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United States Army Engineer School
573-563-8080 / DSN 676-8080

COMMANDANT
MG William H. McCoy
563-6116
<william.h.mccoy@us.army.mil>

ASSISTANT COMMANDANT
BG (P) John E. Sterling, Jr.
563-6192
<john.e.sterling@us.army.mil>

REGIMENTAL COMMAND SERGEANT MAJOR
CSM Clinton J. Pearson
563-8060
<clinton.pearson@us.army.mil>

DEPUTY ASSISTANT COMMANDANT
COL Lou L. Marich
563-8080
<lou.marich@us.army.mil>

DEPUTY ASSISTANT COMMANDANT–USAR
COL Loretta Deaner
563-8045
<loretta.angela.deaner@us.army.mil>

DEPUTY ASSISTANT COMMANDANT–ARNG
LTC Steven K. Knutzen
563-8046
<steven.knutzen@us.army.mil>

CHIEF OF STAFF
LTC Alfred Pantano
563-7116
<alfred.pantano@us.army.mil>

TRADOC SYSTEMS MANAGER – ASSURED MOBILITY
COL Robert W. Nicholson
563-4081
<robert.nicholson@us.army.mil>

TRADOC PROGRAM INTEGRATION OFFICE–TERRAIN DATA
COL Thomas Crabtree
329-1908
<thomas.crabtree@us.army.mil>

COMMANDER, 1st ENGINEER BRIGADE
COL Bjarne Iverson
596-0224, DSN 581-0224
<bjarne.iverson@us.army.mil>

DIRECTOR OF TRAINING AND LEADER DEVELOPMENT
COL Paul W. Kelly
563-4093
<paul.w.kelly@us.army.mil>

DIRECTOR OF ENVIRONMENTAL INTEGRATION
Dr. Rebecca Johnson
329-1931
<rebecca.johnson1@us.army.mil>

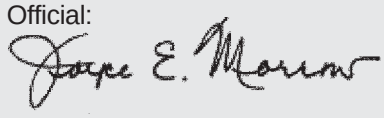
DIRECTOR OF FUTURES CENTER–ENGINEER
COL Richard M. Hornack
563-7955
<richard.hornack@us.army.mil>

HUMANITARIAN DEMINING TRAINING CENTER
Mr. Rodney A. Robideau
596-3870
<rodney.a.robideau@us.army.mil>

COUNTER EXPLOSIVE HAZARDS CENTER
LTC Kent D. Savre
593-8142
<kent.savre@us.army.mil>

By Order of the Secretary of the Army:
GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:



JOYCE E. MORROW
Administrative Assistant to the Secretary of the Army
0705307

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UNITED STATES ARMY ENGINEER SCHOOL

COMMANDANT
Major General William H. McCoy

MANAGING EDITOR
Shirley Bridges

EDITOR
Cheryl Green

GRAPHIC DESIGNER
Jennifer Morgan

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Back Cover: Engineer Soldiers performing vital missions.

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Clear The Way

By Major General William H. McCoy
Commandant, United States Army Engineer School



Greetings from Fort Leonard Wood to all of our Regiment's phenomenal Soldiers, civilians, families, friends, and loved ones. I'd like to begin by emphasizing how immensely proud and in awe I am with the demonstrated performance and potential of our engineer team to address and affect the spectrum of tough issues and challenges associated with training, transforming, rebasing, and caring for the Regiment while simultaneously fighting the Global War on Terrorism. It is truly a team effort that each of you has executed with the utmost professionalism, commitment, and passion despite the challenges, hardships, and resource limitations. Thank you for serving and leading during this dynamic, challenging, and rewarding time in the history of our Regiment. Your selfless and tireless service doesn't go unnoticed or unappreciated.

Our Army and Regiment are currently confronting a host of challenges associated with transforming while at war. As an example, as units address the personnel and equipment challenges associated with sourcing the operational Army, we must see through the immediate hardships and shortcomings that you consistently overcome, and focus on the long-term benefits of all your hard work. There is a lot of goodness in persevering through the challenges to achieve the end state of our Regiment. The USAES Fusion Cell efforts, which now include the Active Army and Reserve Component forces, are the pinnacle of much success. The Fusion Cell continues to serve as a key way to affect transformation, rebasing, and sourcing the war. I appreciate your participation in these efforts and ask for your continued support. I would like to recognize all the great adaptive and persistent leaders who work tirelessly to this end every day, to include notably the teams of engineers at the Pentagon, FORSCOM, and HRC who address some of the toughest issues daily. Thanks for what you do for the Regiment.

Early this summer, we will celebrate the accomplishments of the Regiment with the annual Regimental Engineer Force (ENFORCE) Conference 2007. Block your calendar dates for 20-24 May 2007, and join the engineer community's military and civilian leaders (retired and active), the Army Engineer Association, and commercial industry at St. Louis and later at Fort Leonard Wood. This conference provides Soldiers and leaders an opportunity to participate in working groups intended to identify force issues and develop solutions, exchange and disseminate critical information, build and reinforce long-term relationships, and recognize and honor the accomplishments and sacrifices of units and members of the Regiment. A spouse agenda is planned throughout ENFORCE to provide exchange opportunities amongst spouses.

Also during ENFORCE, we will dedicate the newly constructed $10 million Counter Explosive Hazards Center building in memory and honor of SFC Paul R. Smith, Medal of Honor winner, 11th Engineer Battalion, 4 April 2003. The facility provides state-of-the-art technology systems and facilities for counter IED functions and instruction of students participating in a myriad of counter IED training. This new facility absolutely exemplifies our nation's and Army's commitment and investment in safeguarding and protecting our service members. Our Regiment remains incredibly committed to this important effort to defeat this current and emerging threat to our forces.

In recent weeks, our Army experienced a spike in needless injuries and deaths of Soldiers and families, most prominently due to motor vehicle and motorcycle accidents. I urge engineer Soldiers and leaders at every level to incorporate composite risk management techniques into efforts to protect and safeguard yourselves, your Soldiers, family members, and loved ones. Wear your seatbelts at all times, follow the laws of the road, don't drink and drive, and act responsibly always. Demand and support the same with your fellow Soldiers, families, and loved ones. Our Army, nation, and Regiment need you on the team. And your families and loved ones need you in their lives. Take care of yourselves and each other.

Finally, continue to remember our Soldiers, civilians, families, and loved ones who made enormous, and in some cases ultimate, sacrifices in the service of our nation. Please commemorate and reflect on their service and sacrifices, and join me in keeping our brave deployed service members and their families at home foremost in our efforts, thoughts, and prayers.

Lead The Way

By Command Sergeant Major Clinton J. Pearson
United States Army Engineer School



Since the last Lead the Way article, I have traveled to several installations, and I truly enjoyed visiting with the Soldiers of the Regiment and being immersed in the uniqueness of the many organizations and missions we have in our branch. You can say that I'm biased, but our Soldiers are the greatest in the Army. We are blessed with talented officers and noncommissioned officers who competently lead our Soldiers through the varied and complex missions our Army expects us to execute.

ENFORCE 2007. Conference time is fast approaching, and the theme this year is *Engineers in Full-Spectrum Operations*. I hope that you are looking forward to spending this week renewing friendships and resolving issues as we focus on our full-spectrum engineering capability in support of our Army. I also want to address some issues that will shape the focus of the Council of Command Sergeants Major (CSMs) and generate what I'm sure will be lively discussion among our senior leaders.

The conference will be filled with extraordinary events and social activities in both St. Louis and Fort Leonard Wood, to include vendor displays, the Regimental review, a barbecue, an Army Engineer Association luncheon, and unit plaque dedications. The conference will culminate with the annual Regimental dinner, where we will recognize our 2007 Itschner, Sturgis, and Grizzly winners; the Honorary Colonel of the Regiment, Honorary Command Sergeant Major, and Honorary Warrant Officer; along with our Best Sapper Competition winners. I don't have to remind you of the importance of this week to our Regiment as we continue to *Train*, *Transform*, and *Take Care of the Regiment*, which continues to be restructured to meet the demanding challenges of the future. We truly need to hear input from the field. Among the topics covered will be ARFORGEN challenges, IED-D updates, and base camp engineering issues. The complete agenda is on the ENFORCE site of the Engineer School home page.

NCOES. As our Regiment continues to support the Global War on Terrorism, we still strive to provide our NCOs with the quality training they need. These courses would not be successful or relevant without well-qualified, motivated instructors and small-group leaders (SGLs). It is extremely important to fill these critical instructor and SGL positions with highly qualified NCOs just returning from operations in support of the war. NCOs returning from operational assignments, who are looking for a challenging and career-enhancing opportunity, should consider an assignment at Fort Leonard Wood.

Modularity. In January, the 11th Engineers activated at Fort Benning, Georgia, and in February the 14th Engineer Battalion converted from a Corps Wheeled Engineer Battalion to a Modular Engineer Battalion (Combat Effects). The 14th is comprised of two Sapper Companies and one Equipment Support Company. The 16th Engineer Battalion is preparing to move to Fort Hood, Texas, where it will be reflagged and become the 8th Engineer Battalion. The 5th Engineer Battalion at Fort Leonard Wood is scheduled to convert to a Combat Effects Battalion in May. It will consist of two Mobility Augmentation Companies (the 55th and the 509th), one Sapper Company (the 515th), one Forward Support Company, and a Headquarters Support Company. The 130th Engineer Brigade will relocate from Germany to Fort Lewis, Washington, in June. In October, the 29th Engineer Battalion will be reflagged to the 65th Engineer Battalion, and then the 65th and 84th Engineer Battalions will convert to the modular design.

Along with my firsthand observations, I routinely receive e-mails and calls on the great support and effort our Soldiers provide to installations and missions all over the world. I am extremely proud of all that you and our Soldiers represent. We have a common factor that's evident in all of our organizations: We are all extremely busy and feverishly working to accomplish the missions of our Army and nation. From shaping doctrine and design of our organizational mission and structure to supporting the efforts related to Operations Noble Eagle and Enduring Freedom, engineers are completely integrated and involved.

Finally, continue to focus efforts on the Global War on Terrorism, maintaining high standards and leading the way as engineers do. May God bless the fallen comrades and keep watch over our sons and daughters as we continue to fight the fight.

Essayons—Engineers Lead the Way!



Revising Engineer Keystone Manual for Full Spectrum Operations

By Lieutenant Colonel Edward Lefler and Lieutenant Colonel Barry Supplee (Retired)

Field Manual (FM) 3-34, *Engineer Operations*, which has been revised many times over the years, will soon be revised again. Last published in January 2004, the intent of this 21st edition is to update keystone doctrinal guidance for full spectrum engineer operations and support the new FM 3-0, *Full Spectrum Operations*, to be published in the near future. (FM 3-0 is one of the two Army keystone manuals; FM 1, *The Army*, is the other one). FM 3-34, the engineer keystone manual, also supports joint engineer doctrine in the upcoming revision of Joint Publication (JP) 3-34, *Joint Engineer Operations*, and serves as a reference document for commanders and staff, leaders, training developers, and doctrine developers throughout the Army and the joint, interagency, and multinational community.

Evolution of FM 3-34

While many remember that FM 5-100, *Engineer Combat Operations* (previously *Engineer Operations*) preceded FM 3-34, the full story and history behind this key reference material isn't fully known to most.

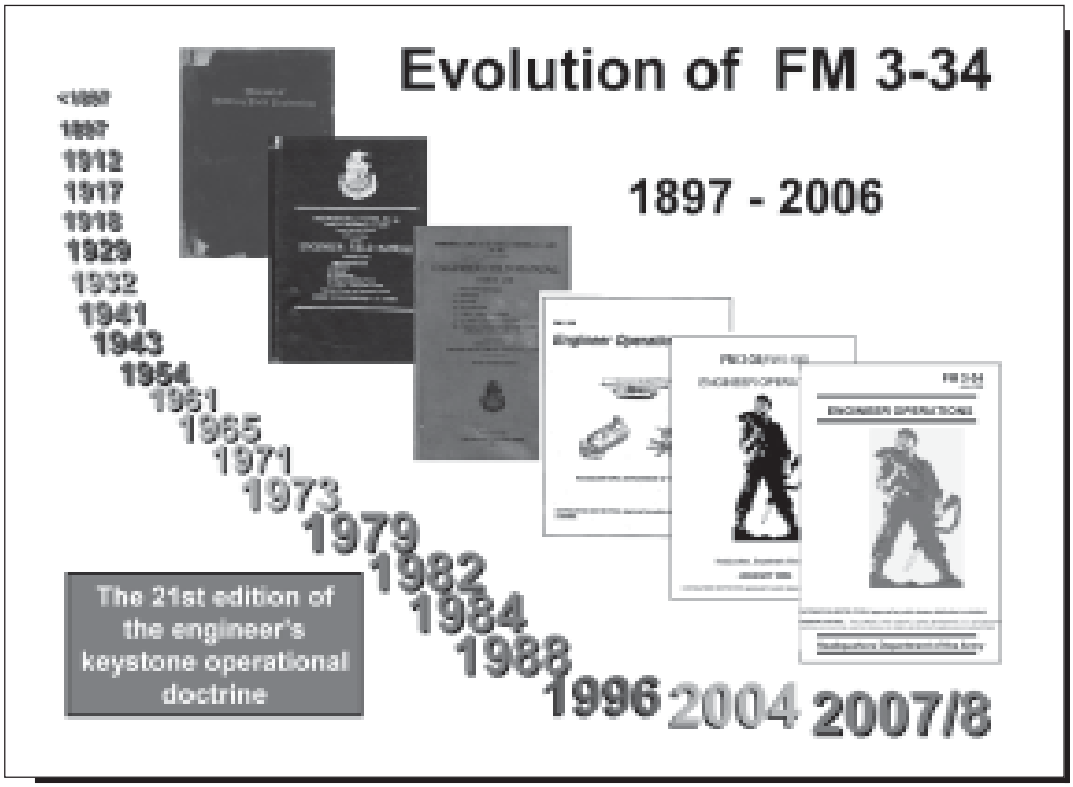
FM 3-34 was first published as the *Manual of Military Field Engineering* before 1897, and the second edition was published in August 1897. The material was prepared by the Department of Engineering at the Infantry and Cavalry School by a Captain William D. Beach, 3d Cavalry. In those days, it was printed by a civilian publishing company with the expectation that engineers would buy it at their own expense.

In 1912, it was printed as professional papers by the Chief of Engineers and simply entitled *Engineer Field Manual, Part I* through *Part VII*, and was revised in 1917 and 1918. The parts were as follows:

- I - Reconnaissance
- II - Bridges
- III - Roads
- IV - Railroads
- V - Field Fortifications
- VI - Animal Transport
- VII - Tables and Reference Data

The first numbering of the field manual (the field manual designation) occurred during the period between World War I and World War II. The August 1929 version—FM 5-5, *Engineer Field Manual, Volume I* and *Volume II*—contained information on engineer troops (Volume I) and military field engineering (Volume II). It was revised in 1932 and 1941.

Before World War II, there were very few manuals throughout the Army. The basic engineer field manual, like many others, was general in context and content. It was expected that units would train and develop their own detailed tactics, techniques, and procedures (more generally called standing operating procedures [SOPs]) to accomplish specific tasks. With the mechanization and expansion of the Army during World War II, and the lack of time for units to individually "mature" doctrinally, it was imperative that manuals become more detailed. This was when the development of specific manuals on river crossing, route reconnaissance, explosives, and demolitions began. In essence, field manuals were moving toward being more "how-to" than general in nature. Also before and during World War II, most field manuals were pocket-size with the expectation that a unit leader, officer, or noncommissioned officer would carry them around.



Being pocket-size also made it easy to keep the manual in a field locker or field desk.

In 1943, as the material grew in content and nature, FM 5-5 was split into two manuals: FM 5-5, *Engineer Field Manual: Engineer Troops*, published in October 1943, and FM 5-6, *Engineer Field Manual: Operations of Engineer Field Units*, published in April 1943. FM 5-5 and FM 5-6 were revised in May and August of 1954 respectively. In May 1961, the two manuals were combined into one again and changed to FM 5-1, *Engineer Troop Organizations and Operations*, and later revised in 1965, 1971, and 1973. In March 1979, the designation and title were changed to FM 5-100, *Engineer Combat Operations*, and it was later revised in 1982, 1984, 1988, and 1996. In 1996, the title was changed again to *Engineer Operations*. The current published version (January 2004) is still titled *Engineer Operations*, and its designation changed to FM 3-34 as the Army adopted the joint and North Atlantic Treaty Organization doctrinal hierarchy system for its numbering system.

Current Revision of FM 3-34

The Doctrine Division at the United States Army Engineer School is leading the development of the revised manual. The development team includes writers who are former engineer officers, subject matter experts from the Engineer School and around the Regiment, as well as the community of combined arms doctrine developers who review and comment on the drafts. Senior engineer leader input from across the Regiment is critical to the development of the manual.

Early in the revision process, a targeted working group of senior engineer leaders was created that provides guidance and ensures that all relevant information is identified and included. They initially corresponded through e-mail and Army Knowledge Online (AKO), but assembled with other key engineer leaders at Fort Leonard Wood in December 2006 for a Council of Colonels. The first council resulted in formulating and confirming the initial guidance for the writing team and the development of the detailed strawman for the table of contents and the program directive.

While the field manual doesn't seem that old, significant content and material changes are needed because of significant operational experience through our participation in the Global War on Terrorism, current operations in Afghanistan and Iraq, and other worldwide operations such as those in the Philippines and during Hurricane Katrina relief. Evolving policy and doctrine, coupled with joint and Army transformation that impacts on the Engineer Regiment, led to the development of the modular engineer force structure that we have converted to. Our doctrine and other key joint and Army manuals (recently revised or under revision) need to be synchronized with increasing focus and emphasis on stability, coupled with the recognition that the Army conducts simultaneous full spectrum operations. This impacts conducting multiple operations simultaneously with distinctly different objectives on forces in the field, the revised force structure and how it is employed, and the modified way that the Army conducts its

operations. The battlefield operating system (BOS) construct was deleted, and Army warfighting functions (WFF) were developed, making it necessary to update assured mobility.

Because of these changes, this revision will link from the three engineer functions of combat, general, and geospatial engineering to the six warfighting functions. These functions (first introduced in FMI 5-0.1, *The Operations Process*) replace the BOS construct and link to the joint functions in the new FM 3-0, and will be reflected in a soon-to-be-revised version of FM 7-15, *The Army Universal Task List*. The revised FM 3-34 will highlight and describe the critical engineer staff integration at all echelons and the importance of functional as well as multifunctional command and control for engineer elements. The manual recognizes the transformation to a modular brigade combat team (BCT)-focused Army and describes engineer capabilities within that context. In conjunction with these changes, the manual also updates integration into the Army and joint planning processes, to include considerations in the rapid decision-making and synchronization process (RDSP).

This revision will complement and integrate other recent and ongoing doctrinal updates within the engineer doctrine proponency as follows:

- Engineer reconnaissance (FM 5-170, *Engineer Reconnaissance*, will be republished as FM 3-34.170/MCWP 3-17.4) and the related infrastructure reconnaissance.
- Explosive hazards operations (FM 20-32, *Mine/Countermine Operations*, will be republished as FM 3-34.210).
- Gap (river) crossing operations (FM 90-13, *River Crossing Operations*, will be republished as FM 3-90.12/MCRP 3-17.1).
- Survivability operations (FM 5-103, *Survivability*, will be republished as FM 3-34.300/MCWP 3-17.6).
- General engineering operations (FM 5-104, *General Engineering*, will be republished as FM 3-34.400/MCWP 3-17.8).
- Environmental considerations (FM 3-100.4, *Environment Considerations in Military Operations*, will be republished as FM 3-34.500/MCRP 4-11B).

These other updates to doctrine are scheduled to be complete and available on AKO within the next six months.

Framing the Revision

The December 2006 Council of Colonels validated a basic framework for the revised FM 3-34 and confirmed the soundness of the writing team's initial outline and plan for the production of this keystone document. The manual will be framed in two major parts:

Part I

Part I is focused on linking engineer operations to the full spectrum framework identified in FM 3-0 and JP 3-0 and is targeted for a combined arms audience for a better understanding of what engineers bring to the fight and how to maximize those capabilities.

- Chapter 1 answers the question "Why do we need Army engineers?" and describes the implications of the operational environment and their focused effect on engineers.
- Chapter 2 answers the question "Who provides engineering?" and describes the Regiment as well as joint, interagency, and multinational engineer capabilities. A discussion on the United States Army Corps of Engineers® (USACE) will be included.
- Chapter 3 answers the question "What are engineer operations?" and describes foundations of engineer operations, including principles, functions, integration requirements, and other primary considerations for engineers.

Part II

Part II provides more of the "how-to" of engineer operations, but remains within the framework of FM 3-0. This part is targeted more for an engineer audience and discusses specific engineer roles, functions, and techniques:

- Chapter 4 answers the question "How do we plan?"
- Chapter 5 answers the question "How do we execute (full spectrum operations)?"
- Chapter 6 answers the question "How do we sustain (our engineer elements)?"

Currently, it has been identified that ten appendixes should be developed for the manual:

- Appendix A – Civil Support Considerations
- Appendix B – Selected Combat Support Organizations and Organic Engineer Staffs
- Appendix C – Field Force Engineering and USACE Capabilities
- Appendix D – Army Engineer Organizations and Capabilities
- Appendix E – Sister Service Engineer Organizations and Capabilities
- Appendix F – Civil Affairs, Multinational, Interagency, Nongovernmental Organization, and Host Nation Considerations
- Appendix G – Contract Construction Agents
- Appendix H – Contingency Authorities and Funding
- Appendix I – Explosive Ordnance Disposal Organizations and Functions

(Continued on page 41)

The Theater Engineer Command – It's Not Your Legacy ENCOM Anymore

By Major General Robert J. Williamson and Lieutenant Colonel Adam S. Roth

A question that is constantly heard around our Regiment and our Army is, "What exactly does an ENCOM do?" Or better said, "I saw something about the ENCOMs in 'The Engineer Blast,' but what do you guys really do?" In years past, many Soldiers would quickly associate an ENCOM with conferences in the major warfighting theaters and, of course, the unforgettable catfish luncheons associated with them in Vicksburg, Mississippi, or the impressive facilities at the Argonne Laboratories in Darien, Illinois.

In the past, the two engineer commands (ENCOMs) have assumed the role of theater engineer, but primarily in support of the Army Service Component Command (ASCC) headquarters. Although a recent 416th ENCOM commander and a majority of his staff—as well as the commander of the 412th ENCOM—have deployed to Iraq during Operation Iraqi Freedom, the ENCOM has been a 226-Soldier headquarters that has not had conditions set for the mobilization of an entire ENCOM since Operations Desert Shield and Desert Storm, due to its large size and rank structure. That moniker has been relegated to the era of "your legacy ENCOM." The purpose of this article is to show—

- The unprecedented change that is occurring to both ENCOMs, as driven by a Department of the Army (DA) Initiative.
- The command and control of units for which the ENCOMs are now responsible in generating forces to support the Global War on Terrorism (GWOT).
- The evolution in support to the geographic combatant commanders (GCC).
- The leadership role that the ENCOMs are playing in the transformation of the Regiment while at war.

