Shaping the Engineer Force for the Asymmetric Threat

A Monograph
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Abstract

SHAPING THE ENGINEER FORCE FOR THE ASYMMETRIC THREAT by MAJ Nicholas W. Katers, United States Army, 73 pages.

This monograph looks at the current state of the divisional engineer capability in both the heavy and light U.S. Army divisions. Its intent is to determine whether or not the divisional engineers are sufficiently capable of dealing with the challenges of the emerging asymmetric environment.

The central theme behind this investigation is to investigate how world has changed since the end of the cold war and whether or not Army Engineers are reacting to the changes. The loss of the global bipolar environment has given way to a new era of increased instability and the emergence of dangerous asymmetric threats. The Army has begun the process of adapting to the new environment thru a long term Transformation process that will eventually yield the Objective Force. Unfortunately, it will be several years before that force is ready to be used and the current force must be ready to counter real world threats.

The methodology for this paper began with an investigation of the new asymmetric environment. The Contemporary Operational Environment (COE) was chosen as the best model to compare engineer capabilities to. Divisional engineer capabilities were compared to several key principals that an asymmetric foe will likely use and a prioritized list of shortfalls was developed. The investigation looked at possible solutions to the shortfalls through reliance on echelon above division (EAD) augmentation and the new force developments embodied in the Force XXI concept and the Interim Force concept. The solutions suggested by EAD augmentation and force modernization both proved inadequate to overcome the shortfalls.

The temporary solution to engineer shortfalls lies with a reorganization of engineer structure within the heavy and light “legacy” divisions. This reorganization calls for the inclusion of several engineer capabilities that are not currently resident in the division structure. The most significant of these are the addition of a modest general engineering capability and the inclusion of an organic river crossing capability. The amount of combat engineering in the division is reduced in physical numbers, but their overall capability to focus on mobility support is enhanced through a few improvements to organization and equipment modernization.

These improvements are necessary to recapitalize the engineer capability in the legacy force until the Objective Force is ready to take the field. Engineers can no longer afford the luxury of focusing on combat engineering at the expense of the wider range of engineering capability. To remain relevant, the branch must become more adaptive and responsive to the full breadth of engineering requirements a division may have. To do anything less may condemn the branch to extinction.

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INTRODUCTION

> ***Our nation is at peace. Our economy is prosperous. We have strategic perspective and technological potential. The window of historic opportunity will grow narrower with each passing day. We can transform today in a time of peace and prosperity. Or we can try to change tomorrow on the eve of the next war, when the window has closed, our perspective has narrowed, and our potential limited by the press of time and the constraints of resources.***
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> ***U.S. Army Chief of Staff General Eric K. Shinseki[1]***

On 11 September 2001 the window of historic opportunity of which General Shinseki spoke grew very narrow. The terrorist attacks on the World Trade Center and the Pentagon have refocused attention back to the present where the U.S. faces an enemy far different from the Soviets and the Cold War. The U.S. Army Transformation goal is to create a modern 21st century force over the course of the next 10 to 15 years. In the interim, the U.S. Army is relying on the current "legacy" force to face very real enemies who have already demonstrated deadly capabilities.

It is obvious in retrospect that the previous U.S. strategy of engaging terrorism through air power and precision munitions was less than effective in deterring aggression.[2] Repeated air attacks against suspected terrorists camps did not prevent the national tragedy that occurred on 11 September 2001. Air power remains effective against larger targets, but simply cannot destroy a distributed enemy operating in small groups. The political and military leaders of our country now agree that the only way to defeat present and future enemies completely is through full

[1] Quote taken from Gen Shinseki's address to the Association of the United States Army (AUSA) Transformation Panel held on 17 OCT 2000.
[2] Jeffrey Record, "Operation Allied Force: Yet Another Wake Up Call for the Army," *Parameters* (Winter 1999-2000), 15-16.

spectrum operations.[3] The global war on terrorism will be fought with all of the instruments of national power. Today's U.S. Army with its current force structure is likely to play a critical role in the war for some time to come.

This monograph focuses on whether or not the U.S. Army Corps of Engineers (USACE) is adequately structured to combat the current and future asymmetric threat. To narrow the focus, the analysis concentrates on how engineers are structured to support both the heavy and light Army divisions.

The outcome of the research demonstrates that the current engineer structure provides some degree of mobility support to the divisions but falls far short in the missions of countermobility, survivability, general engineering and geospatial engineering. For U.S. Army engineers to remain relevant on the modern battlefield, they require the capability to rapidly accomplish everything that is asked of them with a minimal augmentation and force structure. That structure does not currently exist.

[3] *FM 3-0 Operations* defines full spectrum operations as the range of operations Army forces conduct in war and military operations other than war. Department of the Army, *FM 3-0 Operations* (Washington, D.C.: Government Printing Office, 14 June 2001), para 1-4.

CHAPTER 1 – Background and Relevance

The World after the Soviets

Two significant recent events have provided the U.S. Army leadership the imperative to reshape the structure, doctrine and training of our ground forces. The first and by far the most significant event to provide the imperative for change was the collapse of the Soviet Union. The peer enemy that shaped organizational structure, doctrine and training for almost 50 years was gone overnight. The disappearance of such a large conventional adversary left the U.S. with a very expensive forward deployed capability that was deemed unnecessary in light of the new strategic environment. An immediate investigation began to find ways to realize a peace dividend by reducing force structure and defense spending while still remaining strong enough to meet emerging global challenges.

The second defining event that helped to usher in the age of modernization and transformation was the overwhelming destruction of the Iraqi Army during Operation Desert Storm. The "modern" doctrine of AirLand Battle was validated as U.S. forces significantly outclassed the world's fourth largest army while suffering minimal casualties.[4] In many minds, Desert Storm not only validated current structure and doctrine, but also signaled the introduction of a revolution in military affairs (RMA).[5] Though there are many definitions and opinions about what constitutes an RMA, it is clear that the U.S. has created a formidable force by leveraging technology in a way no other nation has. An RMA represents more than just improvements to

[4] AirLand Battle Doctrine was introduced in the 1982 version of *FM 100-5 Operations* and revised in the 1986 version to emphasize operational art. It was designed specifically to combat quantitatively superior Soviet forces by using stronger service integration to see and fight the enemy deep.
[5] John Arquilla and David Ronfeldt, *In Athena's Camp: Preparing for Conflict in the Information Age,* (Rand Corporation, Santa Monica, CA 1997). 80.

technology. It is a fundamental break with precedence and signals a quantum leap in overall capability and the corresponding methods of application.[6]

Potential threat actors paid serious attention to the rapid destruction of the Iraqi military during Desert Storm as American domination of the conventional battlefield was displayed to the entire world in graphic detail. Current and future adversaries now realize that choosing to engage the U.S. military in conventional mechanized warfare is a recipe for disaster.[7]

The danger in trying to face U.S. military power on the battlefield brought about renewed interest in the concept of asymmetric warfare. While the concept is hardly a new one, there are many different definitions as to what asymmetric warfare really means. For the purposes of this research, a working definition of "asymmetric" is as follows: "Deliberate application of power--using different, disproportionate and adaptive ways and means—that is oriented by a continuous assessment of the opponents' vulnerabilities and not easily countered without a significant reorganization or redistribution of forces and means in order to accomplish a specific aim."[8] The emergence of asymmetric warfare against the United States is a trend that is likely to continue until a new peer competitor exists. Conservative estimates indicate that the United States will not encounter a peer competitor for at least 10 years.[9]

The recent attacks against the World Trade Center and the Pentagon have increased an awareness of the rapid evolution of a new asymmetric environment. With the President's declaration of a global war on terrorism, we now face new challenges in a complex operational environment that spans the entire globe. In this new environment, the intelligent enemies observe U.S. actions and adapt to the lessons of Desert Storm, Somalia, and the Balkans by avoiding

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[6] The intent here is not to argue whether or not the U.S. is in the middle of an RMA. For a more comprehensive discussion about the conditions necessary for an RMA consider the work of Arquilla and Ronfeldt, *In Athena's Camp: Preparing for Conflict in the Information Age.*

[7] Jonathan B. Tucker, "Asymmetric Warfare*," Forum for Applied Research and Public Policy* (Summer 1999): 1.

[8] Definition developed by U.S. Army Advanced Military Studies Program (AMSP) students from the Asymmetric Warfare elective, 1 Feb 2002.

[9] Tucker, "Asymmetric Warfare", 1.

attacks against our military strength. By choosing to avoid our sources of strength, the enemy has adopted the concept of asymmetrical warfare.

Engineers and Transformation

To take advantage of the perceived lack of a peer competitor, Chief of Staff of the U.S. Army, General Eric K. Shinseki introduced his concept of U.S. Army Transformation on 12 October 1999.[10] It is designed to continue the previous reorganization efforts that began with the Base Force concept in 1990 and continued with the Army After Next and Force XXI initiatives.[11] General Shinseki's vision of transformation is designed to prepare the Army for future conflicts several years down the road. The Interim Force is the first step towards developing a new capability and is well underway at Fort Lewis, WA with the development of the first two Interim Brigade Combat Teams (IBCTs). The Objective Force is destined to be the end state of this transformation.

The profound increase in military capability and effectiveness has proceeded at different rates for the various branches within the Army. Clearly there have been extreme improvements in intelligence collection ability, command and control, and the ability to deliver long-range precision fires.

Despite the measurable improvements in many other areas, the essential elements of combat engineering have not progressed far beyond the cold war era. One only has to walk through a combat engineer motorpool to see that engineer equipment modernization lags far behind the maneuver elements they support. The typical combat engineer rides in an M113A3 armored personnel carrier that was received when their infantry counterparts abandoned them in favor of the M2 Bradley Fighting Vehicle. The Volcano mine systems are mounted in old M548

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[10] COL Daniel Gerstein, *Information Paper Army Transformation*, (DAMO-SSV, 21 February 2001): 1.
[11] GEN Colin L. Powell, *My American Journey*, (New York: Random House, 1995) 444-445. The Base Force was the first post Cold War round of force reduction proposals. They were introduced by then Chairman of the Joint Chiefs of Staff, General Colin Powell. There is a good discussion of the background surrounding development of the Base Force in the chapter titled "When You've Lost Your Best Enemy."

artillery ammo carriers that were discarded by the artillery branch when they received new equipment. Engineers cannot continue to comb through Army junkyards and call it modernization.

Since Desert Storm, the U.S. Army and the Army Corps of Engineers have remained largely focused on the Desert Storm conventional threat. The Army has allowed the ineptitude of one Soviet model enemy to convince us of the ultimate superiority of our organization and training.[12] During the 1990's, training at the Combat Training Centers (CTC's) and during division Warfighter Exercises has continually reinforced this view of the threat through the use of the FM 100-6x series of manuals to shape the enemy.[13] Engineer doctrine and development have concentrated on improving our ability to rapidly support the maneuver brigades as they combat an enemy with similar capabilities.[14] The threat doctrine manuals based on the Soviet model continued to be used throughout the 1990's and have only recently been superceded by the new capabilities-based manuals centered on the Contemporary Operational Environment. This new threat doctrine is slowly making its way into the training exercises at the CTC's and Warfighters.[15]

As the U.S. Army moves to counter emerging threats, the long standing focus on the Soviets may now prove a significant hindrance in the ability to provide necessary engineer support to the division. This monograph investigates and answers the following issues with respect to projecting military power against asymmetric enemies.

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[12] Ralph Peters, *Fighting for the Future: Will America Triumph?* (Mechanicsburg, PA: Stackpole Books, 1999), x. Peters contends that many leaders believed that perfection had been attained in the victory over the Iraqis. In a period of dynamic change in technology, military leaders chose stasis veiled by massive and wasteful procurement.

[13] Department of the Army, *FM 100-60 Armor and Mechanized Based Opposing Force*, (Washington, D.C.: Government Printing Office, 16 July 1997), iii-xiv.

[14] The U.S. Army Engineer current capstone doctrinal manual is *FM 5-100 Engineer Operations* published 27 February 1996. It is structured around the June 1993 *FM 100-5 Operations*. There is a new engineer capstone manual (*FM 3-34 Engineer Operations*) currently in draft form to respond to the new US Army doctrine found in *FM 3-0 Operations* published in June 2001.

[15] The Battle Command Training Program (BCTP) began using the COE during 2001 for the Division Warfighter Exercises. The older version of the World Class OPFOR continued to be used as late as December 2001 during the 2nd Infantry Division Warfighter.

1. What is the likely asymmetric threat environment that the division and U.S. Army Engineers will face in the near future?

2. How does the division deal with the challenges of conducting effective full spectrum operations against an asymmetric threat?

3. How well do current and proposed engineer capabilities support the division in conducting operations in the new threat environment?

4. What type of divisional engineer design is needed to provide adequate support for both contiguous and non-contiguous operations across the full spectrum?

Outline for the Research

The structure of this investigation systematically seeks to provide clear answers to the previous four questions. Chapter Two outlines how the threat environment has changed since the end of the cold war and how the U.S. Army threat doctrine is changing in response to the new environment. A significant portion of the analysis looks at the development of the U.S. Army's new threat doctrine referred to as the Contemporary Operating Environment (COE). The goal of the chapter is to establish a distinct set of measurable conditions that the U.S. Army can expect to face in an asymmetric environment. Chapter Three identifies the differences between current divisional engineer capability and the challenges of the asymmetric environment described in the previous chapter. Division responses to the challenges of the COE generate a set of engineer requirements. These requirements are then matched against the current engineer capability to conduct the engineer battlespace functions of combat engineering, general engineering and geospatial engineering. The identified shortfalls in divisional engineer capabilities become the motivation for the remainder of this research. Chapter Four examines the current doctrinal solution of using echelons above division (EAD) engineers to augment the mismatch in divisional engineer capability. It focuses on the issues of availability, interoperability and the speed at which EAD engineers can arrive in theater. The intent is to examine whether or not EAD

engineers are able to adequately augment divisional engineer capabilities in the new threat environment. The investigation looks at a recent deployment of EAD engineers and their responsiveness in the theater. Chapter Five determines if current proposals in emerging force structures actually improve the engineer capability for dealing with an asymmetric threat. The emerging force structures that are relevant for investigation include the engineer structure for the Force XXI Division and the proposed structure for the Interim Force. Chapter Six summarizes the strengths and weaknesses in the current and proposed force structures. It also decides whether those organizations are sufficiently capable of providing the needed engineer support to the division. The conclusion includes a recommended design and justification for divisional engineer capability in the legacy force and future force that provides the maneuver commander the basic engineering assets needed to combat the new threat environment.

This analysis is timely and necessary for the near term success of the U.S. Army. The divisional engineers are not currently designed to give the full range of support to the division in the COE. The future Objective Force will hopefully bring significant improvements to the organizational structure of the division. Unfortunately, the threat is here and now, and the U.S. Army must adapt its existing force structure quickly to the new environment or pay the price for complacency in the form of battle casualties. The so-called "Legacy Force" is fighting the battle against global terrorism and will continue to for some time.[16]

[16] As of 1 April 2002, elements of the 10th Mountain Division (Light) and 101st Airborne Division (Air Assault) have already engaged in combat against the terrorist threats in Afghanistan.

