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ENGINEERING THE FUTURE: ORGANIZING UNITED STATES AIR FORCE CIVIL ENGINEERS FOR JOINT OPERATIONS AND THE PROJECTION OF AIRPOWER

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The current United States Air Force (USAF) Civil Engineer (CE) organizational structure was put into place in the early 1990s and there have been no significant changes since then. As the military strategic environment shifted from a cold war stance to one of global engagement, peace-keeping, and humanitarian assistance, USAF CE managed to meet its mission requirements, but not without cost. With the advent of the Aerospace Expeditionary Force (AEF), increased humanitarian assistance missions, and increased garrison requirements, USAF CE experienced stresses in several key specialties. These stresses affect USAF CE's ability to meet contingency and garrison requirements.

USAF CE analyzed the requirements of the new environment and developed the *Civil Engineer Strategic Plan* (CESP). The plan outlines the goals, mission essential tasks, and the modernization framework for a 25-year plan to transform the existing organization into an Aerospace Combat Engineer (ACE) force. This timeline is not sufficiently rapid to prevent a serious degradation of mission capability in the current environment. In order to remain viable, USAF CE must plan and execute an immediate organizational shift to an ACE force within the next two years to address current pressing concerns with plans for a final organizational shift by 2005.

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EXECUTIVE SUMMARY

Title: Engineering the Future: Organizing United States Air Force (USAF) Civil Engineers (CE) for Joint Operations and the Projection of Airpower

Author: Major Valerie L. Hasberry, USAF

Thesis: The current USAF CE organizational structure is not the most effective organization for meeting joint and service requirements.

Discussion: The current USAF CE organizational structure was put into place in the early 1990s and there have been no significant changes since then. As the military strategic environment shifted from a Cold War stance to one of global engagement, peace-keeping, and humanitarian assistance, USAF CE managed to meet its mission requirements, but not without cost. With the advent of the Aerospace Expeditionary Force (AEF), increased humanitarian assistance missions, and increased garrison requirements, USAF CE experienced stresses in several key specialties. These stresses affect USAF CE's ability to meet contingency and garrison requirements.

Realizing the increased difficulty of meeting all of its requirements due to a high ops tempo, aging and excess infrastructure, and recruiting/retention shortfalls, the USAF, like the rest of DoD, began analyzing and assessing its future. For USAF CE, the analysis resulted in the development of the *Civil Engineer Strategic Plan* (CESP). The plan outlines the goals, mission essential tasks, and the modernization framework for a 25-year plan to transform the existing organization into an Aerospace Combat Engineer (ACE) force.

Conclusion: Although the CESP addresses existing and future concerns, the 25-year timeline is not sufficiently rapid to prevent a serious degradation of mission capability in the current environment. In order to remain viable, USAF CE must plan and execute an immediate organizational shift to an ACE force within the next two years to address current pressing concerns with plans for a final organizational shift by 2005.

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PREFACE

The operating environment for the USAF changed dramatically during the past decade. The shift from a Cold War focus to today's small-scale contingency environment caused a cultural change in the USAF. The USAF realized it could no longer operate from fixed, forward basing, and began preparations to operate from multiple, bare base locations. Given the integral beddown and sustainment role of USAF CE, the new operational reality requires an engineer force that is easily scalable and task-organized.

In this paper, I address the continued viability of USAF CE's current organizational structure in light of previous taskings and current, joint, combined, AEF, and garrison requirements. The paper analyzes the potential squadron configurations outlined in the *Civil Engineer Strategic Plan* (CESP) and offers several suggestions for configuring the projected Aerospace Combat Engineer (ACE) force. Finally, the paper discusses the 25-year implementation timeline included in the CESP.

This paper is limited in scope and does not address in-depth key USAF CE issues such as outsourcing, privatization and planned equipment modernization. Given the rapidly changing and on-going nature of the various manpower studies within USAF and the completion timeline for this paper, the paper may not contain the most current manpower and deployment information. Information cited was current as of the dates noted in the footnotes.

Discussion of background information, current manpower status and issues, and joint engineer requirements would not have been possible without assistance from several agencies. Mr. Andy Jackson from the Air Force Civil Engineer Support Agency provided information on the San Antonio Real Property Management Agency. Commander Eric

Odderstol, USN, and Lieutenant Colonel Irv Lee provided access to the Joint Chiefs of Staff Engineer Division's web site. A special thanks goes to Lieutenant Colonel Greg Cummings, Mr. Dick Pinto, and Mr. Ron Lipera from the Installation and Readiness Division, Civil Engineer Directorate, Headquarters United States Air Force for providing updated manpower information. I am especially grateful to my mentors Dr. Wray Johnson and Lieutenant Colonel Charles Hudson for their direction and patience.

CHAPTER 1

THE CATALYST FOR CHANGE

The art of war, independently of its political and moral relations, consists of five principal parts, viz.: Strategy, Grand Tactics, Logistics, Tactics of the different arms, and the Art of the Engineer.

Baron Henri Jomini, *The Art of War*

A quick search of military journals, engineering and logistics magazines, Service websites and Professional Military Education (PME) archives reveals a growing interest and discussion regarding the current and future state of military engineers across all of the services. The focus of these studies run the gamut, from doctrinal adequacy; joint and service training; command and control in a joint environment; the proper location of the engineering function on the joint staff; equipment modernization; implementation of lessons learned; to, of course, the optimal organization for providing combat and combat service support.

While theorists such as Sun Tzu, Clausewitz, and Jomini, and practitioners such as Napoleon, have always known the key strategic and operational value of logistics and engineers, there has long been a tendency with U.S. planners and war gamers to "assume" that beddown of forces and sustainment of the same would simply happen. One can argue that the publication of Joint Vision 2010 (JV 2010) in 1996 changed all of that. The Focused Logistics concept espoused in JV 2010 propelled what many view as the arcane world of logistics into the mainstream of operational planning. Not only are support personnel trying to find solutions, but now the operators are as well.

JV 2010 identified Focused Logistics as a key component of decisive operations and called for logistics forces to be "tailored-to-task, agile, and readily deployable."[1] On the

[1] Joint Chiefs of Staff, *Joint Vision* 2010 (Washington, DC: GPO, 1996), 54.

various staffs, Focused Logistics is often boiled down to catch phrases such as: "reducing the tooth-to-tail ratio"; or "reducing our footprint" and becoming "lighter, leaner, and more lethal." The bottom-line of JV 2010 is a projected transformation from today's current logistics/support organizations to "integrated, modular, and specifically tailored combat service support (CSS) packages" capable of 24-hour, all-weather operations.[2]

Joint Vision 2020 (JV 2020) solidified the Focused Logistics concept outlined in JV 2010 into "the ability to provide the joint force the right personnel, equipment, and supplies in the right place, at the right time, and in the right quantity, across the full range of military operations.[3] Focused Logistics will provide the joint warfighter with support for all functions through organizational and process-oriented innovation.[4] For the USAF, Focused Logistics evolved into the core competency of Agile Combat Support (ACS) and is regarded as a foundation element in successful Air Force operations.[5]

The changing security environment, JV 2010 and 2020 and the follow-on ACS concept of operations have prompted a comprehensive review of engineering and logistics capabilities within the USAF. The USAF logistics and CE communities have made major strides towards implementing Focused Logistics concepts. However, the communities are separate organizations below the Headquarters USAF level and must address organizational constraints and resource shortfalls before they can fully implement the required changes and fulfill the joint and USAF vision for an integrated, modular, task-organized CSS organization.

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[2] JV 2010, 55.
[3] Joint Chiefs of Staff, *Joint Vision 2020* (Washington, DC: GPO, 2000), 24.
[4] JV 2020, 24.
[5] U.S. Air Force, *America's Air Force, Vision 2020*, (n.p., 2000), 6.

For USAF CE, one of the long-term issues of concern has been the viability and structure of its manpower. Recruiting shortfalls and low retention rates in several critical skills, combined with frequent deployments, smaller budgets, aging infrastructure, and increased privatization and competitive sourcing, all lead to questions of sustainability. The addition of new or expanded requirements, such as nuclear, biological, chemical (NBC) and homeland security/defense further exacerbate these concerns.

In light of these issues, USAF CE leadership recognized that the current organizational structure required review and began to study and plan for change. With the dramatic increase in ops tempo, continuing manning shortages, and new requirements such as the critical infrastructure program validating the need for this review, USAF CE now faces two key questions. First, what form will the change take and must it be evolutionary or revolutionary in order for USAF CE to remain a viable component of the joint engineer force? Second, can the existing force continue to perform and excel until 2025 when a new organization will be in place, or must something be done now to stop the hemorrhaging and ease the stress on an overworked career field?

CHAPTER 2

THE ROAD TO THE CURRENT STRUCTURE

The San Antonio Real Property Maintenance Agency (SARPMA was an experiment in centralization. . . . Furthermore, it is important to bear in mind that any effort at centralization brings with it both costs and benefits. It is not always possible to foresee the future clearly, but as we plan for it, the SARPMA experience should alert us to look carefully before we leap into future centralization.

Lieutenant General Robert C. Oaks, SARPMA Study

The current structure of USAF CE squadrons can be traced to the Office of the Secretary of Defense's (OSD) Defense Management Review Decision (DMRD) 967, *Base Engineering Services*, published in December 1990 and the subsequent counter-proposal from the USAF.[6] Under the DMRD 967 concept, the services would consolidate or regionalize base engineering services and establish Public Work Centers (PWC) based on the Navy model in an effort to improve service and save money.[7] Specifically, the document proposed five major initiatives in addition to the creation of the PWCs: (1) shift to zonal maintenance; (2) multi-skilling; (3) creation of a Maintenance Engineering function; (4) reduction of 21,800 military positions; and (5) a 6-year savings of $2.4B.[8] The Navy, which had PWCs dating from 1948, adopted DMRD 967 and completed implementation of the PWC concept and consolidation of all base engineering services.[9] The Army also adopted DMRD 967 and implemented regionalization and the required changes through the Directorate of Public Works (DPW).[10]

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[6] U.S. Air Force Pamphlet (AFPAM) 32-1005, *Working in the Engineering Flight* (n.p., 1 October 1999), 5.
[7] Department of Defense Universities, "TO-BE Workshop Report," 1 September 1995, URL: <www.c3i.osd.mil/bpr/bprcd/3414s2.htm>, accessed 29 September 2001.
[8] AFPAM 32-1005, 5.
[9] U.S, Navy, Navy Public Works Center Norfolk Virginia, URL:<www.norfolk.navy.mil/pwc/history.shtml>, accessed 29 September 2001.
[10] DoD, "TO-BE Workshop Report".

The Air Force, concerned with degradation in customer service and wartime capability, did not adopt DMRD 967. Based on a previous 11-year attempt in the San Antonio area[11] and a firm belief that the concept would degrade wartime capabilities and peacetime responsiveness, the USAF offered a counter-proposal with five major initiatives: (1) reduction of functional layers; (2) reduction in the number of career fields from 17 to 10; (3) reorganization based on tasks vice skills; (4) reduction in military strength from 28,950 to 22,765; and (5) a 6-year savings of $915M.[12] OSD accepted the counter-proposal, paving the way for USAF CE to reorganize under the "objective squadron" concept into the existing eight-flight configuration (Fig. 1).[13] Although this concept was supposed to take USAF CE through at least the opening phases of the 21st century, additional manpower cuts, joint and service visions, implementation of the Expeditionary Aerospace Force (EAF) concept, aging infrastructure, and increased ops tempo all combined to drive an organizational review and planned change.

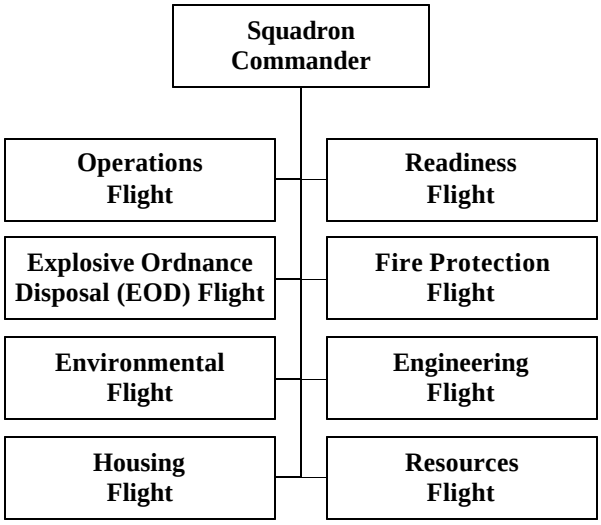

Figure 1. Current USAF CE Organization

[11] J. D. Hunley, *The San Antonio Real Property Maintenance Agency: A Case Study in Centralization*, an Air Training Command Historical Special Study (San Antonio, TX: ATC, April 1990).
[12] AFPAM 32-1005, 5.
[13] AFPAM 32-1005, 5-6.