Background

For purposes of this article, the term "ENCOM" refers to both the 412th and the 416th ENCOMs. Although the authors are more familiar with the 412th ENCOM, many similarities may be found between the two.

The 412th ENCOM is a United States Army Reserve (USAR) unit, nestled in the historic Mississippi town of Vicksburg, along the Mississippi River. For more than a decade, it has served primarily as a wartime command and control headquarters, supporting the United States Army Europe (USAREUR) and Seventh United States Army in Germany; the Eighth United States Army (EUSA) in the Republic of Korea; and the United States Army Pacific (USARPAC), headquartered in Hawaii. The 412th provides support to the GCCs along four lines of operation:

- Enable stability operations with engineer capability
- Protect the force
- Provide engineer intelligence and knowledge management
- Sustain the force

The 416th ENCOM, based in Darien, Illinois, also a USAR unit, has primary responsibility for wartime support of the United States Southern Command (USSOUTHCOM) and United States Central Command (USCENTCOM) areas of responsibility.

Together, the two ENCOMs form the only two-of-a-kind units in the entire Army force structure. Both units are under the operational control (OPCON) of the United States Army Corps of Engineers® (USACE) through a formal Memorandum of Agreement. Both ENCOMs supported hurricane relief under USACE in the wake of Hurricane Katrina, through the Mississippi Valley Division, in both Louisiana and Mississippi. That relief work, and support to Emergency Support Function 3 under the National Response Plan, continues to this day.

TEC Transformation

In close cooperation with USACE as the lead agency, the ENCOMs are actively engaged with the United States Army Engineer School to implement DA Initiatives 18, 23, and 24:

- Initiative 18 is to establish and provide base operations capabilities to support the operational Army in a contingency environment.

- Initiative 23 is to establish a theater engineer element and the processes needed to plan, train, and deploy in support of an ASCC.
- Initiative 24 institutionalizes and improves the responsiveness and readiness of civilian capabilities in support of the ASCC.

Both ENCOMs—in conjunction with USACE—have exercised the implementation of those initiatives through the Castle Quest series of exercises held in the National Capitol Region. The Castle Quest exercise is a tabletop scenario based in a joint, interagency, and multinational (JIM) environment. Once approved, DA Initiative 23, *Theater Engineer Command (TEC)*, will transform both commands from the legacy-based ENCOM structure to a TEC.

Each of the respective commodity areas are represented in the legacy force structure (G1-G8). The challenge has always been, as has been the case with much of the Regiment's force structure, that the United States Army Forces Command (FORSCOM) would either have to mobilize the entire command for a contingency or create a derivative unit identification code for a unit that may possess only a portion of the ENCOM's capability. Currently working through the force development update (FDU) process, DA Initiative 23 would serve to formally establish the TEC, replacing the former ENCOM organization. The TEC will have a main element of approximately 99 Soldiers, commanded by a major general, to form the nucleus for force generation. The main element serves as a platform for command and control for two deployable command posts (DCP) each consisting of roughly 62 Soldiers. The DCPs are led by a colonel or potentially a brigadier general, depending on the factors of mission, enemy, terrain and weather, troops and support available, time available, and civilian considerations (METT-TC). Under the DCP, the staff is aligned in effects-based groupings of combat, construction, and sustainment effects. This new modularity allows the TEC to be deployable in smaller subsets, while maintaining scalable capability in support of the warfighting commander.

The DCP can assume command and control of various specialty "plugs" that it would receive from USACE, such as a contingency real estate support team (CREST), one or more forward engineer support teams (FESTs), or other modified table of organization and equipment (MTOE) units such as a facility engineer detachment or a construction management module. This structure further demonstrates its flexible tailorability to match the requirements of a given contingency. Having two DCPs in each of the ENCOMs provides the ability to either engage at two separate echelons of command simultaneously, such as at the GCC and ASCC levels, or to provide four total DCPs that could be placed in the Army Force Generation (ARFORGEN) Model and deployed in phases. The TEC concept is continuing the FDU process and has already received input from all Army major commands, as well as the Engineer School, USACE, and the 412th and 416th ENCOMs. A decision for the final composition will be made soon.

Command and Control in CONUS

The 412th ENCOM, under the United States Army Reserve Command (USARC), is playing a key role in Army Reserve Command and Control (ARC2) transformation. USARC, under its Millennium Transformation Plan, is standing down the majority of its two-star peacetime command and control headquarters, called regional readiness commands (RRCs), in support of creating four regional readiness sustainment commands (RRSC) across the country.

These RRSCs will be responsible for the base operations functions for all units within their geographic footprint. The units once commanded by the RRCs will now fall under operational and functional commands, that share both a Title X support mission to their respective downtraces as well as a responsibility to maintain their own go-to-war mission. Consistent with the USARC Transformation Plan, the 412th ENCOM is considered an operational command—essentially a senior USAR command headquarters with both engineer and nonengineer units assigned. The driving reason for the shift in emphasis on the USAR operational and functional commands is to ensure training and readiness oversight (TRO) of Soldiers with similar missions, as well as the efficient mobilization of its community-based, skill-rich Soldiers and units to support the joint warfighters whenever needed—anywhere in the world.

As one of the first senior USAR operational and functional commands to lead the USARC transformation, the 412th ENCOM assumed command and control of the new 926th Engineer Brigade on 1 October 2006. The 926th, headquartered in Montgomery, Alabama, also is transforming from a legacy engineer group structure to a brigade during this transition. The concurrent restructuring of the 926th, while shifting senior command relationships and assuming command of seven new USAR engineer battalions during a time of war, further exemplifies the true nature and depth of transformation within our Regiment. The 926th's USAR span of control extends from West Virginia to Florida, and west to the Mississippi River.

The 412th ENCOM will also assume command and control of two additional brigades by the end of this fiscal year. As of 1 October 2007, the 411th Engineer Brigade—based in New Windsor, New York, and currently deployed in support of Operation Iraqi Freedom with four battalion equivalents—will fall under the 412th ENCOM umbrella. The 412th will also stand up the 302d Combat Support Brigade (Maneuver Enhancement) (CSB [ME]) at Westover Air Reserve Base in Massachusetts. The 302d CSB (ME) will contain at least three battalion equivalents, including an engineer battalion, a chemical battalion, and a military police battalion. The geographic endstate of the 412th ENCOM footprint will extend from the tip of Maine to the tip of Florida and west to the Mississippi River. Similarly, during mid-January 2007, the 416th ENCOM assumed OPCON of the 420th Engineer Brigade in Bryan, Texas, and will soon provide command and control for an additional USAR engineer brigade and virtually all USAR engineer units west of the Mississippi River.

"The 412th ENCOM is forging strategic alliances...to anticipate requirements necessitated by transformation and focus targeted individual and collective training requirements on a command-wide scale."

Force Generation and GWOT Support

The headquarters of both ENCOMs have provided modules of task-organized Soldiers at the operational level in support of the GWOT since the start of the campaign. Soldiers from the 412th headquarters have supported USAREUR, operating as the Office of the Deputy Chief of Staff, Engineer (ODCSENGR), in multiple rotations. Additionally, the 412th has deployed its Soldiers to support several rotations for the Multinational Force–Iraq, and continues to support the USACE Gulf Region Division and its subordinate districts. The 412th will continue to provide these modular capabilities while performing its ARC2 command and control responsibilities. The 416th ENCOM is currently preparing to mobilize Soldiers from its headquarters to replace Soldiers from the 412th supporting the Gulf Region Division headquarters in Iraq.

As previously stated, under the new ARC2 arrangement, the ENCOMs will be responsible for TRO of their downtrace units as they progress through the ARFORGEN cycle. The 412th ENCOM, in conjunction with the 416th ENCOM and USARC, are jointly developing challenging gate exercises as units leave the *Reset/Train Pool* and enter the *Ready Pool* through certification in a warrior exercise (WAREX). The 412th ENCOM currently has responsibility for the only USAR validation exercise, Operation Sand Castle (OSC), at the National Training Center at Fort Irwin, California. This gate is for units to leave the *Ready Pool* and enter the *Available Pool*. OSC has seen a fourfold increase in USAR exercise units, now currently at 35, and spans the full spectrum of combat support and combat service support unit employment.

The training organizations within the USAR are also undergoing a total reorganization. The training organizations will focus on three areas in the future:

- Initial-entry training
- Total Army School System for duty military occupational specialty (MOS) – qualified (DMOS-Q)
- Leader development

The 412th ENCOM is forging strategic alliances with these organizations to anticipate requirements necessitated by transformation and focus targeted individual and collective training requirements on a command-wide scale. The 412th ENCOM is engaged with the Engineer School to help develop an engineer-specific training support brigade, which will further facilitate the ENCOM's TRO mission.

The "take away" is this: If a USAR engineer unit is required for future contingencies, it will have been trained and deployed under either the 412th or the 416th ENCOM's TRO mission.

GCC Support

The 412th ENCOM has maintained habitual associations with USAREUR and Seventh Army, EUSA, and USARPAC, as the 416th ENCOM has done with the Third United States Army. Most of our associations have remained with the ASCC in support of theater security cooperation planning (TSCP); however, as we move toward joint operations, the 412th has engaged at the joint headquarters level and will continue to do so in the future.

PACOM

The 412th ENCOM has transformed its engagement in this area to a regional approach, as has the GCC we support. As a result, our Hawaii forward element and Korea forward element are merging under a single command and control element.

Korea

The 412th ENCOM will continue its habitual association with Korea-based missions and the exercises that support it, to include Reception, Staging, Onward Movement, and Integration/Foal Eagle (RSOI/FE) and Ulchi Focus Lens. The deputy commander of the 412th ENCOM is also dual-hatted as the EUSA engineer, further showing our connectivity with our supported command. Whereas in the past we have exclusively supported the ASCC EUSA, the 412th has also identified potential contingency theater engineer synchronization requirements to support laterally the Joint Force Support Component Command (JFSCC) under United States Forces Korea (USFK), as assisted by United States Joint Forces Command (USJFCOM).

Pacific Rim

Just as the 416th ENCOM has done in Central America, the 412th ENCOM has supported humanitarian construction exercises throughout the Pacific Rim under USARPAC. Exercise Talisman Saber, a joint rapid airfield construction (JRAC) mission, will be executed this year in Australia with support from the 412th. USAR Soldiers and units will train during Exercise Khan Quest, which will include vertical construction missions in Mongolia. In the past year, the 412th has supported the GCC TSCP through exercises in Vietnam, the Philippines, and Thailand, among others.

EUCOM

The 412th ENCOM has recently formalized an agreement with EUCOM that will provide engineer planning to support TSCP missions for the EUCOM J4 engineer, while simultaneously supporting the ASCC USAREUR. Elements of the 412th continue planning with the United States Special Operations Command, Europe (SOCEUR), for a vertical construction project scheduled for execution this fiscal year in Africa. Last year, elements of the 412th supported overseas deployment training for a water distribution mission in Angola. Construction missions will continue to support the Joint Multinational Readiness Center at Hohenfels, Germany, as well.

Transformation While at War

Nearly 100 percent of the 412th ENCOM downtrace will modularize within the next 18 months. Both ENCOMs, in conjunction with the Engineer School, are participating in a Fusion Cell, modeled after the Active Army Fusion Cell, to address transformational issues that arise in this truly dynamic period in our history. Participants in this forum will include all major players in the manning, equipping, funding, structuring, and training of units during their conversion. Major issues are vetted by the Engineer Advisory Board, which is chaired by one of the two ENCOM deputy commanders and has senior-level participation from major subordinate engineer commands, USACE, the Engineer School, and the United States Army Maneuver Support Center (MANSCEN).

Doctrine and New Technology

The ENCOMs, in conjunction with the Engineer School and USACE, have actively participated in the revision of several joint publications, to include JP 3-34, *Joint Engineer Operations*. As more and more engineer leaders return to the command with recent combat experience, the ENCOMs will have a greater ability to contribute to the revision of engineer doctrine by synchronizing the experience of a multitude of different types of units within each ENCOM's downtrace and other engineer units.

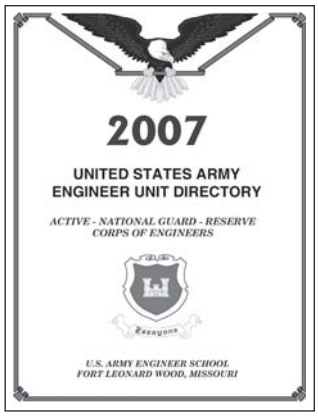
The 412th ENCOM has served a critical role in technology transfer that has directly benefited the warfighter on the ground. Through the Joint Forward Operating Base handbook and related video teleconferences that address both operational and technical aspects of the Joint Contingency Operating Base strategy, the 412th ENCOM, in conjunction with USACE, has provided a key role as knowledge manager to support the efforts of the Joint Staff. The 412th maintains key relationships with various agencies, including the Joint Improvised Explosive Device (IED) Defeat Organization (JIEDDO). This unique relationship has provided the most challenging training opportunities using current tactics, techniques, and procedures for deploying units participating in OSC. Key elements of operational protection will additionally be exercised during this year's OSC exercise at Forward Operating Base Santa Fe, at the National Training Center.

Summary

The anticipated transformation of both the 412th and the 416th ENCOMs to TECs, coupled with new command and control missions, support of force generation, evolving support to the GCCs, leadership in transformation to modularity while at war—while playing a key role as a warfighting theater contingency clearinghouse for engineer capability and support for both doctrinal and technology transfer—should demonstrate that it's not "business as usual." The current ENCOM is truly "not your legacy ENCOM." The ENCOMs of the future look forward to our mutual efforts among all components to support the needs of the warfighting commands through unity of effort throughout the Regiment.

Major General Williamson is the Commander of the 412th Engineer Command. He served in Iraq concurrently as the Deputy Chief of Staff, Engineer, for the Multinational Force-Iraq and as the Director of Operations for the Iraq Reconstruction Management Office in Baghdad. He has commanded at the battalion and group levels and served as the Deputy Commander of the 416th Engineer Command. He is a graduate of the United States Military Academy and the Army War College and holds a master's in operations management from the University of Arkansas.

Lieutenant Colonel Roth is the Deputy G3 of the 412th Engineer Command. He has deployed to Iraq as the Executive Officer of the 458th Engineer Battalion and has commanded a combat heavy engineer company. He is a graduate of the Command and General Staff College and holds a master's in mechanical engineering from Boston University.



2007 Engineer Unit Directory

The 2007 United States Army Engineer Unit Directory is available online in Adobe PDF format at <*http://www.wood.army.mil/engrmag/Engr%20Unit%20Dir/2007Directoryonline.pdf*>. Take a moment and see if your unit's listing is correct. Changes to the Unit Directory can be made by calling (573) 563-7644 or e-mailing <*engineer@wood.army.mil*>.

TRO

Clarifying Roles and Responsibilities

By Colonel Duke DeLuca, Lieutenant Colonel Fred Kaehler, and Lieutenant Colonel Robert T. Morgan

It seems that at every other videoteleconference (VTC) you attend these days you hear "Title 10, Title 10, who's got the Title 10 responsibility?" Or here's another one: "Well, if the commander who is tasked with training and readiness oversight (TRO) of a subordinate functional unit deploys, then he can either turn TRO over to the senior mission commander (SMC) at that remote post or designate an acting TRO commander, with the United States Army Forces Command (FORSCOM) approving the plan."

Is it possible to have missed an entire semester at Command and General Staff College (CGSC)? Paradigms are clearly shifting. What would happen if somebody gave a pop quiz at one of these meetings? Name three or four Title 10 responsibilities—Go! The scores would likely be abysmal. So like any good staff officer, it's off to Google™. But this time, the answers are not so easily found.

The term *Title 10* is short for Title 10, United States Code (USC). If you wade through the USC online, it's fairly daunting—lots of verbiage and no CliffsNotes®. It soon becomes apparent that a tutorial or guidebook would be extremely useful. FORSCOM has now published a Command and Control (C2) Reference Pamphlet to assist in strategic communications for the FORSCOM Modular Force C2 Plan.

At the 20th Engineer Brigade (Combat) (Airborne), Fort Bragg, North Carolina, we had to get smart quickly. In early March 2006, we received the attachment orders for a newly activated battalion at Fort Knox, Kentucky—the 19th Engineer Battalion—increasing the brigade's span of control to four engineer battalions. The 20th Engineer Brigade commander was given TRO authority of this unit.[1] Further dialog with FORSCOM revealed that two additional battalions were coming in October 2006—the 7th Engineer Battalion at Fort Drum, New York, and the 326th Engineer Battalion, Fort Campbell, Kentucky. It was clear that brigade staff officers had to become subject matter experts on administrative control (ADCON)/Title 10 and more specifically on TRO (a subtask of ADCON/Title 10) to successfully define our role with these three geographically separated battalions.

On 6 September 2006, FORSCOM issued the executive order (EXORD) for the Modular Force C2 Plan. This was the Rosetta Stone document that we were searching for, and Annex J: Terms of Reference, was a helpful section. Never mind that some of the terms had *predecisional* in parenthesis, we now had details for each term and a helpful listing of TRO responsibilities needed to identify the oversight of three geographically separated battalions. Select pages from this helpful reference quickly appeared in leader books throughout headquarters.

On page J7 of the annex, these TRO responsibilities are listed:

1. Provide training guidance and approve training programs.
2. Assess state of training and provide training direction.
3. Assess manpower, equipment, and training resource requirements; coordinate the obtaining of needed resources.
4. Provide mission essential task list (METL) guidance and approve the unit's METL.
5. Receive and review unit readiness reports (USRs).
6. Manage military personnel and equipment, including the authority to cross-level between colocated, assigned, or attached units. Cross-leveling between installations will be directed by FORSCOM.
7. Establish a priority for resources (allocation) among assigned or attached units.

We can also cross-reference the listing against SMC responsibilities (installation commander in some cases) as it pertains to the three remote battalions. These are the ADCON-related (ADCON (-)/Title 10) responsibilities (also found on page J7):

1. Personnel services; morale, welfare, and recreation (MWR)/well-being; legal (including disciplinary authority unless specified otherwise); inspector general; public affairs; religious (chaplain); provost marshal; information management; contracting; installation engineer services; and resource management support.
2. Weapon and equipment sustainment and repair (above unit level).
3. New systems fielding and major end item distribution (but not allocation); SMCs, installation commanders, or garrison commanders exercising ADCON(-)/Title 10, minus training and readiness oversight (may not cross-level FORSCOM personnel and equipment unless directed by FORSCOM).
4. Providing base support operations, to include training enablers such as ranges, maneuver areas, training aids, simulation facilities, and training ammunition.

With this outlined, the responsibilities of the SMCs for the three newly assigned battalions were defined:

- 7th Engineer Battalion: Commander, 10th Mountain Division
- 19th Engineer Battalion: Commander, U.S. Army Armor Center and Fort Knox, Kentucky
- 326th Engineer Battalion: Commander, 101st Airborne Division (Air Assault)

Given the myriad of tasks a battalion faces daily, weekly, and monthly, a good bit of analysis and common sense was still required to decide which commander would take the lead on a given topic.

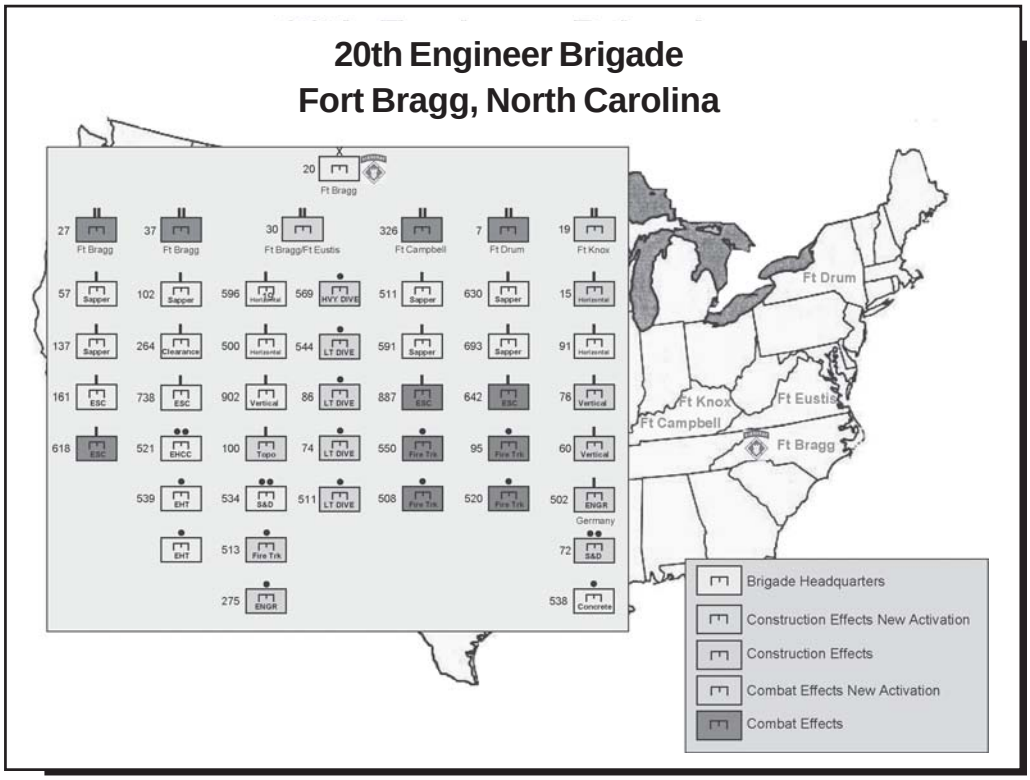
The table below shows only a few of the topics that need to be looked into to define the lead commander for a given area. It is evident that both the SMC at the installation of residence and the functional brigade commander with TRO have a vested interest in the subordinate functional unit, and as such, the brigade commander has coordinating authority with the particular SMC. The 20th Engineer Brigade staff continues to formalize the working relationship and TRO of three remote subordinate battalions, as well as a provisional dive company at Fort Eustis, Virginia. Army command policy, Army regulations and, potentially, memorandums of agreement with the SMC's subordinate chain at the remote installation will result in a common understanding of responsibilities.