CHAPTER 2 – The Asymmetric Environment

Despite the great deal of discussion and research, the term asymmetric warfare remains a topic of considerable debate. One significant reason for this debate is that the term is not defined in joint doctrine and has only recently been addressed in Army doctrine.[17] Adding to the confusion is the fact that "symmetric warfare" is also not defined anywhere in doctrine. The U.S. Army definition is that asymmetry concerns dissimilarities in organization, equipment, doctrine, capabilities and values between other armed forces (formally organized or not) and U.S. forces.[18] It has often been expanded to include the tendency for an enemy not to 'fight fair' or to attack through unconventional means.

The purpose of this chapter is to define a set of likely conditions that a division will face in the near future against an asymmetric threat. In order to do this, it is important to understand why the old threat environment is no longer valid. A short background discussion identifies significant changes at the strategic and operational levels since the end of the cold war. The analysis continues by looking at the development of the U.S. Army's new threat doctrine referred to as the COE. Specifically it identifies seven principles that an asymmetric enemy may use against U.S. forces. These principles, which generate the likely conditions that a division will face, are used in the next chapter to compare against current capabilities.

The Strategic Environment

The end of the cold war and collapse of the Soviet Union ended the bipolar world that existed since the end of World War II. What many did not realize is that the balance of power

[17] Joint Chiefs of Staff, *Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: US Government Printing Office, 10 June 1998).
[18] Department of the Army, *FM 3-0 Operations*, para 4-31.

maintained between the two superpowers actually provided some measure of restraint over would be regional hegemony. Instead of the expected stability in a post cold war environment, the world entered a new era of increased violence and instability as regional and transnational actors attempted to fill the void left by the collapse of the Soviet Union.[19] The global competition for power has shifted away from political ideology to a wider range of issues, which include the desire for economic power, quests for scarce resources, ethnic nationalism and religious expansion. The past 10 years have witnessed more than 50 ethnic wars and 170 border conflicts.[20] Violence through military action continues to be an enduring method to achieve desired political ends. Clausewitz stated it best when he asserted that "War is not a mere act of policy, but a true political instrument, a continuation of political activity by other means."[21] The loss of the bipolar world did not diminish violence; it simple transferred the excuse away from political ideology to other issues.

The next few years will see nations remain in one of three distinct categories. At the high end, the worlds developed democracies continue to be the glue that holds the global society together. They have far too much invested economically to risk losing it in anything other than an extreme case.[22] At the low end of the spectrum, the third world has nothing to offer a potential aggressor except millions of starving refugees and land that has been stripped of virtually every resource. Third world countries continue to exist on the charity and assistance of the developed democracies and the United Nations.[23] The danger lies with the states in the middle. These so-called "transitional" states generally include the former Soviet republics, Middle East and Asia. They often possess a valuable resource such as oil or a reasonably educated society capable of

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[19] COL Max McFarlane, *The Future Operational Environment*, (TRADOC DCSINT,4 May 2001),1.
[20] Ibid.
[21] Carl von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (Princeton: 1976) 87-88.
[22] MG Robert Scales, *Future Warfare Anthology* (U.S. Army War College, Carlisle Barracks, PA), 119-120.
[23] Ibid.

high tech industry. As the "transitional" countries continue to develop, they have the ability to shift economic power towards their military and develop modern forces that may challenge the developed democracies.[24]

During the late 1980's, the U.S. began a concerted effort to convert from a European based forward deployed military to a force projection military. The projection of overwhelming U.S. military power is a time consuming and costly event that involves all of the strategic lift capability and leads to a pattern of predictability in our response cycle. The U.S. force must first gain access to the area and conducts a force build up. This is usually followed by limited precision attacks conducted by the air and naval components. Finally, after overwhelming combat power has been amassed, the U.S. conducts decisive, full spectrum operations.[25]

The key for an asymmetric foe to successfully challenge the U.S. is to try and avoid the full spectrum fight. There are really only two methods to accomplish this. The first is for the adversary to conduct operations within their sphere of influence that lack the political or economic significance to bring about a full scale U.S. response.[26] Care must be taken not to interfere with the flow of a critical U.S. resource such as oil. The second method is to have a force capable of rapid decisive operations that concludes its objectives before U.S. forces can arrive.[27]

It is clear to most observers that the strategic environment has changed in some significant ways over the last ten years. The enemy is more asymmetric in its approach to challenging the U.S. They understand that we are a force projection Army and need port and air facilities to flow forces into the AO. The future U.S. Army must be organized to counter all possible variables that an asymmetric foe might use from the low end of the spectrum up to the selective use of high intensity warfare.

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[24] Ibid.
[25] McFarlane, *The Future Operational Environment,* 3.
[26]Ibid., 2.
[27] Ibid.

U.S. Army Operational Environment

The operational environment is a composite of the conditions, circumstances, and influences that affect the employment of military forces and bear on the decisions of the unit commander.[28]

When examining the possible environments in which U.S. Army forces may operate, it is important to understand the difference between the definitions of threat and enemy. The U.S. Army defines a threat as "any specific foreign nation or organization with intentions and military capabilities that suggest it could become an adversary or challenge the national security interests of the United States or its allies."[29] An enemy is an "individual, group of individuals, paramilitary or military force, national entity, or national alliance that is in actual opposition to the United States, its allies, or multinational partners."[30] While the Army faced many enemies during the cold war, it focused training efforts towards the most likely threat, the Soviet Union.

In 1976, the U.S. Army published Army Regulation (AR) 350-2 which established its Opposing Force (OPFOR) program. The OPFOR is a training tool to help units prepare for combat against a challenging opponent that is representative of possible threats that existed at the time. All early variations of the OPFOR were completely "threat based", in a sense that the OPFOR was designed to replicate the forces of a specific country. The original AR 350-2 directed that the OPFOR should specifically organize and fight like the forces of the Soviet Union. Subsequent updates to the regulation added North Korea and emerging threats in Latin America and Southwest Asia to the threat baseline.[31]

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[28] Joint Chiefs of Staff, *Joint Publication 1-02, Department of Defense Dictionary of Military and Associated Terms*.
[29] Department of the Army, *FM 7-100.2 (Draft) Opposing Force Tactics* (Washington, D.C.: Government Printing Office, 24 August 2001), vi-vii.
[30] Ibid., vi-vii.
[31] Ibid, vi-viii.

While the Soviet Union existed, our threat based OPFOR appeared to be sufficient for dealing with any threat. Desert Storm only served to reaffirm that notion. In the years following Desert Storm the U.S. Army attempted to assess exactly who the next threat would be. Leaders quickly came to the conclusion that the number of potential threats was so large in number and diverse in capability, that picking one or two would probably not represent the enemy we ended up fighting. What was needed was a composite environment that considered the entire spectrum of potential threats.

New U.S. Army doctrine has started to include the issue of the asymmetric environment. The Army's new capstone manual, *FM 3-0 Operations*, identifies four distinct complex operational challenges that a skilled asymmetric threat may employ. These include use of NBC capability, exploitation of displaced persons, unconventional attacks and urban operations.[32] These operational challenges contribute to a new threat environment called the Contemporary Operational Environment (COE).

The Contemporary Operational Environment

Chief of Staff of the Army, General Shinseki directed the Battle Command Training Program (BCTP) to revise the threat model that had been in place since the cold war. His specific guidance was that the threat environment must engage all battlefield operating systems, encompass the entire battlespace, and simultaneously address asymmetric threats.[33] The COE is the response to this directive.

The COE represents a fundamental change from the threat based environments of the past. The new environment is based on a set of capabilities rather than a specific threat. The Contemporary OPFOR is a plausible, flexible military and/or nonmilitary force representing a

[32] Department of the Army, *FM 3-0 Operations*, para 6-17.
[33] MAJ Repetski, "World Class Opposing Force Battle Command Training Program, The Opposing Force in the Contemporary Operational Environment -Overview-", Battle Command Training Program, slide 6, PowerPoint Briefing; presented to AMSP class 4 February 2002.

composite of varying capabilities of actual worldwide forces, used in lieu of a specific threat force, for training and developing U.S. forces.[34]

The COE blurs the distinction between the tactical and operational levels of war. The force in this environment will likely have weapons and capabilities that expand their Area of Operations to include U.S. operational assets such as ports, airfields, and intermediate staging bases that were previously beyond their capability. It is this capabilities based model that will be used to describe probable threat actions in an asymmetric environment.

To determine how divisional engineers are needed on the battlefield, it is first necessary to establish a likely set of threat principles that the division must counter in the COE. *FM 7-100.2(Draft) Opposing Force Tactics* has established seven principles that the threat may use to target U.S. forces asymmetrically. These principles include the following:

(1) *Control access to the region.* The threat knows that once the U.S. has the opportunity to mass forces in the region, they will rapidly achieve overmatch. The likely course of action may take one of two forms. The first is to limit access into the region by attacking the ports and airfields U.S. forces need to flow into the area of operations (AO). The second course of action is to conduct operational exclusion by denying use of forward bases outside the declared AO.[35] This can be accomplished through a variety of means that include terrorist attacks and use of WMD.[36]

(2) *Employ operational shielding.* The threat will try to protect key elements of its combat power from U.S. forces. It may do this by hiding the assets in complex terrain such as urban environments.[37] Urban operations have never been a good environment for attacking forces. This truth goes as far back as Sun Tsu who wrote

[34] Department of the Army, *FM 7-100.2 (Draft) Opposing Force Tactics*, viii.
[35] Ibid., para 1-11.
[36] A more detailed discussion on how the threat may control access to the region is found in the MacFarlane article on *The Future Operational Environment*. McFarlane, *The Future Operational Environment*, 2-6.
[37] Department of the Army, FM 7-100.2 (Draft) Opposing Force Tactics, 1-11.

that "attacking walled cities was the worst of all possible strategies."[38] Urban environments degrade U.S. collection capability as threat forces hide equipment and personnel in buildings and structures that cannot be penetrated by many types of sensors.[39] They may also position the asset in such a place that its destruction will endanger noncombatants or cause unacceptable collateral damage. The threat has also learned to disperse, employ modern camouflage and vastly improved the quality of its fortifications.[40]

(3) *Control tempo.* Modern threats will seek to resolve a conflict quickly before U.S. forces can respond. This rapid tempo sets the stage for access control into the region. With initial war aims accomplished and access controlled, the threat will attempt to dissuade intervention through diplomatic, informational and economic means.[41]

(4) Cause politically unacceptable casualties. Due to disproportionate levels of interest, the threat may be more able to withstand casualties than the U.S. forces. There is a real feeling that the U.S. is a very casualty averse nation and our political will is easily swayed by a few casualties and negative opinion polls.[42] This unwillingness to incur battlefield losses has some historical precedence. The loss of Marines in Lebanon and soldiers in Somalia led to rapid erosion of public support for both missions. The threat will attempt to inflict highly visible casualties to U.S. forces early in the operation and leverage the news media to ensure the American people see it that night on TV. They may even go as far as to inflict casualties on noncombatants and attempt to blame the U.S.

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[38] Sun Tsu, *The Art of War*, translated by Ralph D. Sawyer (Westview Press, 1994): 177.
[39] COL John M. House, The Enemy After Next, Military Review, March 98, p. 2; available from http://www-cgsc.army.mil/milrev/English/MarApr98/house.htm; Internet; accessed 10/5/01.
[40] Ralph Peters, *Fighting for the Future: Will America Triumph?* (Mechanicsburg, PA: Stackpole Books, 1999), 70-83. The essay titled "Our Soldiers, Their Cities" provides compelling evidence that supports the notion that urban warfare is a dangerous environment that U.S. forces will continue to face with more regularity in the future.
[41] Department of the Army, *FM 7-100.2 (Draft) Opposing Force Tactics*, para 1-12.
[42] Ibid., para 1-12.

(5) *Neutralize technological overmatch.* As stated earlier, the threat has learned that linear operations against U.S. forces are a bad idea. The modern threat will disperse its forces and take advantage of complex terrain, poor weather and limited visibility.[43] This lowers the effectiveness of U.S. precision weapons, collection assets and air power. Threat forces invest in low cost, modern weapons such as anti-tank (AT) missiles and surface to air missiles (SAM) to strike at our key weapon systems. The threat also understands the power of the U.S. information operations (IO) and has devised low cost ways to counter or overwhelm our IO systems.

(6) *Change the nature of conflict.* If threat forces are unable to prevent access into the region, they will attempt to change the nature of the conflict. In addition to dispersing their forces, they will avoid decisive engagements. The threat will become more unconventional utilizing ambush and raid techniques against poorly defended targets. They may also attempt to use terrorism and displaced civilians to widen the conflict to neighboring countries and cause a tremendous refugee burden.[44]

(7) *Allow no sanctuary*. While attempting to use every sanctuary available for its own forces, the threat will deny any possible sanctuary for U.S. forces. By investing in theater ballistic missiles the threat is able to attack anywhere in the AO. They will try to engage U.S. forces throughout the depth of the battlefield. This will force the U.S. commander to reallocate his forces to protect key assets throughout the AO.[45]

Clearly there are an infinite number of ways that an asymmetric foe can impact U.S. forces. The seven principles of employment from the COE represent a useful tool to categorize most of these asymmetric tactics into a manageable number for further investigation.

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[43] Ibid., para 1-12.
[44] Ibid., para 1-13.
[45] Ibid., para 1-13.

Summary of the Asymmetric Environment

During the cold war, the United States was able to focus on fighting an enemy that followed a predictable template. With the demise of the Soviet Union and the Warsaw Pact, the U.S. Army faced the challenge of a new global environment with threats that organized and fought in ways far different then what we were used to. This chapter discussed a few of the dramatic changes in both the strategic and operational environments since the end of the cold war. It made the case for how the future threat will rely more on asymmetric warfare to counter U.S. military overmatch. The Army leadership has reacted to the evolving environment and has recently chosen the Contemporary Operating Environment as the model to represent the threat. A significant portion of the analysis looked at the development of the COE and further defined the seven basic principles that an asymmetric enemy might use. The principles include: controlling access to the region, employing operational shielding, controlling the tempo, causing politically unacceptable casualties, neutralizing technological overmatch, changing the nature of the conflict, and allowing no sanctuary. These seven principles of employment for the COE now serve as the basis for further comparison to divisional capabilities for the remainder of the research. The following chapter looks at how U.S. Army divisions and their associated engineers respond to this environment and how the engineers are currently structured to support them.

CHAPTER 3 – The Capabilities Mismatch

U.S. Army divisions face many (full spectrum) threats in today's Contemporary Operational Environment. The size and scale of the operation may necessitate that the division function at both the tactical and operational level of war. *FM 3-0 Operations* acknowledges that a division is able to function at the operational level as the ARFOR or as the land component commander provided they are given significant augmentation.[4647] Actions in Somalia and the recent actions in Afghanistan both had division headquarters as the senior Army command.

The division and its associated engineers must train to perform a wide variety of missions which include offensive, defensive, stability and support operations.[48] The chapter begins with a review of the engineer battlespace functions and the current divisional engineer capability in both the heavy and light divisions. It then continues by looking at how the division responds to the asymmetric threat and uses the COE principles as the baseline for a capabilities based enemy. This division response generates engineer requirements which are then matched against current capability to determine shortfalls. The chapter ends with a listing by engineer battlespace function of the significant shortfalls that engineers face when addressing the COE. Chapter 6 acknowledges that constraints do exist and provides recommendations that can reasonably be accomplished without significant additions to overall force structure.