The decision by the Air Force to opt out of the PWC concept resulted in an engineer organization totally unlike the other services. USAF CE units, except for RED HORSE[14], are tasked with both garrison and combat/combat service support. Although none offer a comparable capability to maintain a fully operational garrison as well as provide contingency engineering packages, Army, Navy, and Marine Corps engineering organizations do offer some insight into providing task organized engineering units for combat or combat service support and also insight into opportunities for basic restructuring. The representative garrison and deployable engineer force organization for the services are provided at Appendix A and a brief description of each service's concept of operations follows. *Engineering Doctrine for Civil Engineering Operations* (JP 3-34), *Joint Doctrine for Civil Engineering Support* (JP 4-04), and service publications provide in-depth details on the various engineer organizations for each service.

The Army has the US Army Corps of Engineers (USACE) and DPWs for garrison support and its combat engineering units for support of combined-arms operations. The Army's structure offers engineer units completely integrated into combined arms teams. However, the engineer units are sized according to the unit they support, e.g., corps or echelons above corps, and not by tasks. The standard engineer units include engineer battalions (combat) (heavy) and specialized teams, such as well drilling, which attach to brigades, groups, or battalions.

[14] RED HORSE units are war-time structured Air Force civil engineer units that provide a heavy engineer capability. The RED HORSE units are theater Air Force assets with regional responsibilities to support the air component commander and provide engineer support to the theater commander-in-chief or joint forces commander as required. As such, they are not tasked for base operations, maintenance, or sustainment. The units are mobile, rapidly deployable, and largely self-sufficient for limited periods of time. They perform the wartime tasks of major force beddown, heavy damage repair, bare base development, and heavy engineering operations. RED HORSE units are based on a 404-person team concept and deploy using a 4-echelon, hub and spoke concept.

The Navy, through the Naval Facilities Command (NAVFAC), provides garrison support through the PWCs and combat support through the Naval Construction Force (NCF) also known as the SEABEEs[15]. As shown in Appendix A, the Navy uses standing Naval Mobile Construction Battalions as the main building blocks for expeditionary engineering requirements. Currently, the SEABEEs can task-organize into a series of detachments and specialized teams such as the readily deployable, self-sustaining air detachment. The NCF also contains stand-alone specialized teams such as the underwater construction team and the construction battalion unit, which provides support to fleet hospitals.

The Marine Corps' structure offers perhaps the best example of task-organized engineer units completely integrated into combat support and combat service support organizations. Combat and general engineers are part of the Marine Air-Ground Task Force (MAGTF), but garrison support is provided by the Navy PWCs. Engineer units are integrated into every element of the Marine Air-Ground Task Force (MAGTF) except for the command element (Appendix A). The standard combat engineer and engineer support battalions, as well as those assets in the Marine Wing Support Squadrons, are capable of task-organizing to support MAGTF missions across the full spectrum of operations.

[15] The NCF are deployable Naval engineering units whose primary mission is to provide responsive contingency construction support for US military forces in theater. NCF SEABEE units are organized under two Naval construction brigades that include both active and reserve units. The NCF is organized, trained, and equipped to construct, maintain, operate, and repair advanced bases and their associated logistic pipelines. The force also provides disaster control and relief assistance, and performs civic action projects to complement military or other national programs. The following SEABEE units make up the NCF: Naval construction brigade (NCB); Naval Construction Regiment (NCR); Naval Mobile Construction Brigade (NMCB); Construction battalion maintenance unit (CBMU); Construction battalion unit (CBU); Underwater

THE USAF CIVIL ENGINEER LEGACY

Although challenged in recent years, USAF CE, through the extraordinary efforts of senior leaders and personnel, has managed to provide the combat service support needed by joint and USAF warfighters. With mottos such as "Can Do, Will Do, Have Done," USAF CE units have used innovation and perseverance to overcome manpower shortages, constrained funding, and increased ops tempo. Though stressed, the organization withstood the numerous tests and challenges of the 1990s and prepared itself to remain an effective enabler during the 21st Century.

Operations Desert Shield/Desert Storm

The first test came with Operations Desert Shield/Desert Storm. Lois Walker's article, *Gulf War Retrospective*, provides a detailed account of the USAF CE taskings, challenges and accomplishments which culminated in the beddown of 55,000 people and more than 1,500 aircraft (a/c) at 25 sites in southwest Asia (SWA).[16] Although several beddown locations such as Eskan Village had existing infrastructure requiring only repairs and enhancements, others, like Al Kharj, were bare bases with only basic pavements and required the full range of beddown upgrades, including construction of runways, roads, revetments, ammunition storage and other facilities; installation of airfield lighting and a/c arresting barriers; facility hardening; sanitation; utilities; water purification and wastewater disposal; and, of course, erection of tent cities.[17] The deployed engineers successfully overcame the challenges of

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Construction Team (UCT); Naval construction force support unit (NCFSU); Amphibious Construction Battalion (ACB).

[16] Lois Walker, "Gulf War Retrospective," *Air Force CE Magazine*, Spring 2001, 7-10.

[17] Walker, 7-10.

working in austere and varied environments while the engineers who remained in garrison successfully kept the bases operational.[18]

Operations Allied Force and Shining Hope

Although Operations Desert Shield and Desert Storm were military successes, none of the services rested on their laurels afterward. No one expected a future adversary to allow a six-month build-up and, on the support side, no one expected a repeat of such a robust existing beddown/support infrastructure. The USAF, like the other services, took the lessons learned from Operations Desert Shield/Desert Storm and began planning for the "next war." In August 1998, the USAF unveiled its EAF concept. Less than a year later, the EAF and its associated Aerospace Expeditionary Forces (AEF) underwent its first trial-by-fire in Operation Allied Force and the associated humanitarian assistance operation Shining Hope.

While Operations Allied Force and Shining Hope may not have approached the scale of Operations Desert Shield/Desert Storm for the Department of Defense (DoD), they were large-scale operations for the USAF. For CE, Operations Allied Force and Shining Hope were a dual test of the existing organizational structure. First, could the existing organization function with significantly reduced manning? Second, could the existing organization adequately support future AEFs?

More than 900 USAF engineers deployed for the operations.[19] Although these engineers encountered numerous challenges, they and the forward-based engineers were an

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[18] Ronald B. Hartzer, "Validating Air Force Civil Engineering Combat Support Doctrine in the Gulf War," *Aerospace Power Chronicles* 8, no. 2 (Summer 1994). URL: <http://www.umi.com/proquest/>, accessed 5 Sep 01.

[19] Lois Walker, "Support of the Mission: Interview with Col Glenn Haggstrom," *Air Force CE Magazine*, Spring 2000: 4.

integral part of a joint and combined team that successfully supported over 18,000 deployed personnel at more than 20 bases, approximately 24,000 personnel stationed at European installations, as well as thousands of Kosovar refugees.[20]

Through a combination of Prime Base Engineer Emergency Force (BEEF)[21] and RED HORSE teams and the USAF Contract Augmentation Program (AFCAP), USAF CE completed a full range of beddown and sustainment activities, including: construction of tent cities at locations in Italy and Albania and "port-a-cabins" at Royal Air Force (RAF) Fairford, United Kingdom[22]; airfield improvements, Explosive Ordnance Disposal (EOD) support and support to multinational forces at Tirana-Rinas Airfield, Albania;[23] and using AFCAP to construct a refugee camp and supply lumber in support of Operation SHINING HOPE.[24] In addition to the normal beddown and sustainment activities, USAF CE forces had to execute a rapid beddown and subsequent relocation of a new weapons system, the Predator unmanned aerial vehicle (UAV), at an austere location.[25]

Air Force CE also experienced a change to its standard advance deployment process during Operations Allied Force and Shining Hope. Headquarters United States Air Forces Europe (HQ USAFE) changed the normal method of sending advance teams from multiple

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[20] Department of Defense, *Annual Report to the President and Congress: Report of the Secretary of the Air Force*, 2000, URL: <http://www.dtic.mil/execsec/adr2000/af.html>, accessed 8 Nov 01.

[21] Prime BEEF teams are formed from existing garrison engineer units and are the primary organizational structure for supporting both mobility and inplace contingency requirements. The principle objective of deploying Prime BEEF teams is to beddown and support an AEF, to maintain/sustain base facilities, and recover the base after attack. Prime BEEF units are deployed in unit type code (UTC) sets based on 28 basic and specialized UTCs. Depending on the mission and engineering requirements, UTCs can, to some degree, be tailored as needed. The basic UTCs for general engineering support are: 4F9EA - Prime BEEF AEF Team A; 4F9EB - Prime BEEF AEF Team B; and 4F9EP - Prime BEEF AEF Team C.

[22] Technical Sergeant Ann Bennett, USAF, "RAF Fairford Sets Up Port-a-Cabins for Deployed Members," 21 April 1999; Senior Airman Karl Duckworth, USAF, "Ramstein Civil Engineers Build Tirana Tent City," 23 April 1999; and " JTF SHINING HOPE Completes Humanitarian Mission," 23 June 1999. URL: <http://www.usafe.af.mil/news/news99/ >, accessed 8 Nov 01.

[23] Captain Aaron Orluck, USAF, "Operating Successfully in an International Environment," *Air Force CE Magazine*, Winter 1999-2000, 14-15.

[24] Lois Walker, "Support of the Mission: Interview with Colonel Glen Haggstrom," *Air Force CE Magazine*,

specialties by employing the 86th Contingency Response Group (CRG). This new Group was developed as a USAF test case shortly before the beginning of Operation Allied Force and was task-organized to respond to the events in Kosovo and Albania.[26] The 134-person team comprises more than 40 specialties, including civil engineering, emphasizing force protection and being a "first-in" force to establish airfield and aerial port operations.[27] To that end, the Group can expand into a team of up to 2,000 personnel

Like Operations Desert Shield/Desert Storm, the new processes and structures employed during Operations Allied Force and Shining Hope provided a rich learning environment for USAF CE. The chosen beddown locations ranged from existing installations such as Aviano Air Base Italy to contingency locations such as RAF Fairford in the United Kingdom. There were also bare base-type installations such as the Tirana-Rinas airfield, which required repair and expansion in order to be operational and austere locations such as Taszar, Hungary. Operation Allied Force clearly demonstrated that military logistics and engineering still had changes to make in order to be lighter and leaner.[28] For USAF CE, Operations Allied Force and Shining Hope, when combined with on-going operations such as Operation Southern Watch over the southern Iraqi no-fly zone, was a clear indicator that the existing organizational structure would not be a perfect fit with the AEF.

Spring 2000, 4.

[25] "Unit Spotlight on USAFE Construction and Training Squadron," *Air Force CE Magazine*, Spring 2000, 7.

[26] General John Jumper, USAF, "Rapidly Deploying Aerospace Power: Lessons from Allied Force," *Aerospace Power Journal*, no. 4 (Winter 1999) URL: <http://www.umi.com/proquest/>, accessed 5 September 2001.

[27] Jumper, "Rapidly Deploying Aerospace Power".

[28] Joint Chiefs of Staff, Engineer Division, "Kosovo Lessons Learned," URL: <http://www.dtic.mil/jcs/j4/divisions/ed>, accessed 18 October 2001.

CHAPTER 3

REQUIREMENTS, MANNING, AND EXPECTATIONS

Within the context of the joint operational environment, engineer operations support the development of the battlespace for maneuver, enhance strategic and operational movement, and provide infrastructure for force projection.

Joint Publication 3-34, *Engineer Doctrine for Joint Operations*

While the USAF CE organization was undergoing real-world testing during the 1990s, the defense establishment was struggling through a post-cold war transformation. Air Force and joint staffs were developing or fine-tuning the doctrine that would shape and define the future role of civil engineers. With reduced forward basing and the new emphasis generated by Focused Logistics and "Agile Infrastructure," there was a renewed effort within the joint and Service communities to define the exact role and purpose of military engineers in the new security environment.

JOINT REQUIREMENTS

The various joint and Service efforts resulted in a full-range of doctrine and strategic plans that attempted to define the new roles and missions associated with Focused Logistics. The Universal Joint Task List (UJTL) provides a macro-level look at required tasks for all services.[29] Joint Publication (JP) 4-04, *Joint Doctrine for Civil Engineering Support*, further defines the engineering tasks required to support joint forces across the full range of military operations and during each phase of joint operations.[30] The functions are divided into three basic task categories of general, topographic, and combat engineering, and include:

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[29] Joint Chiefs of Staff, Chairman, Joint Chiefs of Staff Manual 3500.04B, *Universal Joint Task List* (Washington, DC: GPO, 1 October 1999). Chapter 2, provides the UJTL for all services across the four war objectives levels (National Strategic, Theater Strategic, Operational, and Tactical).