To further complicate this challenge, the brigade headquarters is slated to deploy for an Operation Iraqi Freedom rotation. FORSCOM has already anticipated this scenario and has provided guidance for transferring TRO duties during deployment. The bottom line is that interim TRO responsibilities will always reside with a FORSCOM operational commander. Engineer brigade commanders in the continental United States have agreed informally that

Defining the Lead Commander

Area of Concern	Responsible Commander	Remarks
Doctrine	TRO commander	
Training	TRO commander	The SMC on the installation of residence provides training enablers to support the unit's approved training plan based on ARFORGEN-informed priorities for all units on the installation.
Leader development	TRO commander (in the rating chain of the battalion's officers and noncommissioned officers)	The SMC will be the battalion commander's senior rater[2].
Organizational requirements	TRO commander and SMC	Facility needs are the responsibility of the SMC, but the TRO commander might assist in sourcing solutions with certain equipment needs.
Materiel	TRO commander and SMC	The SMC fields new equipment; the TRO commander cross-levels and lateral-transfers equipment.
Personnel (manning and evaluations)	The SMC has the lead in identifying and sourcing shortages, with TRO commander input and coordinating authority.	Subordinate units at remote installations will incorporate both SMC and TRO commander input into the commander's rating chain[3].
Facilities	SMC	
Budget	SMC (resourced by the installation)	The TRO commander can weigh in with additional requests for funding if the unit isn't resourced adequately.
Unit status report (USR)	SMC (formally through the installation up to the Department of the Army [DA])	The TRO commander gets a copy and incorporates it into the integrated brigade USR.
Ammunition	TRO commander (responsible for forecasting and ordering) and SMC (responsible for resourcing)	Hired contract support maintains fleet at full mission capability (FMC) in low-usage maintenance program or entry into United States Army Materiel Command (AMC)-managed load-bearing equipment (LBE) program.
Equipment left back while a unit is deployed	SMC	
Reenlistment goals and progress	SMC and TRO commander (per FORSCOM mission goals and guidance, both should maintain visibility)	Currently some subordinates have mission goals from their SMC/installation.
Legal	SMC	A personnel action that requires SMC oversight and is also driven by Army command policy.

retaining TRO while deployed is the best option, given the difficulties of building staff linkages and training a new unit, its personnel, and its challenges. This is an Army Force Generation (ARFORGEN) Synchronization Conference action, and choices include passing interim TRO to the local SMC, another engineer brigade headquarters, or a combination. Following the mission sourcing subconference, the FORSCOM G-3 Plans Division will develop courses of actions and get the FORSCOM approval for a FORSCOM commander to perform TRO for those identified units. The final decision is briefed at the ARFORGEN General Officer Steering Committee and codified at the ARFORGEN Synchronization Order (ASO) (who, where, and when). The 20th Engineer Brigade will provide input to this process.



The 30th Engineer Battalion will function as the brigade's rear detachment headquarters during the headquarters' deployment. As such, it will continue to work and rectify several unresolved issues in the brigade.

One of these issues is ordering equipment and material for deployed units. The 19th Engineer Battalion was activated and then deployed before its modified table of organization and equipment (MTOE) was fully issued at Fort Knox, but its equipment shortages were overcome by getting a large amount of theater-provided equipment (TPE) in Iraq. Since the 19th's rear detachment is a derivative unit identification code (UIC), and a low priority due to not being a deploying unit, it faces lengthy equipment delivery times for its shortages. So the 19th can reset and retrain without waiting for shortages to be ordered and delivered, we continue to work sourcing solutions with the XVIII Airborne Corps, FORSCOM G-4, and item managers. Additionally, the brigade S-4 rear continues to work interpost and internal brigade equipment transfers to source some of the equipment shortages in the 19th Engineer Brigade and in the activating 7th and 326th Engineer Brigades.

Today's plan will likely be modified over time. We recently learned that one of the brigade's battalions might inactivate. But throughout, the brigade motto will ring true—*Building Combat Power!* It has taken on a new meaning, as deployable and lethal modular units are formed every day.

Endnotes

[1]In this article, the term "TRO" is used as defined by Annex J of the FORSCOM EXORD and focuses on the Active Army/Active Army training relationship, as opposed to the Department of Defense TRO definition referenced in Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, which reflects the Active Army/Reserve Component relationship.

[2]Per FORSCOM guidance, as long as the SMC chain is also a FORSCOM subordinate, the 19th Engineer Battalion commander at Fort Knox will have a revised rating chain from this example, since he resides on a TRADOC installation.

[3]Ibid.

Colonel DeLuca is the Commander of the 20th Engineer Brigade at Fort Bragg, North Carolina. He has had numerous troop assignments and has deployed to Iraq twice, first as the 326th Engineer Battalion commander and most recently as the Multinational Security Transition Command–Iraq C7. The 20th Engineer Brigade will deploy again for Operation Iraqi Freedom 07-09 as the Multinational Corps–Iraq theater engineer brigade.

Lieutenant Colonel Kaehler is the Deputy District Commander of the Chicago District, United States Army Corps of Engineers®. He was the Deputy Brigade Commander of the 20th Engineer Brigade and the Deputy Brigade Commander for the brigade's Operation Iraqi Freedom 04-06 deployment.

Lieutenant Colonel Morgan is the Assistant Corps Engineer, XVIII Airborne Corps, Fort Bragg, North Carolina. He was the Multinational Corps–Iraq Deputy C7 during Operation Iraqi Freedom 04-06 and previously served as the Combined Joint Task Force-180 Deputy C7 during Operation Enduring Freedom.

IEDS: The Obstacle in the Path to Assured Mobility

By Brigadier General Michael J. Silva

Engineers have traditionally been the vanguard in breaching obstacles and clearing the path for armies to advance. The term *sapper* evolved from the use of engineers to dig what the French termed a *sappe* (trench), using a technique developed for digging trenches that allowed the opposing force's artillery to move forward in the attack to undermine a fortification. Sappers became known for their ability to bypass fortifications or to demolish them, thus the engineer ability to clear a path or breach an obstacle.

Today, engineer route clearance teams (RCTs) are doing the hero work in assuring mobility for combat logistics patrols (CLPs) and the movement of other coalition forces on the roadways. The obstacle encountered today is typically an improvised explosive device (IED). Engineers man the Buffalos, Huskys, RG-31s, and other vehicles as they set out to find the IEDs before they detonate on coalition force vehicles. This protection mission has further proved the value of engineers in the fight. Once engineers locate an IED, they turn the mission over to explosive ordnance disposal (EOD) teams, who have extensive training in ordnance and explosives, having completed an eight-month certification course for their military occupational specialty (MOS) qualification. As long as EOD personnel are embedded within the route clearance mission, they are clearly the best trained Soldiers, Sailors, Airmen, or Marines to detonate IEDs.

Engineer Explosives Training

Engineers do not have a certifying explosive ordnance course. Does that mean that they are not trained on explosives? Certainly not. When one reviews the program of training on explosives that combat engineers have, one might ask, "Why can't engineers detonate IEDs?"

Engineers begin their combat engineering training at the MOS 21B10 level, with basic tasks such as how to neutralize booby traps, construct firing systems, prime explosives, construct demolition initiating systems, and identify characteristics of demolitions and explosives. Over the years, the MOS 21B20 and 21B30 levels of explosives training build on the mastery of skills with successively more complex training; calculations; and knowledge of explosives, ordnance, blast effects, and different target disposal techniques.

Like the enlisted and noncommissioned officer (NCO) ranks, engineer officers learn about explosives and demolitions with a successive training regimen taking place over several years, beginning with their Engineer Basic Officer Leader Course and followed by platoon leader time as a combat engineer. Perhaps the most extensive and intensive demolitions and explosives training occurs for those attending both the Explosive Ordnance Clearance Agent (EOCA) Course and the Sapper Leader Course, which has live demolitions exercises as a part of the curriculum.



Photo by Staff Sergeant Chris A. Durney

The Buffalo's robotic arm is used to investigate and clear IEDs.

Finding an IED

Even though combat engineers train over the years on explosives and demolitions, are they trained enough? What happens when they find an IED?

There are many tactics, techniques, and procedures for RCTs and many different techniques and vehicle configurations for the route clearance patrol. The purpose of this article is not to discuss those differences, but to generically describe the actions typically performed once an IED is found and needs to be cleared.

When the team members in the lead vehicle of the route clearance patrol spot a possible IED on an improved road, the patrol comes to a halt. While there are various initiators that require different responses by the RCT, the first action is to scan for secondary devices and assess the environment. The RCT looks for other possible IEDs nearby, particularly checking for wires or trigger devices. The next step is to interrogate the possible IED, typically by using the mechanical arm on the Buffalo. Once an IED is confirmed, a description of the IED—which may be a full description, to include the type of round, number of rounds, and initiation system that is configured—is radioed to the EOD vehicle, which could be anywhere in the patrol. Again, all personnel scan around their vehicles for secondary devices or booby traps. The EOD team then deploys a TALON® robot from their location and navigates it toward the IED. A camera mounted on the robot can be used to allow them to confirm the engineer assessment, but the robot generally moves forward and places an explosive charge on the IED and, once the patrol is at a safe distance, blows the IED in place.

On those specific occasions where remnants are collected after the controlled detonation, engineers scan around their vehicles before any personnel, including the EOD team, are allowed to dismount. On the vast majority of sites, the EOD team uses the robot to collect remnants, if they collect any at all. Dismounting the armored vehicles is a last option.



A Soldier prepares a TALON robot for use during a route clearance patrol.

This coordinated effort between engineers and EOD personnel works great in the combined effort to clear the IED obstacle from the roadway and render safe the passageway for coalition forces and CLPs. However, if EOD personnel are not embedded, the system breaks down, creating inefficiencies and increased risk. Especially in urban areas, the risk of direct attack via small arms fire or rocket-propelled grenades increases when too much time is spent in one location.

Gathering IED Evidence

Engineers have the training, knowledge, and ability to detonate IEDs, and they can identify munitions and refer to the same or similar manuals as those used by EOD personnel (such as Navy or Air Force manuals). Engineers even have some of the TALON robots that are used to place the explosive charge on the IEDs. But an objection sometimes raised regarding engineers detonating IEDs is that they do not have the knowledge, experience, or training to gather the sensitive forensic evidence necessary to attack the IED network and get to the bomb maker.

First, not all IEDs are worthy of evidence collection, and the most basic IEDs are typically blown by EOD personnel without any attempt to collect evidence. In fact, there may be a 90/10 rule here, where less than 10 percent of IEDs are exploited for evidence.

Second, this argument is not fully sound when taking into account civilian skill sets of Reserve Component Soldiers. Many of them are civilian law enforcement personnel who bring invaluable experience to the route clearance mission due to their training in evidence collection and processing. Such skill sets should be used as an enhancement to mission accomplishment. These men and women work hard every day to take "bad guys" off the streets and know that the slightest mistake in evidence collection and handling may allow a criminal to go free. By tapping into these skills, the Reserve Component RCTs may be best outfitted for forensic evidence collection in the absence of trained EOD personnel.

Conclusion

Engineers spot, interrogate, and confirm IEDs and scan the area for secondary devices or other dangers to the situation. They have the proper manuals to assist in munitions

(Continued on page 23)

CEHC Support to COIN Operations

By Mr. Dorian D'Aria

The events of the past five years have underlined that the United States and its allies confront a very different operational environment from the relatively peaceful and calm environment that so many predicted in the aftermath of the Cold War. In such a brief period, our military has been challenged on multiple levels, throughout the total spectrum of war continuum, which has accelerated change within our military that previously would have taken decades to effect.

Within a single tour of duty, many Soldiers and units have experienced everything from the initiation of war and conventional combat operations, through the transition to asymmetrical warfare and counterinsurgency (COIN) operations, as well as nation building and peacekeeping efforts. These unprecedented demands have challenged previous doctrinal and operational concepts, stressed existing processes, and highlighted the need for the rapid insertion of technological and procedural applications.

These challenges are readily reflected in the development or revision of doctrinal field manuals, the creation of focused organizations to streamline change, the rapid fielding of unique technological systems and capabilities, plus continuously evolving tactics, techniques, and procedures (TTP). Some of the organizations specifically created to address these requirements are the Joint Improvised Explosive Device (IED) Defeat Organization (JIEDDO), the Asymmetrical Warfare Organization (AWO), the United States Army Training and Doctrine Command (TRADOC) IED Defeat Integrated Capabilities Development Team (ICDT), and the Counter Explosive Hazards Center (CEHC).

COIN Environment

What has become extremely evident is the multidimensional aspect of modern warfare, consisting of numerous independent actions simultaneously occurring within the operational environment, many of which have both local and strategic implications. In today's operational environment, asymmetrical warfare and COIN are as much a part of modern combat as mounted and dismounted maneuver. Plus, the objectives and methods of each are so intertwined that they can become indistinguishable and mutually supportive. Combat operations conducted against an aggressive and merciless enemy for its tactical benefit must also consider its impact on COIN objectives. It becomes a balancing act of measured force to accomplish the goals of the mission without creating an environment of greater public dissatisfaction that fertilizes sympathy for our enemy and loses support from the populace. This manifestation has even driven change and adaptation from the highest strategic and operational level down to the tactical level and the individual Soldier.



A suicide bomber prepares to strike.

COIN is a complex fight and is more a war over people than a war over terrain. It involves a balancing act of creating incentives and cooperative support from the populace, while forcefully providing a stable and safe public environment. Victory is achieved when the populace consents to the government's legitimacy and stops actively and passively supporting the insurgency. To this end, security is a cornerstone for successful COIN operations and a principle target for the insurgent. The insurgent enemy will use terrorism, media, and propaganda to foster insecurity with the populace, to promote a lack of confidence in the governmental control, and to cause the populace to question our ability to be an effective and stabilizing combat force.



Insurgents hide nearby to watch, after an attack on a U.S. vehicle.

In COIN, information warfare (IW) is a critical component to the success of either side. Unfortunately, perception and truth are not always synonymous. Insurgents often have an advantage in shaping the information environment and use it as a principal weapon to influence the populace and sway public support. The enemy can make exorbitant promises and point out government shortcomings, many of which are caused or aggravated by the insurgent. They use the open media to learn of our deployments, measure popular opinion, discern equipment capabilities or TTP, and broadcast attacks on U.S. forces to intimidate the populace and boisterously project the impression of invulnerability. On the other hand, U.S. forces seeking to preserve legitimacy must exercise restraint and discipline, remain fair and truthful, and ensure that words are successfully backed by deeds.

Never before have our Soldiers been under such immediate scrutiny of their individual actions, the effectiveness of their operations or equipment, and the outcome of their performance. This is the by-product of the information age, which is as much a component of modern warfare as any weapon on the battlefield. Embedded media; the Internet; the international press; home videos; and satellite, cell, and conventional telephones are common IW tools that can affect the strategic landscape as much as the most eloquent combat operation.

As a result, the demands on today's Soldiers are higher than they have ever been. They must be technically proficient in the most sophisticated military equipment in the world, manage volumes of information, be capable of integrated and joint operations, plus be innovative and adaptable to unique situations or emerging trends. Our Soldiers must be surgically aggressive, massing controlled fires against the enemy while protecting the innocent and minimizing collateral damage. They must be hardened against the violence of warfare, while maintaining compassion for helpless noncombatants. And they must be direct and decisive, while simultaneously remaining diplomatic in given situations.

Respond to the Threat

The dynamics of the contemporary battlefield have also dramatically challenged our Army and generated significant change in its response to the operational environment. Our military is being remolded to become more intelligence-centric; capable of rapid response, seamless integration, and unity of effort; in addition to being able to adjust organizational, conceptual, and tactical responses, while being more culturally aware.



Soldiers discover an arms cache during a search.



A prototype of an RG-31 with an arm investigates a suspicious object during testing.

Key to this effort are U.S. Army engineers. The Engineer Regiment is the most multifaceted branch within the U.S. Army and simultaneously supports the entire spectrum of military operations. While construction engineers support nation building by repairing infrastructures, providing public services, and improving living conditions, sappers provide safety, security, and protection by clearing routes of deadly IEDs, assuring mobility to combat forces, and clearing mines or explosive hazards in operational areas.

From the beginning of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), the United States Army Engineer School's CEHC has been at the forefront of this transformation and has led many of the solutions currently in place at the Army and Department of Defense level. Some of those original initiatives included—

- Blast-resistant route clearance equipment (RCE) such as the Buffalo, Husky, and RG-31.
- Mine detection dogs to support area clearance combat operations.
- Specialized search dogs to support explosive detection and counterterrorist operations.
- Prediction of the timing, use, technology, migration, and evolution of enemy IEDs.
- Development of an explosive hazards tracking system to provide analysis and a common operational picture.
- Counter explosive awareness training packages.
- Mission-specific individual and unit contingency training for route clearance and other operations.
- Early fielding of the AN-PSS/14 Mine Detector.
- Development of the tenets of IED defeat for the IED Task Force from assured mobility concepts.
- Gap analysis and improved doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) integration of solution sets.
- Integration of the combat training centers in counter explosive collective training.
- Specialized military search techniques, training, equipment, and doctrine.

Since then, CEHC has continued to respond to needs from the field while proactively developing innovative explosive hazards countermeasures. As the Army's integrator for all countermeasures involving explosive hazards, CEHC has defined its critical tasks as follows:

- Identify the threat
- Determine vulnerabilities
- Identify and develop solutions through concepts, technology, and training
- Integrate DOTMLPF solutions
- Disseminate countermeasures
- Evaluate effectiveness
- Institutionalize solution sets

Know the Enemy

To stay ahead of the IED and explosive hazards threat, CEHC consistently monitors trends in threat activity and their tactics and technology and tracks the migration and relationships among enemy factions. CEHC performs analysis not executed elsewhere in the Army and has been called on by the Multinational Corps–Iraq (MNC–I), JIEDDO, and TRADOC for specific operational analysis. Between 2005 and 2006, CEHC has analyzed more than 188,000 incidents and records as part of its explosive hazards database. CEHC also coauthored a joint paper on scientific countermeasures to enemy IED technologies and initiation systems.

The explosive hazards tracking system developed by CEHC, and originally used in OEF and OIF, has recently been adopted by Combined Forces Command–Korea as a more efficient tool to track and disseminate minefields or explosive information before and during potential combat operations. This change supersedes the tracking system and methods that were used for decades prior.

Equip the Force

CEHC remains in continuous contact with the field to identify equipment needs or gaps in order to immediately provide combat engineers with better mission capabilities. Having identified a need, CEHC coordinates with program managers, combat developers, government laboratories, the rapid equipping force (REF), JIEDDO, and others to evaluate suitable materiel systems and candidates for potential integration and rapid fielding. Once a device or item is selected, CEHC assists in integrating the system and developing its operational concept and training

Counter Explosive Hazards Center Contingency-Based Courses	
Course Name	**Course Description**
Advanced Search Operations	(22 courses have been conducted, with 667 personnel trained, since October 2005) The course covers systematic search procedures to locate specific targets. The types of search operations that are taught are occupied/unoccupied building search, person search, vehicle search, route search, and area search. Additionally, in-depth training on the different components and uses of the Advanced Search Kit is conducted throughout the course. It is broken into two tracks: search advisers (sergeant first class through major); and search squad members (up to staff sergeant). Each course trains a total of 33 personnel and is conducted over a 3-week period at Fort Leonard Wood. CEHC is also working closely with the Joint Center of Excellence at Fort Irwin, California, in the development of complementary 1-week search awareness training for mission readiness exercises, plus refinement of the Advanced Search Kit.
Counterinsurgency (COIN) Fundamentals	(5 courses have been conducted, with 210 personnel trained, since August 2006) This is a new course that is taught as a stand-alone block of instruction to the Engineer Captains Career Course and others, or as a component of the IED Defeat Planning course. It is designed to provide junior leaders a better understanding of the COIN environment and how to integrate unit operations to affect strategic success.
IED Defeat Planning	(4 courses have been conducted, with 48 personnel trained, since December 2006) Although the new course has been added to the Engineer Captains Career Course, it can be provided as a stand-alone resident or mobile training team (MTT) course. The target audience is aimed at captains, majors, and senior noncommissioned officer (NCO) staff-level personnel and trains students how to plan and execute IED defeat operations at division level and below. The course is built around the understanding and employment of predictive analysis, search, and route clearance with and without RCE.
IED Defeat Train the Trainer (IEDD-T3) Course	(57 courses have been conducted, with 2,548 personnel trained, since January 2006) The course provides students with the individual/collective knowledge and skills required to provide training for their respective units on IED defeat TTP. It also informs Soldiers of current IED threats and countermeasures—such as Soldier awareness, IED search, patrol operations, convoy procedures, entry control points, vehicle-borne IEDs (VBIEDs), combat driving techniques, and electronic jamming—in a 2.5-day residential or MTT course.
Route Reconnaissance and Clearance Course (R2C2)	(23 courses have been conducted, with 1,031 personnel trained, since October 2005) This course teaches the systematic clearance of routes, using specialized mine-protected vehicles (MPVs). These vehicles are the Buffalo, Husky, and RG-31. Each course trains a total of 32 personnel, divided into four route clearance teams (RCTs) consisting of six operators and two leaders each. This is a 2-week residential course aimed at the individual operator and unit supervisors. A stand-alone Route Reconnaissance and Clearance Maintainers Course teaches the maintainer training for military occupational specialty (MOS) 63B (light-wheel vehicle mechanic) on each piece of RCE, as a 1-week residential course.
Area Clearance Course (ACC)	(13 courses have been conducted, with 230 personnel trained, since February 2005) The course begins with an introduction to area clearance principles, followed by area clearance operations methods using manual and mechanical clearance techniques and equipment. It is followed by student-led engineer training presentation and student-led clearance practical exercise. This 4-day residential course is primarily intended for U.S. units deploying to Afghanistan and includes the operation of the MV-4 flail system, plus familiarity with other clearance equipment and techniques.
Route Reconnaissance and Clearance Course-Sapper (R2C2-S)	(9 courses have been conducted, with 110 personnel trained, since April 2006) The course is primarily intended for BCT combat engineers and others who will not have the heavy, specialized RCE at their disposal. The aim of the course is to provide a basic knowledge of using robotic systems for stand-off detection, investigation, and neutralization to conduct route clearance operations without the use of specialized vehicles such as the Buffalo, Husky, and RG-31. This 2-week course has the same rank requirements as the R2C2 course.

support package. If necessary, CEHC will also accompany the system into theater during a final operational assessment.

CEHC coordinates very closely with explosive ordnance disposal (EOD) personnel and the United States Marine Corps engineer community to share IED solutions and equipment and brief JIEDDO to fund the evaluation and fielding of successful counter-IED systems. Basis of issue plans always include equipping forces in-theater, as well as the stateside training base for future rotations or mission readiness exercises. Through the efforts of CEHC, JIEDDO approved the following:

- Engineer robots equipped with a camera and gripper arm to investigate and visually confirm IEDs from a safe stand-off distance during route clearance operations.
- Gyrocam® Systems security cameras to support engineers and EOD technicians by providing stabilized, on-the-move visual detection of suspected IEDs with high resolution color, thermal imaging, and night vision capabilities with a laser range finder.
- An operational assessment of prototype IED detection systems, to include Joint Systems Integration Board (JSIB) approval for all RCTs and brigade combat teams (BCTs), pending a successful in-theater evaluation.