The analysis confirms that current engineer structure and capability fall far short of what a division needs to operate effectively in the COE. Significant capability shortfalls include a lack of engineer assets to support the entire division, obsolete combat platforms for engineers, a lack of general engineering assets and no deliberate river crossing capability. There is also an

[46] An ARFOR consists of the senior Army headquarters and all Army forces assigned or attached to a combatant command, subordinate joint force command, joint functional command, or multi-national command. Department of the Army, *FM 3-0 Operations*, 2-14.
[47] Department of the Army, *FM 3-0 Operations*, 2-14.
[48] Department of the Army, *FM 3-90 Tactics* (Washington, D.C.: Government Printing Office, July 2001), para 2-2.

organizational shortfall for the effective employment of countermobility assets. The current division engineer design places too much emphasis on mobility and neglects the other engineer missions.

Engineer Battlespace Functions

Engineers have the dubious challenge of having to act as a combat, combat support and combat service support force. The division engineer organization is responsible for coordinating the three engineer battlespace functions of combat engineering, general engineering and geospatial engineering.[49] This section briefly reviews the engineer battlespace functions to provide the reader with an idea of the many diverse requirements the engineers must accomplish.

Combat engineering is the dominant engineer battlespace function for most anticipated division operations. It includes mobility, countermobility and survivability operations. Mobility is a broad term that can refer to any type of operation that allows the maneuver commander to have freedom of movement. Specifically it includes operations ranging from gap crossing, to obstacle breaching and from engineer reconnaissance to construction of combat roads and trails.[50]

Countermobility is the second component of combat engineering. It allows the commander to add depth to the battle in space and time by attacking the enemy's mobility. Countermobility reinforces the existing terrain by adding obstacles and mines that affect the enemy in a variety of ways, allowing the commander time to engage with direct and indirect fire systems.[51]

The final component of the combat engineering function is survivability. Its primary purpose is to provide cover and reduce or mitigate the effects of enemy weapons on personnel, equipment and supplies. Survivability may include operations ranging from camouflage and

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[49] Department of the Army, *FM 3-34 (DRAFT) Engineer Operations* (Washington, D.C.: Government Printing Office), para 1-4.
[50] Ibid., para 1-27.
[51] Ibid., para 1-30.

deception to the strengthening of critical division assets.[52] The concept of force protection is now a major component of survivability.[53]

The second engineer battlespace function is general engineering. This function assists in the establishment and maintenance of the infrastructure needed for sustaining military operations in theater. The general engineering tasks include

1. Construction or repair of existing facilities, LOC routes, airfields, ports, water facilities, power facilities, pipelines and base camps.
2. Coordination of external engineering assets which may include joint force engineers, civilian contractors and host nation support.
3. Planning for the storage and use of construction materials needed in theater.[54]

The final engineer battlespace function was recently renamed from topographic to geospatial engineering in order to align with joint doctrine. It includes terrain analysis, map and overlay production, data management and precision survey.[55] With increased reliance on digitization and use of the common operational picture for enhanced situational awareness, this function is likely to increase in importance as the U.S. Army proceeds through Transformation.

The goal of this section was to familiarize the reader with the diverse functions that engineers may need to accomplish. As the research continues, engineer capabilities and possible shortfalls will be categorized in terms of the engineer battlespace functions of combat engineering, general engineering and geospatial engineering.

Division Engineer Capabilities

Heavy Division Organization

[52] Ibid., para 1-33.
[53] Ibid.
[54] Ibid., para 1-36.
[55] Ibid., para 1-43.

Engineer organization in the heavy division includes a brigade headquarters and three engineer combat battalions to support the division's maneuver brigades.[56] An organizational diagram is shown in figure 3-1 below.

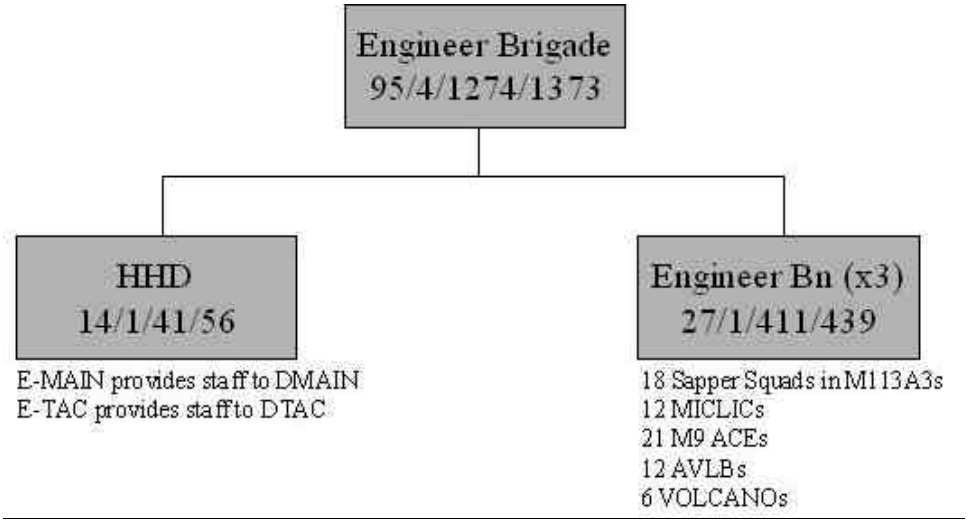

Figure 3-1, Engineer Brigade, Heavy Division[57]

The Engineer Brigade headquarters is commanded by a colonel and has sufficient staff to provide twenty-four hour operations in both the division main command post and TAC command post. It is responsible for:

1. Providing command and control of all engineer units that are operating in the division's AO.
2. Providing engineer specific advice that may impact the division's operations.
3. Coordinating engineer intensive operations such as deliberate defenses and river crossing operations.[58]

[56] Currently in the active component the heavy divisions include 1st Armor Division, 1st Infantry Division, 1st Cavalry Division, 2nd Infantry Division and 3rd Infantry Division. The 4th Infantry Division is considered a Force XXI division and will be discussed in Chapter 5.
[57] US Army Engineer School, *ST 5-101-10 Unit Organizations and Structures*, (Fort Leonard Wood, MO, May 1999): 10. For all the organization diagrams, the personnel numbers reflect "officers/warrant officers/enlisted/total".
[58] Department of the Army, *FM 3-34 (DRAFT) Engineer Operations,* A-49.

The engineer combat battalions are organic to the Engineer Brigade but are normally task organized to maneuver brigades on a habitual basis. They each consist of a headquarters company and three line companies. Like the Engineer Brigade headquarters, the battalion headquarters has the ability to staff both the brigade main and TAC command posts. Engineer battalions generally are responsible for the following types of missions:

1. Establishing and maintaining assault crossings of up to 20 meters.
2. Conducting combined arms breaching operations.
3. Obstacle integration and survivability for brigade defenses.
4. Very limited repairs of bridges, fords and LOCs in the brigade area.
5. Engineer reconnaissance in the brigade area.[59]

Light Division Organization

Engineer organization in the light divisions is centered on a light combat engineer battalion. This battalion consists of a headquarters company and three light sapper companies.[60] The organization and significant equipment are shown in figure 3-2 below.

[59] Ibid., A-50.
[60] The light divisions will include the 10th Mountain Division, 25th Infantry Division, 82nd Airborne Division and 101st Air Assault Division. With minor exceptions, the engineer organization within all of these divisions is essentially the same.

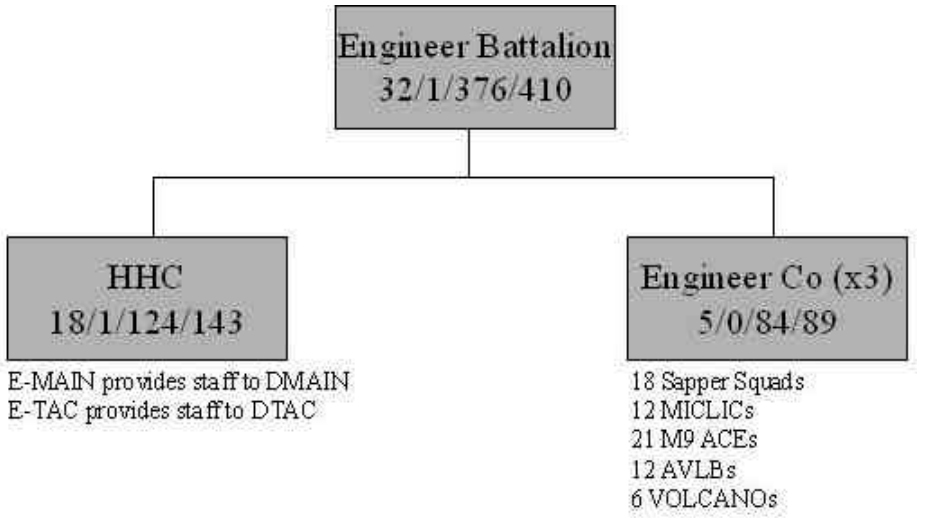

Figure 3-2, Engineer Battalion, Light Division[61]

The light engineer battalion is commanded by a lieutenant colonel and has limited ability to provide twenty-four hour operations in both the division main command post and TAC command post. This headquarters must accomplish all the same advisory roles for the division as the engineer brigade headquarters in the heavy division.

The light engineer companies are organic to the engineer battalion but are normally task organized to maneuver brigades on a habitual basis. They consist of a company headquarters and three line platoons. The company headquarters has very limited capability to provide engineer expertise in the brigade command posts. The principle advisor to the brigade commander is the engineer company commander who may have as little as four years of experience as compared to the 20 years experience the average battalion commander in the heavy force has. Light engineer companies are responsible for the following types of missions:

1. Assisting in the assault of fortified positions.
2. Breaching tactical obstacles.
3. Obstacle integration for brigade defenses.

[61] U.S. Army Engineer School, *ST 5-101-10 Unit Organizations and Structures*, 12.

4. Engineer reconnaissance to support brigade operations
5. Very limited repair and maintenance of bridges, fords and LOCs in the brigade area.[62]

Divisional Response to the Asymmetric Environment

As discussed in the previous chapter, it is nearly impossible to describe an environment that will encompass all possible threats that the U.S. Army could face. The COE provides a robust environment that a U.S. Army division can use as an approximate benchmark to measure capability against. This section looks at the seven principles from the COE that a skilled asymmetric threat will likely employ against U.S. forces. Each of these principles is evaluated to determine a likely divisional response. The division response is then expanded to generate a set of engineer requirements. The capability to meet these engineer requirements is evaluated in terms of the current engineer organization and a listing of significant shortfalls results. The shortfalls identified in this section become the motivation for change to the engineer structure.

Control Access to the Region

The first principle that the threat will use to challenge the U.S. is to attempt to *control access to the region*. This is done by denying U.S. forces the ability to use the necessary ports and airfields it needs to enter the AO. The threat may choose to defend with their forces or attempt to render the facilities unusable. While it is unlikely the threat will be able to prevent access to the ports and airfields indefinitely, it is probable they will be able to cause extensive damage to these facilities. The enemy may attempt to use theater ballistic missiles (TBM) or

[62] Department of the Army, *FM 3-34 (DRAFT) Engineer Operations,* A-55.

other long range weapons to destroy U.S. forces before sufficient air and missile defenses are in place. [63]

Division Response

The U.S. response to exclusionary tactics is to conduct forcible entry operations.[64] This complex joint operation may include Army forces as initial assault force. Within the ten divisions the four light divisions are designed specifically to conduct either air assault or parachute assault entry operations.[65] The division may have responsibility to achieve both tactical and operational objectives during the assault. The entry force either resolves the situation or secures a lodgment for the rapid delivery of additional forces by ships or aircraft.

Engineer Requirements

The division needs an engineer capability to perform three critical tasks during a forcible entry operation. The first, and most important, is to provide combat engineers to support the initial assault by breaching tactical obstacles and assaulting fortified positions. Once the early entry forces have secured the lodgment, the engineer's next function is to rapidly make the airfields and port facilities functional.[66] There exists an immediate need for general engineering capability in the early entry force to conduct expedient runway/port repair and heavy debris removal. Field expedient repairs are necessary before EAD and joint engineers can arrive to improve the facilities. The final critical task is to provide survivability to critical assets such as command posts, radars, and TBM defensive systems. As the division continues to flow into the AO, there may be an immediate additional general engineering requirement for construction of basic life support facilities.

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[63] Department of the Army, *FM 3-0 Operations*, 3-17

[64] *FM 3-0 Operations* defines forcible entry operations as; an offensive operation for seizing and holding a military lodgment in the face of armed opposition.

[65] The third type of forcible entry operation is an amphibious assault. It is normally the function of the US Marine Corps to conduct this type of forcible entry operation and will not be discussed here.

[66] Department of the Army, *FM 5-7-30 Brigade Engineer Operations (Airborne, Air Assault, Light*), (Washington D.C.: Government Printing Office, 14 December 1994) 5-19 – 5-20.

Engineer Shortfalls

Engineer capability in the light divisions is designed to accompany rapid deployment forces in the initial seizure of the ports and airfields but can do very little after that. The light engineer battalions are critically short in capability to fulfill the division's immediate need for general engineering repairs to the ports and airfields. With only six small bulldozers, the light engineers are not able to clear debris and conduct the necessary repairs needed to bring in follow on forces.[67] The division must wait for augmentation from external assets or use joint assets from either the Air Force or Navy to construct basic life support facilities.

Employing Operational Shielding

Once U.S. Army forces have secured access to the AO, the threat will attempt to protect its critical assets by *employing operational shielding*. They will position assets in complex terrain such as urban environments or in areas where their destruction will cause unacceptable collateral damage. The topography and proximity of non-combatants degrade the effectiveness of the U.S. forces advanced sensors and weapons.[68]

Division Response

The best tactic for the division is to expend every effort to prevent the enemy from occupying complex terrain in the first place. Failing this, the division can either establish a cordon around the complex terrain or conduct offensive urban operations. The value of the target may necessitate a direct assault on the city.[69] This operation is not undertaken lightly and requires detailed planning and execution for combined arms action at the small unit level. The

[67] Department of the Army, *FM 3-34 (DRAFT) Engineer Operations*, A-55.
[68] Department of the Army, *FM 3-0 Operations*, 6-19
[69] *FM 3-0 Operations* defines urban operations as; offense, defense, stability and support operations conducted in a topographical complex and adjacent natural terrain where manmade construction and high population density are the dominant features.

high density of non-combatants and need to limit collateral damage may force small units to assault urban objectives with little support from artillery and aviation assets.[70]

Engineer Requirements

Isolating an urban environment or establishing a cordon requires intense countermobility effort to affect all avenues of approach. Engineers may need to lay minefields, construct barriers and degrade existing infrastructure to prevent the enemy from entering or exiting the city. A general engineer capability is needed to disrupt power distribution, communications and pipelines.