[30] Joint Chiefs of Staff, Joint Publication 4-04, *Joint Doctrine for Civil Engineering Support* (Washington, DC: GPO, 2001), lists the five basic processes as mobilization, deployment, employment, sustainment, and redeployment (p. vii); Chapter 4 defines four joint operation phases: deter/engage; seize initiative; decisive operations; and transition.

advanced base development and operations; battle damage repair; support to post-hostilities operations; foreign humanitarian assistance and disaster relief; and specialized civil engineering support such as airfield lighting systems.[31]

Joint Publication 3-34, *Engineer Doctrine for Joint Operations*, further defines the joint engineer requirements and capabilities needed to "shape the battlespace in which the joint force will operate."[32] Joint Publication 3-34 provides an outline of battlespace functions (Fig 5) and lists the capabilities of each service. Air Force CE further summarized the tasks into four categories: beddown, operation, force protection, and base recovery.[33] The tasks and capabilities tables in Appendix B provide the Joint Chiefs of Staff (JCS) J-4 and Joint Forces Command (JFCOM) J-4 synopsized versions of required tasks.

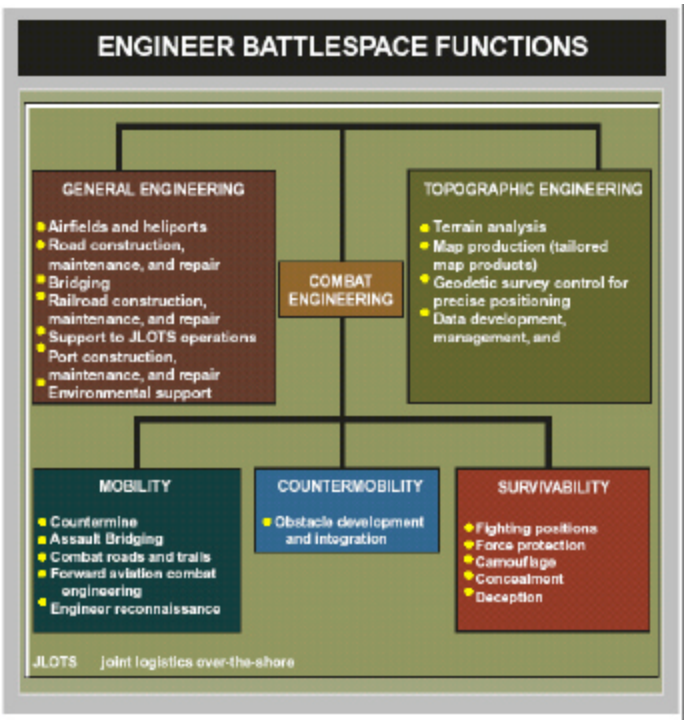

Figure 5. Engineering Battlespace Functions
(Source: JCS, Joint Pub 3-34, *Engineer Doctrine for Joint Operations*)

[31] JCS, Joint Pub 4-04, viii.
[32] JCS, Joint Pub 3-34, I-4.
[33] Colonel Timothy Byers, "Civil Engineer Expeditionary Combat Support (ECS)", 24 July 2000,

Although the joint and service doctrine and visions were all based on a changing security environment and identified homeland defense/security as a new requirement, the main focus was still on the concept of preparing for two major theater wars (MTW) in addition to smaller-scale contingencies (SSC) and the full range of peace and humanitarian operations. The final version of *The Report of the Quadrennial Defense Review* (QDR), published in the weeks following the events of 11 September 2001, changed that focus and accelerated the discussions and review of the requirements generated by the homeland defense/security mission.

The QDR shifted the focus from a "threat-based" to a "capabilities-based" model and outlined "protection of critical U.S. infrastructure" as an essential component of ensuring U.S. security and freedom of action.[34] The QDR further defined defense of the U.S. as the primary mission of DoD and stated that forces must be sized and tasked to: (1) defend the homeland; (2) deter forward; (3) perform warfighting missions; and (4) conduct smaller-scale contingencies.[35] The QDR's prioritization of homeland defense and its direct effect on USAF CE is discussed later in this study.

AIR FORCE REQUIREMENTS

Although the tasks outlined for the USAF in the UJTL, Joint Pub 3-34, and Joint Pub 4-04 were not new, the operating environment, in light of the changing security environment, JV 2010/2020, and the EAF, was significantly different. The USAF used joint vision and doctrine, as well as lessons learned from Operations Desert Shield/Desert Storm, a host of small operations, and Operations Allied Force and Shining Hope to refine its

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URL: <http://www.af.mil/il/ile/ilex>, accessed 6 November 2001.

[34] Department of Defense, *Report of the Quadrennial Defense Review* (Washington, DC: GPO, 2001), vi-2.

doctrine. The end result was the Air Force Task List (AFTL) and the development of ACS as a core competency.[36] Air Force doctrine outlined seven categories of tasks for ACS: (1) readying the force; (2) protecting the force; (3) preparing the operational environment; (4) positioning the force; (5) employing the force; (6) sustaining the force; and (7) recovering the force.[37] Air Force CE has tasks within each category that must be performed on a daily basis, both within garrison and at deployed locations.

Air Force CE took the various legal requirements, doctrine publications and other publications such as the USAF Strategic Plan and the ACS concept of operations document and developed a two-volume plan, the CESP.[38] The plan considered the future security environment, funding, modernization, and missions and outlined the core competencies and mission essential tasks (MET) for USAF CE.[39] While the tasks outlined in the doctrine publications focus on the wartime requirements for engineers, the core competencies outlined in the CESP correctly address the dual mission of USAF civil engineers by focusing on garrison and expeditionary requirements. The five core competencies are listed below and the associated METs are listed in Appendix B.

- **<u>Installation Engineering</u>**
  - Real Property Maintenance
  - Operations
  - Planning and Construction
  - Competitive Sourcing
  - Privatization and Divestiture

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[35] QDR, 17-22.
[36] U.S. Air Force, Air Force Doctrine Document (AFDD) 1-1, *Air Force Task List*, (Washington, DC: GPO, 1998), 121-152.
[37] AFDD 1-1, 121.
[38] Office of the Civil Engineer, Headquarters United States Air Force, *Civil Engineer Strategic Plan* (CESP), *Volume One* (Washington DC: HQ USAF/ILEP, 1999) and *Civil Engineer Strategic Plan, Volume Two* (Washington DC: HQ USAF/ILEP, 2000).
[39] *CESP, Volume One*, 27.

- **Expeditionary Engineering**
  - Prime BEEF
  - RED HORSE
  - Contingency Contracting

- **Environmental Leadership**
  - Conservation and Planning
  - Pollution Prevention
  - Compliance
  - Clean-up

- **Housing Excellence**
  - Dormitories
  - Family Housing
  - Communities

- **Emergency Services**
  - Fire Protection
  - Explosive Ordnance Disposal
  - Readiness

COMPETING DEMANDS AND GROWING EXPECTATIONS

Air Force CE, like the rest of the USAF and the other services, faced a growing list of responsibilities with fewer resources. Since 1989, the USAF has experienced a 400% increase in its operational tempo.[40] During the same period, USAF CE authorized manning decreased approximately 27% from more than 30,000 to 19,236.[41] As mentioned earlier, although USAF CE has made minor adjustments to accommodate the changing environment and missions, there has not been a major overhaul of the basic organizational structure since DMRD 967.

As the military strategic environment has shifted from a Cold War stance to one of global engagement, peace-keeping, and humanitarian assistance, USAF CE has managed to meet its mission requirements, but not without cost. With the advent of the EAF concept,

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[40] Secretary of the Air Force Public Affairs Office, "An Introduction to America's Air Force," May 2001, Slide 32, URL: <http://www.af.mil>, accessed 18 September 2001.

[41] "The Air Force in Facts and Figures: People," *Air Force Magazine*, May 2001, 47.

increased humanitarian assistance missions, and increased home base requirements due to aging infrastructure, USAF CE has experienced stresses in several key specialties which in turn affect overall readiness and the ability to meet joint and service requirements based on agile combat support and infrastructure.

Home Station Requirements

Although the EAF concept changed the way the USAF views deployments, it did not change the garrison support picture. Normally, only a single flying squadron from a base deploys, leaving two or more flying squadrons and a fully functioning installation behind. Combat support personnel are pulled from multiple installations to reduce the affect on garrison operations. However, undermanned career fields or specialties such as security forces and USAF CE readiness are still greatly affected by the AEF rotation cycles and the need to maintain a normal ops tempo at home. With the increased focus on homeland security requirements after 11 September 2001, it has become even more critical to maintain the garrison forces as well as those deployed forward at their operational peak.

The art and science of balancing garrison and expeditionary requirements is made more difficult by aging infrastructure and fiscal constraints. Excess and aging infrastructure and inadequate funding have significantly increased the stress on the engineer force. At a time when the number of deployed airmen is increasing, the home station maintenance and repair requirements are also expanding. The affect of infrastructure status on overall readiness has been addressed at all levels of the USAF leadership and at the DoD level.

The Secretary of the Air Force's portion of the *Annual Report to the President and Congress* has consistently addressed excess infrastructure issues and the inadequate funding that has created a real property replacement cycle that is five times greater than the industry standard

of 50 years.[42] The USAF Civil Engineer (AF/CE) has also consistently addressed these issues and their affect on overall readiness in testimony to Congress. In the latest statement, AF/CE stressed the fact that current real property maintenance (RPM) funding levels only provide for minimal day-to-day critical maintenance, which directly affects operational efficiency.[43] The result is a never-ending situation in which aging infrastructure and facilities require more frequent and extensive maintenance and repair that cannot be accomplished on a timely basis due to inadequate funding.

The direct affect on the USAF is an increasing RPM backlog, which directly influences readiness. The problem is exacerbated by excess infrastructure, further stretching available USAF CE manpower. When combined, these factors stress the capacity of USAF CE and other organizations to maintain normal ops tempo at the home installation. Lack of funding to perform the maintenance also decreases the garrison opportunities for civil engineers to perform tasks that allow them to remain proficient in their wartime skills.

Expeditionary Aerospace Force and Other Requirements

Air Force CE was having difficulty meeting AEF requirements within the original construct before the events of 11 September 2001 due to a shortage of readiness, EOD, and fire protection personnel. As part of the USAF Total Force Career Field Review (TFCFR), AF/CE identified these shortages and other manpower concerns as current and future limiting factors on USAF CE's mission capability. The events of 11 September 2001 and the subsequent publication of the QDR report have exacerbated these difficulties.

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[42] Department of Defense, *Annual Report to the President and Congress*, 2000, URL: <http://www.dtic.mil/execsec/ >, accessed 22 November 2001.

[43] U.S. Congress, House, *Presentation to the Committee on Armed Services, Subcommittee on Military Installations and Facilities, United States House of Representatives, Subject: Condition of Military Facilities: Effects on Readiness and Quality of*

The final TFCFR brief identified a delta of 2,200 active personnel between the number required to perform assigned tasks and the number of personnel assigned.[44] The shortfall gains significance when one takes into account that 74% of USAF CE personnel are assigned to Unit Type Codes (UTCs) while a full 90% of personnel are tasked in direct support of USAF and Commander-in-Chief (CINC) missions.[45] With such a high task rate, any shortages significantly affect USAF CE's ability to support garrison and AEF requirements.

The current nominal AEF combat support construct aims to provide the capability of supporting or establishing up to four bases of operation including one main operating base, one bomber forward operating location, and two limited bases.[46] For USAF CE, this translates into an average of 1,371 civil engineers from the total force deployed in support of the AEFs, exercises, Secret Service missions, Humanitarian Relief Operations, and other taskings each month.[47]

The TFCFR identified the following shortfalls, which affect USAF CE's ability to meet multiple taskings for certain skills:

Life, Statement of Major General Earnest Robbins II, The Civil Engineer, United States Air Force, 107th Cong., 26 April 2001. URL: <http://www.house.gov/hasc/>, accessed 22 November 2001.

[44] Colonel Timothy Byers, USAF, "Total Force Career Filed Review (TFCFR)," Slide 8, 2 May 2001, URL: <http://www.af.mil/il/ile>, accessed 18 September 2001.

[45] Byers, TFCFR, Slide 13.

[46] Lieutenant Colonel Tom Doyne, USAF, "Expeditionary Air Force," briefing presented at the U.S. Marine Corps Command & Staff College Air Force Officer Orientation, MCB Quantico, 26 July 2001,. Slide 24.

[47] Byers, CE ECS, Slide 33.