Recently, CEHC has been evaluating a prototype IED Reconnaissance Vehicle, based on a Cougar 6x6 chassis, and has conducted both system integration and development of the operational concept to employ it in Iraq. The IED Recce package will provide enhanced IED detection features and is intended for use by engineers and EOD personnel. JIEDDO will send it into theater for an operational assessment in 2007, accompanied by members of the CEHC team.

In response to a requirement from OEF, combat engineers need a smaller IED interrogation vehicle, with a lightweight arm to perform route clearance operations in the restrictive Afghanistan terrain. As a result, CEHC has provided a Husky and an RG-31 to the Project Manager-Close Combat Systems (PM-CCS) at Fort Belvoir, Virginia, to develop an articulated arm designed to physically investigate suspicious objects, coupled with a magnetometer to identify metallic objects. Even though the requirement originated in OEF, systems will be sent to both Afghanistan and Iraq in 2007. Although a smaller version of the Buffalo arm, this system will allow better movement through restrictive terrain and poor infrastructure, while still providing mobility and stand-off investigation of explosive hazards.

Finally, CEHC will participate in a follow-up evaluation of tools and skills provided to the 3rd Brigade, 2d Infantry Division Stryker Brigade Combat Team (3/2 SBCT) engineers prior to their deployment last year. This assessment will help to determine the effectiveness of counter-IED training and specialized tools provided them so they could assure mobility for their parent brigade in the absence of heavy RCE. Several innovative tools were identified to augment the reconnaissance, explosives, communications, and weapons already embedded in this vital sapper unit. The Engineer School team also cross-walked the additional skills that unit leaders can obtain—either through existing courses (such as the Explosive Ordnance Clearance Agent [EOCA] Course, the Urban Mobility Breaching Course, and the Sapper Leader Course) or new training in areas like special infrastructure assessment—sewage, water, electricity, academics, and trash (SWEAT).

Train the Force

A key task for CEHC is training and updating the force in current counter explosive hazards techniques and employment of commercial off-the-shelf and contingency equipment. This instruction enables units to receive theater-specific training prior to deployment and allows them to focus on the mission during transition of authority. To ensure that the training is up to date and relevant, CEHC gathers the latest intelligence on explosive hazards TTP employed by the enemy, as well as TTP developed by deployed units, to counter that threat. Contingency training that will be permanently retained in the Engineer Regiment, such as operator training for RCE, will eventually be institutionalized and transferred to the official Engineer School curriculum.

CEHC has not only trained U.S. Soldiers, Marines, Airmen, and Sailors, but has also provided training and assistance to several allies and coalition partners. The table on page 19 lists the current contingency-based instruction offered through CEHC.

Conclusion

CEHC has been at the tip of the spear, identifying gaps and developing solutions against IEDs and other explosive hazards since the Global War on Terrorism began. Working together, CEHC, the Engineer School, and the United States Army Maneuver Support Center (MANSCEN) are part of a joint, interagency, and multinational counter-IED effort that integrates intelligence, training, technology, and materiel solutions into a holistic program. It will continue to seek out the best countermeasures for our units and produce the best training available for Soldiers at war today, while ensuring that our forces are prepared to counter the explosive hazards found in future conflicts around the world.

For more information, call commercial (573) 563-8165 or DSN 676-8165. Or visit our websites at <*http://www.wood.army.mil/cehc/*> and on SIPRNET at <*www.portal.inscom.army.smil.mil/cehc*>.

Mr. D'Aria is the Technical Director for the Counter Explosive Hazards Center and has been assigned to Fort Leonard Wood, Missouri, since 1988. Prior to coming to the CEHC, he was the senior engineer threat subject matter expert for the Engineer School and TRADOC and supported Desert Storm, Somalia, Bosnia, Kosovo, Afghanistan, and Iraq. In addition to his mine warfare and IED intelligence background, he also has experience as a tactics instructor and training developer, military police and security operations, Army aviator, and combat developments.

ASSURING MOBILITY IN A COIN ENVIRONMENT

By Major Iain J. Church

Although the concept of assured mobility was designed to ensure success on a linear battlefield against a conventional enemy, the fundamentals of assured mobility are equally important in defeating an unconventional enemy on an asymmetric battlefield (see Figure 1). Assured mobility can be described as a model that enables commanders to see first, understand first, act first, and finish decisively. While the fundamentals (predict, detect, prevent, avoid, neutralize, protect) remain the same regardless of the operation, they must be understood within the context of the environment faced—in the case of Iraq and Afghanistan, counterinsurgency (COIN) campaigns on an asymmetric battlefield.

Lieutenant General David H. Petraeus described the insurgencies in Iraq and Afghanistan as follows: "*The insurgencies in Iraq and Afghanistan were not, in truth, the wars for which we were best prepared in 2001; however, they are the wars we are fighting and clearly the kind of wars we must master.*"[1] In an effort to master these wars, the Engineer Regiment is developing capabilities that are not only affecting the current fight but also establishing a potent capability for future operations—mixing design and execution of courses to build new capabilities and educating commanders on how all capabilities, new and existing, can impact the asymmetric battlefield. The Engineer Regiment will play a key role in assuring mobility and successful execution of COIN operations. However, to fully understand the impact that harnessing new and existing capabilities can have, we need to first understand the environment they are to be used in.

The linear battlefield is a simple one—success can be quantified by measuring the enemy's remaining combat power in conjunction with the location of the front line. In contrast, COIN operations on the asymmetric battlefield can't be quantified as easily and, by their nature, are drawn-out affairs[2]. Unlike conventional war, they rarely produce instant results. Furthermore, when successful operations occur, success can be quickly overshadowed by the slightest amount of collateral damage that can be used by insurgents to turn a tactical setback into a strategic gain.

While serving as commander of the United States Southern Command, General John R. Galvin succinctly captured the problem facing military powers engaged in COIN operations when he stated, "*The…burden on the military institution is large. Not only must it subdue an armed adversary while attempting to provide security to the civilian population, it must also avoid furthering the insurgents' cause. If, for example, the military's actions in killing 50 guerillas cause 200 previously uncommitted citizens to join the insurgent cause, the use of force will have been counterproductive.*"[3]

Ultimately, success in COIN operations is gained by protecting the populace rather than the COIN force and by maintaining legitimacy. The effect of protecting the populace is twofold: First, COIN forces establish and maintain legitimacy; and second, the insurgents' most valuable resource—the support of the populace—will be eroded. The protection of the populace and the ability of commanders to assure mobility are inextricably linked; you cannot achieve one without the other. Success cannot be achieved through the use of kinetic means alone; success will result from a combined use of kinetic and nonkinetic means. In a COIN environment, it is easier to separate an insurgency from

The Fundamentals of Assured Mobility

Predict actions and circumstances that could affect maneuverability.

Detect early indicators of impediments to battlefield mobility.

Prevent potential impediments to maneuverability from affecting battlefield mobility of the force. A key is to develop predict-to-prevent linkages to detect impediments and identify alternative mobility corridors needed to…

Avoid battlefield impediments.

Neutralize, reduce, or overcome impediments (from traditional mines to industrial chemicals) that cannot be prevented or avoided.

Protect against the effects of enemy impediments. Successful application of assured mobility analysis is gained through a sequential and continuous application of the fundamentals throughout the imperatives en route.

Figure 1

"One of the most overt tools in the current COIN fight is route clearance teams (RCTs), with a combination of Buffalo, RG-31, and Husky or Meerkat vehicles."

its resources than it is to kill every insurgent. Therefore, it is incumbent on the training base to develop capabilities and train the force in the full range of kinetic and nonkinetic skills to set the conditions for success.

The United States Army Engineer School's Counter Explosive Hazards Center (CEHC) at Fort Leonard Wood, Missouri, is developing three key capabilities that will provide commanders the tools to help protect the populace and assure mobility: search, route clearance, and counter explosive hazards planning. Teaching new skills is easy; however, as Sir Basil Liddell Hart stated in *Thoughts on War*, "*...the real challenge is not to put a new idea into the military mind but to put the old one out*...."[4] Educating the chain of command in the use of new skills is just as important as developing and teaching new skills. Search and route clearance courses concentrate on developing skills, and in order to educate the chain of command, the Counter Explosive Hazards–Planning (CEH-P) Course concentrates on how to employ all counter improvised explosive device (IED) assets in a COIN environment.

Search operations, possibly the commander's most potent nonkinetic weapon in COIN operations, can be offensive or defensive in nature. In addition, within an assured mobility context, search operations can impact across each of the fundamentals, but in both cases it is a significant force multiplier. Successful search operations are crucial to the success of COIN operations. It is better to find 100 detonators in a cache than to deal with 100 IEDs on the battlefield. Every layer of an insurgent network is susceptible to search operations, and secrecy and plausible deniability are crucial throughout an insurgent organization. Intelligence-generated search operations allow the counterinsurgent to gather the necessary evidence to negate both. Successful tactical operations have the potential for an operational and strategic impact—a successful search operation may produce the evidence required to convict key insurgent leaders in a court of law.

CEHC has started to develop a comprehensive search capability within the U.S. military, and it was limited to a 3-week advanced search course that covers six core skills: manual route search, person search, vehicle search, occupied- and unoccupied-building search, cache search, and area search. However, in an effort to increase the number of students and better meet the needs of the field, a 1-week all arms combat search course has been designed that focuses on personnel search, vehicle search, cache search, area search, and occupied-building search. Both courses emphasize the importance of intelligence, planning, flexibility on task, methodical searching, evidence handling, completion of documentation, and postoperation debriefs. The net result of these courses will be to build a graduated search capability that commanders can apply to operations depending on the complexity of the task and the value of the target.

One of the most overt tools in the current COIN fight is route clearance teams (RCTs), with a combination of Buffalo, RG-31, and Husky or Meerkat vehicles. RCTs provide a line of defense against IEDs, maintain lines of communication, and protect the populace and coalition forces. CEHC conducts a 2-week route reconnaissance and clearance course for Army and Marine Corps engineers on the use of all route clearance equipment (RCE). Training focuses on the application of fundamental route clearance principles and is aimed at operators and platoon-level leadership.

Due to the success of RCTs, it isn't surprising that they have become insurgent targets. A significant problem that exists for RCTs is the time it takes to deal with IED incidents. In order to enhance the capability of RCTs and reduce incident times, CEHC has developed a 2-week Route Reconnaissance and Clearance Course–Sapper (R2C2-S) to train the investigation and blowing in place (BiP) of IEDs using robotic platforms. Strict protocols have been developed outlining when and what R2C2-S trained personnel can BiP; their actions will be directed by individual theater policy.

Because developing new skills doesn't answer all of the field's needs, CEHC has designed the CEH-P course to ensure that new and existing skills are tasked and coordinated to have maximum impact on COIN operations. The course is aimed at brigade combat team, battalion, and company S-3 personnel who will be responsible for coordinating all counter-IED assets. It isn't designed to be a battle staff course per se. It concentrates on the importance of integrating assets and fundamentals of COIN operations and highlights the impact that current and new capabilities can have if fully integrated with one another, such as building linkages between RCTs; intelligence, surveillance, and reconnaissance (ISR) assets; and predictive analysis. As with all CEHC courses, emphasis is placed on knowledge and *how* to think—not *what* to think.

The development of new skills and the education of the force addresses two of the three areas critical to success: what needs to be trained and how capabilities should be employed. However, the mindset of commanders ultimately decides whether a COIN campaign is successful. It is critical that an offensive mindset is maintained; adopting a defensive posture to mitigate risk to COIN personnel is ultimately counterproductive. Field Manual (FM) 3-24 states, "*If military forces remain in their compounds, they lose touch with the*

Improvised Explosive Device Incidents		
Year	**Number of IEDs**	**Remarks**
2005	12,556	
2006	30,515	
2007 (through 14 February)	4,738	At the current rate, the total for 2007 will be 40,847

Figure 2

people, appear to be running scared, and cede the initiative to the insurgents."[5] Efforts to protect the force have had a significant effect on the effectiveness of IEDs; however, as General Peter Pace stated to the Senate Armed Services Committee: *"The increase in the number [of IEDS], despite the decrease in their effectiveness, has resulted in about a sustained level of casualties from IEDs..."*[6] Figure 2 outlines the significant increase in IED incidents over the last 2 years[7].

The insurgent is thus retaining enough freedom of maneuver to engage coalition forces at times and locations of his choosing; the goals of assured mobility and protecting the populace are not being achieved. While clearly it is important to protect the force against the effects of IEDs, more must be done to protect the force and the populace by preventing their emplacement in the first place. This can be achieved by applying the principles of assured mobility, protecting the populace, and developing a detailed understanding of the operating environment.

The Engineer School and CEHC are spearheading the effort to train the force to allow the U.S. military to master operations in a COIN environment. The skills being developed and trained allow the insurgent network to be engaged at a number of levels in such a way as to not alienate the populace. However, training new skills alone is not the answer. Success on the COIN battlefield will ultimately depend on assuring mobility and protecting the populace—and achieving both in a way to enhance the legitimacy of host nation governments.

For more information on all CEHC courses, see <*www.wood.army.mil/cehc*>.

Endnotes

[1]Lieutenant General David H. Petraeus, "Learning Counterinsurgency: Observations from Iraq," *Military Review*, January-February 2006.

[2]Both General Gregory A. Schumacher, Chief of Staff of the Army, and General James T. Conway, Commandant of the United States Marine Corps, have stated that the Iraq insurgency is likely to last 8 to 12 years.

[3]General John R. Galvin, "Uncomfortable Wars: Towards a New Paradigm," *Parameters*, 16, No 4 (Winter 1986): 6.

[4]Sir Basil Liddell Hart, *Thoughts on War*, Farber and Farber, 1944.

[5]FM 3-24/Marine Corps Warfighting Publication (MCWP) 3-33.5, *Counterinsurgency*, December 2006, para 1-149.

[6]Rowan Scarborough, "Enemy Doubles IED Use in Iraq," *Washington Times*, 7 February 2007, <*www.washingtontimes.com/national*>, accessed on 13 March 2007.

[7]Figures derived from the Combined Information Data Network Exchange (CIDNE), accessed on 14 February 2007.

Major Church is the Chief of the Countermeasures Division, Counter Explosive Hazards Center, Fort Leonard Wood, Missouri. Previous assignments include two tours in Northern Ireland, bomb disposal officer with the 33d Engineer Regiment (EOD), and second in command of an air support squadron. His deployments include Kosovo, Bosnia, and Cyprus, as well as 6 months in Operation Iraqi Freedom. He is a graduate of the Royal Military Academy Sandhurst and the Joint Command and Staff College.

("IEDs," continued from page 15)

identification and often describe in great detail to EOD personnel what they see at the front of the route clearance patrol. So why can't engineers detonate IEDs? They can. While EOD-trained personnel are perhaps the best-qualified individuals for this task, they are not always available. Long wait times, increased risk, and mission requirements make it essential that engineers be allowed to detonate IEDs and complete their mission of breaching the obstacle and clearing the road for CLPs, other coalition forces, and local nationals.

Note: As of mid-March 2007, the theater command is reviewing the current policy to allow selected combat engineers to destroy common IEDs as part of a doctrinal engineer mission. One of those missions is being undertaken now by the RCTs. Task Force Troy and the Explosive Hazards Coordination Cell have been asked to draft a proposal for consideration that would authorize engineers trained in the EOCA Course and the Counter Explosive Hazards Center's Route Reconnaissance and Clearance Course–Sapper (R2C2-S) to destroy IEDs. If approved, it is likely that a new fragmentary order (FRAGO) will be published changing the current theater policy, defining the operational parameters, and authorizing these selected engineers to undertake this mission.

Brigadier General Silva is the Commander of the 411th Engineer Brigade (Theater Army) in support of Operation Iraqi Freedom. He is a graduate of the United States Military Academy, where he was commissioned into the Field Artillery Branch, and has more than 20 years of service in the United States Army Reserve as an engineer. In the civilian sector, he is Vice President, Finance and Business Development, for sPs Consulting, LLC, Lorton, Virginia.



Reserve and National Guard Work Together in Iraq

Photo by Staff Sergeant Chris A. Durney

By Staff Sergeant Chris A. Durney

Army National Guard engineers from the 875th Engineer Battalion, led by the United States Army Reserve 411th Engineer Brigade, are playing a critical role in ensuring military and civilian mobility in Iraq, as only engineers can. Their mission success is a testament to the strength of the Engineer Regiment, no matter the component.

Combat logistics patrols, military columns, and an endless stream of Iraqi civilian traffic move between metropolitan areas that are critical to rebuilding Iraq's infrastructure and economy. Responsibility for assuring mobility falls to the Reserve brigade, whose motto of "plan, build, and protect" describes perfectly their role in Operation Iraqi Freedom. To meet the "protect" part of the motto, the brigade turns to the National Guard battalion to help assure mobility by conducting route clearance missions.

During one of these missions on a major commerce and supply route, a route clearance patrol rumbles along at a snail's pace; sharp eyes peer out of reinforced windows and from inside a succession of heavily armored vehicles. They are looking for signs of buried improvised explosive devices (IEDs). These Soldiers are familiar with this

(Continued on page 36)



Photo by Staff Sergeant Chris A. Durney

A Soldier peers out of the reinforced window of a Buffalo during a route clearance patrol.

Diamondbacks Reduce a High-Threat Area

By Second Lieutenant Charles W. Scheibe

Thousands of Soldiers travel the roads in Iraq daily, and any one of them can tell you that certain areas are constant hotbeds for insurgent activity. Engineers from 2d Platoon, Headquarters and Support Company ("Diamondbacks"), 92d Engineer Battalion (Combat) (Heavy), recently helped to eliminate one of these areas.

Along a supply route in central Iraq, heavy equipment operators from 2d Platoon leveled a berm—a raised earthen barrier that separates two areas—that was routinely used by insurgents to hide from patrols and convoys, just waiting to initiate improvised explosive devices (IEDs) and fire at convoys with rifles and rocket-propelled grenades (RPGs). The heavy-equipment operators from 2d Platoon worked over 28 hours to level more than 40,000 cubic meters of dirt. During that time, they rotated shifts and kept the bulldozers running for 18 hours straight. While 2d Platoon leveled the huge berm, 3d Battalion, 8th Cavalry Regiment, provided security. This was a massive effort by maneuver units and engineers.

After the area was leveled and the threat reduced, Echo Company put up soccer goals on the now-safe site for local children. Units and convoys that have traveled the route since completion of the project have reported seeing children playing on the new soccer field.



Photo by Captain Steven Johnson

The berm was removed, decreasing enemy activity and making way for a new playing field.



Photo by First Lieutenant James Yount

A D7 bulldozer grubs the project site.

Enemy activity at this location has decreased significantly since the berm is no longer there for insurgents to hide behind. Convoys and patrols are safer and can now maneuver through the area with greater ease. But even though the primary goal of this mission was to change the area so the enemy could no longer use it as key terrain, just as importantly, 2d Platoon provided a positive influence for a few more Iraqis of the next generation.

Second Lieutenant Scheibe is the Equipment Platoon Leader, Headquarters and Support Company, 92d Engineer Battalion (Combat) (Heavy). He holds a bachelor's in history and political studies from Chaminade University, Honolulu, Hawaii.

Note: The 92d Engineer Battalion is deployed to Iraq under the 411th Engineer Brigade, New Windsor, New York. The 92d was deployed for the start of Operation Iraqi Freedom, Operation Iraqi Freedom 04–06, and now Operation Iraqi Freedom 06–08—continuing its same mission of keeping supply routes safe for coalition forces.



Expanding Forward Operating Bases in Afghanistan

By Captain Nicholas O. Melin

The Soldiers of Task Force Pacemaker completed numerous road construction missions during their deployment to Afghanistan. However, their nation-building efforts and major infrastructure improvements could not be conducted until they first constructed safe havens to operate from. Three forward operating bases (FOBs) were constructed and two existing FOBs were expanded across southeastern Afghanistan. The expansion of the Sharana Provincial Reconstruction Team (PRT) base is a good example of military construction in Afghanistan. An analysis of this project provides valuable lessons learned that can be applied to the construction of future base camps in austere areas.

The Sharana PRT base is located outside of the city of Sharana. On open terrain with good drainage and no local national property rights issues, it was ideal for expansion from a small base to a larger logistical and operational hub. Sharana, the capital and second largest city in Paktika Province, had a network of roads that required improvement to support the new democratic local government.

The expansion of the Sharana PRT base allowed the construction of improved gravel roads in an area long deprived of a reliable transportation network. Linking the capitals of Paktika and Paktia Provinces to the main paved ring road system—the major trade roads that form a loop by connecting major cities—allowed the central government of Afghanistan to move more freely in areas that were isolated from government influence. Medical assistance, international aid, and security from the Afghan National Army and the Afghan National Police were all benefits to the Afghan people resulting from the FOB and road construction.

The Plan

During the summer of 2005, Task Force Sword (the engineer brigade headquartered in Afghanistan) chose the Sharana PRT base as the future hub of engineer operations in Paktika Province. It was to house elements of Task Force Sword as they completed road construction projects in the area. Task Force Pacemaker would then take over the expansion, while continuing the construction of a network of two-lane gravel roads around the town. All Task Force Pacemaker elements would then move to the Sharana PRT base in December 2005 to support the

turnover of Regional Command South to the International Security Assistance Forces (ISAF). The final phase of the expansion would ensure that all facilities were complete, allowing incoming units to use the Sharana PRT base as a hub of operations for continued road construction efforts in the area.

Getting Started

The first phase of construction began in early September 2005. Force protection walls and guard towers were built, and two Soldier living areas were initiated. By the end of October, significant progress was made on phase one objectives, with construction of Soldier barracks and a command post completed.

Task Force Pacemaker assumed the mission in October 2005. Upon arrival, a survey of construction operations was conducted to decide which areas required action next. Due to mission requirements, road construction projects in the area required that the Sharana PRT base be expanded within a two- to three-month period. The need to provide immediate living space had led to rapid construction of living facilities, so the ground had not been leveled, compacted, or graveled, and many buildings were constructed on a slope. Additionally, some facilities needed to be winterized. Drainage in some areas was insufficient for wet Afghan winters, and a comprehensive electrical design and layout was necessary for efficient use of generators.

The two most pressing issues were materials management and funding. The surge of large amounts of construction materials into the small base made materials management difficult. Also, there was an increase in troop requirements in the middle of the project that made initial estimates no longer valid.

- Although a system was already in place to track materials on the FOB, they were not consolidated and allocated to projects by priority. This led to confusion with multiple units conducting construction operations.
- An audit of project funding also revealed shortfalls. Funding was provided in three separate segments, corresponding with the construction phases. However, cost estimates for the project were determined without completing a design and full material estimate. Thus, the actual cost of materials was far higher than forecasted.

In order to address these issues and complete the expansion on time, Task Force Pacemaker assembled a construction team of military engineers, local Afghan contractors, and civilian contractors from KBR (formerly Kellogg, Brown and Root).