If decision is made to conduct urban operations, the division is faced with a series of complex problems that require a wide range of combat engineering capability. A well developed urban defense will slow or stop any attack unless obstacles can be quickly breached or bypassed. *FM 3-34 (Draft) Engineer Operations* identifies several tasks engineers must accomplish. These include:

1. Conducting detailed technical reconnaissance to determine level of effort needed.
2. Repairing and constructing bridges on critical avenues of approach.
3. Breaching obstacles in close contact both inside and outside the city.
4. Assault breaching into buildings.
5. Reducing enemy strongpoints using demolitions and heavy equipment.
6. Laying mines to protect the flank of the maneuver force and defend against attack.
7. Preparing expedient landing zones.
8. Assisting in the preparation of defensive positions in the event of a counterattack.[71]

Engineer Shortfalls

The current engineer organizations lack several of the combat engineering assets required for the division's success. The most critical shortfall is the lack of an armored breaching vehicle.

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[70] Ralph Peters, *Fighting for the Future*, 76-77.
[71] Department of the Army, *FM 3-34 (Draft) Engineer Operations*, para 7-79.

The task of debris removal and large obstacle clearing falls completely on the Armored Combat Earthmover (ACE). This lightly armored, unarmed vehicle needs augmentation and protection from a heavier obstacle clearing vehicle that does not currently exist.[72] Another critical shortfall exists in the ability to protect engineer soldiers. Sappers need to negotiate the deadly terrain and arrive in one piece where they are needed. The current engineer squad vehicle has one machine gun for protection and less armor protection than the infantry carriers.[73]

Engineer minelaying assets are of little value inside the city but have great utility for areas around the city. To consolidate these assets would require diverting a valuable C2 asset away from the assault. Engineers also lack the capability to span a gap of more than 20 meters. This could seriously impact the division's mobility both inside and outside the city.

The division lacks a general engineering capability to accompany assault forces and take control of utility networks. This shortfall is predominately a training deficiency. The skill currently exists in vertical construction units but could easily be incorporated into combat engineer training.

In the area of geospatial engineering, the division has a need for detailed reconnaissance and geospatial assets that can give all ground commanders detailed maps and imagery of the objective. The single division terrain team that exists in all divisions has great capacity to support the division headquarters but does not have the capacity to provide updated products to some 30 company sized maneuver elements.

Control the Tempo

By attempting to *control the tempo*, the threat seeks to rapidly accomplish its aims before U.S. forces can arrive in theater. This principle closely relates to the first of *controlling access to*

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[72] The United States Army Engineer School, *Engineer Systems Handbook*, (Fort Leonard Wood, MO: Directorate of Combat Development, May 2001) 46-47.
[73] MG Robert B. Flowers, *Prioritization Paper for Future Engineer Capabilities*, Internet, http://www.wood.army.mil/DCD/nolimits/ENDIV/prioritization_paper.htm. accessed 16 August 2001, 9.

the theater and provides no additional insights to the environment. Further analysis is unnecessary.

Cause Politically Unacceptable Casualties

Force protection is a major concern for the entire force today. The threat realizes that the principle of *causing politically unacceptable casualties* is a relatively easy way to weaken U.S. resolve. Even a few attacks against troop concentrations can cause U.S. political and public discontent. The threat also realizes that it is far easier to inflict casualties in the division rear areas than it is to attack the maneuver units.

Division Response

To counter this threat principle, the division must conduct a continual detailed assessment of their vulnerabilities. Force protection includes air, space and missile defense; nuclear, biological, and chemical defense; defensive information operations; and security to operational forces and means.[74] In the non-contiguous environment that the division will likely operate, they must provide protection for bases and base clusters; route security for LOCs that run between AO's and convoy security for assets moving between AO's.[75]

Engineer Requirements

The division must continue to employ engineers across the AO as survivability specialists. To provide basic survivability to the division, the engineers must:

1. Provide technical knowledge and equipment to assist other units in developing defensive positions into fortifications and in improving defensive positions.
2. Provide technical advice on camouflage.
3. Dig fighting positions beyond the combat units' organic capabilities.

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[74] Department of the Army, *FM 3-0 Operations*, 4-8, 4-9.
[75] Department of the Army, *FM 3-90 Tactics*, E9.

4. Harden facilities to resist destruction by the enemy.
5. Provide equipment support necessary to establish NBC decontamination points and assist in route and area decontamination.[76]

Engineer Shortfalls

The most critical engineer shortfall in an environment requiring extraordinary force protection measures is the ability to provide capability to the entire division. Every blade asset in the division is habitually organized into the maneuver brigades. To protect assets outside the maneuver brigade, more than just engineers must be diverted away from their primary missions. Engineers operating outside the maneuver brigade battlespace have very few heavy weapons to protect themselves and are extremely vulnerable to precision ambushes and unconventional attacks. They often require a combat vehicle escort during transit which further bleeds combat power away from the maneuver brigades.

Providing adequate survivability, and enhancing force protection is a massive undertaking that is very time and equipment intensive and may not be possible with the current number of blade assets. The number of critical systems in the division AO continues to rise with the addition of new TBM defense systems and other low density enabling systems while the number of engineer survivability assets has remained fixed. With 63 ACEs in a heavy division working at maximum capacity, the engineers have the ability to construct about 120 combat vehicle fighting positions per day. Heavy bulldozers are able to reduce construction time by as much as 50% per position but there are none organic to the heavy divisions. In the three maneuver brigades combined, there are approximately 450 principle combat vehicles that may need positions.[77] To protect other critical division nodes could easily cause that number to double.

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[76] Department of the Army, *FM 3-34 (Draft) Engineer Operations*, para 1-33.
[77] ACE's work in teams of two and it takes them about five hours for one position with travel time. 30 teams working 15 hours per day can emplace 120 positions. Vehicle estimates in each of the nine maneuver battalions is around 50. Department of the Army, *FM 5-34 Engineer Field Data* (Washington D.C.: 30 August 1999), 8-23 – 8-36.

The argument could easily be made to just task the ACE's to work in the rear areas on force protection. This ignores the fact that this is a one man vehicle and requires a significant augmentation for maintenance and C2 which draws more away from the maneuver brigades.

Maintaining the LOCs presents engineers with additional problems. There is currently no capability to conduct anything other than expedient repairs. Unsecured LOCs not only require repairs but must be frequently swept for mines. With no dedicated route clearance vehicle in the engineer inventory, the only way to clear routes is with dismounted sappers and mine detectors.

Neutralize Technological Overmatch

There are countless ways the threat can attempt to *neutralize technological overmatch*. A perceived favorite within the construct of the COE is for the threat to abandon linear operations against the U.S. Army and disperse assets to negate U.S. ambitions for a decisive battle. They employ large numbers of highly effective SAMs to contest U.S. air superiority.

Division Response

If the threat disperses its forces, the division is faced with the challenge of multiple decisive points. Smaller, extremely mobile and lethal forces lend themselves to simultaneous operations against multiple decisive points. The aim is to induce shock upon the enemy commander and troops by presenting them with multiple problems simultaneously.[78] To accomplish this, the division will likely have to operate with noncontiguous brigade AOs and may not have effective close air support.

Engineer Requirements

Countering non-linear operations is yet another daunting challenge for divisional engineer forces. Engineer forces must conduct all of the engineer battlespace functions in multiple AOs. Offensive mobility forces are needed to support multiple brigade operations.

[78] Department of the Army, *FM 3-0 Operations*, 5-11 – 5-12.

Survivability and general engineering capability is needed throughout the division to protect multiple non-linear AOs and maintain the LOCs between them.

Engineer Shortfalls

The challenges of securing several AO's with 360 degrees of frontage are hard enough for the maneuver brigades and are almost impossible for the non-maneuver elements. That lack of a dedicated capability for non maneuver units is the most critical shortfall in this situation. In the current organization, engineers must be diverted from the decisive maneuver brigade operations to support the rest of the division.

With noncontiguous AO's comes the problem of negotiating and maintaining LOC's between the AO's. The division is responsible for maintaining that critical link between AO's. The problem is that they do not currently have the general engineering capability to accomplish this mission. The doctrinal solution of using EAD engineer units ignores the fact that these units are trained and equipped to operate primarily in the secure linear environment and not in the "whitespace" of the non-contiguous battlefield.

Change the Nature of the Conflict

If the threat is unable to achieve success using the previous principles it will likely attempt to *change the nature of conflict* into an unconventional fight. The use of raids, ambushes and terrorism seeks to avoid decisive engagement and steadily wear down U.S. forces through both small and large scale precision attacks.

Division Response

To protect against raids and ambushes, the division must again focus on protecting the force through enhanced force protection and survivability operations. Though divisions are not designed to conduct counterterrorism missions, they must conduct antiterrorism measures to

reduce vulnerabilities.[79] Some of these measures include the hardening of facilities, construction of countermobility obstacles, and providing protection for weapons of mass destruction.[80]

Engineer Requirements

The engineer priority against unconventional operations revolves mainly around survivability, countermobility and general engineering operations. In the current organization, the heavy division must use the ACE's to provide survivability assets to the three maneuver brigades, DIVARTY, DISCOM, Aviation Brigade, all the command posts and any other critical assets assigned to the division.

Countermobility obstacles are a good tool for engineers to augment protection for assets that may be low on the survivability priority list. With the doctrinal focus on offensive operations and restrictions on use of anti-personnel landmines, engineers have shifted their reliance on conventional mines to the exclusive use of scatterable and dynamic anti-vehicular minefields.[81] The division's primary asset for scatterable mines is the Volcano mine systems located in the maneuver brigades. Dynamic minefields with an on/off capability are starting to enter the force with the fielding of the HORNET and RAPTOR intelligent mines. These mines reduce the requirement for fratricide fencing and provide the same capability as conventional minefields with far fewer mines and significant reduction in manpower requirements.[82]

Engineers must be prepared to rapidly repair any infrastructure that is damaged by unconventional operations. It is likely that engineers will be needed to repair bridges, airfield facilities, and critical road networks.

Engineer Shortfalls

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[79] Ibid.,, 9-11 – 9-12.
[80] Ibid.
[81] MG Robert B. Flowers, *Prioritization Paper for Future Engineer Capabilities*, Internet, http://www.wood.army.mil/DCD/nolimits/ENDIV/prioritization_paper.htm. accessed 16 August 2001.
[82] The United States Army Engineer School, *Engineer Systems Handbook*, 23-25.

The challenge of unconventional warfare helps to identify shortfalls in engineer capability for survivability, countermobility, and general engineering. As with other principles in the COE the most critical shortfall is the engineer ability to provide support to the entire division. With the large number of assets needing protection, it is clear that the heavy engineer force will have a difficult time meeting all the requirements. The light engineer force with its six small bulldozers can only protect a few high priority assets. In the current organization, all the systems are allocated down to the maneuver brigades and must be reallocated if the division wants to protect other assets. Though there are 18 Volcano systems in the division, they are usually spread out in groups of two to the nine task forces. This decentralization makes coordination of massed countermobility effects difficult.

An increased general engineering and river crossing capability is also needed to combat the unconventional enemy. The enemy will likely conduct precision strikes against key infrastructure nodes such as bridges, airfields and port facilities to disrupt the mobility of U.S. forces. The ability to rapidly repair or replace these nodes is critical to the continued success of the division. The loss of a key bridge can have a potentially devastating effect on U.S. forces. The time required to move an EAD bridging unit forward can disrupt the operation for days and perhaps weeks.

Allow No Sanctuary

By *allowing no sanctuary* the threat seeks to force the division to spread its combat power out and protect everywhere. The threat uses theater ballistic missiles (TBM) to hit divisional assets anywhere in the AO.

Division Response

If the threat to the division is primarily TBM, the division can attempt to negate the threat with air missiles defense assets around critical nodes. With both TBM and long range rocket

artillery threats, the division will likely have to spread assets to negate damage caused by long range artillery. Air and missile defense radars and counterbattery radars are low density items and must be given the highest priority for protection in this type of environment.

Engineer Requirements

Engineer capability in this environment focuses on survivability and general engineering. Assets must be available to provide survivability to the entire division. Survivability of the protective radars requires constant attention by engineer assets. Even in lower threat environments, the radars must move often to prevent detection and targeting. Each move requires engineer blade assets to dig new protective positions.

General engineering assets must be available to repair or replace critical infrastructure that is hit by threat forces. Likely operations include bridge repair or replacement, air facility repairs and LOC repairs.

Engineer Shortfalls

As with most principles of the COE, this last one focuses the engineer capability away from the mission of supporting the maneuver brigades. The survivability priority list gets longer and longer with improvements to COE capabilities. Additional capability is needed to focus specifically on these critical assets.

Division Engineer Shortfalls in the Asymmetric Environment

Building on the challenges provided by the COE, this section summarizes the significant shortfalls in divisional capability with respect to the engineer battlespace functions. This is not intended to be an all inclusive list. It is a list of shortfalls that has the potential to negatively impact division operations against the COE.

Combat Engineering Shortfalls

In both the heavy and light division structures, almost all combat engineer capability is focused at providing support to the maneuver brigades. This arrangement remains relatively effective in a linear environment with a defined rear area, but presents a great danger in the COE. The DIVARTY, DISCOM, Aviation Brigade and the Division Cavalry Squadron have no dedicated engineer capability to support their operations unless it is diverted away from one of the maneuver brigades. Any reorganization of engineer capability comes at the expense of the maneuver brigades.

In the area of mobility, the gap crossing capability of both the light and heavy divisions has the greatest potential for problems. The light division has no bridging assets in its current force structure. The heavy division has the 30 year old Armored Vehicle Launched Bridge (AVLB) which only has the ability to pass heavy forces over gaps of less than 20 meters. This platform is unarmed and has a very distinct high profile during deployment making it susceptible to enemy fire.[83] Light anti-armor weapons can easily disable the AVLB during employment. The Army has acknowledged that this platform is obsolete and is starting to replace them in the Force XXI structure. To conduct a river crossing of greater than 20 meters, the division needs to be augmented by an echelon above division (EAD) Bridge Company.

The main focus of mobility at the division level is combined arms breaching operations. This activity has been humorously dubbed the “dance of the farm implements” by many observers. With the loss of the Combat Engineer Vehicle (CEV) from the force structure several years ago, engineers must now rely exclusively on the Mine Clearing Line Charge (MICLIC) or dismounted sappers to breach minefields and obstacles. The lack of an engineer mine clearing blade has forced tanks with mine plows and rollers to be diverted from their primary mission of providing direct fire to the mission of proofing lanes once they are breached. The prototype

[83] Ibid., 48.

Grizzly Breacher was designed to replace the CEV but due to budget constraints has yet to be fielded.[84]

Sappers involved in route clearance, breaching, or urban operations are exposed to great danger and have very limited ability to protect themselves with direct fire. The squads are mounted in thin skinned armored personnel carriers (M113A3) and are not nearly as survivable as their infantry and armor counterparts. With the high density of effective enemy anti-armor weapons in the COE, this shortfall continues to grow in significance.

Countermobility has undergone some significant changes in the last few years and the use of mines continues to be a controversial issue. With the U.S. participation in the ban on anti-personnel mines (everywhere but Korea), conventional minefields have virtually disappeared from engineer training. Until the new dynamic mine systems such as the Hornet and Raptor become widely available, the Volcano mine dispensing system continues to be the weapon of choice for most countermobility effort.