Specialty	Overall Manning	Skill Level with Shortfall[48]	Skill Level Manning
Readiness	80%	5-level	57%
		9-level	44%
Operations Mgmt	108	5-level	67%
Power Production	86%	5-level	69%
Electrical Systems	86%	3-level	67%
Utilities	88%	3-level	65%
Liquid Fuels	94%	3-level	53%
Fire	83%	9-level	62%
EOD	94%	9-level	63%

Table 1. Civil Engineer Manning Shortfalls by Skill-Level
(Source: Total Force Career Field Review Briefing, 2 May 2001)

Homeland Security / Defense

Although joint and service doctrine and vision statements all included references to an increased threat to the U.S. homeland, addressing the threat was part of the long-range planning and budgeting cycle. The USAF began an aggressive force protection program in the wake of Khobar Towers, but appropriately, the initial efforts were at overseas locations and key U.S. facilities. The QDR, as mentioned earlier, established homeland defense and critical infrastructure protection as DoD's number one priority. Although DoD has not determined the final tasks and manning levels needed to execute the homeland defense mission, the change in prioritization is guaranteed to significantly affect USAF CE operations.

Air Force CE has traditionally extended its emergency response capabilities to surrounding civilian communities. Mutual aide agreements and Memorandums of Understanding exist for fire, explosive ordnance disposal (EOD), hazardous material, and disaster response. Air Force and other military engineers are also available for disaster relief

[48] Air Force Civil Engineer enlisted skill levels represent the following qualifications: 1 – Helper; 3 – Apprentice; 5 – Journeyman; 7 – Craftsman; and 9 – Superintendent.

through the Federal Response Plan.[49] These same emergency response capabilities are also critical assets within any given theater area of operation.

As previously discussed, USAF CE is undermanned in several key career fields needed for both the AEF and homeland defense. The TFCFR addressed these concerns in the final May 2001 briefing. However, after 11 September 2001, there was renewed emphasis on correcting the shortfalls in the near-term. The USAF established a Long Haul Manpower Review Panel chaired by the Director, Manpower and Organization (HQ USAF/XPM) to address the corporate ability of the USAF to meet homeland defense requirements.

Although the numbers are not final, AF/CE's initial input into the process identified significant shortfalls in five key areas: firefighters, readiness, EOD, power production, and liquid fuels. As indicated in Table 3, many of these skills are severely stressed at the apprentice and journeyman levels. The various iterations of the Long Haul briefings outline the following concerns: (1) 70% of current readiness manning is needed to meet current contingency requirements; (2) approximately 80% of deployable firefighters are filling current taskings; (3) EOD authorizations were below actual requirements prior to 11 September 2001; (4) over 50% of power production personnel are forward-based and there is limited civilian and Air Reserve Component (ARC) support to backfill; and (5) each installation normally has only a small cadre of liquid fuels personnel and four of these are required to fill Prime BEEF UTCs, leaving no support available at some installations and only limited ARC support available.[50]

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[49] JCS, Joint Pub 3-34, IV-15.

[50] Major Dave Crawford, USAF; Major Brent Moran, USAF; and Mr. Larry McAllister, "NOBLE EAGLE/ENDURING FREEDOM Long Haul Manpower Requirements," 24 October 2001, (Washington, DC: HQ USAF/XPMR), Slides 13-17.

Joint and service requirements, combined with manpower and funding shortfalls, highlighted the need for a comprehensive review of the existing organizational structure. The joint and service task lists also created a requirement for USAF CE to address its long-term ability to meet competing requirements for stressed specialties such as readiness and EOD.

CHAPTER 4

ORGANIZATIONAL OPTIONS

And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.

Niccolo Machiavelli, *The Prince*

Realizing the increased difficulty of meeting all of its requirements due to a high operations tempo, aging and excess infrastructure, and recruiting/retention shortfalls, USAF CE, like the rest of DoD, began analyzing and assessing its future. The analysis resulted in the development of the CESP. The plan outlines the goals, METs, and the modernization framework for a 25-year plan to transform the existing organization into an aerospace combat engineer (ACE) force. The CESP discusses the shortcomings of the existing organizational structure and provides three options for interim reorganization: (1) core competency squadron; (2) spectrum squadron; and (3) focused squadron.

To be effective, any new organizational structure must provide the means to meet current and projected garrison, homeland defense, and joint and USAF expeditionary requirements. The organization must maintain the full complement of military engineers needed to meet the joint general and combat engineering tasks outlined in Tables 1 and 2. It should take advantage of privatization and outsourcing opportunities to reduce the garrison support requirements, but retain enough military personnel to meet homeland defense requirements either alone or as part of a joint or regional team. To meet JV 2020 standards, the organization should be capable of becoming a component of a combat service support organization. Above all, the organization must be a capabilities-based unit, which allows task-organization across the full spectrum of military operations.

STATUS QUO – OPERATIONAL SQUADRON

The current structure (see Figure 1) is based on a Cold War defense posture. As such, it reflects neither the QDR focus on homeland defense nor the EAF focus on rapid, sustainable deployment. As stated in the CESP, the structure "possesses neither the flexibility nor the organizational constructs required by the EAF."[51]

The existing structure, combined with the overall concept of tasking by UTCs, does not allow the USAF to quickly and easily tailor a deployment package. Although the Prime BEEF construct has been modified from the lead (132-person)/follow (61-person) team concept to the smaller AEF Team A (55)/B (46)/C (25) concept,[52] the teams are still UTC-based. Air Force CE personnel from the headquarters, the Air Force Civil Engineer Support Agency (AFCESA), and the major commands continue to work with the AEF Center and personnel from the Headquarters United States Air Force Deputy Chief of Staff (DCS) for Operations (HQ USAF/XO) and DCS for Installation & Logistics (HQ USAF/IL) offices to refine the packages.

[51] CESP, 33.
[52] JCS, Joint Pub 4-04, Appendix C.

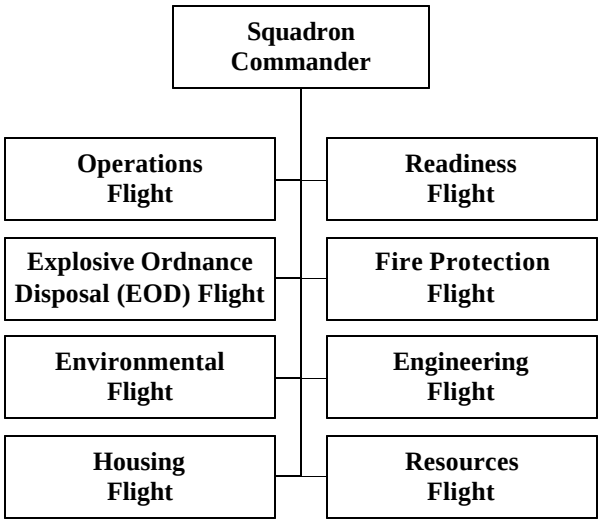


Figure 1. Current USAF CE Organization

CORE COMPETENCY SQUADRON

This concept is based on USAF CE's five core competencies, with a resources flight added. The emergency services flight contains the existing fire protection, readiness, and EOD functions. The expeditionary flight contains the cross-section of skills currently found in the operations flight with engineering site survey and other skills included. Per the CESP, each flight could be sourced from in-house, contract, regional, or multiple sources.[53]

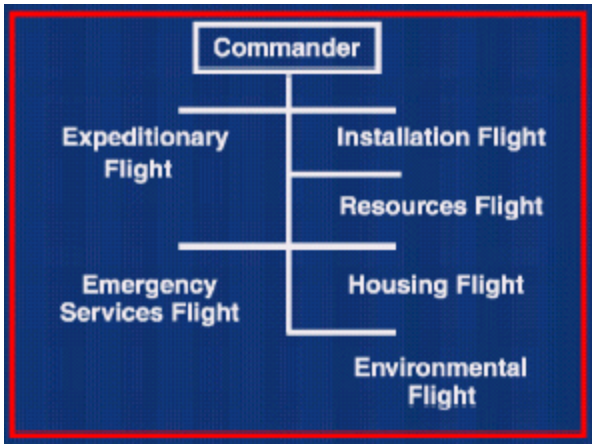


Figure 3. Core Competency Squadron
(Source: Civil Engineer Strategic Plan, Volume Two)

[53] CESP, 35.

One of the benefits of this structure is that it focuses USAF CE efforts on its core competencies. The structure provides a clear delineation between garrison-specific functions such as housing, wartime/contingency functions, and the crosscutting functions of emergency services. However, the structure maintains the same basic flight structure of the existing organization and does not fully address the dual nature of emergency services personnel.

SPECTRUM SQUADRON

This proposed structure is not so much a reorganization as a delineation of manpower sourcing avenues. The model identifies those squadrons, which must be composed of USAF manpower and those such as EOD, which can be composed from a mix of sources. The basic eight-flight structure of the existing squadron is retained with minor changes.

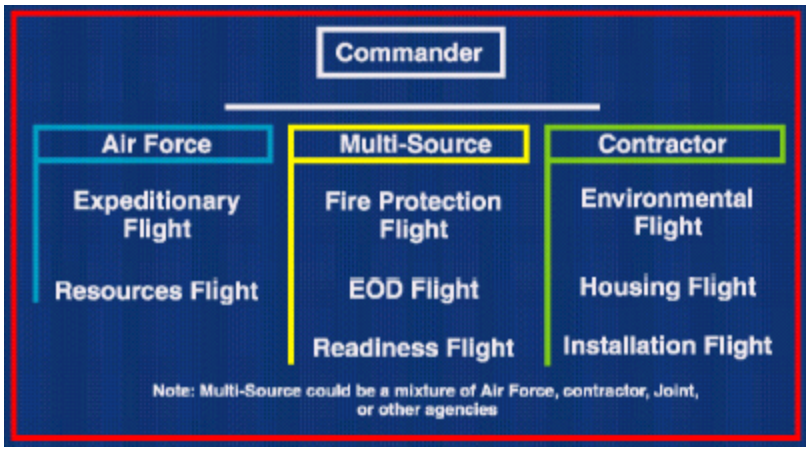


Figure 4. Spectrum Squadron
(Source: Civil Engineer Strategic Plan, Volume Two)

This structure has several positive benefits. One of the benefits of this structure is that it accommodates joint and inter-agency capabilities, which can be brought to bear during normal day-to-day operations or during domestic contingencies. It also provides a potential joint solution for stressed career fields such as fire protection and readiness. More importantly, this structure provides an opportunity to properly position manpower allowing

USAF CE to fully support both homeland defense requirements and expeditionary requirements. However, the fact that it retains the existing eight-flight structure with minor modifications outweighs the positive aspects of this option. As noted earlier, this structure does not facilitate rapid task-organization.

FOCUSED SQUADRON

The Focused Squadron structure organizes the squadron into three main support categories of mission support, expeditionary engineering, and installation support. Like the Spectrum Squadron, it retains the same basic eight-flight structure of the existing organization. While the categories provide the ability to focus on garrison, non-garrison, and crosscutting support, they fall short of significantly changing the structure to enable task-organization. In addition, the placement of the Readiness Flight under the expeditionary category does not account for the key role of readiness personnel in homeland defense.

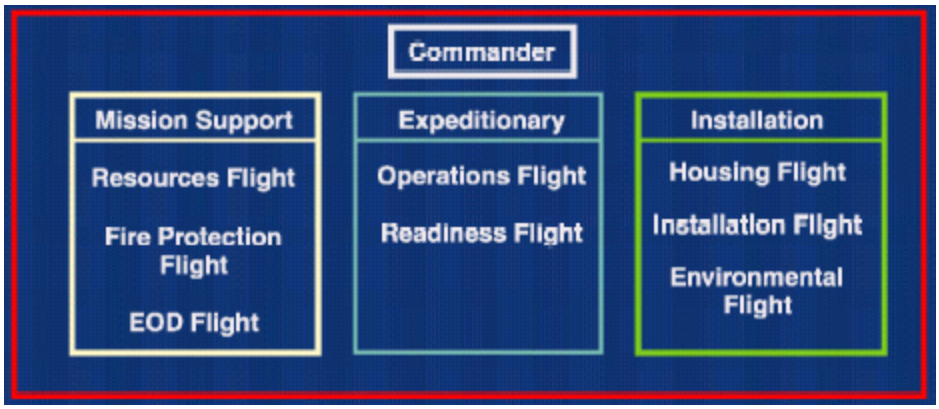


Figure 5. Focus Squadron
(Source: Civil Engineer Strategic Plan, Volume Two)

PUBLIC WORK CENTERS AND WARTIME ONLY MANNING

An option not included in the CESP, but one, which has been the topic of discussion among USAF CE personnel, is that of establishing mini-RED HORSE units (see Fig. 6) at

each installation. The concept would require the USAF to establish PWCs similar to those used by the Navy and Army as discussed in Chapter 2. Contractor or civilian personnel would conduct all garrison support. Military engineers would have only a war-time/contingency role and would conduct no day-to-day operations in garrison.