Completing the Mission

The first step was to create a comprehensive timeline of all construction tasks. Priorities were established for the remaining tasks, with the focus on completing the force protection plan; providing proper living areas and sanitation; and expanding morale, welfare, and recreation facilities. Combined Joint Task Force 76 dictated that facilities be jointly used by all tenant units, so most facilities on the FOB required expansion.

The designs were reviewed, and additional tasks were added to meet the construction intent. An example is the construction of a pump house—a required winterization task—for the expansion well. Additionally, there was a need for a clarification and water storage system on the base. These three needs were combined into a single facility, which was not initially identified as a task.

A contracting officer was assigned to manage all contracts, and the progress of those facilities was integrated into the construction plan. The local construction community provided valuable manpower for large tasks, and local construction methods were suitable for use on the FOBs in many areas. Designs and material estimates were completed for all facilities to correct funding issues. The tasks were then redistributed through the three funding blocks to ensure that all stayed within cost limitations.

During construction operations, it became apparent that consolidating and tracking construction materials was necessary. With more than 80 individual projects at various stages of completion, there were huge amounts of construction materials. No shortage lists existed to track what was available for construction and what should be ordered. A complete inventory of the shipping containers—to include location, contents, and serial numbers—was conducted, and a database of all construction materials on the Sharana PRT base was



U.S. Army photo by 1LT Claudia Crossland, Task Force Pacemaker

A small emplacement excavator (SEE) operator digs through the rocky terrain so sewage pipes can be laid.



U.S. Army photo by 1LT Claudia Crossland, Task Force Pacemaker

Soldiers transport hand-mixed concrete with wheelbarrows during the placement of a maintenance pad.

established. Finally, all construction materials were consolidated into a single area, and the S-4 tracked and controlled their release.

Surveyors conducted a topographic survey of the base to show areas where drainage issues would appear once winter rains began. Additionally, they mapped electrical and communications lines on the base and established a master drawing of the expansion. To prevent severing lines during construction operations, a dig permit system was established.

The surveyors determined a layout for the sewer and water distribution systems, including the repair and integration of the existing water and sewer systems inside the compound. Unfortunately, the ground beneath the expansion site was solid rock a foot below the surface. An excavation plan to dig to a depth of 4 feet (below the frost line) for all sewer and water lines was required. The result was one water system with two operational and insulated wells and all sewage generated on the base flowing to a two-basin oxidation pond.

Obstacles

The constructing commander faced a number of obstacles that complicated construction. The first was employment of local national workers. Many of the workers were unskilled and could only do the most basic tasks, such as filling sandbags. As a result, the employment of large numbers of these workers actually slowed the work. Additionally, the commander had to ensure that proper force protection methods were used when interacting with local nationals. Despite these issues, integrating local workers provided extra muscle for tasks and generated good will in the community by providing jobs.

Another obstacle to efficient construction was the flow of materials. By December, the stockpiled materials on the Sharana PRT base were largely depleted. Local national haul of materials proved unreliable, and long haul distances from coalition logistical bases slowed the flow of materials. In order to continue construction, each Task Force Pacemaker platoon engaged multiple tasks. This allowed progress to continue with available materials while additional materials were transported. However, many tasks remained unfinished for months while awaiting key construction materials.

Tactics, Techniques, and Procedures

Construction at the Sharana PRT base highlights tactics, techniques, and procedures (TTP) to minimize the difficulties of construction in an austere theater of operations. They are as follows:



- Determine the purpose of the expansion. What is the standard of construction for the expansion? If building to facilitate a construction project, determine the need for facilities after your departure.
- Determine funding constraints and a timeline for receiving construction materials on-site. In Afghanistan, the funding process—from submitting the funding request paperwork to approval and receipt of materials—takes at least two months. The design, bill of materials (BOM), and all contracting requirements need to be determined two months in advance.
- Conduct a thorough reconnaissance and construction assessment. The following information is essential for expanding an FOB:
  - Electrical layout and capacity.
  - Water distribution system layout.
  - Sewer system layout.
  - Available square footage within existing perimeter.
  - Available area outside of the existing walls.
  - Portion to be cleared.
  - Existing facilities on the base and their capability for co-use.
  - Drainage analysis.
  - Location for grey and, if necessary, black water disposal.
  - Topographic survey results of the construction area for accurate initial design.
- Develop an initial plan for construction operations.
  - Determine the population requirement (adding a 10 percent overage for surge).
  - Calculate the number of required shower heads, toilet seats, and urinal soakage pits.
  - Determine the layout for the water distribution system. Minimize the system size to save on required plumbing materials.
  - Determine a force protection plan.
  - Identify theater-level requirements before construction.
  - Determine heating and cooling requirements.
  - Determine dining facility requirements.
  - Develop an initial FOB layout.
  - Determine the required electrical layout.
  - Integrate delays in receiving construction materials.
  - Determine the required number and type of contractors required for the expansion. Their expertise is essential for heating, ventilation, and air-conditioning work; plumbing; and electricity.
- Order construction materials as soon as possible. Essential items are in high demand across the theater and may take two or more months to procure.
  - Develop a detailed BOM.
  - Prioritize construction materials by phase of the construction project, taking into account delays caused by local national contract transportation.
  - Stockpile and secure materials at the location, if possible, or—at a minimum—transport materials for the initial construction with the unit by military convoy.
- Conduct troop-to-task for projects (assigning the proper number of Soldiers and types of equipment to successfully execute a task).
  - Consider both vertical and horizontal tasks.
  - Identify key equipment shortages that affect progress.
  - Determine the number of local nationals to employ and the contracted equipment set required to fill shortages.
  - Determine tasks that must be contracted as soon as possible.
  - Initiate the process of finding contractors and securing funding.

- Monitor all local national contractors, and expect delays with any task completed using contract rather than military labor. Local holidays will halt all local national labor.

Potential projects for engineer units in areas of operation like Afghanistan are varied. There are situations where time is not available for detailed planning, and units must attempt to execute the mission as completely as possible, given the available resources. Application of some or all of these TTP should help to avoid potential construction issues and ensure the timely completion of construction.

The Results

When completed, the capability of the Sharana PRT base was greatly expanded. The maximum supportable population increased more than seven times its original size. The base now has showers, an operational laundry facility, and latrines with flushing toilets. The water system has operational pump houses that provide redundancy for the entire facility. The motor pool has office buildings and maintenance facilities that provide heated, all-weather maintenance areas for a battalion task force and a direct-support shop.

The Task Force Pacemaker expansion of FOBs supported the construction of road networks throughout Afghansitan. The long-term result was that the capitals in Zabul, Paktika, and Paktia Provinces were linked to the paved ring road around Afghanistan. This new freedom of movement allowed the central government of Afghanistan to move easier in areas that were once isolated from government influence. Medical assistance, international aid, and security from the Afghan National Army and the Afghan National Police were all benefits to the Afghan people resulting from the road construction.

The roads also facilitated the growth of the Afghan economy by providing reliable, all-weather routes for goods and services to move between provinces. The increase in traffic along the routes and the appearance of gas stations and markets in areas that were deserted before road work was completed is evidence that the road campaign conducted by United States Army engineers in Afghanistan made a difference.

Captain Melin, the Commander of Bravo Company, 864th Engineer Battalion (Combat) (Heavy), conducts road construction and forward operating base improvement. He previously managed the Task Force Pacemaker construction projects as the Assistant S-3 for the 864th Engineer Battalion at Fort Lewis, Washington. He is a graduate of the United States Military Academy.

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Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in PowerPoint. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including your full name, rank, current unit, and job title; a list of your past assignments, experience, and education; your mailing address; and a fax number and commercial daytime telephone number.

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Send submissions by e-mail to <*engineer@wood.army.mil*> or on a 3 1/2-inch disk or CD in Microsoft Word, along with a double-spaced copy of the manuscript, to: Managing Editor, *Engineer Professional Bulletin*, 320 MANSCEN Loop, Suite 348, Fort Leonard Wood, Missouri 65473-8929.

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Detecting Underground Penetration Attempts at Secure Facilities

By Lieutenant Colonel Robert E. Tucker Ph.D., Dr. Jason R. McKenna, Dr. Mihan H. McKenna, and Dr. Michael S. Mattice

The protection of secure facilities such as forward operating bases (FOBs) and theater internment facilities (TIFs) is an emerging issue in light of the successful and nearly successful underground breaches at overseas bases, along our borders, and at prisons in foreign countries where suspected terrorists are held. The armed forces are now investigating sensor modalities to protect secure facilities, because covert tunnels can conceal and protect terrorist activities, weapons of mass destruction, command and control facilities, and other functions. The technological sophistication observed in some of the tunnels (such as uses of power conduits; heating, ventilation, and air-conditioning [HVAC] systems; reinforced concrete; and other metallic objects) shows a high degree of engineering skill and financial backing. But seismic and acoustic technology that is currently available can be used to span the underground protection gap within our force protection strategy.

During studies conducted at a base camp in Iraq from July-November 2005, the most promising technology used an array of acoustic and seismic sensors placed at various depths to determine the characteristic signatures produced by underground tunneling, as well as signatures produced by personnel and equipment typically located within a base camp (such as generators, vehicles, and heavy equipment). Subsequent analysis determined that local geologic characteristics were of primary importance in governing both surface and subsurface signals of interest.

Site Geology and Test Facility

The general geologic setting of the base camp consists of various layers of fine-grained sediments from surficial windblown silts and sands to compacted silt and clay-bearing layers with varying amounts of gypsum and unconsolidated coarse to fine sands at a depth of 7 meters. All sediments are damp below about 1 meter.

The windblown material is typically well-rounded quartz grains that are 1 millimeter or less in diameter. This mixture of small mineral grains becomes cemented at a depth of about 30 centimeters, apparently due to precipitating gypsum minerals. This top layer gives way to between three or four distinct layers of buff or tan layers that are intermixed with gray-green layers of compacted silts and clay minerals (Figure 1). These layers vary in depth and vertical extent, depending on the location within the camp. Gypsum is present in the upper layers.

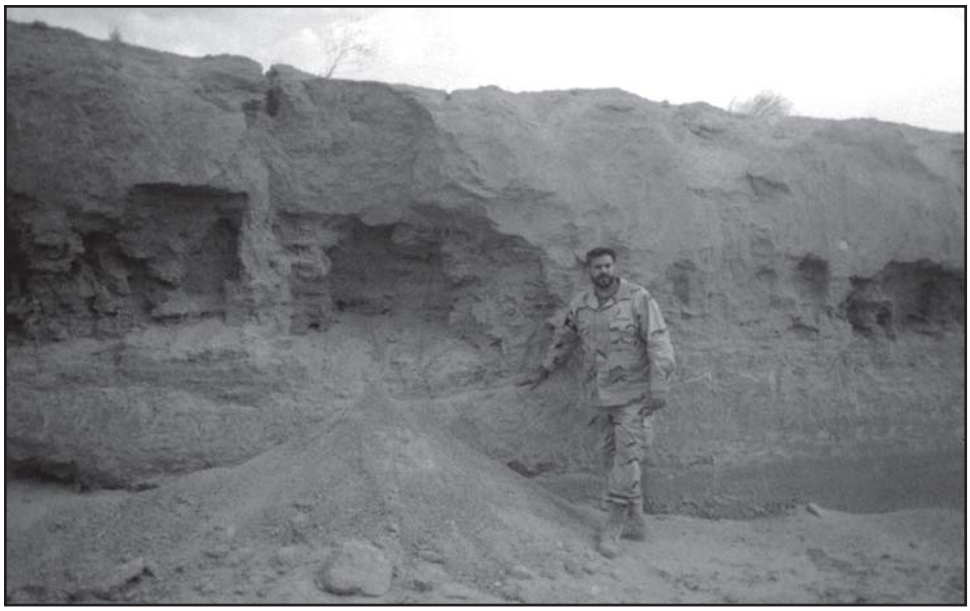


Figure 1. A typical strata sequence in the study area. Note the subtle color changes and weathering differences.

Within the base camp, the natural topography has been disturbed by extensive leveling and building. However, throughout most of the area, an unconsolidated layer of sand is encountered at a depth of about 6.5 to 7 meters. The sand layer has visibly distinct bedding planes occurring at all angles. The overlying silt slumps into the sand layer so there is not a distinct boundary between the two layers.

To validate sensor performance, an 8-meter vertical shaft with an interior side dimension of 1.2 meters (4 feet) was designed and constructed. Camp personnel excavated a pit with a vertical wall (Figure 2) where the shaft was placed so the tunnel would be right at the silt-sand contact (about 7 meters deep at this spot). This allowed about 1 meter of the shaft to stick up aboveground. A pulley system attached to a head frame allowed the spoil to be removed at about 0.25 cubic feet per bucket (about one-third of a 5-gallon bucket).

The tunnel leaving the shaft was about 1.2 meters in height and width, and the shoring consisted of vertical posts with 2 by 6 lumber on the top and sides (Figure 3). The tunnel began in the sand layer, and almost immediately, the silt layer slumped into the course of the tunnel from the right, leaving only about one-third of the working face as unconsolidated sand. Thus, the back and sides of the tunnel were constructed in hard silt, which made the tunnel extremely safe. However, it took about 3 days to dig the tunnel to the desired length (6 meters) before testing was initiated. The data collection was initiated at this length in an attempt to minimize any backscatter problems from the digging operations and unwanted clutter noise coming down the shaft and into the tunnel. Analysis of the data could not detect any such spurious acoustic or seismic contamination.



Figure 3. A look down the tunnel to the working face.

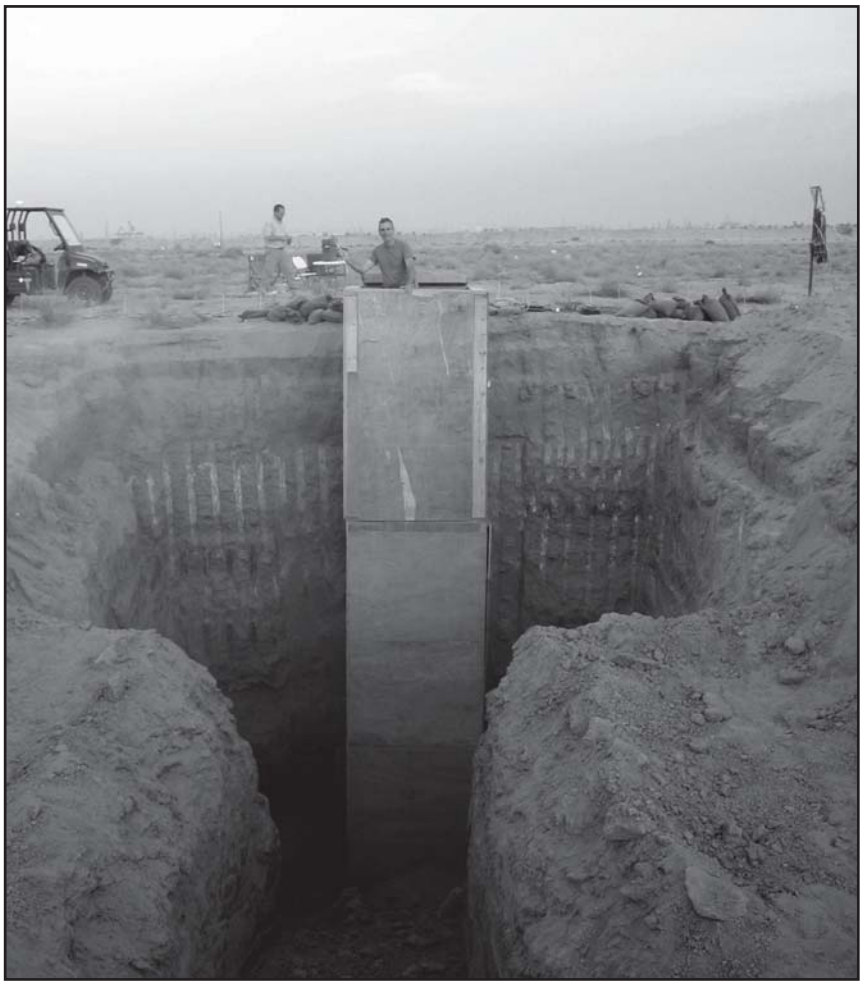


Figure 2. The shaft in place. Note the various layers of compacted silt.

Geophysical Data

The data collection sensors were placed along the line of the tunnel and perpendicular to it. The sensors were also placed at varying depths to determine the attenuation capabilities of the layers for sounds generated at the surface and in the tunnel (such as from trucks, generators, walking, and digging). A variety of data was collected during underground digging operations, which was completed with tools similar to those used by detainees to construct tunnels. After a series of signal-processing algorithm are implemented, it is possible to automatically differentiate signals underground at the 90 percent confidence interval or better (Figure 4).

It is important to note that the near-surface environment is dynamic: changes in the soil conditions in the upper few meters of soil can influence sensor performance dramatically. For example, after the initial series of data was collected, a 36-hour rain occurred. After the rain stopped, a second series of tests was conducted, using the same collection parameters. The particular signature of a source signal did not change, but the amplitudes increased significantly. The increase in the amplitude of the measured data varied from 10-15 decibels (dB) up to 450 hertz (Hz) (Figure 5). This is interpreted to be the infilling of interstitial voids by water, providing a better medium for wave propagation than grain-to-air and grain-to-grain interface. These types of evolving sensor-soil interactions illustrate the need for multisensor protection models and also illustrate why simple threshold detection methods invariably have high false-alarm rates.

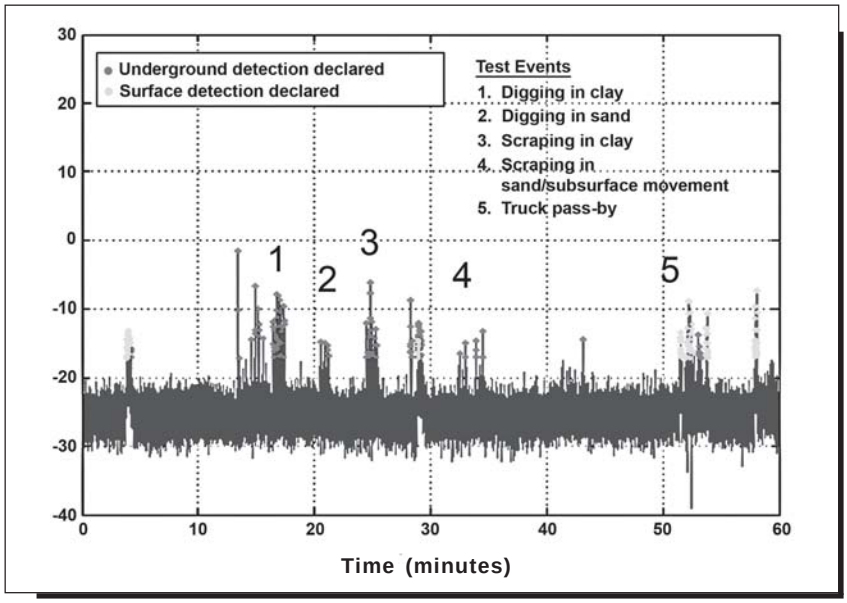


Figure courtesy of BBN Technologies

Figure 4. Results of signal processing to automatically classify signals originating from the surface and underground.

Force Protection Models

Analysis of the test data indicate that passive seismic and acoustic collection arrays will detect and classify active digging operations near a protected facility after advanced signal processing is performed. Emplacement of a seismic/acoustic array will cause a minimal surface footprint or impact to the facility operations. Five concerns need to be addressed to take full advantage of this technology:

- Designing and integrating the seismic/acoustic array into the overall security plans of the facility.
- Constructing the array in conjunction with the facility to minimize costs and maximize effectiveness.

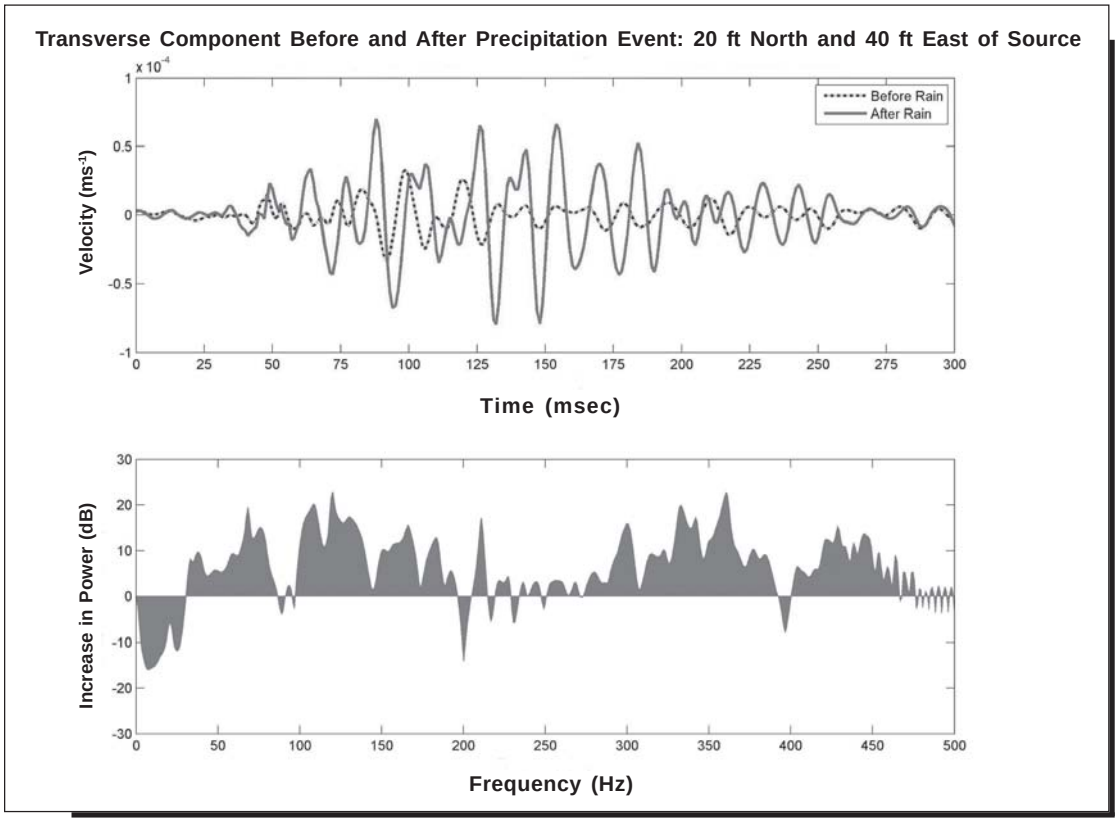


Figure courtesy of Dr. Jason R. McKenna

Figure 5. Example of the increase in seismic amplitude after a steady 36-hour rain (same source and location).

- Collecting enough data to categorize the cultural signatures within and near the facility in order to integrate these signatures into the detection algorithm.
- Training the facility managers on the system and how to recognize anomalies (for example, if actual tunneling occurs).
- Maintaining reachback to the system administrator to provide expert interpretation, troubleshooting advice, and additional upgrades as situations change.