There is currently a mismatch between the organization and use of the Volcano mines systems. The emplacement authority for most minefields usually remains at the brigade level for short duration and division level for long duration, yet Volcano's are spread across the engineer brigade down to the company level. Decentralized execution of minefields fails to mass this valuable asset and leads to frequent fratricide incidents in training as minefield reporting procedures are often inconsistent among the many units that have Volcano's.[85]

Countermobility assets can be used in other ways besides the traditional role of shaping main battle engagement areas. Protective minefields are a legitimate resource to protect assets in the division that may be low on the survivability priority list. Well marked, ground emplaced

[84] Program Budget Decision 745 issued by the Office of the Secretary of Defense on 27 December 1999 effectively killed the fielding of the Grizzly. Efforts are currently underway to restore limited funding for the Force XXI engineer organization.
[85] LTC Scott Bickell, "Battle Command Training Program 2001 Perceptions for Mobility/Survivability"

Volcano around large logistics nodes and airfields provides excellent deterrent to threat forces. The current organization of Volcano's is very dispersed and unresponsive to division priorities.

The threat environment today contains a variety of theater ballistic missiles and long range artillery that make the challenge of survivability and force protection even more difficult. In addition to the mission of digging vehicle fighting positions for direct fire weapon systems found in the brigades, the division engineers must also consider a wider range of critical assets to protect. Counterbattery and air defense radars along with C2 nodes and logistics nodes are in short supply and are essential to the division's success. The ACEs in the heavy division engineer brigade and the six light bulldozers in the light division can be diverted to this mission but at great cost to the survivability and mobility of the maneuver elements.

General Engineering Shortfalls

Most of the principles used to challenge the U.S. within the COE require the division to respond with some form of general engineer capability. In both the heavy and light force there exists no organization dedicated to conducting general engineering tasks. The combat engineer soldier receives only rudimentary training in the areas of vertical and horizontal construction. Sapper platoons have very limited toolkits that allow them to build some facilities but generally rely on externally provided engineer units to accomplish this mission. The only equipment resident in the divisions to accomplish horizontal earthmoving operations are the ACE's in the heavy divisions and light bulldozers in the light divisions. These assets normally function in a survivability role and were not designed to conduct precision earthmoving.

In the modern threat environment, the enemy specifically targets the infrastructure nodes needed for U.S. forces to enter the AO. The division must be able to secure and repair both airfields and port facilities in order to facilitate rapid entry into the AO. For the division to accomplish this mission without significant external help, a dedicated construction capability must be added to the division engineer structure.

Geospatial Engineering Shortfalls

In the current divisional organization, all of the dedicated geospatial engineering assets are consolidated in the division headquarters under the control of the Division G2. This terrain team is run by a warrant officer with specialized topographic training and has the ability to produce special terrain products such as updated maps and overlays.

With brigades operating in the COE the one division terrain team may no longer be adequate. For the information to be useful it must find its way down to the lowest levels of command in a timely manner. With the development of new inexpensive terrain software packages such as Terrabase, Falconview and the Maneuver Control System (MCS), there is now the ability to conduct advanced geospatial analysis at the brigade and task force levels on inexpensive portable computers. Unfortunately, very little geospatial training is given to the staffs at this level and the systems are often underutilized. Any expertise that exists at this level is purely a result of personal initiative. Terrain warrants at the brigade level could fill both the training gap at the task force level and provide the brigade commander with expert terrain analysis.

Summary of Significant Shortfalls

The COE presents the division with many challenges that did not exist in previous threat environments. The scale of the operation may necessitate that the division operate at both the tactical and operational levels of war. The doctrinal fixation on offensive maneuver and situational awareness has left some significant engineering shortfalls that may adversely affect the division's ability to accomplish its mission in an asymmetric environment.[86] This chapter demonstrated how the division might respond to the asymmetric principles of employment that are found in the COE. Each principle in the COE demonstrated shortfalls in divisional engineer

capability. A summary of the most significant shortfalls is shown below in their order of precedence.

1. Engineer capability is needed for the entire division. It is no longer adequate to dedicate all the capability to the maneuver brigades. Reorganization of capability comes at the expense of the maneuver brigades.
2. The division lacks an organic general engineering capability to deal with immediate problems of entry into the theater, repair of critical infrastructure nodes and maintenance of LOC's. This capability can also be used to improve the ability for the division to protect itself from the wide range of threat actions.
3. Though the capability to conduct mobility operations is still relatively strong in the division, there is a lack of modernization and redundancy for the platforms used by engineers. Engineers need a more survivable fighting vehicle than the M113A3 and an armored breach vehicle replacement for the retired CEV.
4. An organic river crossing capability is not purely a weakness demonstrated by the COE but has existed since the bridging companies were removed from the division. This asset should be returned to the division organization to allow the enhanced mobility that modern doctrine calls for.
5. Geospatial engineering is powerful capability that is not present at the brigade level. One divisional team cannot meet all the requirements generated by the COE.
6. The Volcano's continue to be spread across the division AO. There is currently no organization designed to mass these assets. Threats exist across the division AO and the current organization is too distributed to be effective.

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[86] Department of the Army, *FM 3-0 Operations*, 7-2. This doctrine claims that the offense is the decisive form of war. In reality decisive operations may be difficult against an enemy that seeks to avoid decisive battle.

These six significant shortfalls in engineer capability must be addressed for the division to be successful in the COE. The next two chapters look at how the shortfalls are currently addressed through the EAD augmentation plan and future force designs.

CHAPTER 4 – The EAD Augmentation Plan

One of the defining concepts behind the division structure is that it was designed to be the smallest organization capable of independent full spectrum operations. There are, however, many shortfalls in division capability that exist across the battlefield functions. In addition to the deficiencies outlined in the previous chapter, the current organizational structure for divisional engineers has many doctrinally acknowledged shortfalls. The doctrinal method to make up for the capability shortages is to rely on a habitual augmentation from corps level units.

The purpose of this chapter is to examine the U.S. Army's current solution of using EAD engineer units to augment the mismatch in divisional engineer capability. It begins by looking at the organization and availability of active component engineer units that can quickly augment the division. It also looks at the question of interoperability of EAD engineer units with their divisional counterparts and the speed at which EAD engineers can arrive in theater.

The research shows that though the plan seems viable on paper, it relies heavily on a large activation of reserve component engineers which could take several months to complete. The rapid pace of operations against the COE may not give the U.S. the several months needed to conduct a reserve activation and EAD force buildup. The plan is designed for the infrequent major theater wars and not for the far more common smaller scale contingencies.

Organization and Availability of Engineer Forces

Organization

The command echelon above the divisional engineer command structure is the corps engineer brigade. This is a flexible organization that can be altered to fit the specific needs of the theater. It is composed of specialized engineer companies, a variety of engineer battalions and engineer group headquarters. *FM 3-34 Engineer Operations,* provides a lay down of what a

typical corps engineer brigade might look like in a traditional corps theater that includes two combat divisions. Figure 4-1, below displays this notional lay down.

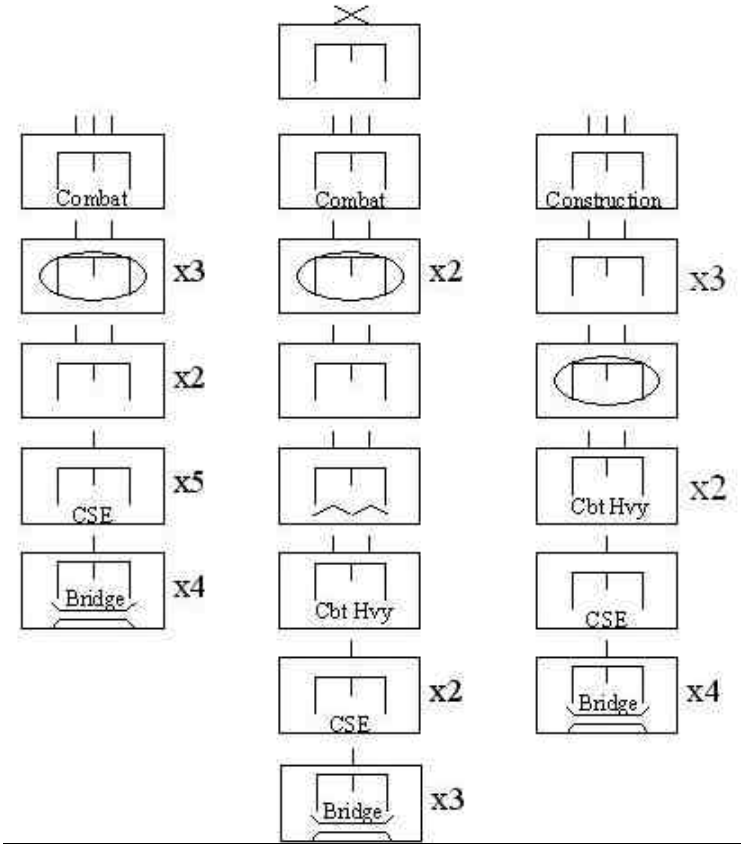

Figure 4-1, Typical Corps Engineer Brigade

The exact mix and type of engineer units is dependent on the number and types of divisions that make up the corps and the specific characteristics of the AO.[87] A typical corps engineer brigade consists of three engineer groups, six mechanized and six wheeled combat engineer battalions, and three combat heavy construction battalions. Several separate specialized engineer companies and teams round out the corps engineer brigade. This group may include six to ten combat support equipment companies and six or more bridge companies of various designs.

Corps engineer brigades use the engineer groups to subdivide the AO into manageable geographic pieces that support division and the corps areas of responsibility. These engineer groups are categorized as either combat or construction groups. The combat groups often provide the C2 for an augmentation package provided to a division. The augmentation package each division receives usually includes, as a minimum, the capability to make up for the acknowledged shortfalls in bridging and construction. In a recent Warfighter Exercise, the division augmentation package included a group headquarters, two mechanized combat battalions, a combat heavy battalion, two combat support equipment companies and two multi-role bridge companies.[88]

Corps engineer combat battalions are organized as *mechanized*, *wheeled* or *light* combat battalions. All three can reinforce the divisional battalions in the forward brigade areas, support the division rear, or work in the corps area behind the division. The mechanized battalion operates well forward in the heavy division area. The wheeled battalion operates in any type of division, but is at risk when the threat is an armored force. The airborne or light battalion supports the initial deployment of such units in contingency operations. Combat heavy battalions perform vertical and horizontal construction and can also support the construction of battle positions, roads and obstacles. They are equipment intensive organizations with bulldozers, scrapers, graders, bucket loaders, entrenching machines, dump trucks, cranes and heavy equipment transporters.

Availability of EAD Units

The foundation of the EAD augmentation plan is to use a corps engineer brigade to coordinate augmentation to the divisions. Of major concern is the fact that only two of the four

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[87] Department of the Army, *FM 5-100 Engineer Operations* (Washington D.C: United States Government Printing Office, 1996) 2-7.
[88] Personal observation taken from duty as an observer/controller during 2nd Infantry Division Warfighter Exercise, Camp Casey, Republic of Korea, December 2001.

active corps has an active duty corps engineer brigade. The 20th Engineer Brigade supports the XVIII Airborne Corps and the 130th Engineer Brigade supports V Corps. Both III Corps and I Corps have reserve component engineer brigades to support their corps. Without activation of these reserve component engineer brigades, the corps' must rely on an engineer group to fill a C2 role they were not designed for.

The most significant challenge to the corps augmentation plan is the lack of corps level engineer units in the active component. Table 4-1 below shows the breakdown of active component EAD engineer units.

Type of Engineer Unit	Total Active Inventory	Number of units in Corps Engr Brigade	Typical Division Augmentation	Divisional Shortfalls for a 2 Div Corps
Engr Group	3	3	1	0
Engr Bn (Mech)	2	6	2-3	2-4
Engr Bn (Wheeled)	1	6	2-3	3-5
Engr Bn (Heavy)	7	3	1	0
Engr Co (Bridge)	6	11	2	0
Engr Co (CSE)	6	7	2	0

Table 4-1 EAD Engineer Units

As the table above indicates, only one heavy division can be augmented without activating significant portions of the reserve components. There are large shortages of anywhere from five to nine combat battalions in the active component if there is a need to operate a corps engineer brigade in the AO or if there are multiple operations occurring at the same time.

A potentially critical shortfall exists in the inventory of engineer bridge companies. This particular asset cannot be easily substituted with other capability. The six active component bridge companies are spread throughout the world with two in Europe, one in Korea and the rest in the U.S. According to *FM 90-13 River Crossing Operations*, just one opposed division river crossing requires two bridge companies per lead brigade.[89] The need for bridge crossing is just as

[89] Department of the Army, *FM 90-13 River-Crossing Operations*, (Washington D.C.: Government Printing Office, 26 January 1998) 5-3 – 5-4.

critical in lower threat environments. The unopposed crossing of the Sava River in December 1995 and January 1996 took several weeks and demonstrates just how dependent maneuver forces can be on the success of this critical asset. Five bridge companies were needed to establish and maintain the crossing points that allowed Task Force Eagle to operate in Bosnia. With the exception of the company in Korea, the U.S. Army had no additional active component bridge units and there wasn't even a major operation underway. This shortage has long impacted the proficiency of divisions to conduct river crossing operations. Most divisions continually have a difficult time synchronizing deliberate river crossing operations due to lack of staff training and the availability of bridge units for training exercises.[90]

Interoperability of EAD Engineer Units

There are many challenges with the introduction of EAD engineer units into the divisional structure. Some significant issues include the introduction of new types of equipment, knowledge of the division standard operating procedures (SOPs) and mobility of EAD engineer forces.

In an environment without a corps, or one that is distributed across a large AO, the division must accept the responsibility for logistical support of EAD units. The introduction of large earthmoving equipment, bridging equipment and heavy equipment transporters can place an extreme burden on the maintenance and supply functions of the division. Though the EAD units bring their own maintenance and some spare parts, these assets are rapidly consumed once operations begin. To make matters worse, EAD engineer units are not at the top of the list for the fielding of new digital equipment and are often at least one generation behind in communications equipment.

[90] LTC Scott Bickell, "Battle Command Training Program 2000 Perceptions for Mobility/Survivability," *Engineer*, (May 2001): 68-69.

Another significant issue with the employment of EAD engineer units is their knowledge of local SOPs and procedures. Reporting procedures, logistics information and special signal information differs from division to division. This can provide an EAD engineer unit with additional complications that further delay their effective employment in the AO. Operations against the COE are a difficult time to be learning new SOPs.

The final significant issue that EAD units must contend with is difficulty with tactical mobility. Once in theater, many EAD units lack organic lift capability to move their unit. During Desert Storm, the 43rd Combat Heavy Battalion took nearly a month to move a distance of about 250 miles from the port facility to their work site near King Khalid Military City.[91] Luckily, they did not have to follow maneuver units into Iraq. In their current organizational form, many EAD units would have a difficult time keeping pace with a rapidly moving division.

Responsiveness of Corps Engineer Units

The only recent significant test of the Army's EAD engineer augmentation plan took place during Operation Desert Storm. At the end of the operation, there were 141 engineer units deployed, including three engineer brigades, six engineer groups, 32 engineer battalions and 99 separate companies and teams.[92] Though the mission was successfully executed, engineer responsiveness was a cause of some concern.