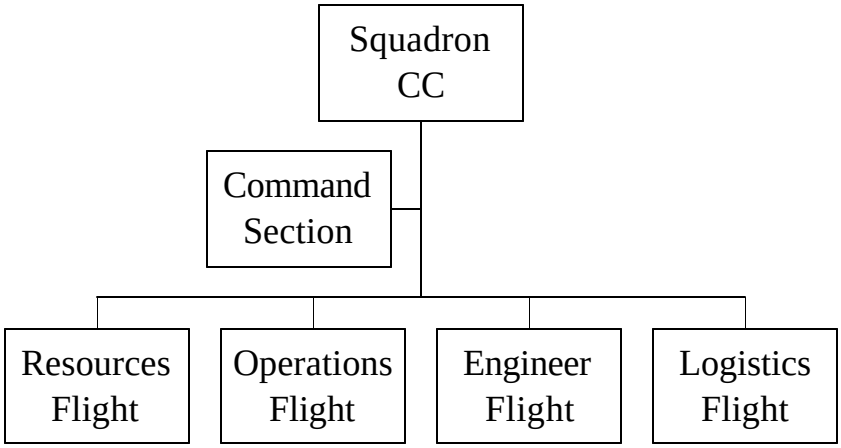


Figure 6. Notional Mini-RED HORSE Squadron

While this organization does address expeditionary requirements and offers opportunities to task-organize along the traditional RED HORSE echelon concept, it fails to address homeland defense requirements that may dictate military engineer support in garrison. In addition, this structure creates some concern with available training opportunities to maintain wartime skills while in garrison.

Each of the options discussed above falls short of the long-range joint vision of integrated combat service support organizations capable of task-organization. Although they provide options for sourcing manpower and for focusing efforts, they still follow the same basic eight-flight organization of the existing organization and do not allow the USAF to readily task-organize the units. A better concept outlined in the CESP is the long-range ACE force.

AEROSPACE COMBAT ENGINEER FORCE

The CESP identifies the ACE force as the 2025 endstate for USAF CE structure. The ACE represents the evolution from the current UTC-based system of Prime BEEF, RED HORSE and special teams to the cross-functional, capability-based engineer force shown in Figure 6. The plan also identifies the four capabilities required by this structure: (1) a trained, equipped, and ready expeditionary force built on the Total Force; (2) a technologically superior force incorporating all elements of information technology, intelligence, surveillance, and reconnaissance to achieve global engineering dominance; (3) organizational doctrine and force structure to enable ACE operations; and (4) integration of non-traditional and traditional engineering services through organizational doctrine, policy, and operating instructions.[54]

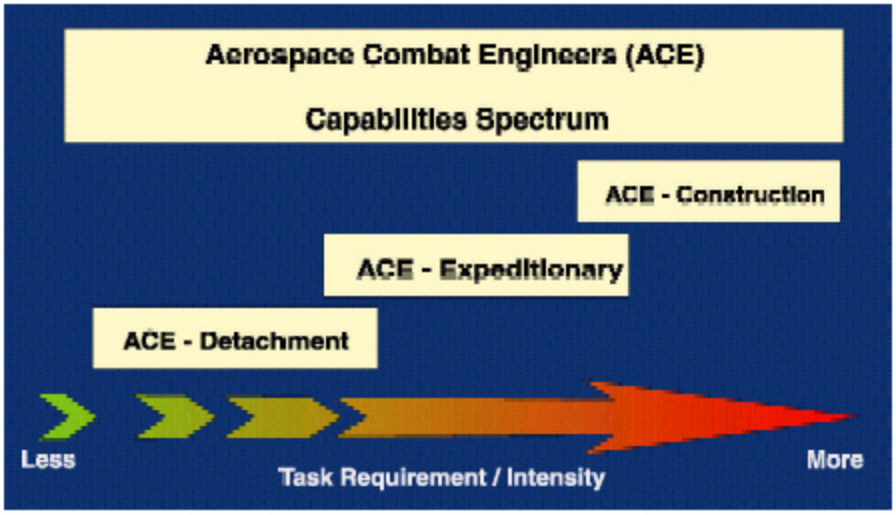


Figure 7. Aerospace Combat Engineer Capabilities Spectrum
(Source: Civil Engineer Strategic Plan, Volume Two)

The ACE concept conforms to the joint vision of a rapidly deployable, task-organized force while still providing for garrison support and homeland defense activities. In addition,

[54] CESP, 37.

placing the existing RED HORSE, Prime BEEF, and special team capabilities into one structure allows USAF CE to meet the joint taskings identified in Tables 1 and 2 through one organization instead of two. It also provides the proper organizational structure to fold capabilities into an organization such as the Contingency Response Group (CRG), which exists in USAFE and Pacific Air Forces (PACAF) and may become the combat service support standard organization.

Configuration Recommendations

One suggested ACE configuration is shown in Figure 8. The operations flight would encompass the current operations flights with engineering site survey and other skills added and would perform the general and combat engineering tasks outlined in Tables 1 and 2 and all garrison support linked to warfighting requirements. The current environmental, housing and engineering flights would become majority contractor support with a small cadre of military and DoD civilians for oversight and wartime skill retention and would merge into the installation flight. Depending on its size, each squadron could field the full ACE range of task-organized units.

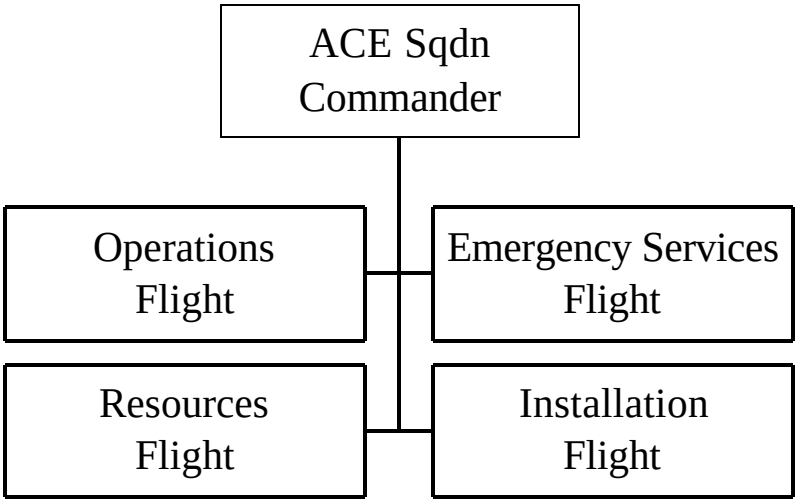


Figure 8. Suggested ACE Squadron Structure, Option 1

A second possible option is shown in Figure 9. Emergency services manpower would be a combination of USAF military, civilian, or contractor personnel. The civilian and contractor personnel would remain in place to provide garrison emergency support in the event all military personnel are forward deployed or required to respond to a homeland defense tasking. The four ACE flight alignment allows for a single, cross-functional flight to be attached to an individual aircraft squadron from that installation to fit the current AEF construct. It also allows for task-organization into larger or smaller units based on the capabilities required to execute the mission.

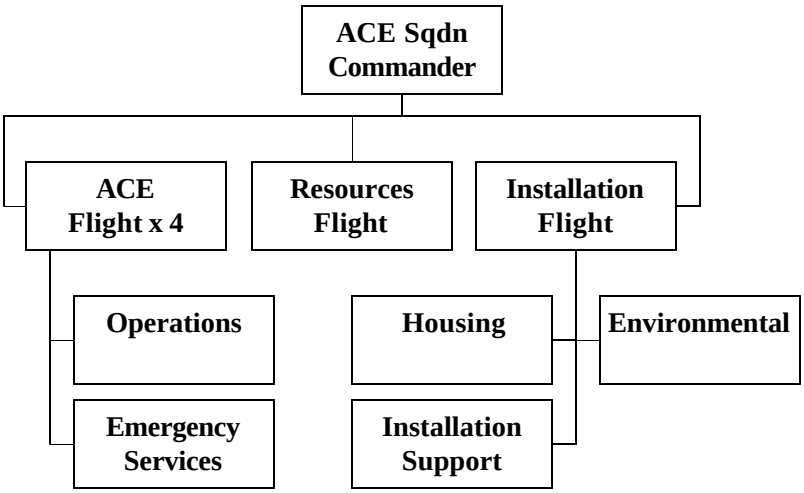


Figure 9. Suggested ACE Squadron Structure, Option 2

To take advantage of existing installations with RED HORSE units, USAF CE should consider creating new groups at these installations. The new groups would possess the full range of ACE capabilities from heavy construction to specialized teams (Fig. 10). In addition, existing USAF CE groups could be trained, equipped, and postured to provide the heavy construction capabilities that currently only exist in RED HORSE squadrons.

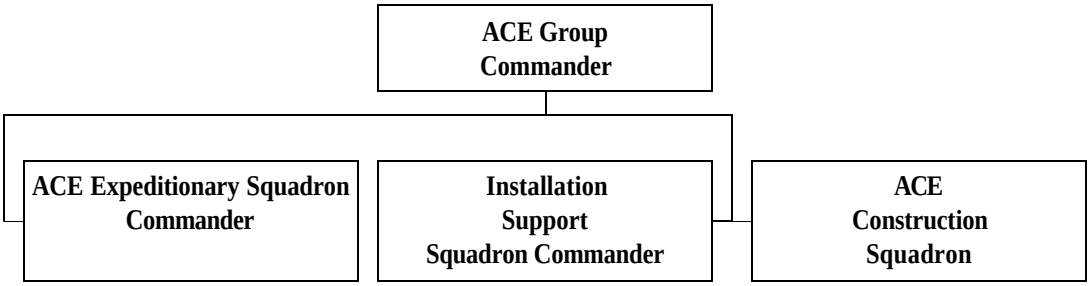


Figure 10. Suggested ACE Group Structure

The existing small squadrons would provide capabilities at the mid- to low-range of the ACE spectrum. These units could also combine or attach to larger units for more robust capabilities. In keeping with the requirement to continue to operate a fully functioning installation, the most likely scenario would entail combining capabilities from multiple installations to form one of the task-organized ACE units.

CHAPTER 5

TIMELINES AND THE EXTENT OF CHANGE

In military operations, time is everything.
The Duke of Wellington, 30 June 1800, Dispatch

Air Force CE outlines a 25-year modernization plan in the CESP (Fig. 11). The plan provides detailed goals for each core competency area and assigns a HQ USAF Civil Engineer division as the lead or "champion" for each process. Like JV 2020 and other defense plans, the modernization plan is built around the reality of the current planning, programming, and budgeting system (PPBS), which normally precludes the funding of rapid change. The plan is also based on the need to develop the appropriate command and control systems and equipment needed to field a CE force that is capable of integration into a combat service support team as envisioned in JV 2020.

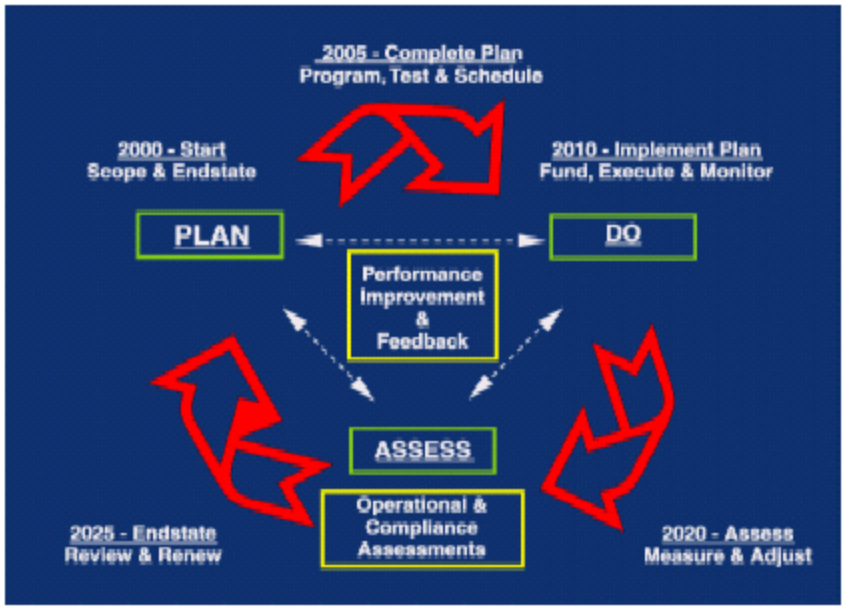


Figure 11. Modernization Milestones
(Source: Civil Engineer Strategic Plan, Volume Two)

As noted in the CESP, the full transformation to an ACE force requires modernization, funding, and philosophical shifts. Major requirements for the transformation include:

- Equipment modernization to allow USAF CE to be lighter, leaner, and more rapidly deployable.
    - Several steps have already been taken to improve equipment including the development of new lightweight shelter systems to replace existing general purpose and TEMPER tents and new environmental control units and generators.
- The appropriate command and control systems to allow integration of fire protection, EOD, and readiness capabilities into the Full Spectrum Response Force capable of detection, reporting, rapid response and consequence management within garrison and at deployed locations.
- Correct manpower shortfalls
    - Shortfalls existed before 11 September 2001. Those events and subsequent taskings increased the stress on undermanned specialties and further highlighted the situation at higher levels.
    - Efforts such as the Total Force Career Field Review and the Long Haul Review may result in USAF CE receiving additional manpower. In addition, USAF-wide recruiting and retention efforts should help retain the manpower.
- Training
    - Once the manning levels are increased, the ability to transform rapidly is limited by the surge capability of the technical training system.
- Divestiture of excess infrastructure
    - The potential for additional base closure rounds offers some hope that current budgetary and manpower stresses caused by excess and aging infrastructure may be resolved.
    - Divestiture is, to some degree, a double-edged sword. Although the reduced infrastructure improves the ability to support the remaining installations, the fewer number of bases increases the regional response requirements.

