |
|---|---|---|
| | | |

| Project Supervisor | Project Safety Supervisor | Safety Inspector |
|---|---|---|
| | | |

| Rates | | Description of Work |
|---|---|---|
| BU | EO | |
| CE | SW | |
| CM | UT | |
| EA | Other | |

| Safety Inspection Plan Items | Results |
|---|---|
| | |
| | |
| | |
| | |
| | |

| | ITEM | N/A | YES | NO | | ITEM | N/A | YES | NO |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Safety Talk given? Subj: | | | | 16 | Ladders Scaffolding: Safe cond/use? | | | |
| 2 | GFCI protection on project and used? | | | | 17 | Are wall floor openings guarded? | | | |
| 3 | Req'd PPE in use? | | | | 18 | Is good housekeeping observed? | | | |
| 4 | Hazmat/Hazflam inventory current? | | | | 19 | Tool Storage Area: Properly stored? | | | |
| 5 | Material Safety Data Sheet available? | | | | 20 | Hand Tools: Useable condition? | | | |
| 6 | Flammable liquids stored properly? | | | | 21 | Is good area sanitation being observed? | | | |
| 7 | Eyewash/shower maintained IAW w/ SOP? | | | | 22 | Water jugs maintained IAW w/ SOP? | | | |
| 8 | Lockout/tagout required and used? | | | | 23 | Fire extinguishers charged and current tags? | | | |
| 9 | Electrical Boxes secured and labeled? | | | | 24 | First aid kits on project? | | | |
| 10 | Temporary power inspected and tagged? | | | | 25 | Equipment Pre-start done? | | | |
| 11 | Are construction signs in place? | | | | 26 | Are backup guides being utilized? | | | |
| 12 | Excavation: Permits/shoring approved? | | | | 27 | Are parked vehicles being choked? | | | |
| 13 | Crew leader using safety plan? | | | | 28 | Respirator protection:w/ SOP? | | | |
| 14 | Review daily safety report for trends? | | | | 29 | Equipment Operators Licensed? | | | |
| 15 | Welding: Cutting & permits required? | | | | 30 | Fall protection correctly in place? | | | |

| SAFETY HAZARD / DEFICIENCY | ACTION TAKEN TO CORRECT HAZARD/DEFICIENCY |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

| PROJECT SUPERVISOR | PROJECT SAFETY SUPERVISOR | BATTALION SAFETY INSPECTOR |
|---|---|---|
| | | |

DISTRIBUTION: WHITE: ROUTING CHAIN YELLOW: TEMPORARY FILE PINK: PROJECT

**SECOND/THIRDNCB** **5100/2 (Rev. 3/96)**

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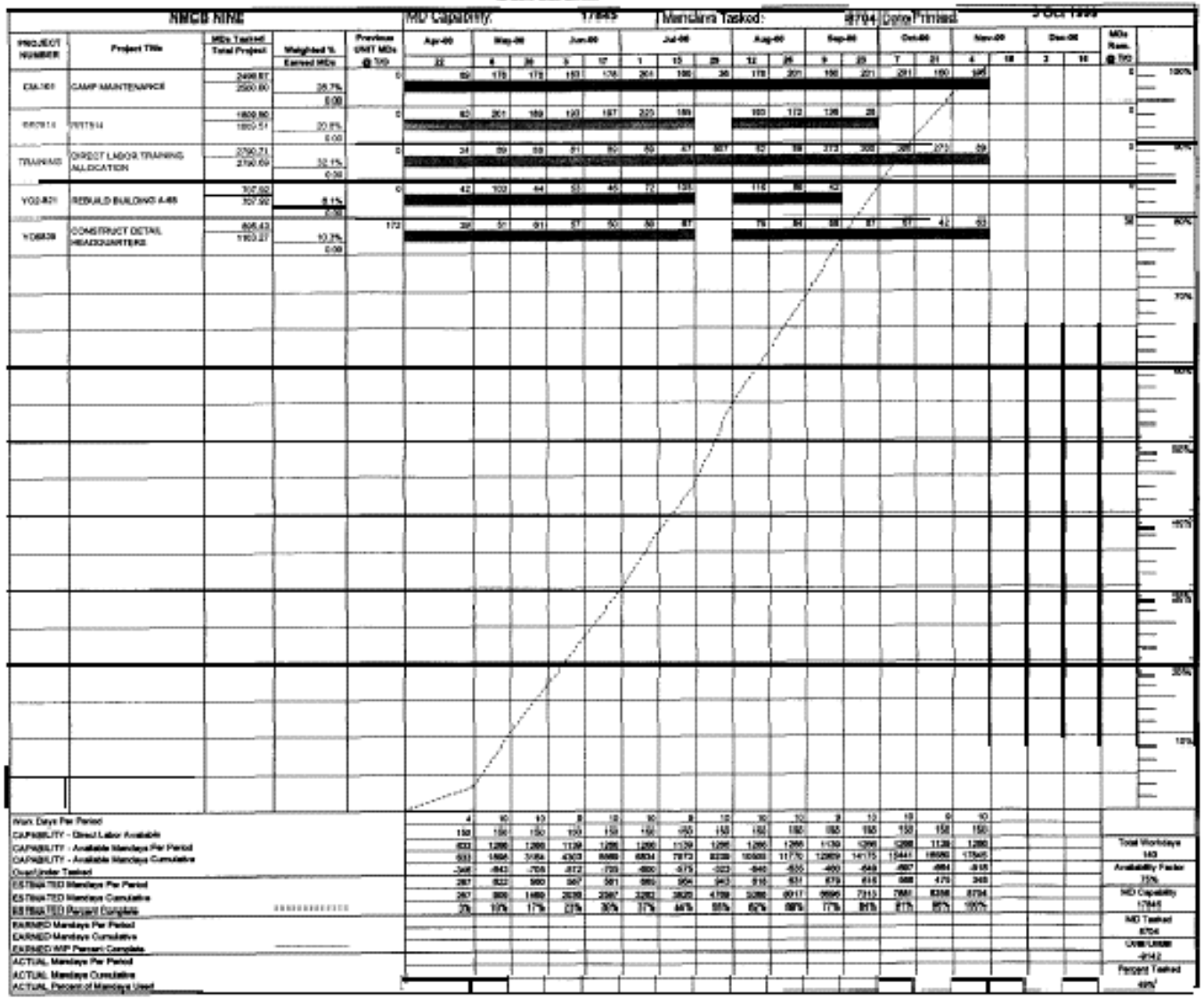
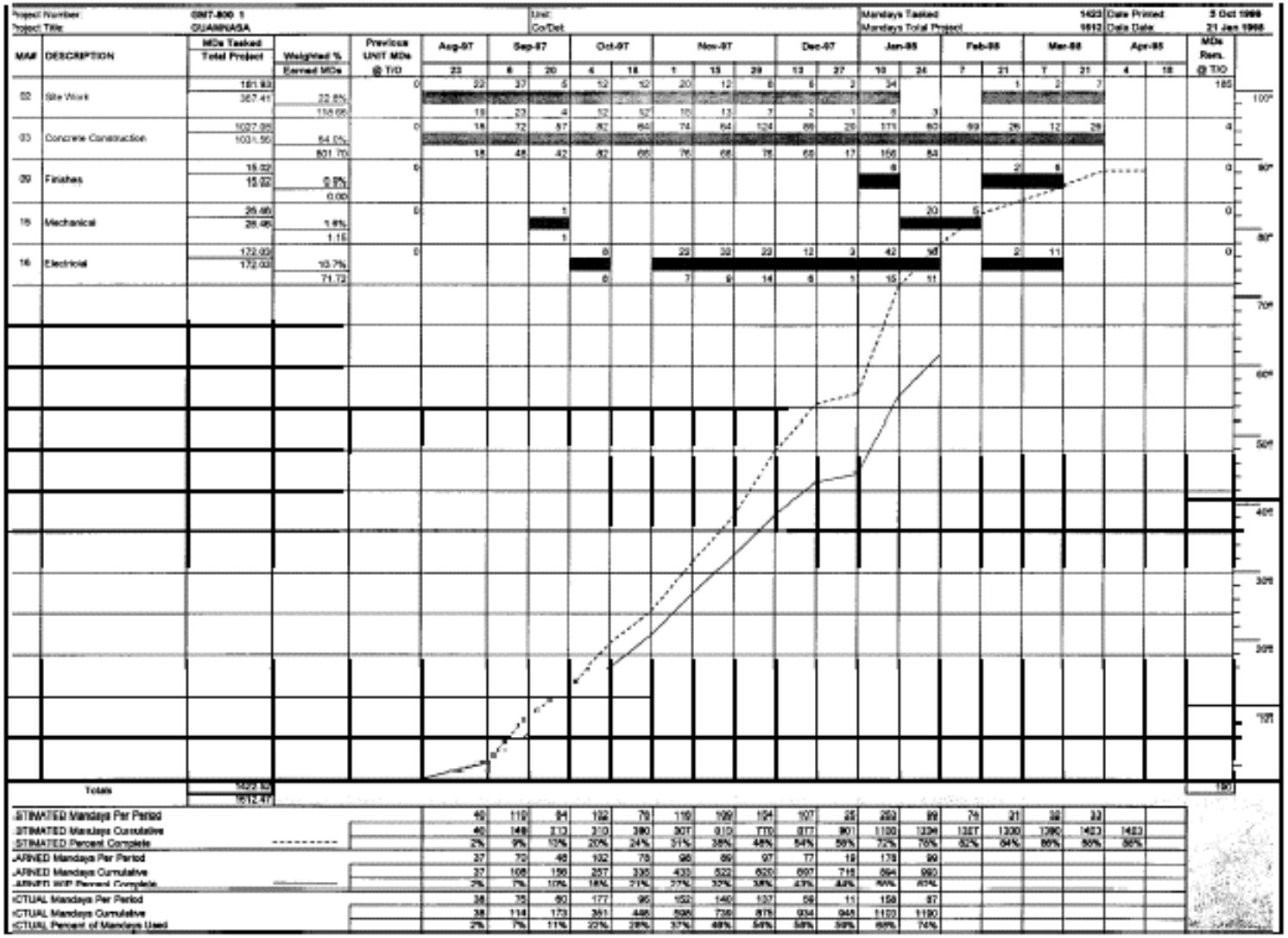
**FIGURE IV-2**
**SEABEE LEVEL I**