Throughout the force build up, engineer forces continued to be pushed further down in the priority list for deployment. The sheer size of the force being deployed to the Gulf region necessitated the use of the entire U.S. strategic lift capability. The danger of Iraqi forces continuing into Saudi Arabia forced the Army planners to prioritize what units would be transported into theater first. With the exception of light equipment companies of the XVIII

[91] Janet A. McDonnell, *Supporting the Troops: The U.S. Army Corps of Engineers in the Persian Gulf War*, (Office of History, U.S. Army Corps of Engineers, Alexandria, VA, 1996): 192.
[92] Ibid., 30.

Airborne Corps, engineer construction units are limited to sealift deployment. Tanks and artillery dominated the first turn of the Navy's sealift capability.[93]

Two months into the deployment, no Army EAD units had arrived in theater, though several were finally en route. The shortage of engineer soldiers and equipment forced the U.S. Central Command (CENTCOM) to rely heavily on contractors.[94] The only Army engineer units to support the force during this critical build up period consisted of two light equipment companies and an airborne engineer battalion that deployed as part of the lead division.[95] Engineer soldiers were deployed into theater in advance of their equipment and had to rely on leased equipment they were not trained on to accomplish critical missions. At the time the air offensive began, a full five months into the deployment, only 54% of the VII Corps (3rd Army main effort) engineer force was in place.[96] It is fortunate that the Iraqi defensive belts lacked depth and were easily breached.

Summary

The Army's EAD augmentation plan is not very responsive in the modern threat environment. Though the plan has the ability to address most of the engineer shortfalls listed in chapter three, the time involved can take several months. With 76% of engineer capability in the reserve component, there is simply not enough force structure in the active component to rapidly support more than one division at a time. The EAD units in both the active and reserve component have great challenges to overcome in the area of interoperability, digitization and force modernization. For the divisions to be effective, some of this capability must exist organic within the division organization.

[93] Ibid., 191-192.
[94] Ibid., 30.
[95] Ibid., 23.
[96] Ibid., 29.

CHAPTER 5 – Does Future Force Structure Improve Engineer Capability

Along with the rest of the Army, the Corps of Engineers is involved in a massive transformation designed to reshape the branch for future threats. The engineer branch leadership has developed a clear strategy to provide focus to the efforts. The three priorities are:

1. Focus primarily on mobility, countermobility, and survivability systems.
2. Continue integration of digital-terrain support through the current fielding schedule.
3. Take risks in general engineering by only sustaining and recapitalizing the existing capabilities.[97]

These very broad goals are proceeding through four parallel tracks. These tracks include recapitalization of the legacy force, Force XXI modernization of the Counteroffensive Corps, continued development of the Interim Brigade Combat Team (IBCT) and eventual fielding of the Objective Force.[9899] This chapter investigates how well the future force structures provide the full range of engineer support to the maneuver commander. The Objective Force design is not discussed because it is not developed enough to conduct a realistic assessment of its capabilities.

The research specifically looks at the Force XXI modernization and the Interim Force. The evidence demonstrates that both the Force XXI and Interim engineer designs have become overly reliant on mobility in order to conduct rapid decisive operations. They may not be well suited to face an asymmetric enemy that seeks to avoid engagement and focuses on unconventional or urban warfare.

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[97] CPT William R. Guevremont, "Engineer Force-Modernization Strategy," *Engineer* (May 2001): 4-5.
[98] Ibid.
[99] The US Army has identified the Counteroffensive Corps as a heavy corps capable of following medium forces into the theater and delivering the decisive blow. It is built around the existing III Corps and consists of the 1st CAV, 4th ID, 3rd ID, and the 3rd ACR.

Force XXI Engineer

Central to the Force XXI concept is the development of a smaller force that achieves increased lethality through enabling systems.[100] Conversion to the Force XXI division represents an attempt to modernize heavy forces through improved digitization and situational awareness. These improvements are designed to allow the force to operate over larger areas of the battlespace and defeat a technologically sophisticated enemy. This process began with the 4th Infantry Division at Fort Hood and now continues with the 1st Cavalry Division. The goal is to have a fully digitized Corps by FY 05.[101] This section looks at both the organization of the Force XXI engineer organization, improvements to their capability, and the challenges yet to be addressed by this modernization. It demonstrates that though there are some significant improvements to mobility, situational awareness and C2, the overall breadth of capability for divisional engineers is reduced.

Design for Force XXI Engineer Capability

The Force XXI division structure has some rather significant reductions in engineer manpower and equipment. The most obvious is that the engineer brigade headquarters is eliminated and replaced with a division staff section under the control of the Division G3. The loss of this brigade level headquarters has caused the engineer battalions to become organic to the three maneuver brigades. Within the engineer battalions, the new structure eliminates the battalion support platoons and reduces the number of sapper squads per platoon from three down to two.[102]

In the new structure, there are three separate combat engineer battalions. These engineer battalions consists of three combat companies and one headquarters company. The strength of

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[100] CPT Jason Kirk and LTC Jeffrey A. Bedley, "Transitioning to the Bradley," *Engineer* (May 2001): 19.
[101] MG Robert B. Flowers, *Prioritization Paper for Future Engineer Capabilities*, Internet, http://www.wood.army.mil/DCD/nolimits/ENDIV/prioritization_paper.htm. accessed 16 August 2001.

each battalion is reduced from 442 soldiers down to 312 in the latest Table of Organization and Equipment (FY 02 TOE).[103] The total divisional reduction in engineer personnel from the current design is 437 soldiers.

The Force XXI engineer line company structure is displayed in figure 5-1 below.

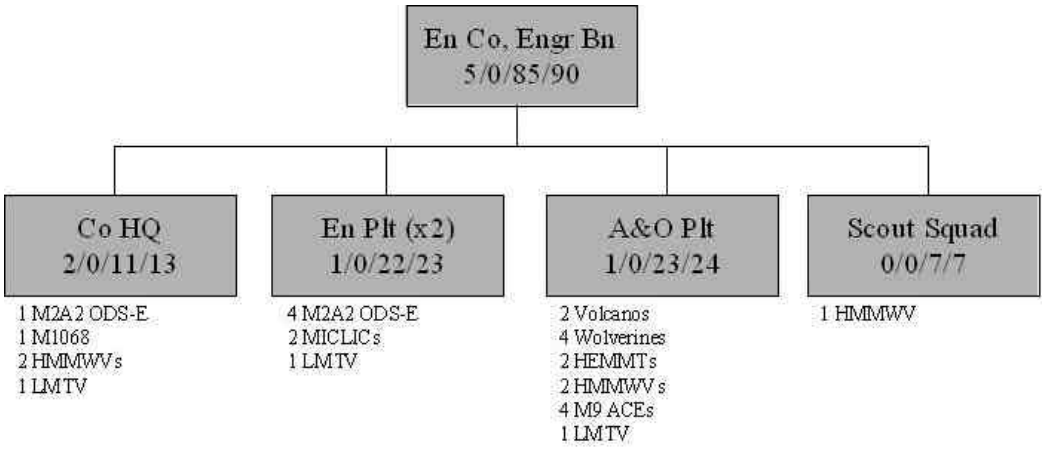

Figure 5-1, Force XXI Engineer Company [104]

Force XXI Improvements for Engineer Capability

All Force XXI units share significant improvements in the command and control systems. Engineer battalions received the Maneuver Control System (MCS) and Force XXI Battle Command Brigade and Below (FBCB2) System. To improve geospatial engineering support, the engineers are fielding the Digital Topographic Support System (DTSS).[105]

The most visible improvement to the engineer battalions came with the fielding of some long overdue modern equipment. The Engineer Bradley Fighting Vehicle (E-BFV) is replacing the old M113A3 armored personnel carriers as the engineer squad vehicle. This far more lethal

[102] Kirk and Bedley, "Transitioning to the Bradley," 19-20.
[103] Ibid., 19.
[104] Ibid., 21.
[105] The United States Army Engineer School, *Engineer Systems Handbook*, 31,37, 117-126.

and survivable platform gives engineers the ability engage in deliberate breach operations in more than just a reduction capacity. They can now secure the breach site with direct fire systems and take part in the far side attack.[106] The other significant equipment improvement is in the area of assault bridging. The AVLB is being replaced with the Wolverine Heavy Assault Bridge. This modern system is based on an M1 tank chassis with fully imbedded digital communications and command and control capabilities. It is able to keep up with the maneuver force and has a much lower profile than the AVLB during employment.[107]

Organizational and equipment changes have driven two major modifications to the way the engineer company is employed in task force operations. The first is that the engineer company can now function as the fourth maneuver element in the task force. With 9 E-BFV's, the engineer company capability has improved in all the elements of combat power.[108] The most notable improvements the E-BFV brings over the M113A3 are its firepower and survivability. The other employment modification is the use of engineer scouts. The engineer scouts are capable of employing dynamic obstacles and providing focused engineer reconnaissance that allows greater freedom of maneuver for the task forces.[109]

Force XXI Challenges for Engineer Capability

For the engineers, the Force XXI modernization has not provided all of the promised enablers to make it a more lethal organization. Program Budget Decision 745 issued by the Office of the Secretary of Defense on 27 December 1999 effectively killed the fielding of the most powerful piece of combat engineer equipment to be developed in years. The loss of the Grizzly complex-obstacle breaching vehicle removed the centerpiece of the engineer Force XXI modernization program. The Grizzly was designed to conduct rapid in-stride breaches of

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[106] Flowers, Prioritization Paper for Future Engineer Capabilities, Internet.
[107] Ibid.
[108] *FM 3-0 Operations* defines the Elements of Combat Power as Maneuver, Firepower, Leadership, Protection, and Information.

complex obstacles.[110] This vehicle was designed to save lives and equipment by eliminating the need for sappers to conduct time consuming manual or explosive breaches. The loss of an engineer squad in each platoon was a trade off for the addition of the Grizzly.

Without the Grizzly, the losses to the engineer company become significant in both personnel and equipment as a reduced number of sappers again become the primary asset for breaching operations. The number of engineer squads is reduced from six to four, which reduces the total number of dismounted sappers to just 28 in the engineer company. Half of the E-BFV's must pull MICLIC trailers into battle, which seriously degrades their mobility and the speed the squad can deploy out of the vehicle. The capability to conduct survivability missions is reduced by cutting the number of ACE's from seven down to four. While the scout squad seems to be a positive addition to the engineer company, its real purpose is as a personnel placeholder for the hopeful restoration of funding for the Grizzly.[111]

The loss of the engineer brigade headquarters provides additional challenges to the division. The division commander has lost the dedicated commander to coordinate engineer operations throughout the division area of operations. The engineer brigade headquarters also provided significant coordination and standardization to both leader and soldier training. In the tactical environment, the engineer brigade provided command and control to EAD units supporting the division. This requirement now falls upon an engineer group that is not habitually associated with the division.

Summary of Force XXI Engineer Design

The Force XXI engineer structure completely fails to address several of the six significant divisional engineer shortfalls outlined in chapter three. The problem of providing engineering capability to the entire division is worse in the Force XXI structure because all the

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[109] Kirk and Bedley, "Transitioning to the Bradley," 21.
[110] Flowers, Prioritization Paper for Future Engineer Capabilities, Internet.
[111] Kirk and Bedley, "Transitioning to the Bradley," 21.

engineers are organic to the maneuver brigades and must be re-tasked by the G3. There is still no organic general engineering capability in the division. This problem is further exacerbated by the complete reliance on non-digital engineer EAD units for this mission and no engineer brigade headquarters to coordinate their actions.

Though there have been improvements in mobility and combat power with the fielding of the E-BFV and the Wolverine, the sacrifices made to achieve these improvements outweigh the benefits. The loss of the Grizzly combined with the loss of sapper squads represents an alarming loss of force structure that cannot be easily countered with new equipment. The loss of 27 ACEs causes almost a 50% drop in survivability capability for the division. There continues to be no attempt to address the lack of river crossing assets or consolidation of countermobility assets.

When the Force XXI improvements and challenges are compared to the COE, the conclusion seems clear that though this modernization has many improvements, it still does not go far enough. This offensively minded force is not well rounded enough to respond to the variety of asymmetric challenges that the COE may provide.

Interim Force Engineer

As part of the U.S. Army Transformation, the Interim Brigade is designed to bridge the gap between the current legacy force and the Objective Force. The Interim Brigade Combat Team (IBCT) is designed as a full spectrum early-entry combat force, optimized primarily for small-scale contingency operations in complex and urban environments.[112] The first two IBCT's are currently being fielded at Fort Lewis, WA.

The engineer force structure within the IBCT represents a fundamental break from the structure in the heavy brigade. The typical heavy brigade has an engineer battalion in its force structure while the IBCT has only a company. This section looks at the engineer design within

the IBCT and investigates the improvements and challenges facing engineers in the implementation of this design. It also briefly looks at the potential engineer design for a proposed Interim Division (IDIV).

IBCT Engineer Design

In September 2000, Alpha Company of the 169th Engineer Battalion became the 18th Engineer Company of the first IBCT.[113] The complete organization of the IBCT engineer company is shown in figure 5-2 below.

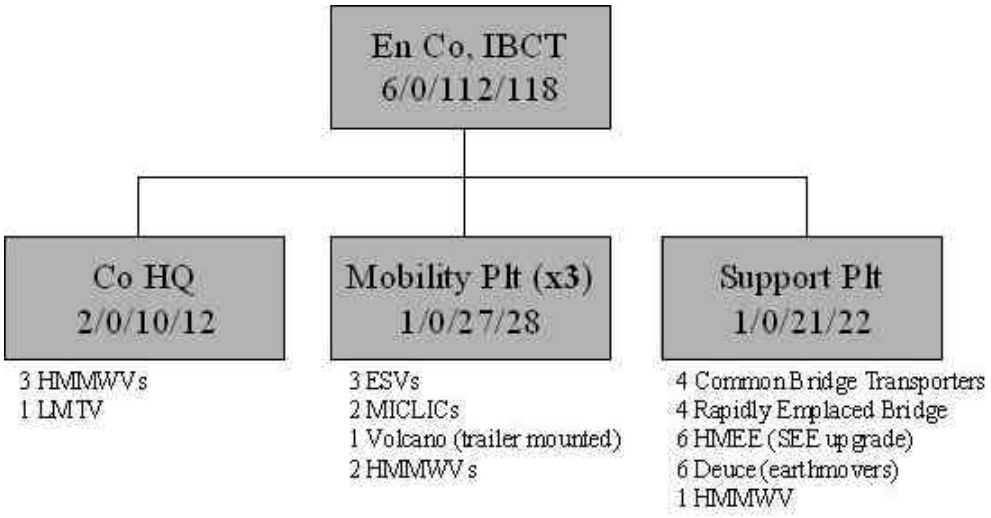

Figure 5-2, IBCT Engineer Company[114]

At first glance the IBCT Engineer Company resembles a motorized version of a light engineer company. The company has three combat mobility platoons that are habitually task organized with the three motorized infantry battalions. They are equipped with the engineer

[112] *Organizational and Operational Concept for the Interim Brigade Combat Team*, (TRADOC, Fort Monroe, VA: 30 June 2000), Chapter 1.
[113] MAJ Anthony O. Wright, "Concept and Organization of the IBCT Engineer Company," *Engineer* (May 2001): 6.
[114] Ibid., 8.

variant of the common infantry carrier and pull either mine clearing line charges (MICLIC) or a trailer mounted Volcano mine dispenser. The support platoon has four Rapidly Emplaced Bridge Systems (REBS) and the corresponding Common Bridge Transporters (CBT) that give the brigade capability to cross gaps of less than 14.3 meters.[115] The platoon also has six Deployable Universal Combat Earthmovers (DEUCEs) and six High Mobility Emplacement Excavators (HMEEs).[116] [117]

IBCT Improvements for Engineer Capability

The challenge in analyzing the improvements in this design is trying to decide what to compare the IBCT Engineer Company to. It is functions more like a light engineer company but has many of the capabilities of a heavy engineer company. The fact that this is a totally new organization may be the greatest improvement because it provides an engineer unit that is more robust than a light engineer company and is more rapidly deployable than a heavy engineer unit.