While the PPBS precludes, to some extent, a revolutionary change in organizational structure, USAF CE should take steps now to make some major modifications to existing plans and squadrons. The first step is to compress the timeline for implementation of the

ACE concept. To ensure USAF CE is postured as a viable force within the existing and future security environment, the ACE structure must be fully planned by 2003 and implemented by 2005. The future asymmetric threat environment envisioned in the CESP is here now and USAF CE, as well as DoD, can no longer afford to take evolutionary approaches stretching over 20 to 25 years to implement many of the changes espoused in joint and service doctrine.

The next step is for the various USAF CE core competency teams and boards to continue their work on developing and resolving equipment issues, but within the reduced timeframe. Although delaying the organizational restructuring to coincide with equipment modernization would be the ideal, the reality of the current and future security environment preclude waiting for ideal conditions. In order to continue fulfilling its wide variety of missions, USAF CE must address organizational issues in the near-term. Innovative measures must be taken to implement changes within a budget system that is unresponsive to rapid change.

CHAPTER 6

CONCLUSION

The events of 11 September 2001 and their aftermath exposed the average American to a new lexicon of terms and acronyms that form the basis for day-to-day operations within the military: WMD; asymmetric attack; anthrax; NBC; anti-terrorism; force protection; expeditionary forces; and homeland defense are just a few examples. Although these terms were a part of the military's vocabulary for some time, all too often they were tied to long-range thinking and plans within a long lead-time budgeting system. The terrorist attacks on the World Trade Center and the Pentagon were clear indicators that the "future" security environment alluded to in various joint and service publications is here now. Given the altered present, the services must consider implementing changes, where possible, outside of the budget cycle.

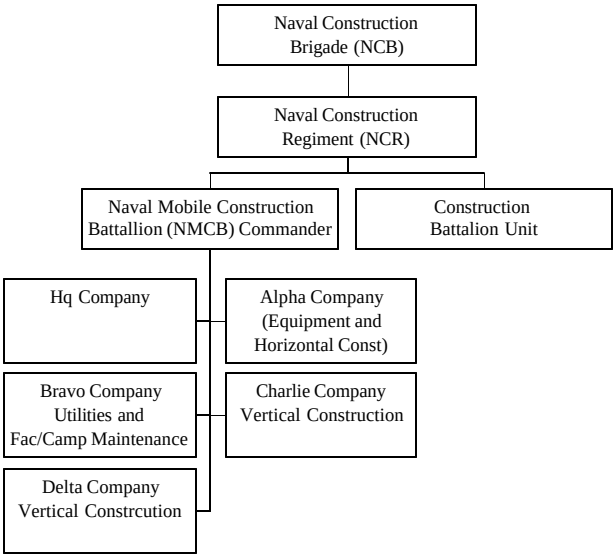
The US Air Force, like many other organizations, recognized the need to review its current structure in light of a changing security environment and new doctrine and vision. Since 1990, the scope and frequency of USAF and joint operations have changed dramatically. From Operations Desert Shield/STORM and Allied Force to humanitarian relief operations and joint exercises, USAF CE is itself engaged across the full spectrum of military operations. The two-volume CESP accurately captures the requirements needed to operate in the new security environment. However, in order to continue meeting the challenges of a changing security environment, AEF requirements, and its on-going garrison requirements, USAF CE must remove the reorganization portion of the CESP from the extended implementation cycle imposed by an unresponsive budgeting system.

The Air Force is not alone in its quest for the optimal organization. The logistics visions laid out in JV2010 and JV2020 presented major challenges to all of the services.

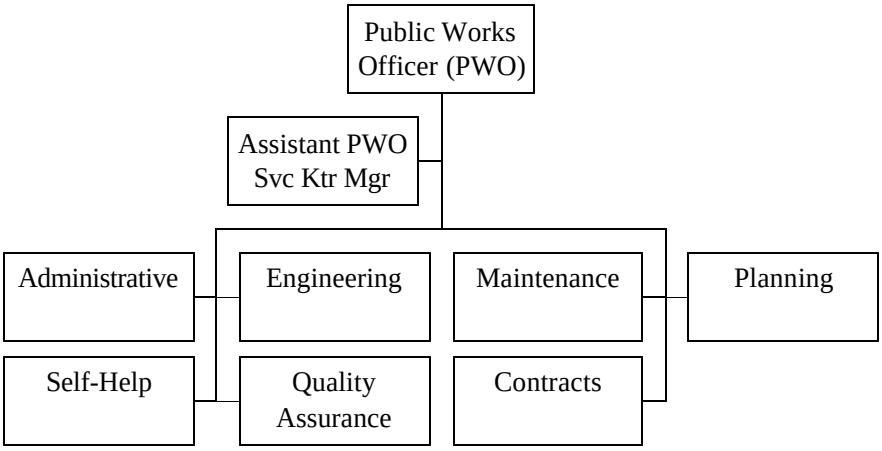
Focused Logistics required the joint staff and each service to begin an examination of a wide variety of issues including: processes and equipment, command and control issues; information technology; the type and quantity of prepositioned assets; host nation support expectations, contractor support within theater; doctrinal shortfalls; and intra- and inter-service relationships. Joint military engineers must continue to address and take action on some of the major issues facing the community and must do so within reduced timeframes where possible.

For USAF CE, this means they must address existing manpower shortages and organizational issues that strain their ability to meet joint, AEF, and garrison requirements. They must shorten the projected timeline for developing and implementing a new organizational structure. Specifically, they must address the need to implement the ACE force envisioned in the CESP before 2025. The ACE force would provide the ability to task-organize USAF CE units, which is essential to their continued viability within the joint arena.

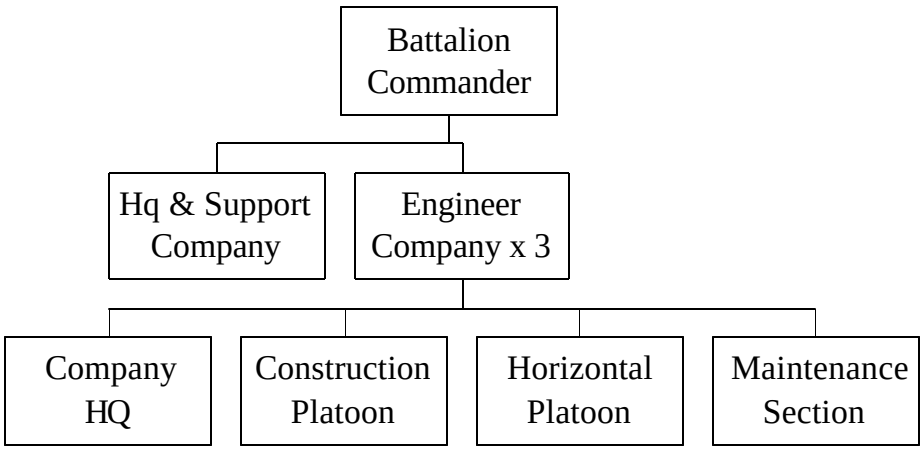
APPENDIX A – NOTIONAL US ARMED FORCES ENGINEER ORGANIZATIONAL STRUCTURES



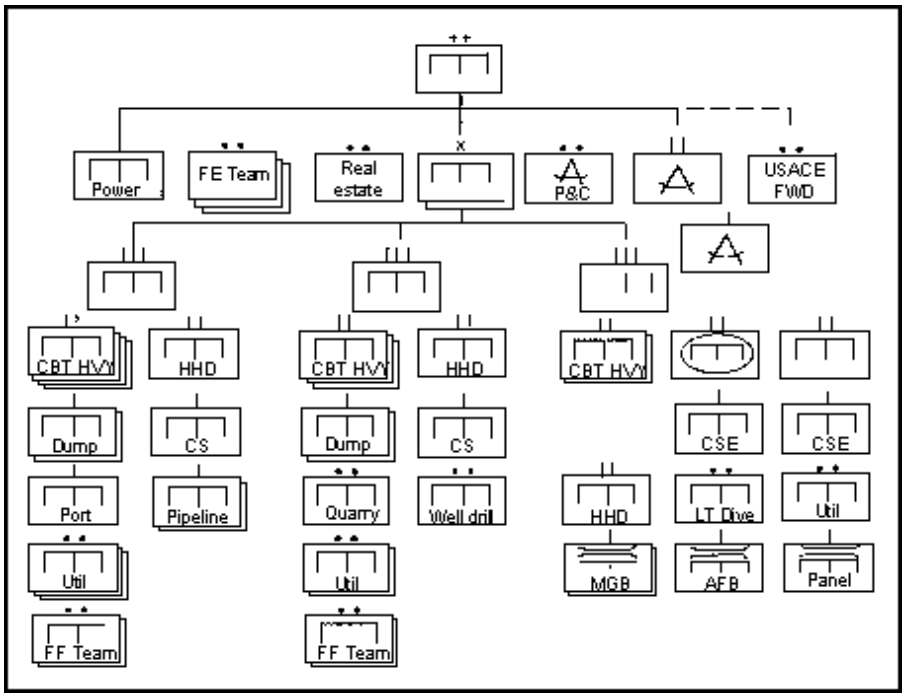
Notional U.S. Navy Naval Mobile Construction Battalion Organization
(Based on Information at: http://www.seabee.navy.mil/, accessed on 12 Dec 01



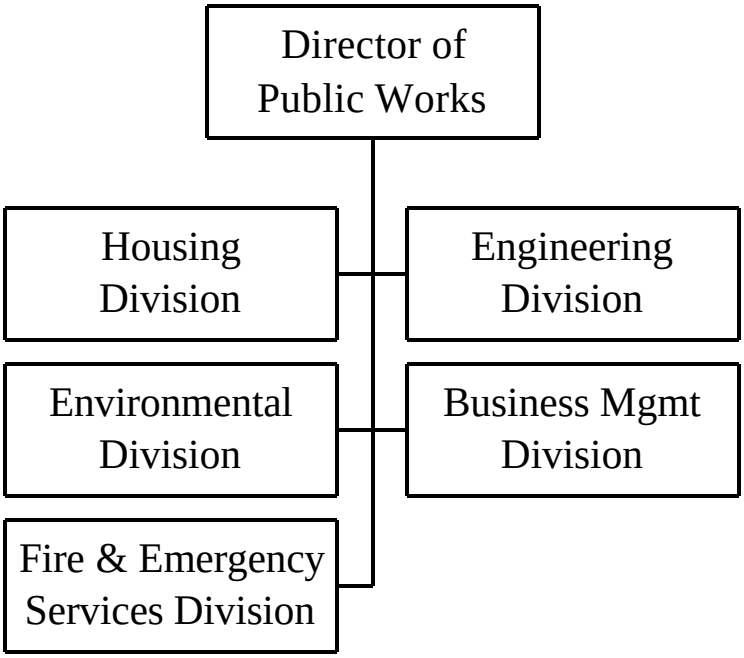
Notional U.S. Navy Public Works Center Organization
(Source: http://www.af.navy.mil/, accessed on 12 Dec 01)