# FIGURE IV-1
# SEABEE LEVEL II



DAILY

QUALITY CONTROL

INSPECTOR'S REPORT

| ROUTE TO: | INITIAL | DATE | REMARKS |
|---|---|---|---|
| S3 | | | |
| S3C | | | |
| S3QC | | | |
| S3S | | | |
| PRIME | | | |
| SUB | | | |

| DATE | TIME | PROJECT NO. | REPORT NO. |
|---|---|---|---|
| PRIME CO. | | PROJECT TITLE | |
| SUB CO. | | WEATHER | |
| SUPERVISOR | | INSPECTOR | |

| ACTIVITY | RATE | DESCRIPTION OF WORK PERFORMED |
|---|---|---|
| | | |
| | | |
| | | |

| ACTIVITIES STARTED | ACTIVITIES COMPLETED |
|---|---|
| | |

| CONSTRUCTION INSPECTION PLAN ITEMS CHECKED | RESULTS |
|---|---|
| | |
| | |

| DELAYS | SAFETY HAZARDS PRESENT |
|---|---|
| | |
| | |

REMARKS

MATERIAL RECEIVED

CERTIFY ALL WORK PERFORMED THIS DATE IS IAW PLANS AND SPECIFICATIONS

PROJECT SUPERVISOR QC INSPECTOR REVIEWED (S3QC)

DISTIRUBTION:
ROICC
QC FILE VIA S3
PRIME CONTRACTOR

Encl (3)

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# Appendix 7

NCF Human and Organizational Factors Survey

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14 November 2002

From: LT Roland J. de Guzman, CEC, USN
To: Survey Respondents, U.S. Naval Mobile Construction Battalion FOUR

Subj: SURVEY ABOUT HUMAN AND ORGANIZATIONAL FACTORS IN THE NAVAL CONSTRUCTION FORCE

Encl: (1) Survey About Human and Organizational Factors in the NCF

1. **Situation**. Thank you for taking part in this survey. I greatly appreciate your time and effort. I am a graduate student at UC Berkeley and a former "Fearless Seabee" from US Naval Mobile Construction Battalion SEVENTY FOUR. As a former Charlie Company Commander, I decided to write an academic thesis to study how Human and Organizational Factors play a significant role in Naval Construction Force operations. Our two-fold *Build and Fight* mission in the Seabees has significant impact on the outcome of the construction projects we do. Part of my research involves gathering survey data from the field; this is where you come in. This survey is designed to gather your thoughts and opinions about your most recently completed deployment to Okinawa. You have been chosen because- in my humble opinion- you are the critical Seabees in our construction effort. You are senior in the chain of command, so you have considerable authority in the prosecution of our construction projects and you have valuable experience to guide your efforts. But you are also close enough to the deckplates to see the day to day details out on the job sites where we really "make our money" as construction professionals.

2. **Mission**. I have developed a short informal survey for you to fill out. This survey will quantify- to some extent- how you feel about the deployment you completed in May.

3. **Execution**. Once you receive this survey, please fill it out at your leisure. It only requires you to circle your answers, but there will be space for you to provide additional comments. Further, I will conduct a personal interview, tentatively scheduled for Monday, 18 November. Please limit your thoughts and responses to events from the most recent Okinawa deployment.

4. **Admin and Logistics**. If you are done with the survey early enough, you can give it directly to me. If not, simply give it to BUC (SCW) Tuazon over at the Safety Department and he will mail it to me.

5. **Command and Control**. If you have any questions about this survey, please e-mail me at **deguzman@uclink.berkeley.edu** or call me at 510.703.3708.

6. **Conclusion**. Thank you again for your time and effort. I will use your responses to form some thoughts about the way we do business in the Seabees and include them in my thesis.

Can do,

R. J. DE GUZMAN
LT, CEC, USN

# Survey: Human and Organizational Factors in the Naval Construction Force

by Lieutenant Roland J. de Guzman, Civil Engineer Corps, U.S. Navy

Engineering and Project Management Group
Civil & Environmental Engineering Department
University of California, Berkeley, CA

**Survey: Human and Organizational Factors in the Naval Construction Force**

**Survey Instructions**

This survey is designed to gather your thoughts and opinions about your most recently completed deployment to Okinawa. As you answer these questions, please limit your decisions to events from that deployment. If you want to discuss other topics, please use the comments sections.

For your answers, please use the following scale:

1. Strongly agree with little or no doubt
2. Strongly agree
3. Agree
4. No feelings one way or another
5. Disagree
6. Strongly disagree
7. Strongly disagree with little or no doubt

---

**1. Mission**

a. In your own words, please write down the mission of your Battalion during your 2002 deployment to Okinawa. Then describe your particular team's part of that mission:

2. **Human and Organizational Factors**

a. Selection: A critical factor that influences quality in construction is the selection of key positions in the project team. Do you feel that you were properly selected for your job during the Okinawa Deployment '01-'02?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

b. Selection: Do you feel others in the chain of command (above you or below you) were selected properly?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

c. Training: Do you feel that you received the proper training for your rating during A-School?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

d. Training: Do you feel that you received the proper training for your job during C-School (if any)?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

e. Training: Do you feel that you received the proper training for your job assignment for this deployment during homeport training?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

f. Training: Do you feel that other members of your project team received sufficient training for this deployment?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not? What job did they have? What type of training would have helped?

g. Command Culture: The command climate and culture is another factor that significantly influences construction operations. Which of the following project attributes do you believe your command valued the most on the construction project/s that you worked on?

❑ Safety ❑ Durability ❑ Schedule ❑ Cost ❑ Environmental

h. Command Culture: Which of the following project attributes did YOU value the most on the construction project/s that you worked on?

❑ Safety ❑ Durability ❑ Schedule ❑ Cost ❑ Environmental

i. Command Culture: Were you able to instill this value (selected above) in the other members of your project team?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

j. SCWS: Are you SCWS qualified?

❑ Yes ❑ No

k. SCWS: Did your battalion's SCWS program significantly impact the performance of your construction team?

❑ Yes ❑ No

If you answered *Yes*, please describe this impact:

l. Organization: Were you a part of the battalion's specific task-organized teams? (ie. Air Det, RRR, CBR, etc.).

❑ Yes ❑ No

If you answered *Yes*, list your organizations and your duties within those teams:

_____

_____

_____

_____

m. Organization: Please indicate whether or not the requirements of any of the battalion's task-organized teams impacted the following aspects of your deployment projects:

1) Homeport: Job Assignment ❑ Yes ❑ No
2) Homeport: Planning and Estimating ❑ Yes ❑ No
3) Homeport: Training ❑ Yes ❑ No
4) Deployment: Construction ❑ Yes ❑ No

Please name the task-organized team that impacted your project the most:

_____

* Note: This impact does NOT have to be a result of YOUR personal involvement on a task-organized team. For example, you may have been a Crew Leader but Air Detachment requirements prevented you from getting a properly trained Project Safety Supervisor for your project.

3. **Risk Assessment and Management Approaches**

Risk Assessment and Management is the most critical thing that we do in the Seabees. For the following questions, please use a more general definition of risk as articulated by Terje Aven and Robert Bea:

> ***Risk**: The product of the likelihood that adequate or acceptable quality is not achieved and the consequences associated with the lack of achieved quality.*[1]

In other words, risk involves more than just the likelihood of physical injury. It involves concepts such as the risk of insufficient structural durability or risk of going over budget.

a. Proactive Approaches: Do you think that the planning and estimating efforts in homeport properly prepared your team for your deployed construction project?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

[1] pg 117, Bea, Human and Organizational Factors: Risk Assessment and Management of Engineered Systems

b. Proactive Approaches: Do you think your command culture properly reinforced an environment that focused on safety to prevent mishaps?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

c. Reactive Approaches: Do you think Mishap Investigations were conducted properly? Were they effective in passing on lessons learned to prevent future mishaps?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

d. Reactive Approaches: Do you think regular visits by the chain of command effectively evaluated the causes of problems and determined ways to fix them?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

e. Interactive Approaches: Do you think the QC Program created an effective team to continuously evaluate the progress and quality of your construction project during this deployment?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

f. Interactive Approaches: Do you think that daily Stand-up Safety Lectures effectively reduced safety mishaps on your project? Did Crew Leaders prudently selected lecture topics that matched a given day's construction activities? Were the lectures effective?

❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7

If not, why not?

_____

_____

_____

_____

4. **Additional Comments**: Please use this space to make any other comments you feel may be helpful. Feel free to continue on the back if necessary.

_____

_____

_____

_____

_____

_____

_____

_____

5. Thank you again for your time and effort in filling out this survey. I also want to take this opportunity to thank you for your service; you are part of a special team of construction professionals with a distinguished history and a bright future. I am honored to serve with you.

Can do,

R. J. DE GUZMAN
LT, CEC, USN

# Appendix 8

Proposed Instructor Guide, HOFs in the NCF

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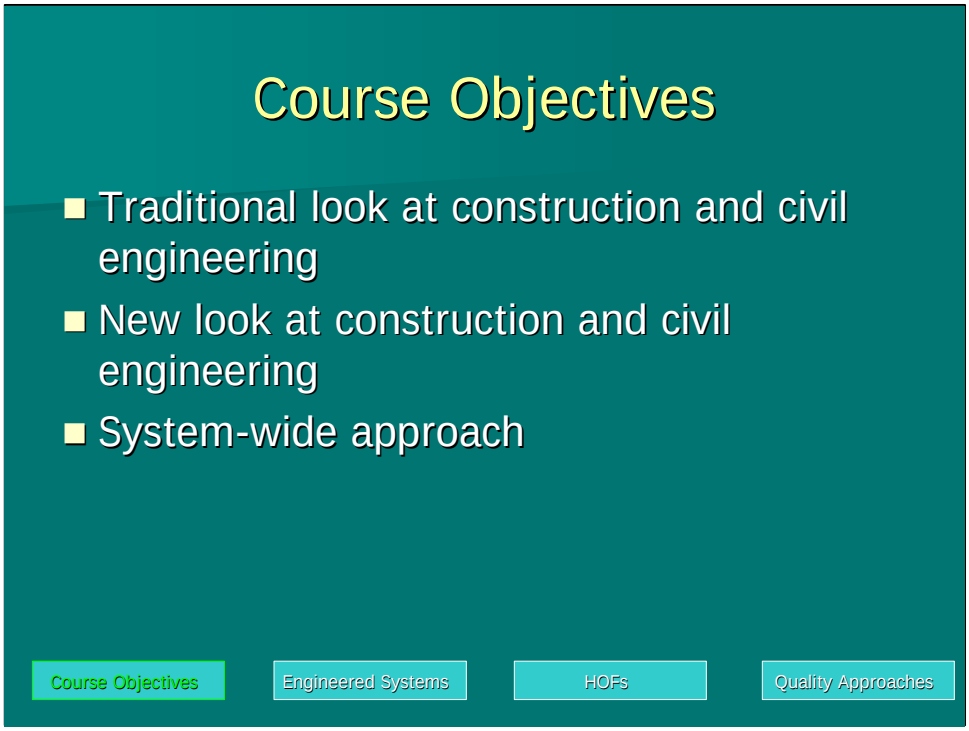
# Civil Engineered Systems in the NCF

A Big Picture View

# Welcome Aboard

- Introduction/ Overview
- Course Objectives
- Civil Engineering Systems/ Life Cycles
- Human and Organizational Factors
- Quality Approaches
- Conclusion

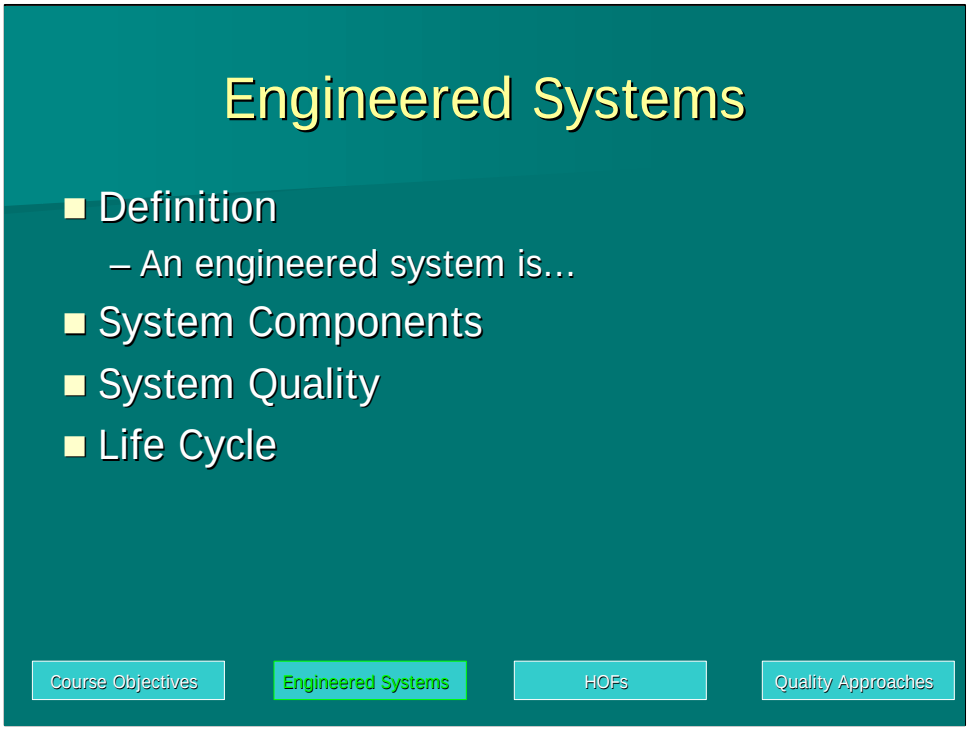
Training itinerary for today




Civil Engineered Systems

- This module will present a different way to look at our projects and our jobs. This look is perhaps more complete because it looks at everything involved in a given construction project, including the design, the crew members, etc.

- In the Navy and in the Seabees, we learn a lot about leadership. We also learn a lot about engineering. But we don't often learn about how they interact with one another. This system-wide approach allows us to see this interaction more clearly.

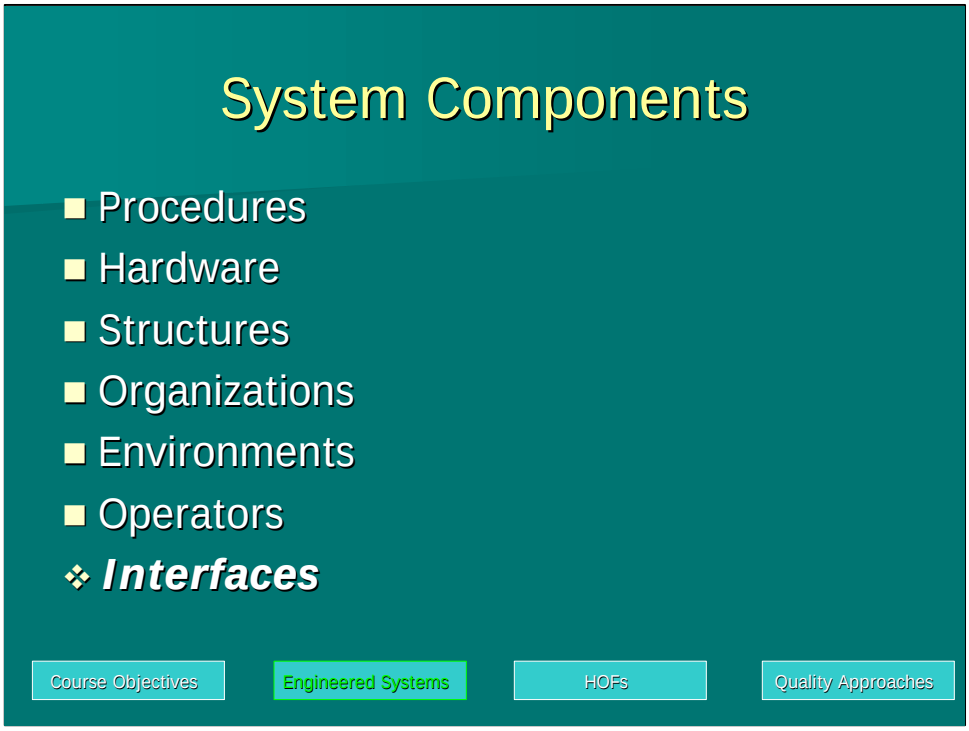



Civil Engineered Systems

Definition: An engineered system is a network of structures, procedures and people designed and built for a specific purpose.