A conscious decision seems to have been made early in the development of the IBCT engineer capability to focus on mobility as the primary mission of the engineer company.[118] It is equipped with the full suite of enabling systems found in the Force XXI modernization program.

IBCT Challenges for Engineer Capability

The obvious emphasis on mobility has left the company lacking in their capability to conduct countermobility, survivability and general engineering missions. In the organizational and operational (O&O) concept, the designers dismissed this concern because they felt the IBCT

[115] The United States Army Engineer School, *Engineer Systems Handbook*, 119.
[116] Ibid., 29,93.
[117] For a detailed description of IBCT engineer organization, see the draft doctrinal manual FM 5-2. Department of the Army, *FM 5-2 Interim Brigade Operational Environment and Engineer Company Operations (Initial Draft)* (Washington, D.C.: Government Printing Office, not yet approved for publication), 1-7.
[118] Wright, "Concept and Organization," 8.

would only be used early in a conflict as a purely offensive force.[119] Survivability is maintained though enhanced mobility and improved situational awareness. If the IBCT becomes engaged in defensive operations or in stability and support operations, the engineer company requires significant augmentation from higher echelons.[120]

The brigade contains less engineer capability than its heavy force predecessor while maintaining many of the same requirements. The mine laying capability is reduced by 50%. The bridging capability is reduced from 12 bridges down to four. Blades to support survivability operations decreases from 21 down to six and are based on a much lighter platform that has limited effectiveness in hard and rocky soils.

In the realm of command and control, the IBCT engineer company provides far less capability and experience to the maneuver commander. Instead of a seasoned engineer battalion commander and a dedicated staff, the brigade engineer is now a captain with as few as four years of experience. The small company staff is expected to leverage new terrain and C2 technology to provide the brigade commander with the full range of engineering options. The addition of geospatial assets are added to the company without the expert knowledge provided by a terrain warrant officer.

IDIV Engineer Design

Though the IBCT's are designed for independent operation or to operate as part of a corps, there is a proposal to combine them into an Interim Division.[121] Imbedded in this proposal is an engineer organization that combines the IBCT Engineer Companies and adds three others to form a small engineer regiment. The proposed design for this regiment is shown in figure 5-3 below.

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[119] Ibid., 7.
[120] Ibid., 6-7.
[121] Interim Division (COA4) O&O Plan draft version 3.8 (14 Mar 01): 2-3.

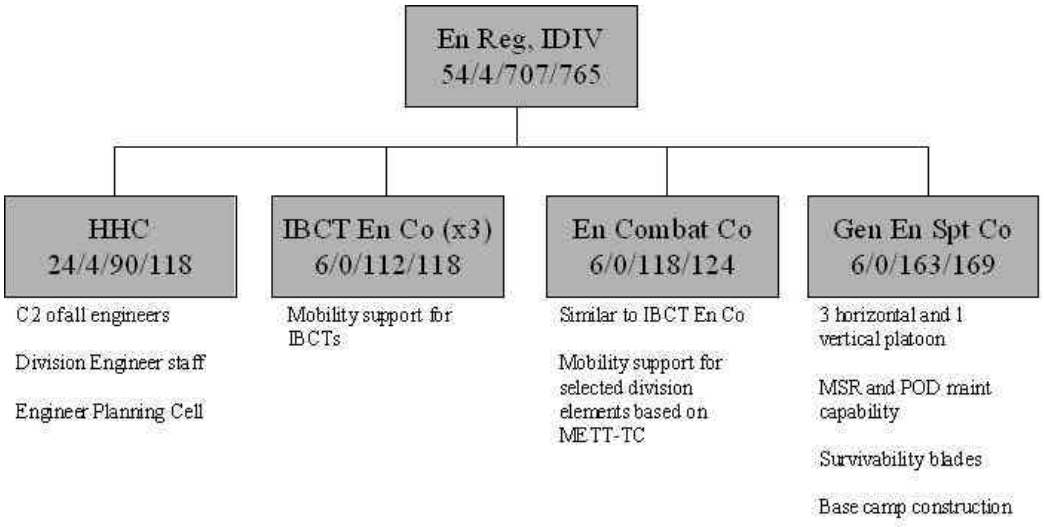

Figure 5-3, Proposed Engineer Regiment, Interim Division[122]

In addition to the three IBCT Engineer Companies, the regiment contains a headquarters company, an additional engineer combat company, and a general engineering support company. This organization goes a long way towards addressing the shortages associated with the IBCT. The engineer commander has the flexibility of an extra combat company to either weight the main effort or support elements that usually receive no support. This organization returns a divisional level engineer headquarters to the force and is the first to address the need for an organic general engineer capability. It still lacks an organic river crossing capability and continues to spread countermobility assets below the level of normal emplacement authority.

Summary of Interim Engineer Design

In the final analysis, the IBCT looks very much like a highly specialized early entry force that must keep moving to be effective. Like the Force XXI structure, the IBCT structure fails to address many of the shortfalls outlined in chapter three. It is designed solely to support maneuver and ignores other elements. There is no general engineering capability and very limited gap

[122] Ibid.

crossing ability. The proposed IDIV Engineer Regiment addresses many of the shortfalls but is still only in the concept phase and may never see implementation.

Summary of Force XXI and Interim Engineer Design

Both the Force XXI and Interim Force engineer structures have some improvements in mobility and combat power over its predecessors. The Force XXI structure and the IBCT structure fail to address many of the shortfalls outlined in chapter three. They are designed solely to support maneuver and ignore other elements of the division. There continues to be no general engineering capability and very limited gap crossing ability. The proposed IDIV Engineer Regiment does address many of the shortfalls but is still only in the concept phase. These offensively minded force designs are not well rounded enough to respond to the variety of asymmetric challenges that the COE may provide.

CHAPTER 6 – Summary and Recommendations

This investigation has sought to answer the question of whether of not the divisional engineers are capable of dealing with the current and future asymmetric threat environments. It has been made abundantly clear through this research that the answer to that question is no. This chapter briefly summarizes the issues raised in the previous chapters and provides a recommendation as to how engineers can be restructured at the division level to meet the new challenges and fill the shortfalls that currently exist.

Summary of the Findings

The investigation began with a discussion of the changes in the threat environment since the end of the cold war. It made the case for how the future threat will rely more on asymmetric warfare to counter U.S. military conventional overmatch. The Contemporary Operational Environment represented the most logical construct to evaluate the new environment. The seven principles of employment for the COE served as the basis for comparison to divisional engineer capabilities for future chapters.

The COE is a capabilities based threat that presents the division with many challenges that did not exist in previous threat environments. The fixation on mobility and situational awareness has left some significant engineering shortfalls that may adversely affect the division's ability to accomplish its mission. Chapter three demonstrated how the division might respond to the asymmetric principles of employment that are found in the COE. The analysis demonstrated several shortfalls in divisional engineer capability for each of the COE employment principles. These shortfalls were summarized into a list of the six most pressing issues in their order of importance. That list is shown again below to remind the reader.

1. Engineer capability is needed for the entire division. It is no longer adequate to dedicate all the capability to the maneuver brigades.

2. The division lacks an organic general engineering capability to deal with immediate problems of entry into the theater, repair of critical infrastructure nodes and maintenance of LOC's. This capability can also be used to improve the ability for the division to protect itself from the wide range of threat actions.
3. Though the capability to conduct mobility operations is still relatively strong in the division, there is a lack of modernization and redundancy for the platforms used by engineers. Engineers need a more survivable fighting vehicle than the M113 and an armored breach vehicle replacement for the retired CEV.
4. An organic river crossing capability is not purely a weakness demonstrated by the COE but has existed since the asset was removed from the division. This asset should be returned to the division organization to allow the enhanced mobility that modern doctrine calls for.
5. Geospatial engineering is powerful capability that is not present at the brigade level. One divisional team cannot meet all the requirements generated by the COE.
6. The Volcano's continue to be spread across the division AO. There is currently no organization designed to mass these assets. Threats exist across the division AO and the current organization is too distributed to be effective.

The chapter on the EAD engineer augmentation plan provided compelling evidence to indicate that this solution is not adequate in the modern environment. With the vast majority of engineer capability in the reserve component, there is simply not enough force structure in the active component to rapidly support more than one division operation at a time. The EAD units in both the active and reserve component continue have great challenges to overcome in the areas of interoperability, digitization and force modernization. The example of Desert Storm demonstrated that the one significant opportunity to exercise the EAD augmentation plan was far from effective. For the divisions to be more effective, some of the corps level capability should exist organic to the division organization.

Chapter five looked at the emerging force structures for the Force XXI division and the IBCT. Both the Force XXI and Interim Force engineer structures have a great many improvements in mobility and combat power over its predecessors. These designs however, fail to address many of the shortfalls outlined in chapter three. They are designed solely to support maneuver and ignore other elements of the division. There is no general engineering capability and very limited gap crossing ability. The proposed IDIV Engineer Regiment does address many of the shortfalls but is still only in the concept phase and may never see implementation. These offensively minded force structures are not well rounded enough to respond to the variety of challenges that the COE may provide.

Recommendations

With the evidence provided that the current and emerging force structure are not adequate in the modern environment, it is time to look for a new solution. The following two sections provide recommendations for the reorganization of both the heavy and light division engineer organizations. The last section briefly looks at the impact this reorganization has on the total engineer force structure.

Heavy Engineer Recommendations

The heavy division engineer structure should remain centered on an Engineer Brigade and not follow the example of the Force XXI Division. The headquarters continues to provide all of the functions that exist in the current organization. The proposed heavy engineer brigade is shown in figure 6-1 below.

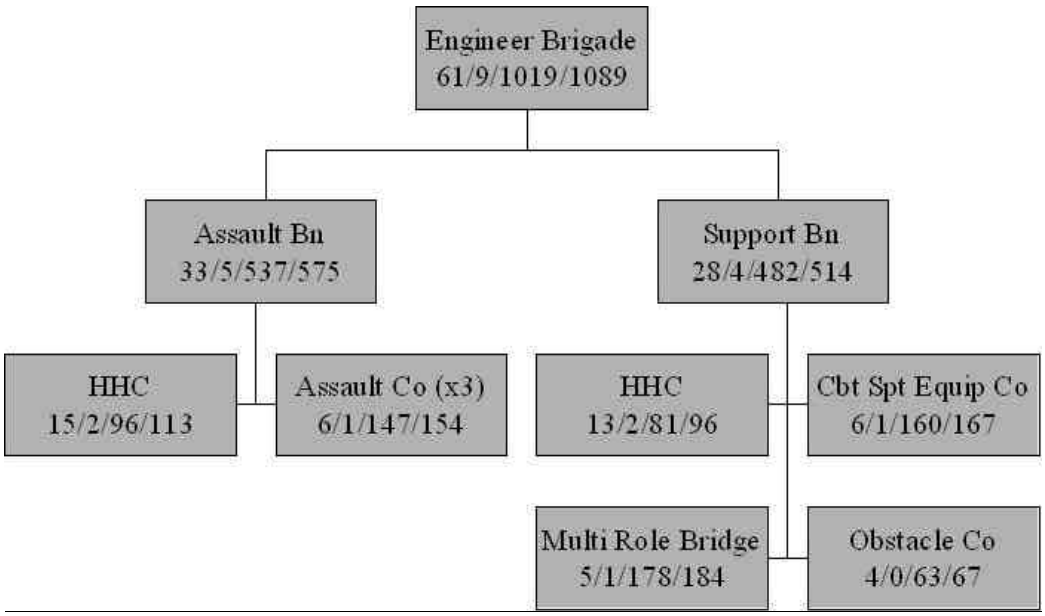

Figure 6-1, Proposed Heavy Engineer Brigade, Heavy Division

The engineer brigade needs a minimum of two engineer battalions. The proposed assault battalion combines the essential combat engineer capability that exists in the three combat engineer battalions currently in the heavy divisions. The engineer support battalion is a new organization that augments the shortages in engineer capability that has been discussed in great detail in chapters three through five. The intent is to provide the division with imbedded capability to accomplish all of the engineer battlespace functions with minimal augmentation from EAD. The following two sections go into greater detail about the organization, personnel and equipment in both the assault battalion and the support battalion.

Heavy Engineer Assault Battalion

The proposed engineer assault battalion consists of three line companies and a headquarters company. Each of the line companies supports a maneuver brigade. The battalion is larger than a current engineer combat battalion by 136 soldiers yet it fulfills the essential combat engineering roles of three of those battalions.

Within the Assault Battalion, the heavy engineer assault company is designed to be a powerful, mobility focused organization that provides the maneuver brigade capability to maintain momentum in most threat environments. The proposed organization of the company is shown below in figure 6-2.

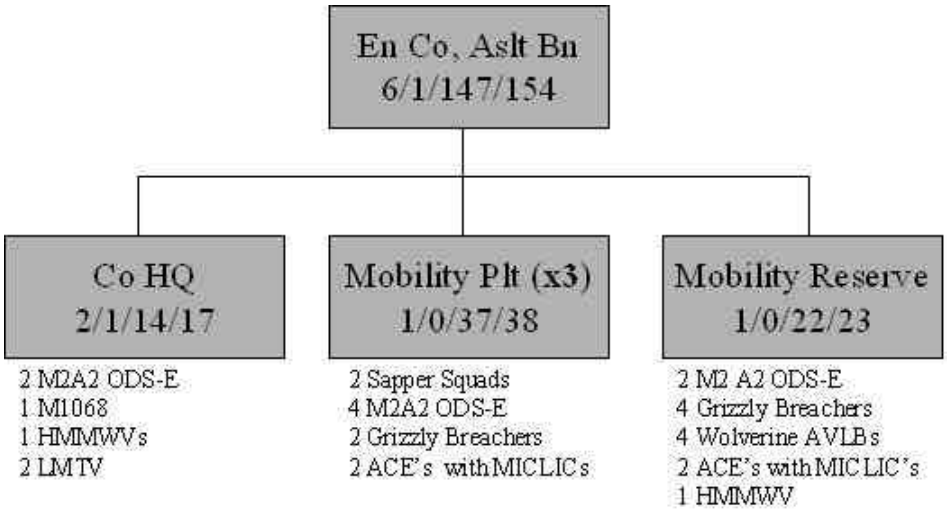

Figure 6-2 Proposed Heavy Engineer Assault Company

The heavy engineer assault company has the flexibility to be utilized in two ways. The first is to allocate the three mobility platoons to each of the task forces in the brigade giving them capability to conduct in-stride breaching across the brigade AO. The engineer company commander still retains a mobility reserve platoon to influence the fight when necessary. The other option is for the company to remain together and fight as a distinct maneuver element. This gives the brigade a dedicated deliberate breach force that can fight its way through complex obstacles. The mobility reserve platoon has the capability to support the direct support artillery battalion or other assets assigned to the brigade.