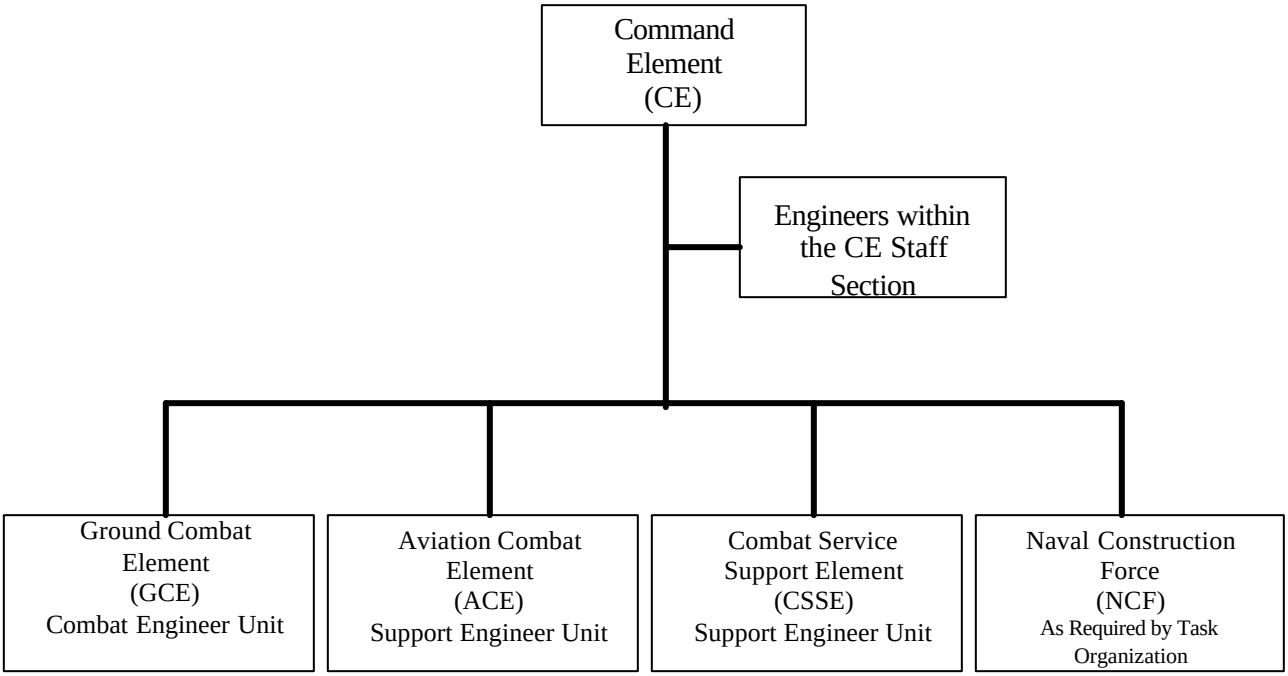
Notional U.S. Army Engineer Battalion (Combat Heavy)
(Based on FM 5-116, Engineer Echelons Above Corps, 9 Feb 99)



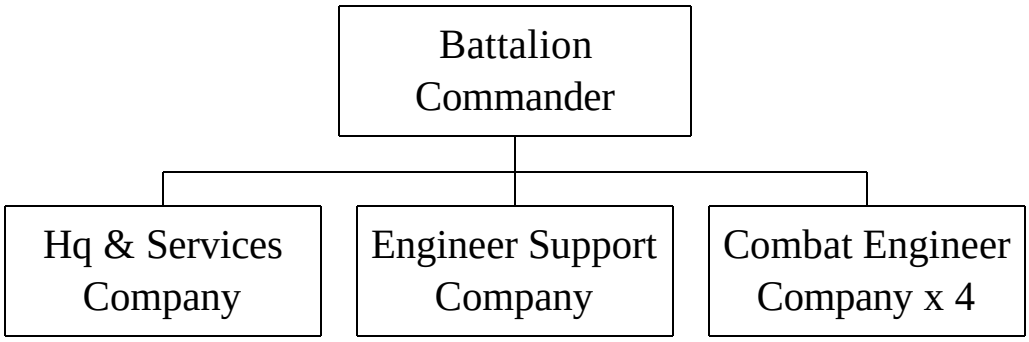
Generic U.S. Army Engineer Command (ENCOM)
(Source: Engineer Operations (Initial Draft), FM3-34, http://www.wood.army.mil/)



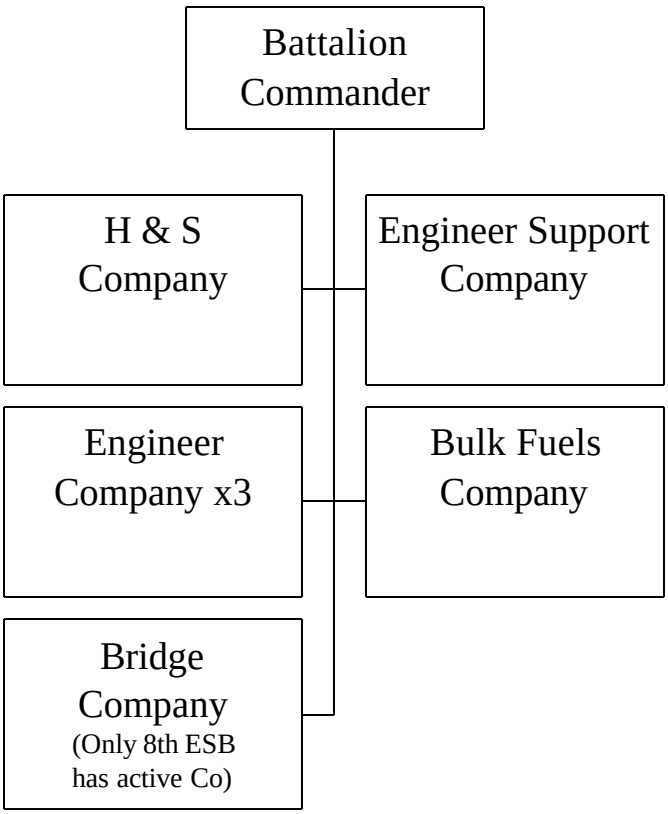
Notional U.S. Army Public Works
(Source: Ft Leonard Wood, http://www.wood.army.mil/dpw/)



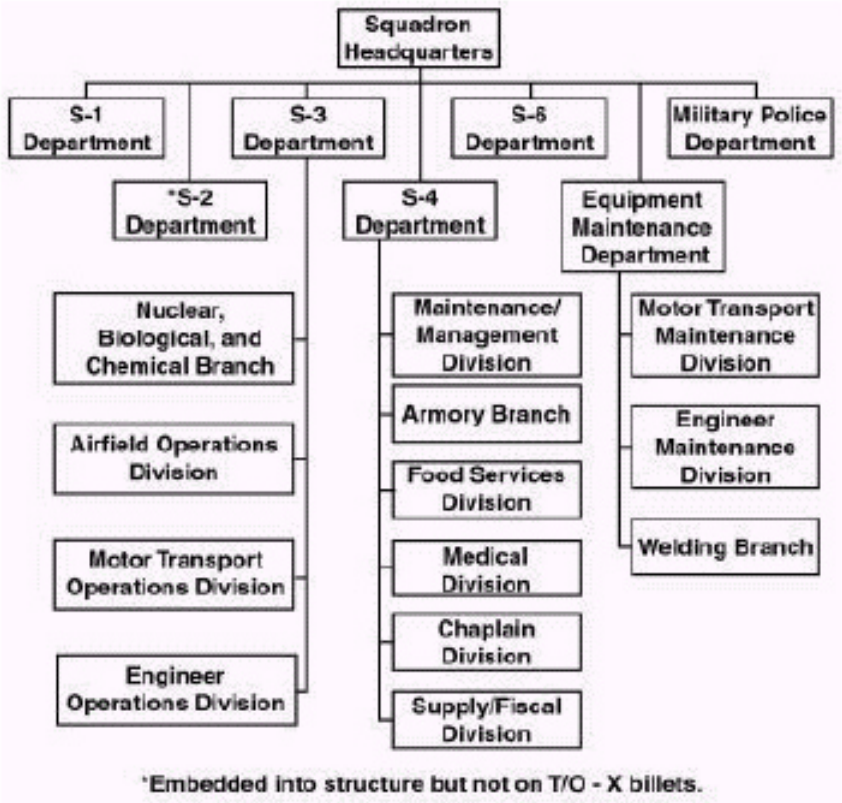
Notional U.S. Marine Corps Marine Air-Ground Task Force (MAGTF) Engineer Assets
(Source: MCWP 3-17, Engineering Operations)



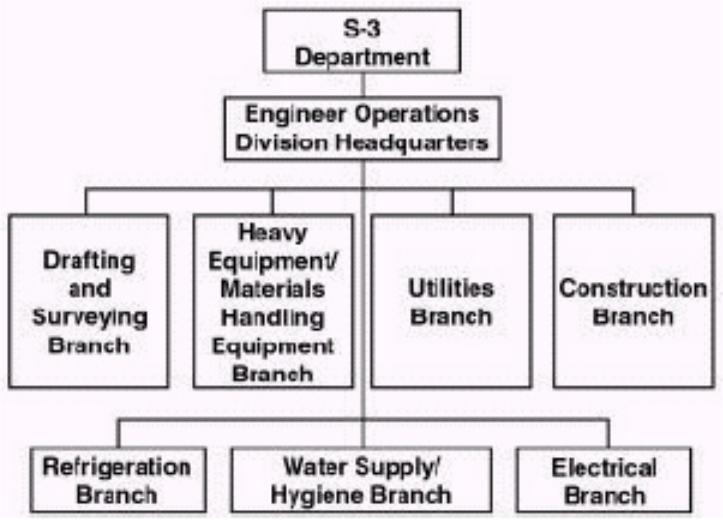
Notional U.S. Marine Corps Combat Engineer Battalion
(Source: MCRP 5-12, Organization of Marine Corps Forces, 4-15)



Notional U.S. Marine Corps Engineer Support Battalion
(Source: MCRP 5-12, Organization of Marine Corps Forces, 5-39)



Notional U.S. Marine Corps Base Marine Wing Support Squadron
(Source: MCWP 3-21.1, Aviation Ground Support)



Notional U.S. Marine Corp Engineer Operations Division
(Source: MCWP 3-21.1, Aviation Ground Support)

APPENDIX B – JOINT ENGINEER TASKS AND CAPABILITIES

ENGINEERING CAPABILITIES MATRIX

Task Component / Type of Unit
Aerial Port of Debarkation (APOD) Expansion
RED HORSE, Army Combat Heavy (CH)
RSOI Support
Divisional Engineer Battalion (Bn)
Establish Operating Bases
AFFOR Engrs, Army CH
Conduct Port Survey
NAVFOR Underwater Construction Team (UCT)
MCM Operations
NAVFOR
EOD Support Operations
Army/AFFOR/NAVFOR/MARFOR EOD units
Conduct Survivability Operations
ARFOR/MARFOR Combat Engrs
Conduct Countermobility Operations
ARFOR/MARFOR Combat Engrs
Conduct Pre-Assault Survey
MARFOR Engrs
Construct Field Hospital

ARFOR/MARFOR Const Units

Maintain Main Supply Routes (MSRs)

All

Support Amphibious Operations

MARFOR Engrs

Emplace Bridges

MARFOR/ARFOR MRBCs

Conduct salvage operations

NAVFOR UCTs

Maintain Ports of Debarkation (PODs)

ARFOR CHs/SEABEES/AFFOR Engrs

Force Protection

ARFOR/MARFOR Engrs

Destroy Weapon Caches

ARFOR/MARFOR Cbt Engrs

Construct Displace Civilian Camps

ARFOR CH Bns/SEABEES/ MARFOR Engrs

Conduct Infrastructure repair

ARFOR CH Bns/SEABEES/ MARFOR Engrs

Joint Engineer Capabilities Matrix
(Source: J-4 Engineer Web, http://www.dtic.mil/jcs/j4/divisions/ed, accessed 4 Oct 01)

1. **Engineering Unit Abbreviations Used for the Following Table:**

Marine Corps	
CEB	Combat Engineer Battalion
ESB	Engineer Support Battalion
MWSS	Marine Wing Support Squadron
Navy	
NMCB	Naval Mobile Construction Battalion
ACB	Amphibious Construction Battalion
CBMU	Construction Battalion Maintenance Unit
Army	
HVY	Engineer Combat Heavy Battalion
CBT	Engineer Combat Battalion
ABN	Airborne
CSE	Combat Support Equipment
Othr	Other
Air Force	
RH	RED HORSE
PB	Prime BEEF
Oth	Other, e.g. Fire Fighters, Explosive Ordnance Disposal

2. Task Priority and Capability Code used for the following table:

First Letter:	Second Letter:
P Primary Task Responsibility	H Heavy Capability
S Secondary Task	M Medium Capability
N Not a Task	L Low Capability
	N No Tasking

* FULLY CAPABLE WITH PROPER AUGMENT UNITS
# USUALLY DONE IN SUPPORT OF AIR FORCE PRIME BEEF UNITS
Notes:
The Army and Navy Engineers are capable of performing all Mobility, Countermobility, Survivability, General Engineering, Utilities, and Bulk Fuel support to varying degrees. However, the units that perform the general utilities and bulk fuel are most generally very specialized companies (e.g. quarry OPS, well drilling and port/waterfront construction) that need to be specifically requested.