The working system that is envisioned contains the sensor array along the perimeter, continuously collecting data that is fed into a central data processing or monitoring site at the facility. This is where incoming signals are compared to test modules. Any detection of targeted frequencies or modules alerts the on-site system managers. At this point, the data stream with the module or frequencies of interest can be sent to a reachback service for confirmation and/or further analysis. The key to a successful interception operation is continued surveillance of incoming underground data and triangulation of the source in reference to depth and direction. Most of the tunnels take time to construct, particularly if they are constructed by hand. Commanders then make decisions on the best method to intercept the perimeter intrusion.

It is important to realize that during this study, the TIF operations focused on detecting outgoing tunnels. However, there is a significant need to detect incoming tunnels that could bring explosives or weapons into a secure facility. A tunnel used to breach the security perimeter of an outpost along the Israeli border contributed to the military operations that were conducted this past summer in Lebanon between the Israeli Defense Forces and Hezbollah.

Another important aspect of the system data analysis is to ensure that the false positive rate is kept to a negligible rate. One solution is to provide the facility with its own tunnel, where periodic testing of the sensor array would originate. This negative Z detection capability provides commanders confidence in their force protection technologies.

To illustrate the usefulness of such a force protection model globally, consider the Otay Mesa tunnel discovered on 26 January 2006. The tunnel, one of four located within a two-week period between Tijuana, Mexico, and San Diego, California, is the longest (approximately 731 meters, or 2,400 feet) and most sophisticated tunnel ever found under the southern border of the United States. Beginning in a warehouse near the Tijuana Airport in Mexico, it follows a northeasterly route to a warehouse in Otay Mesa, California. The entrance on the U.S. side was concealed by the tile floor of an office in the warehouse.

Soil sampled in the tunnel was very moist and sandy and contained large (at least 4-centimeter) clasts of volcanic tuff. Layers of clay were interbedded with the sandy material, and white concretions were visible throughout. In the Otay Mesa area, the geology is very similar to that encountered overseas. The seismic-acoustic signals from digging appear very similar to those detected overseas, but here, the ambient noise is much more intense. However, despite the presence of numerous trucks idling near the sensors, the signals of interest are clearly visible.

Conclusions

Protecting underground perimeters is the next capability gap to be bridged in the force protection arena. The potential underground penetration of secure facilities needs to be addressed in our current force protection models and capabilities. A system for protection of these facilities must be planned during the earliest phase of facility construction and integrated into the construction scheme. The system must be able to monitor or detect attempts at underground penetration; use current technologies for immediate operational employment and upgrades; and be easily monitored by personnel at the site, with constant technical reachback ability. The use of seismic and acoustic sensors provides the facility commander with an excellent passive data collection capability that can readily distinguish tunneling activities from the surface-originating sounds encountered on a base.

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For additional information on the study, contact Lieutenant Colonel Tucker at <*robert.tucker2@us.army.mil*>.

Lieutenant Colonel Robert E. Tucker is assigned to the Capability Development & Integration Directorate (CDID) at the MANSCEN Futures Center, Fort Leonard Wood, Missouri. He holds a doctorate in geochemistry from Colorado School of Mines.

Dr. Jason R. McKenna is a geophysicist at the United States Army Engineer Research and Development Center, Vicksburg, Mississippi, and the technical lead for the ERDC Tunnel Detection and Deterrence Team.

Dr. Mihan H. McKenna is a geophysicist at the United States Army Engineer Research and Development Center, Vicksburg, Mississippi, specializing in seismic-acoustic monitoring.

Dr. Michael S. Mattice was the project lead, working with the United States Army Rapid Equipping Force, Fort Belvoir, Virginia.

Winning Hearts and Minds – Eagle Style

By Captain Becky L. Lapidow

The concept of "winning the hearts and minds" is heard so often in the media when discussing the Global War on Terrorism that it has almost become meaningless. Winning hearts and minds can be especially tough in a country such as Afghanistan, where decades of armed conflict have made the rural population leery of armed personnel bearing gifts. Despite this challenge, elements from the Afghan National Army (ANA); Headquarters Company, Task Force Eagle; and Charlie Company, Task Force Eagle, conducted a combined medical assistance and humanitarian assistance mission. By giving supplies such as shoes, food, and clothing and providing medical attention, Afghan and American Soldiers demonstrated the meaning of winning the hearts and minds to the local population and demonstrated the benefits of supporting the Afghanistan government's efforts to bring security and stability to this area of the Paktika Province.



Photo by Captain Becky Lapidow

A Task Force Eagle Soldier helps local children carry supplies received from the humanitarian assistance mission.

While medical screenings were conducted and humanitarian assistance packages were provided, ANA and Charlie Company Soldiers provided inner and outer rings of security. The key to this mission was to ensure that the ANA was the lead so the townspeople could see the role their army played in improving their daily lives. Before setup was finished, the townspeople started filtering inside for medical screenings. Symptoms such as burns, pink eye, diarrhea, and skin infections were treated by ANA doctors and Task Force Eagle medics. Female medics and assistants stood by to support the medical requirements of adult women and young girls, while male medics treated adult males in a separate room. More than 50 children came for medical treatment, and with the assistance of two ANA medics, no time was wasted—everyone was treated. The medics worked nonstop and had plenty of supplies on hand to treat everyone who came for aid. As with the ANA security lead, it was critical to have the ANA doctors and medics present to treat patients. Besides showing their lead in the event, it allowed Task Force Eagle medics an opportunity to train their Afghan counterparts. An ANA doctor remarked that a Medical Civil Affairs Program (MEDCAP) is good for the ANA and townspeople alike. It shows a close relationship between the ANA and the locals and that the American Soldiers are here to help. Referral slips with the name of the doctor and location of the new government clinic were provided to patients to demonstrate the Islamic Republic of Afghanistan's commitment to improving their lives.

Another way Afghan and American Soldiers helped win over the townspeople was to hand out everyday supplies to the children and the adults. An ANA and Task Force Eagle team provided aid to more than 150 people in desperate need of such supplies. Similar to the combined medical assistance part of the mission, the focus was to ensure that the Afghan soldiers were seen handing out the items alongside the American Soldiers. Most of the items—such as clothes, backpacks, shoes, pens, pencils, and coats—were geared toward the children. Many of them walked away with bundles of items bigger than they were. While the U.S. Army provided most of the supplies, some of the materials were donated by Soldiers' family members. Adults were provided staples such as rice, beans, flour, and blankets for the cold winter ahead. The town elders were pleased with the humanitarian assistance, because they realize that some of their townspeople have very little as the winter approaches. The mission brought assistance to people in need, and the hope is that Afghan nationals and the government of



Photo by First Lieutenant Keith Mueling

A Soldier helps fill a backpack for some local children.

Afghanistan will be able to help themselves for the long term. This is also why it is so important to have the ANA involved in these operations—to develop their ability to execute the missions and provide future assistance on their own.

In addition to winning the hearts and minds of the Afghan nationals, this assistance mission helped build a relationship with them so they'd be more welcoming to Task Force Eagle engineers conducting road construction near their town. This demonstrates an important balance between building needed roads and reaching out to the public, showing the benefits of such infrastructure. This mission was also an opportunity for the Afghan and American Soldiers to work together, proving that coalition success requires working for the common goal of rebuilding the nation of Afghanistan. Just as important, the Task Force Eagle Soldiers walked away feeling that they made a difference in the country of Afghanistan—illustrating that the term "winning the hearts and minds" is more than a meaningless catch phrase.

Captain Lapidow is the Public Affairs Officer for Headquarters and Headquarters Company, 37th Engineer Battalion (Combat). Previous assignments include executive officer, platoon leader, and assistant S-1 for the 37th Engineer Battalion. She has attended the Engineer Officer Basic Course, Airborne School, the NBC Defense course, and Jumpmaster School and has a bachelor's in earth and environmental sciences from Lehigh University, Bethlehem, Pennsylvania.

Fort Hood Training Capabilities Website

The Fort Hood Training Capabilities Website at <*https://mdtt.hood.army.mil/capability/main.html*> is a single online entry point for III Corps and Fort Hood's Live Virtual and Constructive (LVC) and Joint, Interagency, and Multinational (JIM) training capabilities. The site provides users with training resource descriptions, scheduling instructions, and resources information links to help match training requirements with Fort Hood's vast array of training resources. Fort Hood is one of the premier Army locations providing Soldiers with a wide variety of realistic maneuver areas and live-fire training ranges designed to support training at both the individual and collective levels. Visit the Fort Hood Training Capabilities Website today, and learn about training resources available to enhance your training mission.

The point of contact is <*kristin.boyd@hood.army.mil*> or call (254) 287-0574 or DSN 737-0574.

("Reserve and National Guard," continued from page 24)

stretch of highway and the consequences that await anyone who is not vigilant.

On this particular night patrol, one of the trail gun-trucks spots a tiny stretch of cleverly concealed command wire and notifies the operator of the patrol's main route clearance workhorse—a Buffalo, a huge, truck-like armored vehicle—which pulls up to an area just off the pavement and goes to work. With a deft hand, an engineer Soldier inside manipulates the Buffalo's robotic arm and investigates the site. In a few minutes, he has uncovered and disarmed the buried munition, chalking up another success in disrupting insurgent activities. An explosive ordnance disposal (EOD) team harmlessly detonates the IED before the patrol continues on.

After more than eight hours outside the wire, the patrol pulls back into their motor pool. Dawn light is beginning to filter in over the camp as the Soldiers dismount and shed their body armor, helmets, and gear. They show a reserved satisfaction as they wrap up their duties and head for their quarters.

In the finest engineer tradition, the Reserve and the National Guard have formed a tight professional bond that has resulted in an impressive success record. As of 1 February, the National Guard unit conducted more than 800 route clearance patrols, covered more than 100,000 kilometers of roadway, and uncovered more than 300 threats to assured mobility. They know that each patrol is one step forward in the ongoing fight to bring stability and freedom to Iraq.

Staff Sergeant Durney is a member of the Arkansas Army National Guard's 119th Mobile Public Affairs Detachment and is currently on deployment with the 875th Engineer Battalion in support of Operation Iraqi Freedom. He began his career as a Navy journalist in 1976 and rejoined the military after a 25-year break in service. He is an award winning photographer and a private pilot. As a civilian, he is a public affairs specialist with the Arkansas National Guard Public Affairs Office and editor of the Arkansas Minuteman quarterly magazine.

Joint Engineer Operations Course

By Mr. Robert B. McFarland, Jr.

The joint engineer community continues to move forward in the process of educating and preparing its officers and noncommissioned officers for operations in the joint environment. The Doctrine Training Working Group (DTWG) of the Joint Operational Engineer Board (JOEB) overwatches the combined efforts of its engineer centers of excellence to fully develop the Joint Engineer Operations Course (JEOC), formerly known as the Joint Engineer Officer Course. The new course title provides a more accurate description of the intent and content of the course. The JEOC is a two-phase course designed to better prepare officers and selected senior noncommissioned officers for duty on the joint engineer staff of a joint task force (JTF). The distributed learning (dL) phase is designed to be 40 to 48 hours and a prerequisite for attendance of the resident phase, designed to be 32 to 40 hours.

Prompted by its own introspection (see *Engineer*, January-March 2006, "Joint Engineer Officer Course," page 17) and guidance derived from the *National Military Strategy*, *Quadrennial Defense Review*, and the Chairman of the Joint Chiefs of Staff's *CJCS Vision for Joint Officer Development*, as well as from other sources, the joint engineer community has firmly set its sights on developing engineers who are better prepared and who can quickly immerse themselves into the JTF and its ongoing campaign.

To date, there have been two JEOC pilots. The popularity of the course has resulted in a continuing dialogue among the joint engineer community on the course itself, as well as on joint operations and its impact on the education of the engineer force for the future. Enrollment queries occur regularly, in particular from junior leaders wanting to enhance their knowledge of joint engineer operations.

Course Concept

In October 2004, members of the JOEB-DTWG training subworking group met at Fort Leonard Wood, Missouri, to discuss JEOC development. Officers at the senior company grade and junior field grade levels were the target audience, but it was expanded to include senior noncommissioned officers and government civilians who could also serve in a JTF engineer billet. The concept of the course was defined as follows: *Understand and be able to integrate engineer capabilities across the spectrum of operations to ensure support of joint force commanders' engineer requirements and accomplishment of the joint mission.* The end state competencies that the student would possess upon completion of the course were to—

- Describe joint operations, joint warfare, and the joint planning system.
- Describe, comprehend, and apply joint engineer doctrine.
- Describe, comprehend, and apply joint engineer planning using scenarios, historical examples, and case studies.
- Describe and comprehend service engineer capabilities and unique requirements.
- Describe, comprehend, and apply the strengths, effects, and basic doctrinal employment concepts of service engineers.
- Describe, comprehend, and apply employment principles for using service engineer capabilities to support joint and service engineer requirements.

DTWG Determinations

The United States Army Engineer School's Directorate of Training and Leader Development (DOTLD) tasked its Training Integration Office to write the JEOC white paper that was distributed in March 2005 for comments from the field. Based on feedback, a formal JEOC presentation was given to the JOEB-DTWG on 7 April 2005. The presentation included a draft 160-hour course with an 80-hour dL phase and an 80-hour resident phase. The resident phase focused on the operational side of staff work and concentrated on a capstone engineer exercise centered on crisis action planning.

The DTWG determined that although the students needed to understand the operational environment where they worked, they needed to focus more on execution and less on planning. The resident phase length was relooked, with a target of 40 hours being the goal. All agreed that a resident phase was crucial to enhance the educational opportunity of the junior

"The JEOC is a two-phase course designed to better prepare officers and selected senior noncommissioned officers for duty on the joint engineer staff of a joint task force"

members of the joint engineer community. The ability to interact in a classroom environment, while focusing on issues and exercises specific to the joint engineer community, would provide an excellent opportunity to better understand each other's capabilities.

Training Developer's Conference

From 31 August to 1 September 2005, DOTLD hosted a training developer's conference (TDC) with 27 representatives from the Army, Navy, Marine Corps, Air Force, and other associated organizations. The attendees were formed into three working groups to address issues specific to their group:

- dL working group
- Resident phase working group
- Administrative working group

Each working group was assigned a senior advisor (a senior lieutenant colonel or a colonel), and these senior advisors were also the JEOC Executive Steering Committee.

On the second day, the Engineer School hosted a video-teleconference, with several of the combatant command engineers (United States Central Command, United States Southern Command, United States European Command, and United States Pacific Command) attending and incorporating their input into the course design. The end result of the TDC was a proposed two-phase 80-hour course with a 48-hour dL phase and a 32-hour resident phase. The decision was made that Fort Leonard Wood would host the first pilot course in June 2006.

Upon completion of the TDC, members of the working groups—consisting of key personnel from the Joint Forces Command, the Joint Staff J-4, the Air Force Institute of Technology, the Civil Engineer Corps Officer School, and the Marine Corps Headquarters—held monthly teleconference in-progress reviews (IPRs), providing lesson material and pursuing funding. The results of the TDC were consolidated, and the course concept was designed to meet the identified requirements. The proposed concept was presented to the JOEB at the next quarterly videoteleconference in November 2005. Coordination among the joint engineer community resulted in the United States Army Corps of Engineers® committing to provide funds for hiring two temporary employees to develop the JEOC program of instruction and associated lesson plans. The Joint Staff J-4 agreed to provide funds to develop the dL phase courseware.

In December 2005, the JEOC web portal was developed by the Directorate of Common Leader Training (DCLT) and a beta test was conducted to determine accessibility throughout the continental United States. A resident phase coordination IPR was held at Fort Leonard Wood in January 2006, where the TDC resident phase developer's intent was further clarified. This intent was then applied to the dL phase development to create the module linkage between the two phases. Further coordination with the Joint Forces Staff College, National Defense University, resulted in the *Purple Sunset* concept plan exercise becoming the primary source for driving the resident phase practical exercises.

A key result of the TDC was the determination of seat quotas. Upon returning from the conference, the Joint Staff J-4 engineer representative queried the combatant commands for their estimates of officers, senior noncommissioned officers, and selected civilians within their commands and component commands who would benefit from attending the JEOC. These personnel were divided into three bands, depending on their status and probability of participation with a JTF engineer staff.

- Band 1 personnel were those assigned to a JTF, combatant command, or component command.
- Band 2 personnel have a high probability of being tasked to help stand up a JTF.
- Band 3 personnel are junior officers preparing to join a prospective JTF headquarters and all others who would benefit from the JEOC.

The decision was made to use Band 1 numbers to determine seat quotas and keep with the original intent of having three small groups of 15 students for a total class size of 45. The total rollup for Band 1 was 174 personnel. This number provided the developers with a base figure to determine that an annual throughput of up to 174 personnel in 45-person groups would equate to conducting three to four classes per year. The personnel numbers were submitted by Service, and these figures were used to determine seat percentages. The Army received 21 seats (46 percent), the Air Force 16 seats (36 percent), the Navy 7 seats (16 percent), and the Marine Corps 1 seat (2 percent). The Army gave two of its seats to the Marine Corps to ensure that each small group had representation in it.

Course Development

In January 2006, a JEOC Tiger Team consisting of DOTLD and DCLT members was organized at Fort Leonard Wood to kick off the development of the dL phase. The team coordinated with the Joint Forces Staff College to use approximately 10 hours of existing Joint Knowledge Development Distribution Capability courseware in the first and second modules of the dL phase. A weekly IPR was established to coordinate the team effort. A *SharePoint* site was established to exchange materials and discussion among the team members, and DCLT assumed responsibility for developing the Learning Management System (LMS) portal for the JEOC dL phase. The decision was made to use *Blackboard* as the LMS to host the dL phase and to open it to the students in April.

Small-group facilitators for the resident phase were provided by each of the Services. The goal was to provide a facilitator (a senior major or a lieutenant colonel) who had served as a key member of a JTF engineer staff. Ideally, the facilitator would have served as a deputy JTF engineer or as a plans or operations chief. Each Service identified one facilitator, and they began to participate in the IPRs where they were assisted in navigating the dL phase lessons in *Blackboard* and shown some of the features that could assist them in corresponding with their students. Additionally, the facilitators arrived four days before the students and participated in a resident phase train-up session with the Fort Leonard Wood development team. The students were divided into three small groups. Each facilitator was assigned a group and began the collaborative process of assisting them as they progressed through the dL phase and prepared for the resident phase.

Pilot Course 1

There were 53 students enrolled in the first JEOC pilot course, conducted from April to June 2006, and 37 attended the resident phase. All four Services were represented. The student population also included four senior noncommissioned officers and two government civilians. The students were surveyed on each lesson during the dL phase and resident phase. A final course after-action review was held upon completion of the resident phase with the students, facilitators, and course developers. Recommendations from the students and facilitators were staffed and used to make updates and changes to the lessons. The students felt the course was important for their development, as well as that of their peers and subordinates, and many commented that they wished they had attended a course like this earlier in their careers.

Pilot Course 2

There were 83 students enrolled in the second JEOC pilot course, conducted from October to December 2006, and 48 students attended the resident phase. The dL phase was opened to the students in October, and the resident phase was conducted at Fort Leonard Wood in December. Facilitator selection and student notification were similar to the first pilot. However, for the second pilot, five facilitators participated. Additionally, the Joint Forces Command engineer representative attended and, in essence, provided a sixth facilitator. This tag team approach appeared to work well, and the facilitators recommended that it be used in future courses. As with the first pilot, student feedback was positive and enthusiastic.

The high level of interest within the joint engineer community resulted in the dL phase lessons from the second pilot being placed on the Fort Leonard Wood engineer portal—the JEOC Open Enrollment Course is open to anyone with an Army Knowledge Online (AKO) account. Students without an account are sponsored by others in the engineer community who have one, but the new Defense Knowledge Online (DKO) system is expected to help resolve this issue. This course currently has 38 students.

Pilot Course 3

JEOC development continues through fiscal year 2007. Through the cooperative efforts of the Joint Forces Command, Engineer School, Air Force Institute of Technology, Civil Engineer Corps Officer School, and Marine Corps Headquarters, the third JEOC pilot is scheduled for April to July 2007. The dL phase opens in April, and the resident phase will occur at Fort Leonard Wood in July. Both the facilitator and the student will be key players in ensuring the success of the course, not only for their Service but for the entire joint engineer community.

JEOC Graduates

Graduates of the JEOC pilot courses are followed for one year after their attendance—through surveys sent at 90, 180, and 365 days—to ensure that the course content continues to be relevant in their environment while serving in a JTF assignment. Although not all JEOC graduates are assigned to a JTF, many are assigned to combatant command staffs or serve with a service component staff in support of a joint force commander, and they also provide the JEOC development team with valuable feedback.

Mr. Robert McFarland is a contractor with C2 Technologies, Inc. and works in the Training Integration Office, Directorate of Training and Leader Development, United States Army Engineer School. A retired Army lieutenant colonel and a former battalion commander, he is a graduate of the Command and General Staff College and the School of Advanced Military Studies (SAMS). He is the project manager for developing the Joint Engineer Operations Course, along with other ongoing initiatives at the Engineer School.

Cooperative Graduate Degree Program at Fort Leonard Wood



By Dr. William J. Daughton

A cooperative degree program between the University of Missouri-Rolla and the United States Army Engineer School at Fort Leonard Wood leads to a graduate certificate in military construction management and to a master of science degree in engineering management, civil engineering, geological engineering, or public policy for officers in the Captain's Career Course.

In 1994, the University of Missouri-Rolla (UMR) and the United States Army Engineer School began a program of intensive study taught by UMR faculty at Fort Leonard Wood that allowed officers attending the Captain's Career Course to earn university graduate credit leading to a certificate in military construction management and then to a master's degree in engineering management. The program was established with a special tuition rate that makes it quite competitive and affordable. The first group of students completed this program in the spring semester of 1995, and since its inception, 881 officers have successfully completed their master's in engineering management through this program.

With the success of the program in engineering management, other degree programs were added in civil engineering, geological engineering, environmental engineering, and public policy. The program in public policy is supported by faculty from the Public Policy Administration Department at the University of Missouri-St. Louis (UMSL). Engineering management has been the most popular program by far, but all of the programs have been successful. The Fort Leonard Wood program is supported on-site by two UMR staff members to facilitate matriculation and completion of the program. All of the UMR programs are integrated into the Army's new web-based tuition assistance program *GoArmyEd* at <*http://GoArmyEd.com*>.

Program Structure

Military Construction Management Certificate

All officers entering the Captain's Career Course complete a core of four shared-credit courses that are a combination of instruction provided by Engineer School instructors and UMR faculty. Each course is worth 3 semester hours of graduate credit, resulting in the student accumulating 12 semester hours of graduate credit during the 20-week career course. The shared-credit courses are as follows:

- Engineering Management 313, Managerial Decision Making
- Engineering Management 314, Management for Engineers and Scientists
- Civil Engineering 345, Construction Methods
- Civil Engineering 442, Construction Administration, Planning, and Control

Upon completing these courses, students in engineering management, civil engineering, and environmental engineering receive a graduate certificate in military construction management. Public policy and geological engineering students earn 12 credits, but not a certificate.