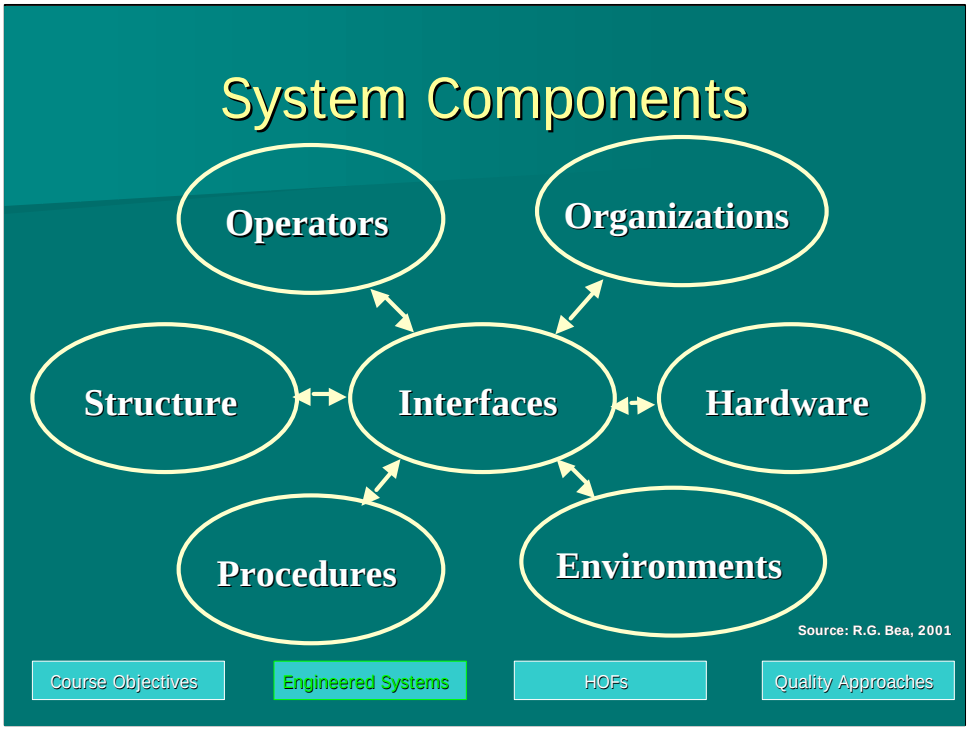
But this is not a satisfactory definition. To fully understand engineered systems, we have to answer a few questions:

- What are the components of an engineered system?
- What do we mean by *quality* in an engineered system?
- What is the life-cycle of an engineered system?




These are the seven components that make up a given engineered system. For the most part, they are self-explanatory.

Each of these components requires specific management attention. This nomenclature gives us a framework to view our processes and determine if we are giving each component the appropriate type and amount of attention.




A visual representation of how these components interact.


What defines system quality?

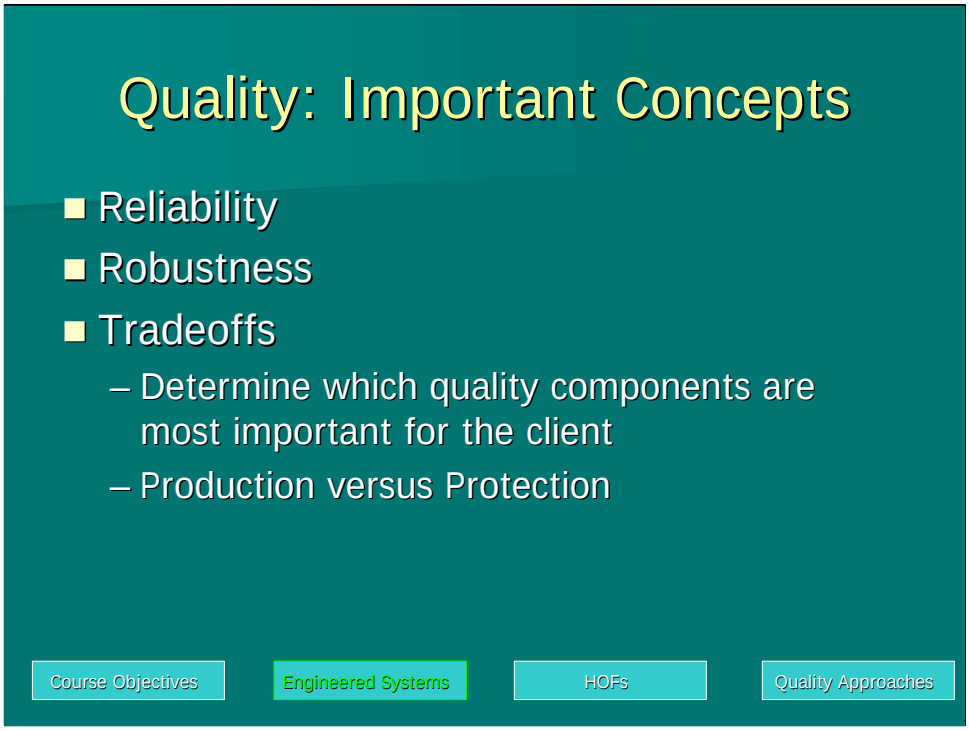
The term “quality” is so commonly used, that it remains poorly defined most of the time in everyday conversation. However, this analysis requires an explicit definition of system quality. Dr. Bob Bea from UC Berkeley tells us: *[Quality is] freedom from unanticipated defects. Quality is fitness for purpose. Quality is meeting the requirements of those that own, operate, design, construct and regulate engineered systems. These requirements include those of serviceability, safety, compatibility and durability.*

Durability: Freedom from unexpected degradation.

Serviceability: Suitability and fitness for purpose.

Compatibility: Free of undesired consequences to other entities. *On time, on budget and happy customers.*

Safety: Free of unexpected and unmanaged risk of damage. **This is the most important component of the engineered systems that we build in the NCF!**




Important concepts regarding quality:

Reliability: The probability a given system will exhibit a given level of quality

Robustness: The ability of a given system to maintain quality while sustaining damage

Tradeoffs: This is where junior officers and senior enlisted make our money…in managing the gray areas and evaluating day to day tradeoffs.

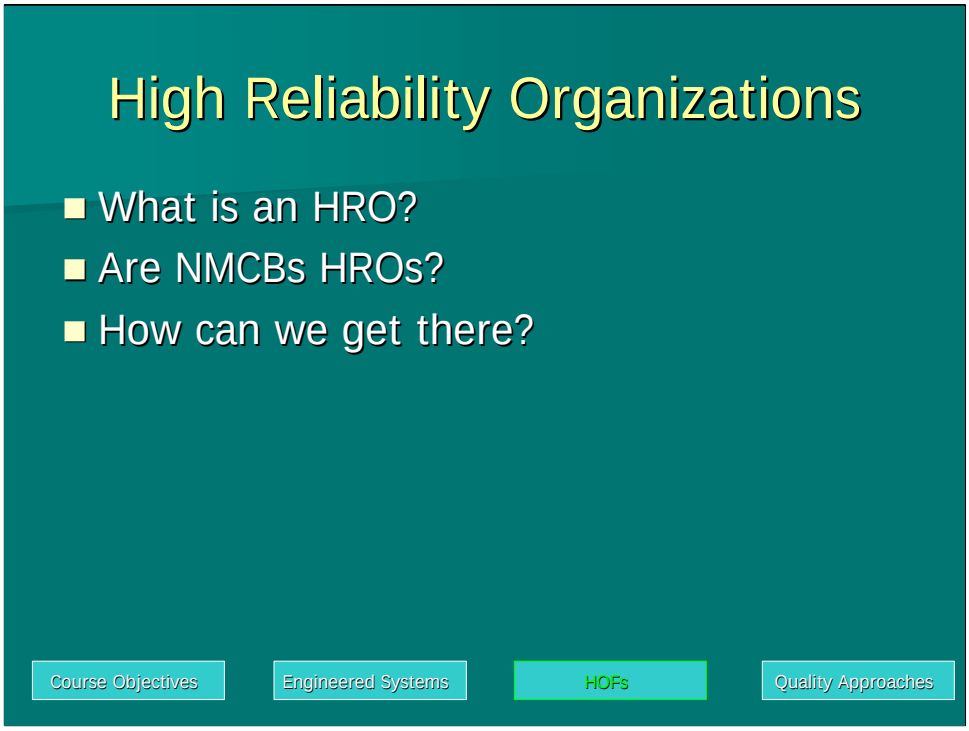
Production vs Protection: This is the classic example of a tradeoff between quality components. We'll talk about this later…


In the armed forces, we spend more time focusing on leadership than in just about any other sector of professional endeavor. In the Seabees, we spend more time focusing on engineering than many other sectors of the Navy.

But there is a place where leadership meets engineering. That place is called *Human and Organizational Factors*.

These concepts govern the management of engineered systems just as much as do concepts such as soil settlement and load distribution.

These are not all of the HOFs that operate. This concept is not as well defined as others, so there is not even a universally accepted taxonomy. But this doesn't mean we should ignore it.