	MARINES			NAVY			ARMY					AIR FORCE			CIV
	CEB	**ESB**	**MWSS**	**NMBC**	**ACB**	**CBMU**	**HVY**	**CBT**	**ABN**	**CSE**	**Oth**	**RH**	**PB**	**Oth**	
MOBILITY TASKS (Cbt Support)															
Conduct Engr Recon	PM	PM	PL	NM	NL	NN	PL	PH	PH	PH	NN	NL	NL	NN	NN
Breach Obstacles	PH	SM	NL	NM	NN	NN	SM	PH	PM	PH	NN	NL	NN	NN	NL
Construct Pioneer Roads	PH	SH	SL	SH	NN	NL	PH	PH	PL	PH	NL	NL	NN	NN	NL
Assault Bridging	PL	SL	NN	NN	NN	NN	NN	PH*	NN	PH*	NN	NN	NN	NN	NN
Clear Mines	PH	SH	SL	NN	NN	NN	SL	PH	PM	SL	NN	NL	NN	SM	NN
Clear Helo Landing Fields	PM	PH	SL	SH	NN	NL	PH	PH	PM	PH	NL	PH	PM	NN	NL
Improve Beaches	PH	SH	NN	PH	SL	NL	SL	PH	PL	PH	SM	NL	NN	NN	NN
Employ Special Demolitions	PH	SH	NL	NL	NN	NN	SM	PH	PH	SL	SL	SL	NN	SL	NN
Provide Tech Engr Advice	PH	NH	PH	NM	NL	NL	PH	PH	PL	PH	NN	PM	PM	NN	NN
Fight as Infantry	SM	NL	NN	SL	NN	SL	NN	SH	SH	SL	NN	SL	SL	NN	NN
COUNTERMOBILITY (Cmbt Support)															
Conduct Engr Recon	PM	PM	PM	NL	NL	NN	PL	PH	PM	PH	NN	NL	NL	NN	NN
Place Mines	PH	SH	SL	NN	NN	NN	SL	PH	PM	SL	NN	NL	NN	NL	NN
Plan/Install Obstacles	PH	SH	SL	NH	NL	NL	SH	PH	PH	PH	NN	SM	SM	NN	NN
Special Demolitions	PH	SH	NL	NL	NN	NN	SM	PH	PH	SL	SL	SL	NN	SL	NN
Provide Tech Engr Advice	PH	SH	PH	NM	NL	NL	PH	PH	PH	PH	NN	PM	PM	NN	NN
Fight as Infantry	SM	NL	NN	NL	NN	NL	NN	SM	SM	SM	NN	SL	SL	NN	NN
SURVIVABILITY TASK (Cmbt Support)															
Construct Field Fortifications	PH	PH	PM	SH	NN	NN	PH	PH	PM	PH	NN	SM	SL	NN	NL
Employ Special Demolitions	PH	PH	NL	NL	NN	NN	SL	PH	PL	PH	NL	SL	NN	SL	NN
Provide Tech Engr Advice	PH	PH	PH	NM	NL	NL	PH	PH	PM	PH	NN	PM	PM	NN	NN
GEN ENGR TASKS (Combat Service Support)															
a. General Engineering															
Conduct Engr Recon	SM	PM	PL	PM	NL	NL	PH	PH	PH	PH	SM	PM	PM	NN	PM
Surveying & Drafting	SL	PM	PL	PH	NN	NL	PH	SM	SL	SM	NN	PH	PH	NN	NL
Plan Construction, Repair and Maintain Camps	SL	PH	PM	PH	NL	PM	PH	SL	PM	SL	PM	PH	PH	NN	SL
Improve Beaches	SL	PH	NL	PH	PM	NN	SM	SL	SL	SL	PM	NM	NL	NN	NN
Construct Bridges	SL	PH	NN	PH	NN	NN	PH	PH*	PM	NN *	NN	NL	NL	NN	NL
Improve Roads, Airstrips and Marshalling Areas	SL	PH	SL	PH	NL	SL	PH	SL	PM	PH	SM	PH	PM	NN	NM
Rapid Runway Repair	NN	SM	PM	SM	NN	SL	PH#	NN	SM	SM #	NN	PH	PH	NN	NL
Improve Bare Base Airfields	NN	PH	PM	SM	NN	SL	PH#	NL	PM	SM #	SM	PH	PM	NL	NH
Build Expedient Airfields (Matting)	NN	PH	SL	PH	NN	NN	PH	SM #	PM	NN	NN	PH	PM	NN	NN
Plan & Estimate Projects	PM	PH	PM	PH	NL	SL	PH	PL	PM	PM	PM	PH	PH	NN	PM
Materials Testing	SL	PM	PL	PH	NN	NN	PM	NN	PM	PL	NL	PH	SL	NN	PH
Soil Stabilization	SL	PH	PL	PH	NN	NL	PM	NN	PL	PM	NN	PH	SM	NN	NM

Engineer Tasks, Capabilities and Sources of Support
(Source: Joint Forces Standard Operating Procedures Manual, http://jwfc.jfcom.mil)

	MARINES			NAVY			ARMY					AIR FORCE			CIV
	CEB	**ESB**	**MWSS**	**NMBC**	**ACB**	**CBMU**	**HVY**	**CBT**	**ABN**	**CSE**	**Oth**	**RH**	**PB**	**Oth**	
Construct Aircraft Revetment/Dispersal	NL	SH	PM	SH	NN	ML	PH	NM	PM	NM	NL	PH	PM	NN	NL
Repair Airfield Damage	NL	PH	PM	PH	NN	NL	PH	SL	PL	SM	NL	PH	PH	NN	SM
Engr Design - Deliberate	NL	PH	SL	PH	NL	NL	PH	NL	PL	NL	NN	PH	PH	NN	SM
Pile Driving	NN	PM	SL	PL*	PM	NN	PH	NN	SL	PH	PH	NN	NN	NN	SM
Repair War Damage	NL	NM	NL	SH	NN	PL	PH	SM	SM	SM	PM	PH	PH	NN	PM
Drill Wells	NN	NN	NN	PH	NN	NN	SM	NN	SM*	SM*	PH	PH	NN	NN	SM
Construct Semi-Perm Camps	NL	PH	SL	PH	NL	NN	PH	SL	SL	NN	SL	PH	PM	NL	SM
Erect Pre-Engr Structures	NL	PH	PL	PH	NN	NL	PH	NL	NL	NL	PM	PH	PH	NL	SM
Hard Surface Staging Areas	NN	NN	NN	PH	NN	NL	PH	NN	NN	NM	NN	PH	PH	NN	SL
Perform Vertical Construction	NL	PM	PL	PH	NN	NL	PH	NL	SL	NL	PM	PH	PM	NN	SM
Asphalt Roads	NN	NN	NN	PH	NN	NN	PM	NN	NN	NN	PM	PH	NL	NN	SM
Operate Central Power Plant	NN	NN	NN	PM	NN	PM	NN	NN	NN	NN	PH	SL	SL	NN	SM
Perform Base Maintenance	NL	SM	SL	SH	NN	PH	SM	NL	NL	NL	PM	SH	PH	NN	SM
Concrete Production Ops	NN	NL	NL	PL*	NN	NN	PM	NN	NN	NN	PL	PM	NN	NN	SM
Asphalt Production Ops	NN	NN	NN	PL*	NN	NN	NN	NN	NN	NN	PL	SL	NN	NN	SM
Quarry Operations	NL	SM	NL	PL*	NN	NN	NN	NN	NL	NL	PH	PH	NN	NN	SM
Rock Crusher Operations	NN	SM	NL	PL*	NN	NN	NL	NN	NL	NL	PH	PM	NN	NN	SM
Construct Logistical Support Bases	NL	PH	NL	PH	PH	NN	PH	NL	PL	NL	SM	SM	SL	NN	SM
Construct Air Bases	NN	PH	NN	PH	NN	NN	PH	NN	NL	NM	NN	PH	PM	NN	PM
Construct & Repair Port/ Waterfront Structures	NL	NM	NL	PL*	NL	NN	SL	NN	NN	NH *	PH	SM	SL	NN	PM
Employ Special Demolitions	NH	PH	NL	PH	NN	NN	SL	PH	NN	PH	SM	SL	NN	SL	NN
Non-Explosive Demo and Obstacle Removal	NL	PH	NL	PH	NL	NN	PH	PH	PM	PH	SM	SM	SL	SM	PH
Provide Tech Engr Advice	NL	PH	PM	PH	NL	NM	PH	PH	PH	PH	PM	PH	PH	NN	PH
Fight as Infantry	NM	SL	NN	SM	NN	PL	NN	SH	SH	SL	NL	SL	SL	NN	NN
b. Utilities Support															
Tactical Water/hygiene Svcs	SL	PH	PM	PH	NN	NL	NN	NN	NN	NN	NN	SM	SL	NN	NL
Tactical Electrical Supply	SL	PH	PM	PH	NN	NL	NN	NL	NL	NL	PH	PM	PL	NN	NN
Develop Sewage and Water Systems	NN	NL	NL	PM	NN	NN	NN	NN	NN	NM	NN	PM	PL	NN	PM
c. Bulk Fuel Support															
Provide Bulk Fuel Storage & Dispersing	NN	PH	PM	NL	PH	NN	NN	NN	NN	NN	PH	PM	PL	NN	SL
d. Hydro Survey	NN	NN	NN	PH	NN	NN	NN	NN	NN	NN	PH	NN	NN	NN	PM
e. Underwater Const./Maint.	NN	NN	NN	PH	NN	NN	NN	NN	NN	NN	PH	NN	NN	NN	PM
f. Crash Rescue	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	PM	NN	NN	PH	NN
g. Firefighting	NN	NN	NN	NN	NN	NN	NN	NN	NN	NN	PM	NN	NN	PH	PM

Engineer Tasks, Capabilities, and Sources of Support (cont'd)
(Source: Joint Forces Standard Operating Procedures Manual, http://jwfc.jfcom.mil)

Civil Engineer Mission Essential Task List

Goal 1: QUALITY ENGINEERING - Provide well-trained and equipped civil engineer (CE) forces to construct, operate and maintain facilities, housing, infrastructure and utilities that preserve sense of community and uphold quality of life

MET 1.A: Provide modern and safe facilities, infrastructure and services that ensure quality in the workplace
PM 1.A.1: Condition of bases, infrastructure and facilities

MET 1.B: Provide adequate, quality housing and dormitories that preserve our sense of community for Air Force members
PM 1.B.1: Number and percentage of housing units meeting Air Force standards

MET 1.C: Improve quality of life and protect Air Force people through conscientious and rigorous management of our pollutants and wastes
PM 1.C.1: Number of open enforcement actions

Goal 2: AGILE ENGINEERING - Develop and modernize CE forces and equipment that are light and lean to provide support across the full range of military operations

MET 2.A: Provide well-trained and fully capable forces to support military operations anywhere in the world
PM 2.A.1: Percentage of CE Forces fully mission ready (SORTS)

MET 2.B: Provide robust and well-trained forces and equipment to respond to the full spectrum of emergencies
PM 2.B.1: In-service rates for mission essential equipment
PM 2.B.2: Status of CE training and certification

Goal 3: FOCUSED ENGINEERING - Provide strategic direction to modernize Air Force installations that efficiently and effectively support Air Force missions and people

MET 3.A: Optimize Air Force resources through proper planning, programming and execution of our facility and infrastructure programs
PM 3.A.1: Funding allocated versus requirement by major funding (i.e. program) category

MET 3.B: Maximize housing opportunities and efficiency through balance of construction, revitalization, maintenance and privatization
PM 3.B.1: Funding allocated versus requirement for housing and dormitories

MET 3.C: Effectively manage our environmental programs, ranges and airspace to maximize operations and training of Air Force weapons and units well into the future
PM 3.C.1: Funding allocated versus requirement for environmental requirements

Note: The performance measures in this list are a notional representation of quantitative assessments. All performance measures must be objectively focused and contain quantitative assessments. Proposed changes to the Air Force level METs and notional PMs in this table will be submitted from the Process Action Teams to HQ USAF/ILEP and routed to HQ USAF/ILE for approval. MAJCOMs and installations are encouraged to develop additional METs and PMs specific to their mission and requirements.

MET - Mission Essential Task
PM - Performance Measure

(Source: Civil Engineer Strategic Plan, Volume Two)

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