Master's Degree

Completion of the graduate certificate in military construction management with a grade of B or higher in each course enables students to enter the master's program in engineering management without taking the Graduate Record Examination (GRE), provided they meet the normal requirements for their undergraduate degree field and cumulative grade point average. Students entering the master's program in the other fields are still required to take the GRE. Once admitted, students then complete the remaining six courses in one equivalent semester. The format of those remaining courses varies, depending on the program.

In engineering management, which is the most popular option, the courses are either taught in two 8-week compressed sessions at Fort Leonard Wood, or on the UMR campus in the normal 16-week semester. The determining factor is the alignment of the Captain's Career Course with the standard UMR semesters. There are four career course groups spread throughout each year, and typically two of them dovetail with the UMR semesters, and two do not. In the first case, students take the remaining courses on the UMR campus with the normal assembly of graduate students. In the latter case, engineering management instructors teach the remaining six courses exclusively to the officers at Fort Leonard Wood in two 8-week sessions. Civil engineering is only offered twice per year to those in career course classes that line up with the

UMR semesters; public policy courses are taught at Fort Leonard Wood only; and the geological engineering courses are taught on the UMR campus.

Program Feedback

The overall feedback from the participants is positive; they cite this cooperative program as an excellent way to earn a master's in an otherwise busy time. In particular, the UMR support staff on-site receive positive feedback for their helpfulness, easy availability, and positive attitude. The program also draws high praise from the participating faculty as well. Most faculty members view the officers as very motivated and engaged students, and they consider it a pleasure to teach them. The faculty members describe these students as among the very best graduate students they encounter. This creates a winning combination and contributes to a very productive and exciting learning environment.

The Future

Both UMR and the Engineer School consider this program to be very valuable. For UMR, the program represents an important extension activity in fulfilling its mission to provide outstanding engineering education in the state. The Engineer School values the opportunity to engage a highly rated university in a cooperative program that has real benefit for its officers. Representatives of both groups continue to meet to discuss how the program is working and seek ways to improve it. One of the more recent improvements has been the introduction of an option to complete the degree program remotely. With the continuing growth of the distance education capability at UMR, the option now exists for officers to complete the master's program at a distance if they are required to leave before completing all of the courses. As communication technology continues to advance, this option will get easier to use regardless of the officers' location.

Questions about this program may be addressed to Lahne Black at 573-341-4410 or at <*lahne@umr.edu*>.

Dr. Daughton is a professor and department chair of the Engineering Management and Systems Engineering Department at the University of Missouri-Rolla. He holds a debriefing session with each class that completes the program.

UMR
UNIVERSITY OF MISSOURI-ROLLA

("Keystone Manual," continued from page 6)

- Appendix J – Engineer Field Manuals and Related Joint Publications

Additionally, the December council recommended that two overarching themes guide the development of this revision:

- Primacy of the Warfighting Functions
  - Leverage engineer links to the warfighting functions to define the Regiment.
  - Adopt warfighting functions as our common language.
- Criticality of Engineer Command and Control and Staff Integration
  - Include functional and multifunctional command and control structures.
  - Emphasize engineer staff participation at all levels (to include sustainment-type units). Define doctrinal requirements, even if specific engineer staff and command and control structure doesn't currently exist organically at the proper locations in the force.
  - Broaden the description of engineer staff responsibilities to include new roles and selected historical roles that have not been focused on in the past.

Production and Publication

The writing team is currently preparing the first draft (author draft), which will be completed in time for a presentation and discussion during ENFORCE 2007. Based on the guidance from the review of this document and this meeting, a second draft (initial draft) will be completed in June 2007. The initial draft will be sent out for Armywide staffing, to include a focused review within the Regiment. After the comments from that staffing are received and adjudicated, a final draft will be prepared in time for a final Council of Colonels in late 2007. Other working group actions and council dates will be developed as necessary to support the production of the manual for the Regiment. The publication of this latest version of FM 3-34 is projected for fall 2008. Your participation is necessary to help make this 21st edition of the Regiment's keystone manual relevant and used by all leaders in the Regiment and the Army.

Lieutenant Colonel Lefler is the Chief of the Doctrine Development Division at the United States Army Engineer School, Fort Leonard Wood, Missouri. He is a registered professional engineer in Nebraska and a Project Management Professional.

Lieutenant Colonel Supplee (Retired) is a senior military analyst with the Army Program Office of Advancia Corporation, based in St. Robert, Missouri. His last active duty assignment was as the Operations Branch Chief for the Office of the Chief of Engineers at the Pentagon.

Army Civilian Corps

By Ms. Karin Gan

In addition to its Officer Corps and Noncommissioned Officer Corps, there is now a new corps in the Army family—the Army Civilian Corps. The establishment of this corps was announced to Army personnel in a 19 June 2006 memorandum signed by General Peter J. Schoomaker, then Chief of Staff of the Army, and Dr. Francis J. Harvey, then Secretary of the Army.[1] In the memorandum, they stated that Army civilians have a 230-year record of service and are extremely critical to the total Army force structure. *Army Civilian Corps* is a fitting title for this group of people; the name helps unify the Army civilian service and exemplifies the commitment of these dedicated individuals.

The memorandum further stated that Army civilians serve in all theaters and are deployed throughout the world in support of the Army's missions, to include the Global War on Terrorism. Not only do they assist with many of the reconstruction projects in Iraq and Afghanistan, but Army civilians are also being recruited to fill other positions to support the war.[2] And here at home, they help train Soldiers for deployment and maintain the facilities while the Soldiers are away, defending our country. As the missions have evolved and become more complex, so have the roles of Army civilians. In addition, the stability and continuity that the civilians provide is invaluable in keeping the Army at a high state of readiness.

Like their uniformed counterparts, Army civilians are committed to selfless service in the performance of their duties. This is illustrated in the Army Civilian Corps Creed,[3] which defines the purpose and role of Army civilian employees (see Figure 1).

Army Civilian Corps Creation

The creation of the Army Civilian Corps resulted from a study conducted from August 2001 through February 2003 by the Army Training and Leadership Development Panel (ATLDP).[4] Through this study (which involved 40,000 civilians, using written and online surveys, focus-group sessions, and personal interviews), the panel of senior civilian and military subject matter experts were able to determine the needs and concerns of Army civilians.

One thing that the study revealed was that Army civilians were not being adequately trained for leadership roles. "The Army grows and develops the best Soldiers in the world—and trains them to be leaders. However, growing Army civilian leaders has fallen short of that requirement."[5] As the Army transforms, the reliance on the civilian workforce will increase.

Army civilian leaders of the 21st century must be well-trained so they can support our Soldiers to their fullest potential. They must be *pentathlete* leaders—multiskilled strategic and creative thinkers who can build leaders and teams. Figure 2 shows the skills and attributes[6] needed to become pentathlete civilian leaders who personify the Warrior Ethos in all aspects, from warfighting support, to statesmanship, to business management.[7]

Civilian Education System

The ATLDP recommended four "imperatives" designed to help develop Army civilians and grow leaders: accountability, lifelong learning, interpersonal skills, and Army culture.[8] "Like their uniformed counterparts, Army

Army Civilian Corps Creed

- **I am an Army Civilian – a member of the Army Team**
- **I am dedicated to our Army, our Soldiers, and Civilians**
- **I will always support the mission**
- **I provide stability and continuity during war and peace**
- **I support and defend the Constitution of the United States and consider it an honor to serve our Nation and our Army**
- **I live the Army values of Loyalty, Duty, Respect, Selfless Service, Honor, Integrity, and Personal Courage**
- **I am an Army Civilian**

Figure 1

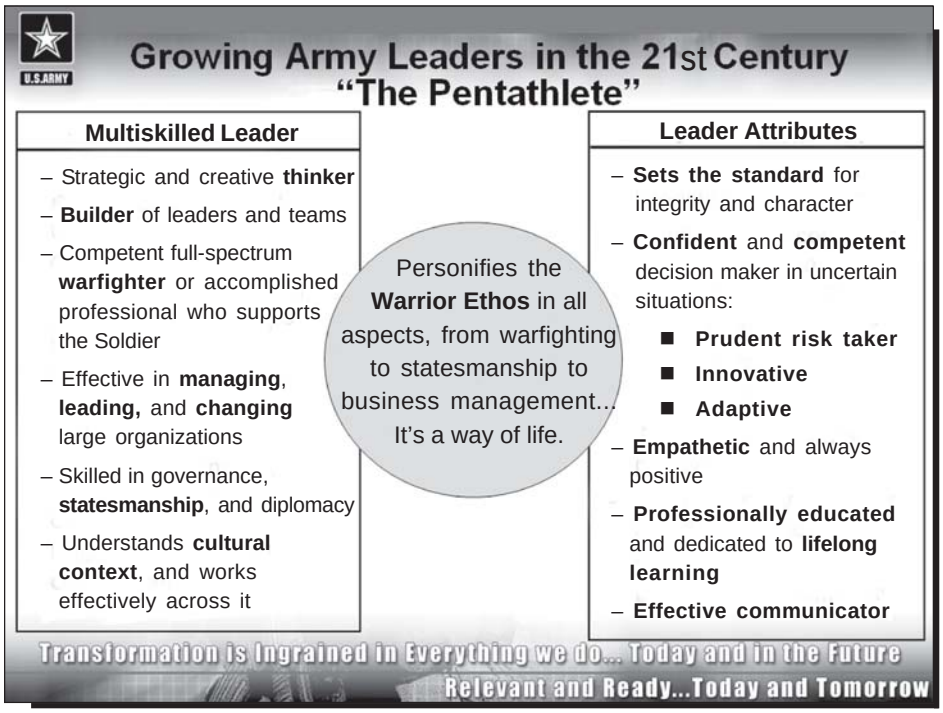


Figure 2

civilians must be well-developed, motivated, and forward-thinking to meet the challenges of the 21st century."[9] They "require a leader development education structure parallel to that of their uniformed counterparts."[10]

Toward that end, a new Civilian Education System (CES) is being developed and staffed with the major commands. Phase 1 began in January 2007; additional phases will begin as the CES program develops.[11]

The CES plan includes four courses that are sequential and progressive:[12]

- *Foundation Course (FC).* This course is for civilians entering the Army with various levels of previous experience. It is entirely distributed learning (dL). Students will learn to understand and appreciate Army values and customs, serve professionally as a member of the Department of the Army, acquire foundation competencies for leader development, develop effective communication skills, and be ready to assume a first leadership role.
- *Basic Course (BC).* This course is for leaders who exercise direct leadership to effectively lead a team. It will be a combination of dL and a 2-week resident phase at the Army Management Staff College (AMSC) Fort Leavenworth, Kansas, campus. Students will understand and apply basic leadership skills to effectively lead and care for small teams, apply effective communication skills, and develop and mentor subordinates.
- *Intermediate Course (IC).* This course is for leaders who exercise direct and indirect supervision. It is a combination of dL and a 3-week resident phase at either the AMSC Fort Leavenworth or Fort Belvoir, Virginia, campus. Students learn skills to manage human and financial resources, direct program management and systems integration, display flexibility and resilience, and focus on the mission.
- *Advanced Course (AC).* This course is for leaders who exercise predominately indirect supervision. It is a combination of dL and a 4-week resident phase at the AMSC Fort Belvoir campus. Students become skilled in leading a complex organization, managing human and financial resources, leading change, inspiring vision and creativity, directing program management and systems integration, displaying flexibility and resilience, and focusing on the mission.

Legacy leader development courses such as Leadership Education and Development (LEAD), Leadership Education and Development Train the Trainer (LEAD TTT), Organizational Leadership for Executives (OLE), Personnel Management for Executives (PME) I and II, Strategic Leadership Education (SLE), and Sustaining Base Leadership and Management (SBLM) have been phased out and will be replaced by, or incorporated into, the four CES courses.[13] Information on dates and location of the classes will be posted on the AMSC website at <*http://www.amsc.belvoir.army.mil/ces/*> and in the Civilian Leader Development Transformation Community on Army Knowledge Online (AKO).[14]

Another result of the panel was the November 2004 establishment of the Civilian Advisory Board.[15] The purpose of this board is to—

- Provide the Chief of Staff, Army, and his staff with professional advice and assistance in matters pertaining to the civilian work force.
- Serve as a representative and advocate for Army civilians in matters raised to the Chief of Staff, Army.

- Strengthen the bonds between uniformed and civilian members of the Army.
- Highlight the importance of keeping Army civilian workforce issues integrated into the Army planning process. Advance training and leader development to the forefront of Army priorities.

Conclusion

According to former Chief of Staff of the Army Schoomaker and former Secretary of the Army Harvey, Army civilian employees of yesterday, today, and tomorrow are—and will remain—an integral part of the Army team. They have earned this distinction because of their vital service to the Nation and the Army.[16] To support our Soldiers as they carry out the Army's missions, the Army Civilian Corps, too, must be *Army Strong*.

Personal Observations

Growing up as an "Army brat," I learned from my father a deep respect for my country, the American Flag, and the United States Army. I began my civil service career straight out of high school as a Federal Junior Fellow, GS-2, in the Civilian Personnel Office at Fort Leonard Wood, Missouri. During the time I was completing my college degree, I was very lucky to have supervisors and mentors in the Civilian Personnel Office who personified and enforced in me the importance of my responsibilities as an Army civilian and of giving 100 percent while performing quality work.

The Army Civilian Corps Creed should be a reminder to civilian employees that our purpose is to serve and support—our country, our Army, and our Soldiers. We made that choice when we decided to work in the public sector rather than in the private sector. And we are truly fortunate to have that opportunity. Take a moment to study the creed. Most will find that not only do we practice these beliefs, we also understand and support them.

Although there will always be some Army civilians who fail to live up to their commitment and, as a result, cause all of us to be viewed negatively by some Soldiers, they are far outnumbered by the many who strive to support the Army's mission and to protect our country and our Constitution. Most of us take pride in being part of the Army Civilian Corps and look forward to transforming with this great Army team.

Ms. Gan is the lead editor for the Publications Production Division, Directorate of Training and Leader Development, United States Army Engineer School, Fort Leonard Wood, Missouri. Her previous experience includes sixteen years working in civilian personnel. She is a graduate of Southwest Missouri State University (now Missouri State University), Springfield, Missouri.

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WINTER ROAD CONSTRUCTION

By Captain Becky L. Lapidow

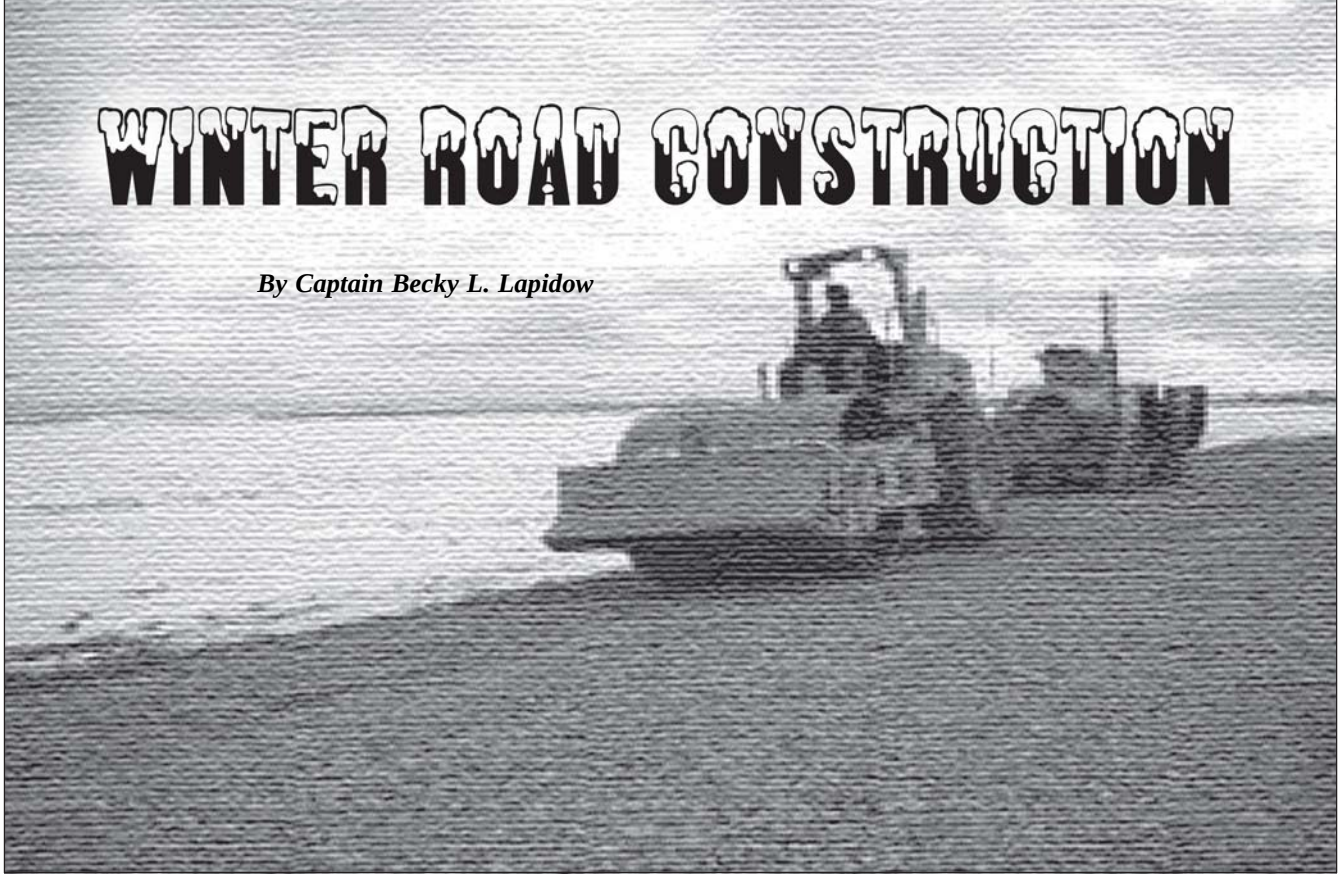


Photo by Sergeant First Class Mark Ferron, Task Force Eagle

While cold weather and freezing temperatures may stop the Taliban, harsh conditions don't stop Task Force Eagle. These Soldiers are committed to building roads to help the people of the Islamic Republic of Afghanistan. Although at times the ground is freezing and road construction is limited because of the bad weather, the local nationals of Afghanistan and American Soldiers continue their work when the weather permits because they know that accomplishing this mission will benefit many. They use four different types of equipment, including a dozer to cut the ditches and push fill onto the road, a sheep's foot roller to break up frozen dirt and start compaction on the 18 to 24 inches of fill, a smooth-wheel roller to finish the soil and compact the gravel, and a grader to cut the final grade on the road and spread the gravel.

First, snow is removed from the existing area far enough for two days of work. Then, dozers are used to rip up the frozen ground in small increments. Workers are careful not to rip open too much earth in case snow falls overnight and fills the holes with frost and moisture. The dozers then push fill material into the existing road and push frozen and dry material onto the road. The sheep's foot roller is then used to roll over the material to break up the frozen chunks of dirt and mix the dry and frozen material together. After a base course (the subbase layer of an asphalt roadway) is compacted, the grader is rolled over it to ensure that the road is even. The smooth-wheel roller is used to compact the top 4 to 6 inches of road.



Photo by Sergeant First Class Mark Ferron, Task Force Eagle

A high-speed compactor breaks up frozen chunks of soil and compacts it to strengthen the subbase.

The next day, the top 2 inches of the road are final-graded, and 3 inches of well-graded #5 gravel are spread, graded, and compacted once more. While this is being done, other

(Continued on page 49)

Dive Team Implodes Building on Kwajalein Atoll

By Captain Charles T. Denike

Kwajalein Atoll, the largest coral atoll in the world, is part of the Republic of the Marshall Islands in the western Pacific Ocean. Since 1944, when the United States captured the atoll from the Japanese, it has been used for military purposes. Unaccompanied personnel who are assigned there live in apartment-style housing. When one of these buildings (Building 708) was determined to be unsafe for occupancy, plans were made to implode the building to make way for a new structure.

The project, which was accomplished in July 2006, took place in two phases: an *explosive demolition* conducted by the 7th Engineer Dive Team, 29th Engineer Battalion, and a *mechanical demolition and debris removal* conducted by the 82d Engineer Company (Engineer Support Company [ESC]). The dive team detonated 84 pounds of M1 dynamite, bringing the three-story, 450-foot-long building to the ground. Imploding the building facilitated the mechanical demolition by reducing the height of the structure by at least half and catastrophically damaging the entire structure. A blast of this type had never been performed with military explosives and required extensive research and planning.

Preparation

From March through June, Kwajalein Range Services (KRS) conducted soft demolition of the building, which included removing all glass, interior walls, paint, electrical wires, plumbing, fixtures, and furniture. KRS also installed window barricades on surrounding buildings to protect against glass breakage, but did not remove the building's four stairwells, each of which went to the third floor and was surrounded by secondary columns and concrete masonry unit (CMU) walls. While not designed to be load bearing beyond the limits of the stairwells, these columns and walls were strong enough to withstand a substantial load. With the time allowed, the 82d Engineer Company was able to remove three of the four stairwells on the first floor.



Glass and other interior components were removed from Building 708 in preparation for the implosion.

Demolition

The blast team placed the M1 charges inside the columns surrounding the stairwells. To do so, they drilled boreholes 1.375 inches in diameter and 13 inches deep at elevations of 2 and 6 feet into the north faces of each column to protect the M11 blasting caps from fragmentation. After drilling the boreholes, the blast team and KRS installed a chain-link fence and a nonwoven geotextile fabric curtain around the south, west, and north sides of the first floor.

The blast team conducted a test shot on 6 July to verify the charge quantity and placement. The M1 dynamite completely breached the column at the charge placements. The remaining concrete at an elevation of 4 feet was severely displaced, and the rebar was deformed. The chain-link fence and nonwoven geotextile fabric wrap remained intact. The test shot confirmed the proposed plan, and the blast team loaded the structure with explosives for the blast.

The team primed 168 charges, loaded them in the boreholes, and stemmed the boreholes with expanding foam. They wrapped all 84 columns with two layers of chain-link fence and nonwoven geotextile fabric to contain fragmentation. On each column, the chain-link fence was secured with four hog rings and the nonwoven geotextile fabric was secured with three wire ties. Four M15 high- and low-strength time delay blasting caps (two primary and two secondary systems) were used, and two M11 high-strength blasting caps were used to create the 225 milliseconds delay between each of the eleven sequences that detonated consecutively from the south to the north end of the building. The net explosive weight (NEW) of each sequence was 8.92 pounds and the total NEW for all sequences was 94.45 pounds. Since the sequences were delayed 225 milliseconds (more than the industry standard of 8 milliseconds), the entire blast was modeled with a NEW of 8.92 pounds. The blast was initiated with two M81 igniters (primary and secondary) and two M13 (1,000-foot) low-strength blasting caps.