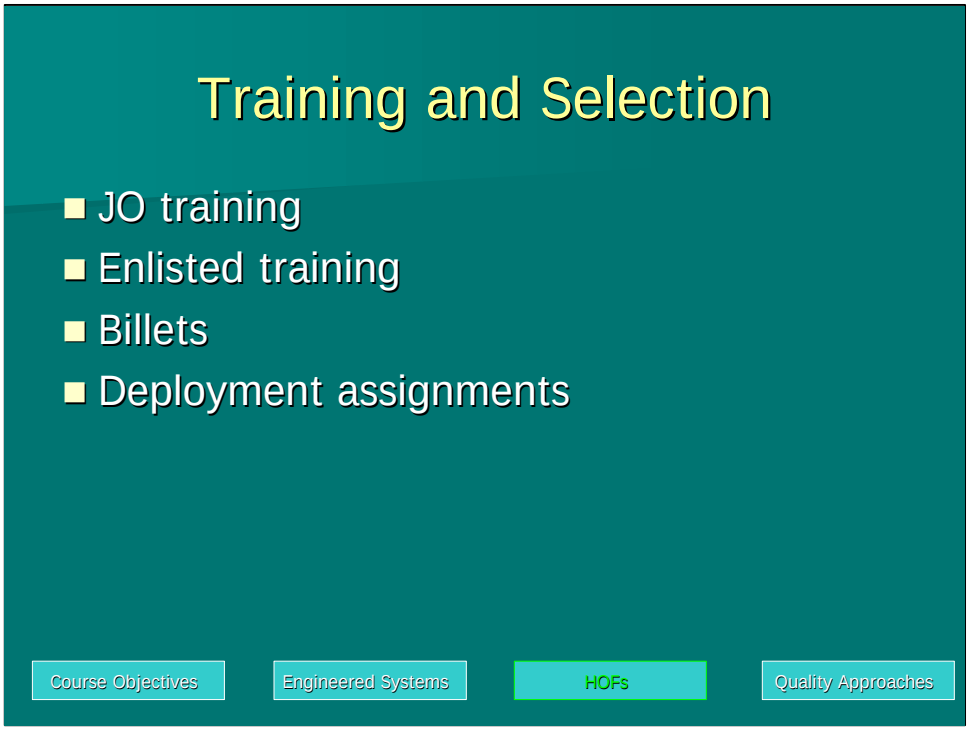



HRO: High Reliability Organization.

Dr. Robert Bea from UC Berkeley defines HROs as: *organizations that have operated nearly error free over long periods of time*. Dr. Bea and his colleagues conducted extensive research about HROs in varied disciplines such as Naval Aviation, infant, neo-natal emergency care wards, and the French National Police. His research yields a list of common practices and characteristics of these HROs.

Are NMCBs HROs? The provided definition of HRO leaves room for interpretation, but this author would offer that Seabee battalions do exhibit many of the characteristics that distinguish HROs. Furthermore, Seabee battalions often exhibit many of these characteristics that their civilian counterparts in the construction industry do not, thanks mostly to their military culture.

If NMCBs are not HROs, then how do we get there? By crisply defining what we mean by quality and reliability and then gearing our organizations to meet those requirements.




*Training and Selection* tend to be different but inter-dependent concepts. Selection of billets is dependent upon the training resources available and vice versa.

Junior officers are not always civil engineers, so their main thrust has always been project management. This is important to realize when selecting JOs for assignments to battalions and for selecting deployment assignments.

Enlisted Seabees gain valuable technical training in A-school, but it is designed to create generalists, not specialists. This is a big reason why finish work in the Seabees often lags behind that of their civilian counterparts.

Officer and enlisted billets typically change each deployment cycle which- again- creates generalists.


Core Values- We (the U.S. Navy) have published our core values. This act alone goes a long way towards establishing a command culture. But if you add the fact that we do a reasonably good job of weaving these values into our training pipeline, our mission statement development and our daily operations you get a synergy and harmony between vision and action, objectives and operations.

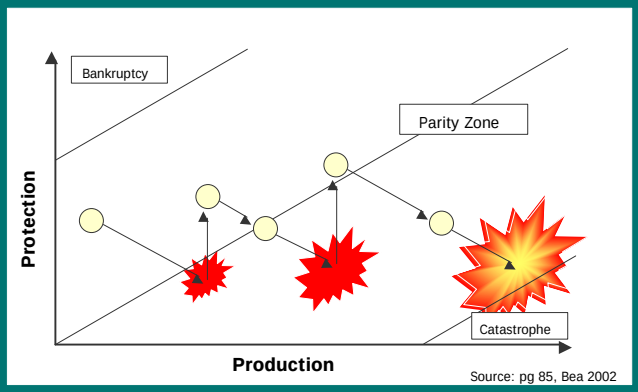
Unit Integrity- As an armed service, we prize unit integrity. This impacts how we do business on the job site, esp regarding things such as job selection and crew selection.

"Command Culture Teams": Wardroom, Chief Petty Officers' Mess and First Class Petty Officers' Association are all professional development organizations that go a long way towards creating and reinforcing command culture. They represent strong leverage points that senior leadership can use to guide the entire organization.

Production vs Protection curve…next slide.

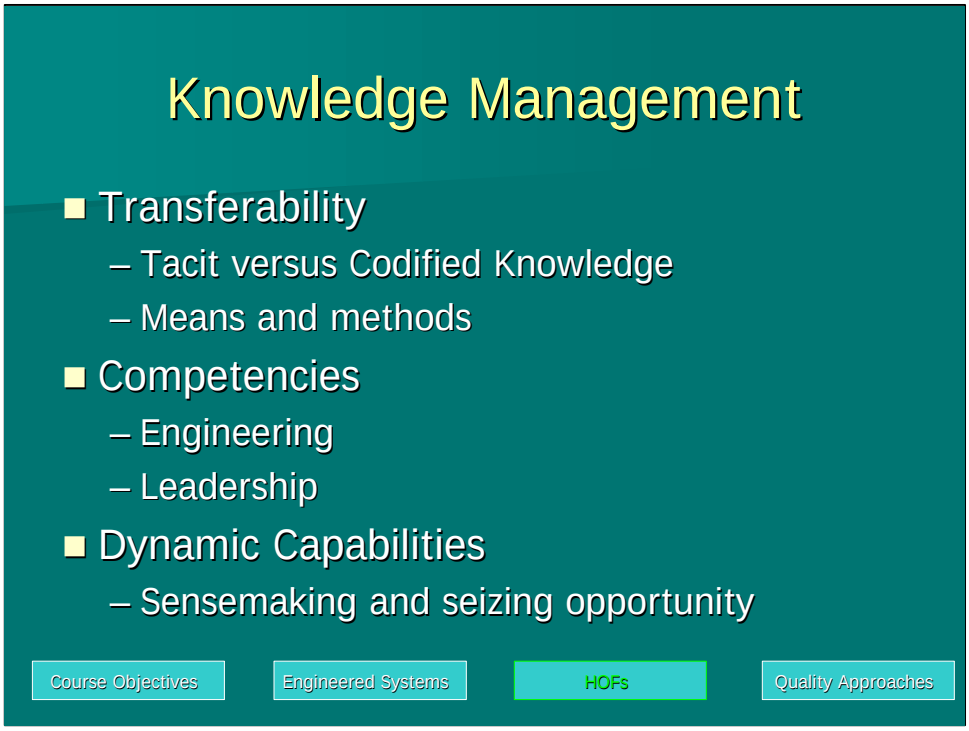
# Command Culture

- Safety versus Schedule




Course Objectives | Engineered Systems | HOFs | Quality Approaches

This graphic visually demonstrates the “incident-driven” nature of safety focus. An organization starts out focused on safety (protection), but gradually begins to cut corners and focus on production. This happens until an accident which causes everyone to “tighten up” and re-focus on safety. This cycle occurs until either the project finishes (or a major catastrophic incident happens).




Transferability

* Codified Knowledge: Knowledge which is encoded into symbology (words, numbers, etc.).

* Tacit Knowledge: Knowledge which is not codified. A given organization's tacit knowledge lies in the minds of its members. However, it also lies in places such as the processes and equipment the organization employs, the relationships and organizational structures it uses, etc.

* Means and methods. Tacit knowledge is much harder to transfer than codified knowledge. The spectrum goes from information → codified knowledge → tacit knowledge. It requires actual personnel transfer to effect tacit knowledge transfer, and even that does not always completely accomplish the transfer.

Competencies: These are the two major competencies that we have as project managers in the NCF (whether we are Company Commanders, Operations Chiefs, Project Supervisors, Crew Leaders, Safety Supervisors, etc.)

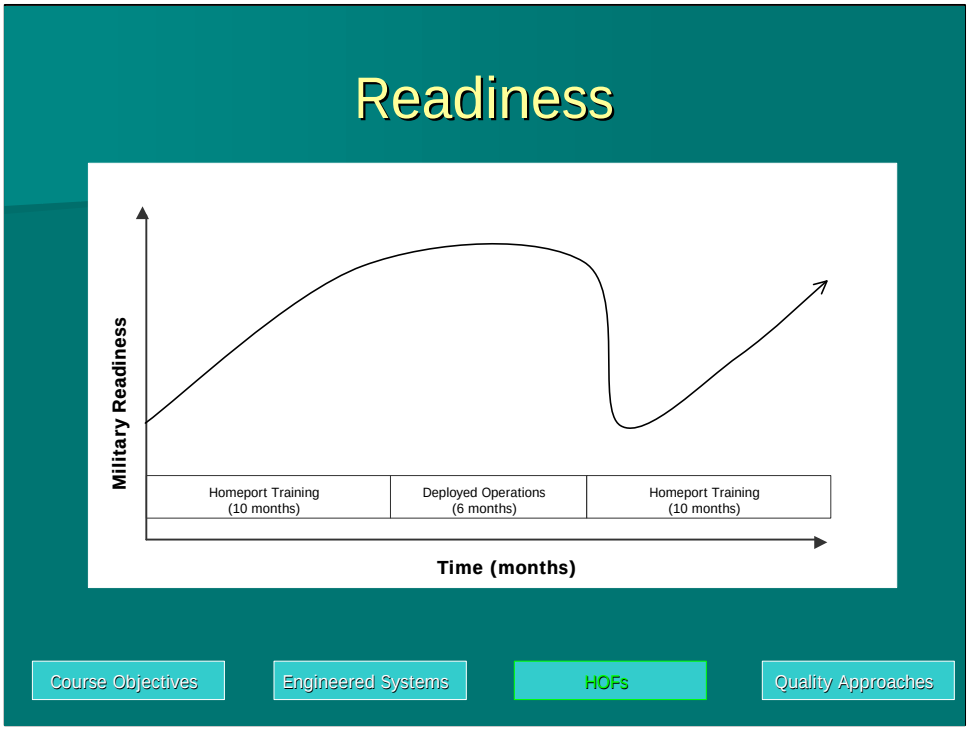
Engineering

Leadership

Dynamic Capabilities: Dynamic Capabilities

Put simply, Dr. David Teece (Haas School of Business, UC Berkeley) defines *dynamic capabilities* as the ability of a given organization to recognize and seize opportunity.