The company has the complete Force XXI modernization package. Sapper squads are mounted in the E-BFV giving them the same firepower and mobility of the task forces they support. There are two Grizzly's in each of the mobility platoons and four in the mobility

reserve. Four Wolverines in the mobility reserve gives the brigade the ability to cross 20 meter gaps. The ACE's can be used for survivability operations or pull MICLIC's to provide redundant breach capability. The only countermobility capability in this organization is for the sappers to emplace the new generation of dynamic mines.

The company commander is the brigade engineer. Though he is lacking the experience found the in current organization, he is provided with enough capability to focus on the primary mission of mobility. The commander provides and assistant brigade engineer staff element to function as his representative on the brigade staff. The company is also enhanced with a terrain warrant officer giving the brigade robust geospatial capability.

The heavy engineer assault battalion headquarters company is designed primarily to support the three assault companies. The battalion commander is the primary advisor to the engineer brigade commander on all combat engineering issues in the division. He can also act as an advisor to the maneuver brigades to augment the lack of experience the company commander may have. The proposed organization of the company is shown below in figure 6-3.

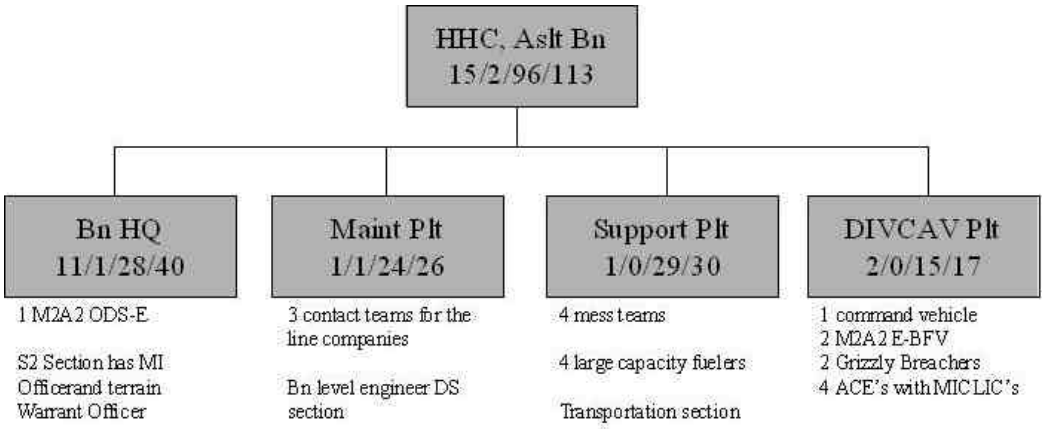

Figure 6-3, Proposed Headquarters Company, Assault Battalion

The company is organized into four platoon sized elements. The battalion headquarters contains the command group and all the staff sections. Significant to this design is the inclusion

of a Military Intelligence officer for the S2 section and a terrain warrant to provide robust geospatial capability to the battalion. The maintenance platoon is organic to the engineer battalion and has capability to provide three teams for the assault companies and retain an engineer direct support maintenance capability in the battalion. The support platoon provides cooks, fuel tankers and transportation assets to support the assault companies. The final platoon in the company is a combat engineer platoon designed to provide dedicated engineer support to the division cavalry squadron. The platoon is mobility focused with an enhanced C2 section to interface with the DIV CAV staff.

Heavy Engineer Support Battalion

The idea behind the heavy engineer support battalion is to provide a smaller version of an EAD engineer group. This battalion gives the division full control of float bridging, general engineering, and countermobility capability. It has three special purpose engineering companies and a headquarters company (refer back to figure 6-1). The following paragraphs describe the organization and functions of each company.

The engineer support battalion headquarters company is identical to the headquarters company in the assault battalion with the exception of the DIV CAV platoon. The battalion commander is the primary advisor to the engineer brigade commander on all general engineering issues in the division. The battalion's focus is primarily the general engineering requirements in the battlespace between brigades in a non-contiguous environment. This headquarters is designed to act as a C2 element for additional engineer units allocated from corps.

The obstacle company is a new approach to countermobility warfare and is an idea that has floated around the engineer community for some time. With the doctrinal focus on rapid mobility and reluctance to delegate scatterable mine authority below the division level, it seems a logical time to remove the Volcano mine systems from the brigades and consolidate them into

one organization that can rapidly achieve massed effects.. The proposed organization is shown below in figure 6-4.

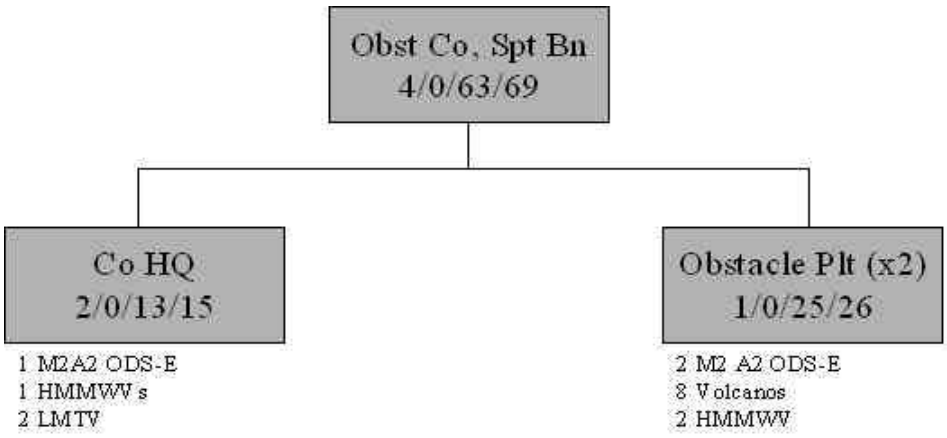

Figure 6-4, Proposed Obstacle Company, Support Battalion

The obstacle company has two obstacle platoons and a company headquarters. The platoons are capable of independent operation and each includes two E-BFV's to protect the Volcano's during transit and minefield emplacement. With eight Volcano's per platoon, the division has the capability to rapidly emplace entire obstacle groups to support division shaping operations. The company headquarters becomes the division countermobility coordination headquarters and is responsible for disseminating all obstacle information throughout the division.

The Multi-Role Bridge Company is a relatively new organization that had been developed as an EAD engineer unit.[123] This proposed engineer design moves the bridge company into the division under the control of the engineer support battalion. The company is equipped with the Common Bridge Transporter (CBT) truck and has the ability to emplace a number of different types of bridges based on the situation. The company has four medium girder bridge (MGB) sets for fixed bridging and 213 meters of assault float bridging.

[123] U.S. Army Engineer School, *ST 5-101-10 Unit Organizations and Structures*, 18.

The Combat Support Equipment Company (CSE) is another current organization that should be moved from the EAD level into the division.[124] It is designed primarily as a general engineering asset but also has the capability to perform survivability and countermobility tasks. The CSE provides engineer construction equipment to build, rehabilitate or repair landing strips, airfields, base camps, command posts, and other lines of communications.

Summary of Heavy Division Concept

The proposed heavy division design meets all six of the shortfalls outlined out in chapter three with almost 300 fewer soldiers and one less battalion than the current design. Engineer capability is provided to the entire division with the development of the support battalion to focus on non-maneuver elements. The support battalion also gives the division an organic general engineering capability and river crossing capability. It also consolidates the obstacle assets under division control to provide a more responsive unit capable of massing effects. In the assault battalion, the shortfalls in mobility and protection are overcome with the addition of a breaching vehicle and an upgrade to the E-BFV for sapper squads. Geospatial capability is improved by adding terrain teams to each of the maneuver brigades and one to the support battalion.

Light Engineer Recommendations

The proposed engineer design for the light divisions is a radical departure from the current organization. Similar to the heavy division, this proposal calls for the development of a two battalion engineer brigade to support the division. This means that the total engineer strength more than doubles from the current level of 410 soldiers to approximately 912 soldiers. The proposed organization is shown below in figure 6-5.

[124] Ibid., 23.

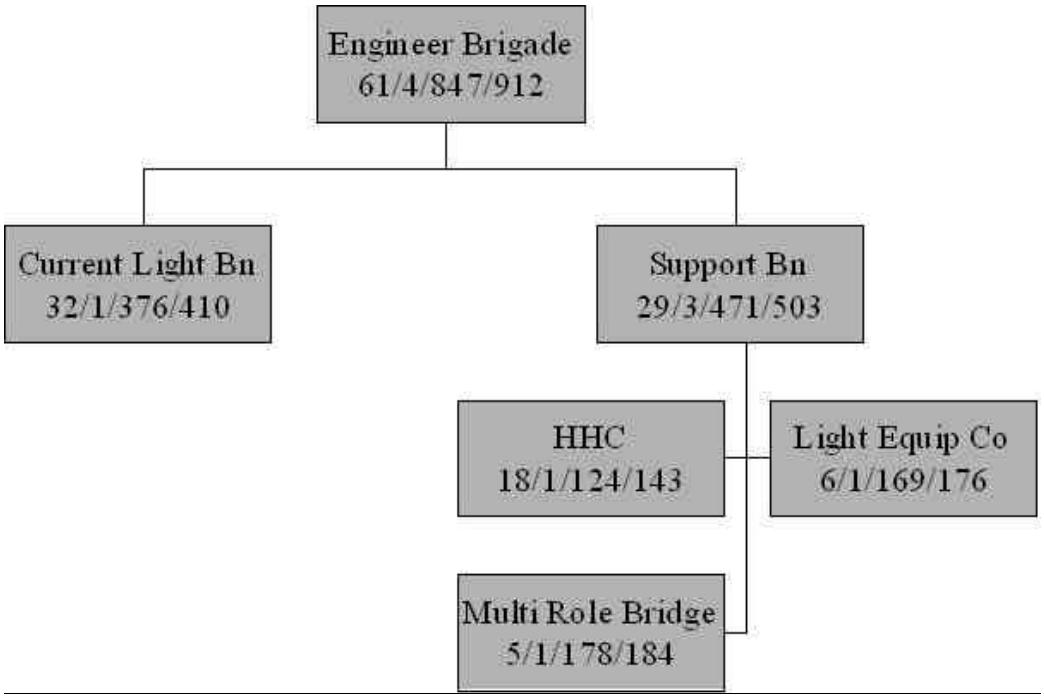

Figure 6-5, Proposed Light Engineer Brigade

The design proposal calls for the retention of the current light engineer battalion and the creation of a three company support battalion. The concept for the support battalion is similar to that of the heavy engineer brigade with the exception of the obstacle company.

The support battalion consists of a headquarters company, multi-role bridge company, and a light equipment company. The headquarters company is identical to its counterpart company in the light engineer battalion and has the capacity to provide C2 for any other assets assigned to the division from EAD. The multi-role bridge company is identical to its counterpart in the heavy design with the exception of the types of bridges it employs. The lighter version of the bridge company uses the new bridges being fielded for the IBCT which include the Heavy Dry Support Bridge or the newly developed lines of communication (LOC) bridge.[125] The light equipment company is a current organization designed specifically to give general engineering

[125] The United States Army Engineer School, *Engineer Systems Handbook*, 13,15.

support to light and early entry forces.[126] This proposal moves it from EAD level into the division.

Summary of Light Division Concept

The proposed light division design meets also overcomes the shortfalls that apply to their force structure. To accomplish this, the number of engineer soldiers in a light division has to more than double and an additional battalion must be added. The support battalion addresses all the shortfalls that the heavy division support battalion does with the exception of consolidating the obstacle assets. The light sapper battalion remains unchanged with the exception of adding a terrain team to provide additional geospatial capability. This design does not address improvements to the mobility shortfall because the engineer soldiers already have similar protection as their infantry counterparts.

Impacts on the Engineer Force Structure

At first glance, the recommendations in this chapter seem like a large increase in engineer force structure. The current engineer strength in the ten divisions is approximately 8,800 soldiers. With full implementation of the recommended designs, the engineer strength in the divisions would stand around 10,200 soldiers. The intent behind the new engineer design was to accomplish the changes with zero increase to the number of active component engineer soldiers. This is accomplished by moving capability within the active component from the EAD level into the division. This section briefly lays out the reorganization required to field six heavy engineer brigades for the six heavy divisions and four light engineer brigades for the four light divisions.

The first and possibly most difficult hurdle to overcome is the creation of several engineer brigades for the light divisions and the Force XXI division. At the EAD level, there are

[126] U.S. Army Engineer School, *ST 5-101-10 Unit Organizations and Structures*, 23.

two active component corps engineer brigades and three engineer groups all commanded by colonels with full staffs. These five commands should be re-flagged as the engineer brigade headquarters for the four light divisions and the Force XXI division. This re-flagging eliminates the controversial issue of creating new senior command positions. Responsibility for EAD C2 elements must now be moved to the reserve component where the vast majority of the assets reside.

The new design actually decreases the number of other subordinate command elements. The total number of engineer battalion commands in the divisions drops from the current level of 21 down to 20. Engineer company command positions in the divisions are reduced from 84 down to 76.

Providing the divisions with the needed special purpose engineer companies requires some tough decisions. To give all the divisions a multi-role bridge company requires moving all six of the existing active component companies into the divisions and creating four new companies. The same is true for the equipment companies. After all six of the active component equipment companies are moved to the divisions, there is still a requirement for four additional companies that do not currently exist. A possible solution for the creation of the four bridge companies is to disband the one remaining corps wheeled engineer battalion. To create the additional four equipment companies logically entails the redistribution of personnel and equipment from one of the seven combat heavy battalions.

For reorganization to be successful, a substantial investment in new equipment is necessary. The true test for success rests on the fielding of the Force XXI modernization packages and most importantly the Grizzly Breacher or a suitable substitute. While most equipment for the reorganization currently exists or has an adequate substitute, this is not true of the Grizzly. Full funding for the Grizzly is absolutely essential for the heavy division design to be successful.

Reorganization focuses on augmentation to division capability and less reliance on corps augmentation. After reorganization the EAD engineer capability consists of six combat heavy battalions and two mechanized battalions. This obviously requires significant new roles for the reserve component in the EAD mission.

Final Observations

As the world's only remaining superpower, the U.S. will likely have to intervene in a variety of conflicts all over the globe. Army forces will continue to be the decisive component in land warfare by deploying divisions to meet to global challengers. Global threats today are far more sophisticated and deadly in their approach to warfare. The Army must adapt quickly to the changing environment in order to counter adaptations that asymmetric enemies continue to make.

For engineers to remain relevant in today's division structure, they must be capable of providing the maneuver commander with the full range of engineer battlespace functions. The current and proposed designs are far too focused on mobility to the detriment of the other functions. The COE specifically targets assets that are not currently protected by current engineer capability. The engineer force must adapt now to meet the changes in the threat environment or risk becoming irrelevant.

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