* Sensemaking and seizing opportunity. Lots of research exists about these two topics, but we learn about this in the OODA loop: Observe, Orient Decide, Act.




This is a VERY general qualitative visual description of military readiness throughout the deployment cycle of an NMCB. Readiness is probably the key metric of a battalion's success as a Seabee unit.


There are three types of approaches that an engineerd system employs to ensure quality:

A proactive appraoach is an approach that system operators take to ensure quality by preventing errors and failures.

A reactive approach is an approach that system operators take to ensure quality by determining the best ways to fix errors after they have happened and by passing on knowledge about errors so that they do not occur in the future.

An interactive approach is an approach that system operators take to ensure quality by iteratively examining and acting on a particular activity to ensure quality while the activity is occurring.


A proactive approach is an approach that system operators take to ensure quality by preventing errors and failures. These approaches listed are familiar concepts to Seabees, but it is important to realize their role in ensuring a quality product.

Design QC: CEC Officers at headquarters commands and NAVFAC commands should be involved in the QC process- when practical- of the design of Seabee construction projects.

Planning and Estimating; It is hard to overstate the direct impact that good planning and estimating can have on creating a quality product. This is a proactive approach that can pay big dividends.

Team knowledge: Another proactive approach involves ensuring that the entire construction team knows the projects- from the crew, to the QC inspectors, to the Company leadership.

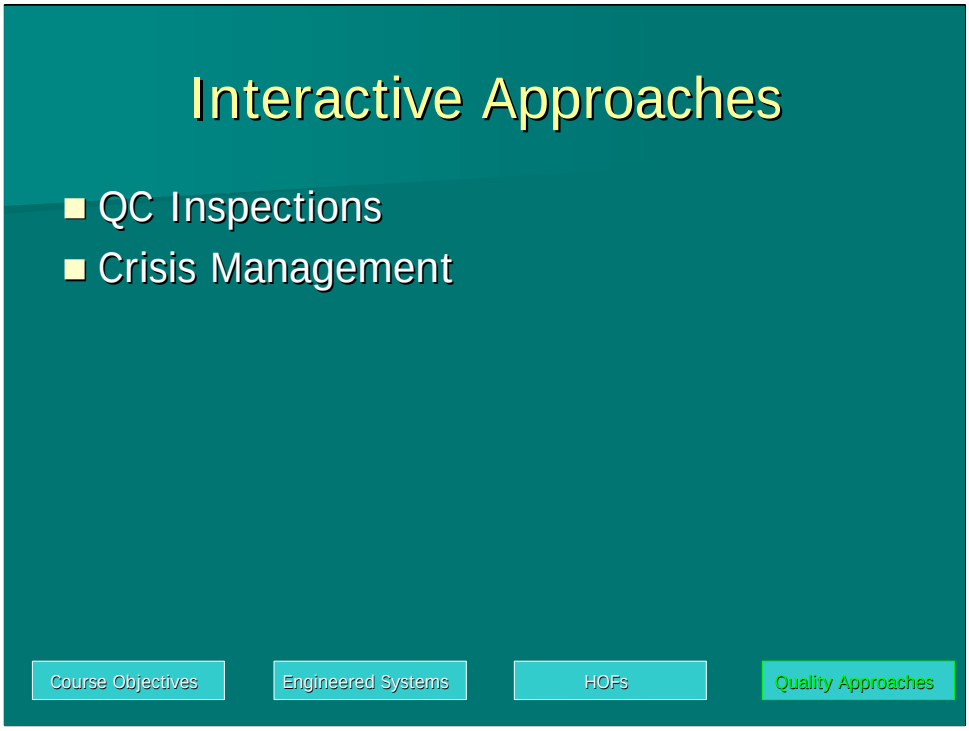
Chain of Command visits: This is another proactive approach that accomplishes several things:

1) It encourages team knowledge. No one wants to be on the job site and have an uneducated answer to a simple question from the Commanding Officer.
2) Chain of Command visits also enhance unit morale and esprit de corps.


A reactive approach is an approach that system operators take to ensure quality by determining the best ways to fix errors after they have happened and by passing on knowledge about errors so that they do not occur in the future.

QC Inspections: All system operators need to conscientiously document the errors discovered during QC inspections and follow-up with each other to ensure that the agreed upon remedies are implemented.

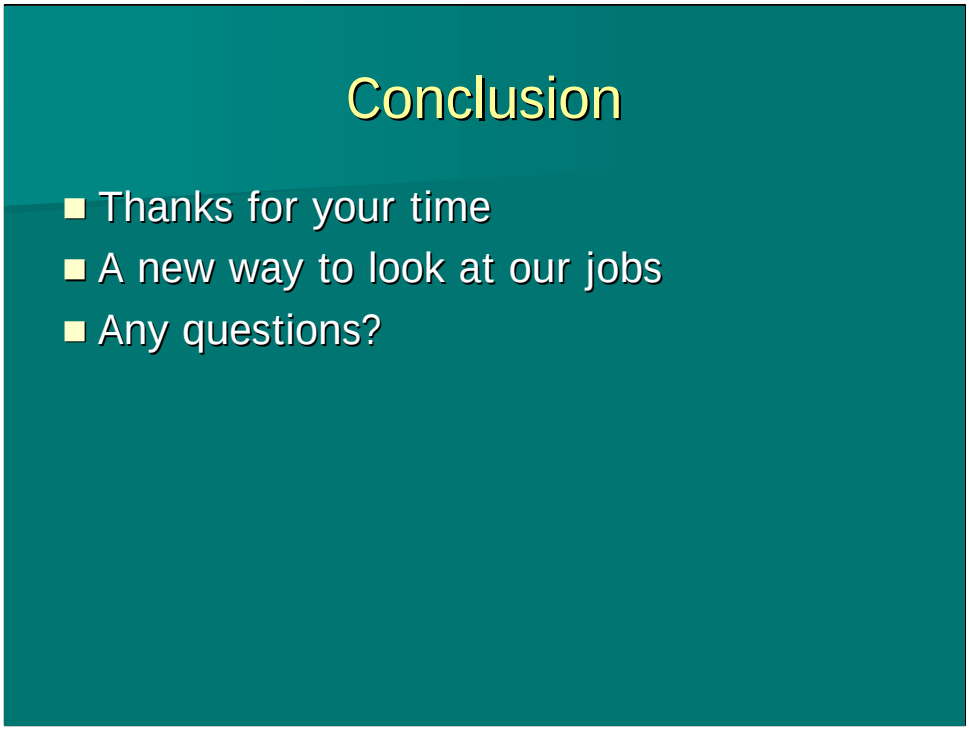
Safety Mishap Investigations: These are crucial tools for the chain of command to use to follow up on safety mishaps and ensure that the appropriate lessons are learned and passed on.




An interactive approach is an approach that system operators take to ensure quality by iteratively examining and acting on a particular activity to ensure quality while the activity is occurring.

QC inspections are also interactive because they often document ongoing activities and help operators ensure quality at all intermediate steps.

Crisis Management: This is the most readily apparent method of managing an activity as it is unfolding. As military units, NMCBs value crisis management in teams and in individuals. But more importantly, NMCBs train to improve their crisis management skills.




This is a new way to look at our jobs, because it incorporates the human factor into our operational planning. A building is more than the sum of the concrete and steel that is put into the ground. We need to realize this to better do our jobs.

# Appendix 9

OPNAV Note 3111
Establishment of First Naval Construction Division (1NCD)/ Naval Construction Forces Command (NCFC) and Modification of Atlantic and Pacific Naval Construction Forces (NCF)

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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

Canc frp: Jul 2003

OPNAVNOTE 3111
Ser DNS-RMC2/2U503217
26 July 2002

OPNAV NOTICE 3111

From: Chief of Naval Operations

Subj: ESTABLISHMENT OF FIRST NAVAL CONSTRUCTION DIVISION (1NCD)/ NAVAL CONSTRUCTION FORCES COMMAND (NCFC) AND MODIFICATION OF ATLANTIC AND PACIFIC NAVAL CONSTRUCTION FORCES (NCF)

Ref: (a) OPNAVINST 3111.14V
(b) BUPERSINST 7040.6
(c) OPNAVNOTE 5400 of 14 Jun 02

1. Purpose. To approve establishment of FIRST Naval Construction Division (1NCD)/Naval Construction Forces Command (NCFC) and modification of Atlantic and Pacific Naval Construction Forces (NCF) under the administrative chain of command of the Chief of Naval Operations per reference (a).

2. Background. The Naval Construction Division concept resulted from the NCF Alignment Study completed in FY-01 and approved by the Chief of Naval Operations. This action unifies the Atlantic and Pacific Naval Construction Force (NCF). The Commander 1NCD shall report for additional duty to CINCPACFLT and for concurrent duty Commander, Naval Construction Forces Command to Commander Fleet Forces Command, and shall serve as the single command interface with CINCLANTFLT, CINCPACFLT and CINCUSNAVEUR for Seabee operations. The Commander, FIRST Naval Construction Division (1NCD) shall have concurrent duty as Commander, Naval Construction Forces Command (NCFC), and shall serve as the single command interface with Commander Fleet Forces Command to develop, coordinate, and implement policy and requirements to man, equip and train Seabees. The Commander 1NCD/NCFC will be located at Little Creek, VA in spaces currently occupied by the SECOND Naval Construction Brigade. Two existing active duty Naval Construction Regiments (NCRs) are realigned under 1NCD, the TWENTY-SECOND NCR, which will relocate from Little Creek, VA to Gulfport, MS, and the THIRTIETH NCR located in Pearl Harbor, HI. Four existing reserve regiments (3NCR – Atlanta, GA, 7NCR - Newport, RI, 1NCR – Port Hueneme, CA, and 9NCR – Dallas, TX) are also realigned under 1NCD. This action will enhance Seabee readiness, improve alignment and operational effectiveness, and promote efficiencies within the Naval Construction Force (NCF).

3. Organizational Change. Establish Commander, FIRST Naval Construction Division (1NCD)/Commander, Naval Construction Forces Command (NCFC) and modify Atlantic and Pacific Naval Construction Forces effective 1 August 2002. Effect Permanent Duty Station (PDS) Change for TWENTY-SECOND NCR to Gulfport, MS effective 1 October 2002. The following applies:

| a. **Establishment** | **Effective Date** |
|---|---|
| Commander<br>FIRST Naval Construction Division<br>and Commander<br>Naval Construction Forces Command<br>1310 8th St Suite 100<br>Naval Amphibious Base Little Creek<br>Norfolk VA 23521-2435<br><br>(SNDL: 39A) (UIC: 57034)<br>(PLA: COMFIRSTNCD/COMNAVCONFORCOM<br>LITTLE CREEK VA)<br>(PDS: Norfolk, VA) | 1 August 2002 |
| Officer in Charge<br>FIRST Naval Construction Division<br>Forward<br>258 Makalapa Drive Suite 200<br>Pearl Harbor HI 96860-3121<br><br>(SNDL: 39B) (UIC: 57046)<br>(PLA: FIRST NCD (FORWARD)<br>PEARL HARBOR HI)<br>(PDS: Pearl Harbor, HI) | 1 August 2002 |
| Commander<br>Seabee Readiness Group Atlantic<br>4902 Marvin Shields Blvd<br>Gulfport MS 39501-5005<br><br>(SNDL: 39K2 ) (UIC: 55460)<br>(PLA: SEABEE READINESS GROUP LANT<br>GULFPORT MS)<br>(PDS: Gulfport, MS) | 1 August 2002 |
| Commander<br>Seabee Readiness Group Pacific<br>2551 Pacific Rd Suite 2<br>Port Hueneme CA 93043-4332<br><br>(SNDL: 39K1) (UIC: 55752)<br>(PLA: SEABEE READINESS GROUP PAC<br>PORT HUENEME CA)<br>(PDS: Port Hueneme, CA) | 1 August 2002 |

| b. **Disestablishment** | **Effective Date** |
|---|---|
| Commander<br>SECOND Naval Construction Brigade<br>1310 8th St Suite 100<br>Norfolk VA 23521-2435<br><br>(SNDL: 39B1) (UIC: 57034)<br>(PLA: COM SECOND NCB LITTLE CREEK VA)<br>(PDS: Norfolk, VA) | 1 August 2002 |
| Commander<br>THIRD Naval Construction Brigade<br>258 Makalapa Drive Suite 200<br>Pearl Harbor HI 96860-3121<br><br>(SNDL: 39B2) (UIC: 57046)<br>(PLA: COM THIRD NCB PEARL HARBOR HI)<br>(PDS: Pearl Harbor, HI) | 1 August 2002 |
| Officer in Charge<br>SECOND Naval Construction Brigade<br>Det Gulfport<br>5606 CBC 6th St<br>Gulfport MS 39501-5005<br><br>(SNDL: 39F1) (UIC: 35554)<br>(PLA: SECOND NCB DET GULFPORT MS)<br>(PDS: Gulfport, MS) | 1 August 2002 |
| Commander<br>COM TWO ZERO NCR<br>4902 Marvin Shields Blvd<br>Gulfport MS 39501-5002<br><br>(SNDL: 39C1) (UIC: 55460)<br>(PLA: COM TWO ZERO NCR GULFPORT MS)<br>(PDS: Gulfport, MS) | 1 August 2002 |
| Commander<br>COM THREE ONE NCR<br>1991 Pacific Rd<br>Port Hueneme CA 93043-4306<br><br>(SNDL: 39C2) (UIC: 55752)<br>(PLA: COM THREE ONE NCR PORT HUENEMA CA)<br>(PDS: Port Huenema, CA) | 1 August 2002 |

c. **RELOCATE**

| From | To |
|---|---|
| Commander<br>COM TWO TWO NCR<br>Unit 60507<br>FPO AE 09501-7058 | Commander<br>COM TWO TWO NCR<br>4902 Marvin Shields Blvd<br>Gulfport MS 39501-50 |
| (SNDL: 39C1) (UIC: 55614)<br>(PLA: COM TWO TWO NCR LITTLE CREEK VA)<br>(PDS: Little Creek, VA) | (SNDL: 39C1) (UIC: 55614)<br>(PLA: COM TWO TWO NCR)<br>(PDS: Gulfport, MS) |

d. **TITLE CHANGE**

| From | To |
|---|---|
| Officer in Charge<br>SECOND Naval Construction Brigade Det Atlantic<br>FPO AA 34051 | Officer in Charge<br>FIRST NCD Detachment Atlantic<br>FPO AA 34051-5000 |
| (SNDL: 39F1) (UIC: 35182)<br>(PLA: SECOND NCB DET ATLANTIC)<br>(PDS: Roosevelt Road, PR) | (SNDL: 39F1) (UIC: 35182)<br>(PLA: FIRST NCD DET ATLANTIC)<br>(PDS: Roosevelt Road, PR) |
| Officer in Charge<br>SECOND Naval Construction Brigade Det Europe<br>PSC 819 Box 38<br>FPO AE 09645-4000 | Officer in Charge<br>FIRST NCD Detachment Europe<br>PSC 819 Box 38<br>FPO AE 09645-4000 |
| (SNDL: 39F1) (UIC: 41908)<br>(PLA: SECOND NCB DET EUROPE)<br>(PDS: Rota, Spain) | (SNDL: 39F1) (UIC: 41908)<br>(PLA: FIRST NCD DET EUROPE)<br>(PDS: Rota, Spain) |
| Officer in Charge<br>SECOND Naval Construction Brigade Det Sigonella<br>Unit 50068<br>FPO AE 09627-2800 | Officer in Charge<br>FIRST NCD Det Sigonella<br>Unit 50068<br>PSC 819 Box 38<br>FPO AE 09645 |
| (SNDL: 39F1) (UIC: 41909)<br>(PLA: SECOND NCB DET SIGONELLA IT)<br>(PDS: Sigonella, IT) | (SNDL: 39F1) (UIC: 41909)<br>(PLA: FIRST NCD DET SIGONELLA IT)<br>(PDS: Sigonella, IT) |

Officer in Charge
THIRD NCB Det GU
PSC 455 Box 181
FPO AP 96540-2970

(SNDL: 39F2) (UIC: 53878)
(PLA: THIRD NCB DET GU)
(PDS: Guam)

Officer in Charge
FIRST NCD Det Guam
Bldg 556
FPO AP 96601-4629

(SNDL: 39F1) (UIC: 53878)
(PLA: FIRST NCD DET GUAM)
(PDS: Guam)

Officer in Charge
THIRD NCB Det Okinawa
PSC 480
FPO AP 96370-0059

(SNDL: 39F2) (UIC: 53882)
(PLA: THIRD NCB DET OKINAWA JA)
(PDS: Okinawa, JA)

Officer in Charge
FIRST NCD Det Okinawa
PSC 480
FPO AP 96370-0059

(SNDL: 39F1) (UIC: 53882)
(PLA: FIRST NCD DET OKINAWA)
(PDS: Okinawa, JA)

Officer in Charge
THIRD NCB Det Port Hueneme
2251 Pacific Rd Suite 2
Port Hueneme CA 93043-4332

(SNDL: 39F2) (UIC: 43303)
(PLA: THIRD NCB DET PORT HUENEME CA)
(PDS: Port Hueneme, CA)

Officer in Charge
THREE Zero NCR Det
Port Hueneme CA
2251 Pacific Rd Suite 2
Port Hueneme CA 93043-4332

(SNDL: 39F1) (UIC: 43303)
(PLA: THIRTIETH NCR DET
Port Hueneme CA)
(PDS: Port Hueneme, CA)

Officer in Charge
SECOND Naval Construction
Brigade Det Atlanta
Bldg 70
Naval Air Station Atlanta
Marietta GA 30060-5099

(SNDL: 39F1) (UIC: 49993)
(PLA: SECOND NCB DET ATLANTA GA)
(PDS: Atlanta, GA)

Officer in Charge
FIRST NCD Det Atlanta
Bldg 70
Naval Air Station Atlanta
Marietta GA 30060-5099

(SNDL: 39F1) (UIC: 49993)
(PLA: FIRST NCD DET ATLANTA GA)
(PDS: Atlanta, GA)

Officer in Charge
COM TWO ZERO NCR Det
Camp Lejeune
Sneads Ferry Rd Bldg 901
P O Box 20114
Camp Lejeune NC 28542-0114

(SNDL: 39C1) (UIC: 49992)
(PLA: COM TWO ZERO NCR DET CAMP LEJEUNE NC)
(PDS: Camp Lejeune, NC)

Officer in Charge
SRGLANT Det Camp Lejeune
P O Box 20114
Camp Lejeune NC 28542

(SNDL: 39C1) (UIC: 49992)
(PLA: SRGLANT DET CAMP LEJEUNE NC)
(PDS: Camp Lejeune, NC)

e. Mission. To organize, train, operate and maintain the Naval Construction Force, to command and control echelon IV Naval Construction Force Commands, and to develop, coordinate and implement policy and requirements to man, equip and train Seabees. In exercising this mission, FIRST Naval Construction Division (1NCD) and Naval Construction Forces Command (NCFC) will provide combat construction forces to fulfill operational and forward engagemet requirements of a Combatant or Component Commander; contingency and deliberate planning in support of OPLANs, training for Naval Construction Force units, and contributory construction support to Naval Shore Activities. FIRST Naval Construction Division (1NCD) and Naval Construction Forces Command (NCFC) will execute operations covering the full spectrum of engineering and construction tasks through task tailored units deployed around the world within the full spectrum of threat environments. A substantial percentage of operations will be prosecuted in joint/combined scenarios. Through its assigned units, FIRST Naval Construction Division (1NCD) and Naval Construction Forces Command (NCFC), supports Unified Commanders, Fleet Commanders in Chief, and Component Commanders. FIRST Naval Construction Division (1NCD) and Naval Construction Forces Command (NCFC) will sustain the required operational capabilities to perform assigned primary missions in all projected operational environments while maintaining command and control of assigned forces.

f. Major Claimant. CINCLANTFLT

g. OPNAV Resource Sponsor. N44

h. Administrative Assignment. Commander in Chief, U.S. Atlantic Fleet to be exercised by:

| Echelon | Administrative Chain of Command |
|---|---|
| **3** | **Commander, FIRST Naval Construction Division*** |
| | **(FIRST Naval Construction Division Forward)** |
| | **(FIRST Naval Construction Division Det Atlantic)** |
| | **(FIRST Naval Construction Division Det Europe)** |
| | **(FIRST Naval Construction Division Det Sigonella)** |

(FIRST Naval Construction Division Det Guam)
(FIRST Naval Construction Division Det Okinawa)
(FIRST Naval Construction Division Det Atlanta)

4 Officer in Charge, Naval Construction Battalion Unit 401
4 Officer in Charge, Naval Construction Battalion Unit 402
4 Officer in Charge, Naval Construction Battalion Unit 403
4 Officer in Charge, Naval Construction Battalion Unit 405
4 Officer in Charge, Naval Construction Battalion Unit 406
4 Officer in Charge, Naval Construction Battalion Unit 410
4 Officer in Charge, Naval Construction Battalion Unit 411
4 Officer in Charge, Naval Construction Battalion Unit 412
4 Officer in Charge, Naval Construction Battalion Unit 413
4 Officer in Charge, Naval Construction Battalion Unit 414
4 Officer in Charge, Naval Construction Battalion Unit 415
4 Officer in Charge, Naval Construction Battalion Unit 416
4 Officer in Charge, Naval Construction Battalion Unit 417
4 Officer in Charge, Naval Construction Battalion Unit 418
4 Officer in Charge, Naval Construction Battalion Unit 420
4 Officer in Charge, Naval Construction Battalion Unit 421
4 Officer in Charge, Naval Construction Battalion Unit 422
4 Officer in Charge, Naval Construction Battalion Unit 423

**4 Officer in Charge, Naval Construction Battalion Unit 427**
**4 Commander, FIRST Naval Construction Regiment**
**5 Commanding Officer, Naval Mobile Construction Battalion SEVENTEEN**
**5 Commanding Officer, Naval Mobile Construction Battalion EIGHTEEN**
**5 Commanding Officer, Naval Construction Force Support Unit TWO**
**5 Commanding Officer, Construction Battalion Maintenance Unit THREE ZERO THREE**
**4 Commander, THIRD Naval Construction Regiment**
**5 Commanding Officer, Naval Mobile Construction Battalion FOURTEEN**
**5 Commanding Officer, Naval Mobile Construction Battalion TWO THREE**
**5 Commanding Officer, Naval Mobile Construction Battalion TWO FOUR**
**5 Commanding Officer, Naval Construction Force Support Unit THREE**
**4 Commander, SEVENTH Naval Construction Regiment**
**5 Commanding Officer, Naval Mobile Construction Battalion TW0 ONE**
**5 Commanding Officer, Naval Mobile Construction Battalion TWO SIX**
**5 Commanding Officer, Naval Mobile Construction Battalion TWO SEVEN**
**5 Commanding Officer, Construction Battalion Maintenance Unit TWO ZERO TWO**
**4 Commander, NINTH Naval Construction Regiment**
**5 Commanding Officer, Naval Mobile Construction Battalion FIFTEEN**
**5 Commanding Officer, Naval Mobile Construction Battaion TWO TWO**
**5 Commanding Officer, Naval Mobile Construction Battalion TWO FIVE**

| | |
|---|---|
| **5** | **Commanding Officer, Naval Mobile Construction Battalion TWO EIGHT** |
| **4** | **Commander, TWO TWO Naval Construction Regiment** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion ONE** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion SEVEN** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion SEVEN FOUR** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion ONE THREE THREE** |
| **5** | **Commanding Officer, Underwater Construction Team ONE** |
| **4** | **Commander, THREE ZERO Naval Construction Regiment (THREE ZERO NCR Det Port Hueneme)** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion THREE** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion FOUR** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion FIVE** |
| **5** | **Commanding Officer, Naval Mobile Construction Battalion FOUR ZERO** |
| **5** | **Commanding Officer, Underwater Construction Team TWO** |
| **4** | **Commander, Seabee Readiness Group Atlantic (Seabee Readiness Group Atlantic Det Camp Lejeune)** |
| **4** | **Commander, Seabee Readiness Group Pacific** |

***Concurrent duty as Commander, Naval Construction Forces Command**

4. Action

a. For prospective Commander, FIRST Naval Construction Division\Commander, Naval Construction Forces Command: Action is required by applicable sections of reference (b).

b. This is advance change 38-02 to enclosure (5) of reference (c). DNS-RMC2 will revise SNDL.

5. Cancellation Contingency. This notice may be retained for reference purposes. The organization action will remain effective until changed by DNS.

V. H. ACKLEY
Director, Navy Staff
(Resource Management and
Comptroller)

Distribution:

| | |
|---|---|
| SNDL B2A | (Special Agencies, Staffs, Boards and Committees) (DFAS Cleveland (Code ABB2) and Pensacola (AOD) only) |
| B2E | (National Imagery and Mapping Agency Components and Elements (Washington DC (Code MS D44 only)) |
| B2F | (MIL POSTAL SVC AGCY/JT MIL POSTAL ACTIVITIES and Mobile Mail Centers) (EXEC DIR MIL POSTAL SVC AGCY Alexandria, only) |
| 21A1 | (CINCLANTFLT) (Code N4621A) |
| 21A2 | (CINCPACFLT) (Code 46) |
| 21A3 | (COMMANDER IN CHIEF, U.S. NAVAL FORCES, EUROPE) (CINCUSNAVEUR LONDON UK, only) |
| 23C | (COMNAVRESFOR) |
| 24J1 | (MARINE CORPS FORCES COMMANDS) (COMMARFORLANT, and COMMARFORPAC, only) |
| C28M | (NAVNETSPAOPSCOMDET) (Code N31) |
| FG6 | (NCTAMS) |
| FJA10 | (NAVMAC) (Code 30, 54) |
| FJA3 | (COMNAVPERSCOM) (PERS-40, 404E, 43, 433, 662) |
| FJA9 | (EPMAC) |
| FKA1C | (COMNAVFACENGCOM) |
| FKM14 | (NAVICP) |
| FKM18 | (NAVTRANSSUPPCEN) (Code 031) |

OPNAV Principal Officials
N122C1, N100E3, N44, N441

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## U.S. NAVY SEABEES – CAN DO


WITH COMPASSION FOR OTHERS
WE BUILD – WE FIGHT
FOR PEACE WITH FREEDOM