The blast collapsed the entire first floor, 75 percent of the second floor, and 50 percent of the third floor. The final stairwell that was unable to be removed on the first floor supported some of the structure during the collapse. Portions of the second and third floor remained supported since the stairwells had not been removed above the first floor.

Quantity-Distances

The most significant deviation from normal military explosive procedures was the use of reduced safe distances. The blast team used a distance of 681 feet for the blast (both the test shot and the entire building) and 200 feet for accidental detonations. The quantity-distance was calculated using the equation:

$$D\ (ft) = K \times W^{1/3}$$

D is the distance in feet, K is a factor (also called K-factor) that is dependent on the permitted risk level, and W is NEW in pounds. For accidental detonations, a K-factor of 40[1] is normally used; however, this distance does not account for fragmentation. Therefore, a distance of 200 feet was used for accidental detonations. For intentional detonations, a K-factor of 328[2] was used, representing an incident overpressure of 0.0655 pounds per square inch at the calculated distance. This resulted in a distance of 681 feet and accounted for the dangers of overpressure. There was no concern of fragmentation because control measures were in place to limit the distance that fragmentation was thrown.

Blast Considerations

Concerns about fragmentation included the distance of flying debris, damage to neighboring buildings, and damage to initiation systems. The fragmentation could have caused window breakage in neighboring buildings and severed the sequences. Fragmentation was mitigated using three methods:

- Using protective materials at the charge placement. Each column was wrapped with two layers of chain-link fence and two layers of nonwoven geotextile fabric that reduced the number of fragments projected from the column and their speed. The wrap contained 95 percent of the fragmentation on the test shot column. Additionally, the



Each column was wrapped with two layers of chain-link fence and nonwoven geotextile fabric to contain fragmentation.



The builidng was reduced by at least half by the blast.

maximum fragment throw distance for the remaining 5 percent was 20 feet.

- Covering the first floor openings on the south and west sides, two pedestrian doors on the north side, and the first 60 feet of the east side from the north with a chain-link fence curtain and nonwoven geotextile fabric. The fence was secured at the top, but allowed to hang free at the bottom. The fabric was 15 feet high, providing enough fabric lying on the ground to secure with sandbags once installed over the fence. The fabric had enough slack to allow it to move if impacted by fragmentation and decelerate the fragment instead of allowing the fragment to pierce the fabric.
- Covering all exposed initiation system components inside the building with two layers of sandbags. This significantly reduced the chance of misfires due to components being severed from flying debris. After analyzing the results of the blast, the team thought that a single sandbag layer covering the detonation cord and a double sandbag layer over the initiator components would have been sufficient. Covering the detonation cord with sandbags also provided suppression of blast overpressure since the detonation cord was exploding in free air lying on the building floor.

KRS installed 3/4-inch plywood barricades over windows and air conditioning units in close proximity and facing the building to protect against flying debris and constructed a barricade around a nearby building.

Since the charges were positioned inside the columns, blast overpressure was not a major concern. The amount of explosives used per charge was the minimum amount needed to achieve the desired blast results. The majority of energy of the blast overpressure was directed within the borehole, resulting in breaching of the column. Once the column was breached, there was minimal overpressure remaining to impact surrounding structures or personnel.

"Great strides were achieved while planning for the implosion-style blast in a confined urban environment..."

Ground shock was negligible due to the coral substrate, height of the structure, and amount of explosives used. It is common practice to measure vibration at surrounding buildings using a seismograph; however, the blast team did not have equipment to support this. For future operations, this might be added for research and training value. For a larger structure, seismographic measurements would be a requirement.

Conclusion

Building 708 detonated and collapsed as planned, with no damage to surrounding structures. The sequences detonated from south to north to control the fall of the structure away from nearby buildings—the building successfully fell down onto its own foundation. Portions of the building between the second and third floor stairwells that remained intact went into complete progressive collapse, showing the significance of leaving those stairwells in place. This result was acceptable since reducing the structure height by one floor brought the entire structure within reach of the hydraulic excavators for mechanical demolition. However, removing the stairwells on the second and third floors would have caused the building to completely collapse and should be pursued on future operations.

Great strides were achieved while planning for the implosion-style blast in a confined urban environment since it required nonregulation minimum distances and used nonstandard methods for employing military explosives. This experience was an invaluable training opportunity and demonstrated greatly expanded capabilities of military explosives for future operations.

Captain Denike is the plans officer for the 29th Engineer Battalion, Schofield Barracks, Hawaii. Previous assignments include executive officer for the 7th Engineer Dive Team, 29th Engineer Battalion, and diving officer student at Delta Company, 577th Engineer Battalion, Panama City, Florida. He holds a bachelor's in mechanical engineering from the University of Virginia.

Endnote

[1]Department of Defense Directive 6055.9, *DoD Explosives Safety Board (DDESB) and DoD Component Explosives Safety Responsibilities, 29 July 1996.*

[2]Ibid.

Note: The techniques and procedures presented in this document are the opinion of the author and other personnel consulted for endorsement due to their technical background and expertise. Adherence to these techniques and procedures provided an acceptable level of safety; however, they don't guarantee a risk-free operation or address every possible situation that occurred. The blast team was responsible for addressing unexpected conditions based on technical knowledge. The use of explosives to collapse the building was inherently dangerous, but extensive control measures were followed to conduct the operation safely.



("Road Construction," continued from page 45)



Photo by First Lieutenant Keith Muehling, Task Force Eagle

After graders smooth the road and create ditches, the smooth-wheel roller compacts the dirt.

Soldiers grade and compact the ditches along the side and complete the finish work. This process may sound easy, but when the top 12 inches of road are frozen, it is not a simple task.

The road that Task Force Eagle is working on is important to the local population for many reasons. First of all, it connects towns (over a 100-kilometer stretch) that were previously isolated from one another. This has significant economic impacts because these towns can now trade and export among each other. The road allows the small village governments to communicate and become a stronger government. The road also impacts education and health care because it is now easier to get to school or see a doctor when needed. But most importantly, Afghan local nationals are helping with the project by providing gravel, fuel, and water used in construction, which creates jobs for the local populace. In turn, the Afghan workers learn how to care and maintain the roads themselves, helping to make them autonomous once coalition forces leave the country.

This is why Afghan local nationals and Task Force Eagle Soldiers, although facing harsh and at times impossible conditions, continue their construction efforts. Afghanistan needs the benefits of roads, no matter what the season. Afghan workers and coalition forces understand this and will continue building this road until their project is completed.

Captain Lapidow is the Public Affairs Officer for Headquarters and Headquarters Company, 37th Engineer Battalion (Combat). Previous assignments include executive officer, platoon leader, and assistant S-1 for the 37th Engineer Battalion. She has attended the Engineer Officer Basic Course, Airborne School, the NBC Defense course, and Jumpmaster School and holds a bachelor's in earth and environmental sciences from Lehigh University, Bethlehem, Pennsylvania.



Photo by Peter Shugert, U.S. Army Corps of Engineers, New York District

USACE-Navy Team Frees the USS Intrepid

By Dr. JoAnne Castagna

Felix Novelli was 19 years old when he was assigned to the *USS Intrepid* during World War II. He clearly remembers the horror and splendor he experienced while onboard the aircraft carrier, including the first attack.

"I was standing on the flight deck when a twin-engine Japanese dive-bomber attacked from the fantail. He came along the starboard side when one of our guns hit him, blowing his wing off and sending it into the ship, causing a very bad fire," said Novelli, who saw many of his "brothers" being killed and wounded.

Novelli witnessed numerous attacks during the war, to include many kamikaze attacks that blackened the sky. They kept on coming from the left and the right, 200 to 300 each day, trying to sink the *Intrepid*. She was hit five times by kamikaze bombers.

In addition to its World War II service, the 925-foot-long ship saw action in the Korean and Vietnam conflicts. "The Ghost Ship," as she was known by the enemy, tracked Soviet submarines during the Cold War and served as the National Aeronautics and Space Administration's prime recovery vessel for Mercury and Gemini capsules in the 1960s.

In 1981, the aircraft carrier was saved from being scrapped when it was purchased by the Intrepid Foundation, a charitable organization started by the New York City-based Fisher construction and real estate family. The



Photo by Peter Shugert, U.S. Army Corps of Engineers, New York District

The *USS Intrepid* docked at Pier 86 on the Hudson River on Manhattan's west side.

foundation, through its Fallen Heroes Fund, the Center for the Intrepid, and Fisher Houses, responds to the hardships of military service and meets a humanitarian need beyond that normally provided by the Department of Defense. Fisher Houses are located at military hospitals worldwide and provide assistance to the families of critically injured servicemen and servicewomen. Novelli, who also supports these programs, says that every time a Fisher House is opened, American flags are raised from the *Intrepid* flight deck and then presented to the Fisher House at a ceremony.

In 1982, the retired warship became the Intrepid Sea, Air, and Space Museum. It is the world's largest naval museum and has been berthed at Pier 86 on Manhattan Island in the Hudson River. After 24 years as a museum, officials of the Intrepid Foundation decided that the ship needed repairs and refurbishment, as well as a rebuilt public pier to serve the 700,000 visitors each year.

In August 2006, the museum received a federal permit from the United States Army Corps of Engineers® (USACE) to dredge an access channel from the berthing area to the main federal channel of the Hudson River to move the vessel to Bayonne, New Jersey, where it would undergo inspection and necessary repairs. The dredging operation, which was completed in October, removed approximately 16,000 cubic yards of river mud.



Photo by Peter Shugert, U.S. Army Corps of Engineers, New York District

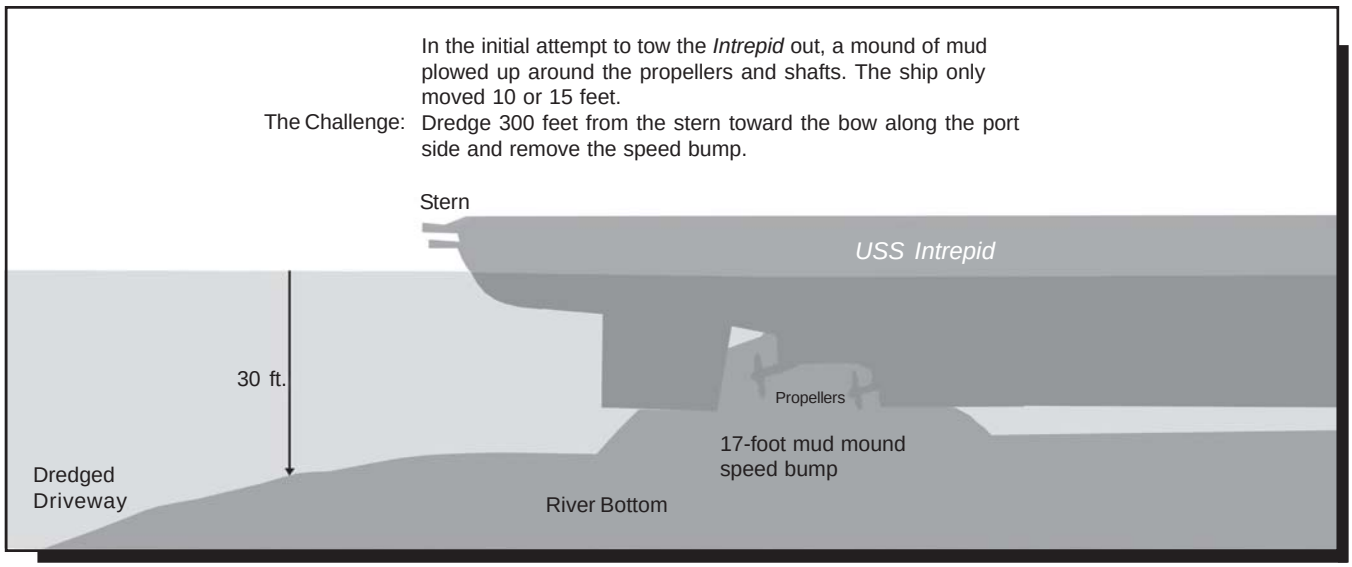
USACE vessels *Gelberman* and *Hayward* lead the flotilla as the *USS Intrepid* is towed stern first down the New York Harbor, en route to its temporary dock in Bayonne, New Jersey.

On 6 November 2006, an "*Intrepid* on Leave" celebration was conducted by Intrepid Foundation officials to give the ship an elaborate send-off to its temporary home. Several public service agencies' vessels were invited to escort the ship downriver, with four USACE workboats leading the flotilla. During this initial attempt to remove the engineless ship, seven tugboats began to pull, and the *Intrepid* literally got stuck in the mud.

The 27,100-ton ship moved backward, stern first, about 15 feet before its four giant propellers, each measuring 16 feet in diameter, dug into the river sediment and prevented any further movement. Try as the straining tugboats might, the *Intrepid* would not budge. The effect was a compacted "speed bump" of mud under the ship's fantail (see figure below).

Museum officials immediately called numerous government agencies for help, including Pentagon officials. The USACE New York District, the closest federal agency with expertise, responded within 2 hours with its district commander and technical experts on the adjacent pier assessing the situation.

The stern of the ship was 2 feet higher than the bow. At low tide, the ship was only resting on the bow and the stern's speed bump. This was adding serious stress to the hull, according to the District Chief of Operations. This was not a simple matter of more dredging, but



a grounded ship that needed to be carefully freed.

USACE recommended that *Intrepid* officials contact United States Navy salvage experts, since they have unique knowledge and experience in freeing large ships. They would also know how the *Intrepid* would react to being in such a precarious situation. The next day, the United States Naval Sea Systems Command (NAVSEA) salvage contractor had an assessment team at the *Intrepid*. Salvage divers surveyed below the waterline to inspect the vessel for damage and determine the extent of the speed bump. The divers' firsthand examination confirmed the initial assumptions and documented the extent of the problem. Soon the Navy was working with USACE, the Intrepid Foundation, and state and city agencies to execute a unique and highly visible dredging operation to remove compacted sediment from around the propellers and shafts.

The Navy brought technical and contractor expertise to the partnership, and USACE provided project oversight and integration. Because this is their home area, District team members had the local knowledge and existing relationships with stakeholders, government agencies and officials, and the media. This mission was executed as a joint military operation with daily progress meetings and situation reports. The team devised a three-phase execution plan.

- Dig the existing access channel deeper and wider and add an access trench on the south side of the vessel from the *Intrepid's* stern to beyond its trapped propellers and shafts.
- Use a drag bar under the stern and rake the sediment out.
- Airlift or vacuum the remaining mud from under the ship's fantail.

Crews worked around the clock to remove the mud in 29 days, before the next high tide, which would provide an extra 5 feet of water to remove the ship. That was their best shot at freeing the vessel, and they didn't want to miss the opportunity.

Work also moved swiftly due to environmental concerns over the *Intrepid's* precarious state. Her hull plates could separate and leak petroleum-contaminated bilge water—which was to be removed and environmentally disposed of during the shipyard visit in Bayonne—into the river. Also concerned about the return of anadromous fish species to the river estuary for the winter spawning season, work continued so the fish would settle into other parts of the estuary. Since the weather and the river temperatures were remaining unusually warm, the return of the fish was delayed. Because of this and the urgent need to dredge, the Intrepid Museum received extended work permits from USACE and the New York State Department of Environmental Conservation to allow the dredging to start a week after the grounding.

An environmental dredging bucket was used to minimize any adverse water quality and fisheries impacts. The clamshell bucket is fitted with gaskets over the openings so dredged material stays inside the bucket and the water goes back into the river. First, the existing dredged access channel to the main channel was deepened and widened. Then, to start access under the ship, a 150-foot-long by 30-foot-wide by 35-foot-deep trench was dredged down the starboard (outboard) stern side of the ship, from the *Intrepid's* stern to beyond the propellers and shafts encased in mud. Unfortunately, the access trench could not be dug directly beside the hull because the flight deck overhang prevented the crane dredge from coming up next to the ship.

To overcome this, a drag-bar barge was moved under the flight deck alongside the hull, where the drag-bar blade was lowered to the shallow bottom. Then, pulling the barge and blade away from the ship, the bar raked the river mud into the trench, working like an underwater bulldozer. The plowed mud was then dredged out of the trench, and the process was repeated until the 35-foot trench expanded all the way to the ship's hull. As the trench approached the hull, river mud that fell into the trench from under the fantail and around the propellers and shafts was raked by the drag bar and removed by the environmental bucket dredge.

The ship needed 28 feet of water to be extracted from its berth. As divers and hydrographic survey crews measured progress next to and under the ship, they saw that the propellers and shafts on the starboard (outboard) side of the ship were nearly exposed as the mud was sloughing down into the trench. These in-progress investigations, together with the experience of the salvage crew, prompted officials to extend the access trench an additional 150 feet toward the bow. The extended trench allowed the



Photo by Dan Desmet, U.S. Army Corps of Engineers, New York District

As it passes Ground Zero, a 100-foot American Flag is unfurled by *USS Intrepid* veterans as a tribute to the lives lost there on 11 September 2001.



Photo courtesy of USS Intrepid Sea and Air Space Museum

The *USS Intrepid* receives a water cannon salute in New York Harbor as the ship pauses near the Statue of Liberty.

ship to be pulled both sideways from the pier and backward toward the main channel before being extricated from the remaining mud on the port side.

After almost 3 weeks of work and the removal of approximately 39,000 cubic yards of river mud, divers were able to touch the exposed propellers and shafts, showing that the dragging and dredging operations were working and the ship would soon be ready to tow. Luckily, the slow and inefficient airlifting method would not have to be used.

One of the biggest challenges was the availability of dredged material processing barges. To ensure that an empty barge was next to every dredge, the New York City Economic Development Corporation and the Department of Sanitation worked jointly to locate and track barges around the clock so the dredging cycle could continue.

Another challenge was how to beneficially use the dredged material. The 39,000 cubic yards of river mud were transported and processed in fifty-three New York City Department of Sanitation barges. The sediment was tested for pollutants and found to be acceptable for reuse. Portland cement was added to each barge load and thoroughly mixed, which chemically and structurally stabilized the dredged material, capturing any pollutants in the processed material. It was then used as interim cover in the closure of New York City's former Fresh Kills landfill at Staten Island. Once the largest landfill in the world, it is being transformed into reclaimed wetlands, recreational facilities, and a landscaped public park.

On 6 December 2006—the 29th day of the emergency operation—officials from the Intrepid Foundation, USACE, and the Navy, as well as *USS Intrepid* veterans (including Felix Novelli) and the media, stood on the *Intrepid's* flight deck. The ship was surrounded by tugboats, USACE harbor workboats, United States Coast Guard cutters, New York City police boats and fireboats, and a flock of helicopters. It was the coldest morning of the year—with constant winds of 10 to 20 knots from the west pushing against the ship—and the Hudson River's high tide and slack water were not at the same time. When the tide was the highest, the river's strong current had not stopped yet and was still running upriver at more than 5 knots. The tugboats had to extract the *Intrepid* with great force and finesse, pulling the ship at a 5-degree angle away from the remaining mud in the berth, while maintaining tight control so it didn't swing out and crash back into Pier 86 as it entered the swift river currents.

After 29 minutes of relentless pulling by five powerful tugboats and the combined force of 21,000 horsepower, the *Intrepid* moved forward. The ship moved gracefully out of the berth, through the newly dredged access channel, and out to the main Hudson River federal channel in a slow but majestic voyage 5 miles down the Hudson River.

On the way downriver, the *Intrepid* slowed slightly while passing the World Trade Center site, as twenty former crewmembers unfurled a 100-foot American flag to honor those who died there on 11 September 2001. The *Intrepid* paused again briefly while passing the Statue of Liberty en route to the ship's temporary home, the Bayonne Dry Dock Company at the former United States Army Military Ocean Terminal in Bayonne, New Jersey. There the 63-year-old ship began a long-overdue refurbishment, after which it will be moved to Staten Island, New York, for interior renovations before returning to a rebuilt Pier 86 in late 2008.

Seeing the *Intrepid* move again was inspiring for Novelli, who stood on the flight deck like he did as a teenager. "It was like I was a kid, waking up on Christmas morning and finding a nice set of electric trains under the tree. You're filled with joy. I was back at sea and 19 years old again. A million thoughts came back. My main thought being the kids that we left on the floor of the ocean."

For more information about the Intrepid Sea, Air, and Space Museum, please visit <www.intrepidmuseum.org>.

Dr. Castagna is a technical writer-editor for the United States Army Corps of Engineers, New York District. She can be reached at <joanne.castagna@usace.army.mil>.

Firefighting Unit Leadership: An Opportunity for Change

By Captain Max Hanna



United States Army firefighting detachments are sorely needed for airfield and base camp operations throughout the current operating environment. These units fulfill a very important function for the Army—that of force protection through reduction or elimination of fire hazards. While deployed, these detachments also provide vital mission support in the form of vehicle crash rescue, confined space rescue, high angle rescue, and immediate hazardous materials (HAZMAT) response. Nearly all of the military occupational specialty (MOS) 21M (firefighter) Soldiers are either professional or volunteer firefighters in their civilian careers and practice these skills on a regular basis. All but one of the military firefighting detachments are either United States Army Reserve or Army National Guard units.

The unit commander is usually a first lieutenant or a junior captain. According to the modified table of equipment (MTOE), they are the fire marshal—with responsibilities ranging from morale, safety, training, maintenance, preparation for deployments, and development and implementation of fire protection plans. If this fire marshal is the only engineer officer attached to an aviation brigade, he is likely assigned the additional duty of brigade staff engineer liaison officer and a myriad of other duties.

With only rare exceptions, these officers have no firefighting experience, which puts them at a distinct disadvantage. Firefighting is not taught in any engineer officer courses, to include the Engineer Basic Officer Leader Course (BOLC), Engineer Captain's Career Course (ECCC), Combined Arms Exercise (CAX) Course, and Combined Arms and Services Staff School (CAS3). In fact, some engineer officers are not aware that firefighting detachments exist, much less that they fall under the giant umbrella of the Engineer Regiment.

The senior noncommissioned officer (NCO), or fire chief, is—according to the current MTOE—an E6 21M who has advanced through the ranks of the unit. Most fire chiefs have been 21Ms their entire career and have stayed in the same unit because it was the only firefighting detachment within the regional readiness command or the state. Without a doubt, they know their job. The fire inspector is an E5 or E6 and is typically only slightly junior to the fire chief. These two senior NCOs have a tremendous responsibility, especially on the fire scene. However, in a brigade or division setting, they carry little weight, even as an E7.

In order to be promoted to E7, most 21Ms have to move to another unit and accept another MOS. Only after that assignment can they move back to the firefighting detachment as the senior NCO. This prevents many NCOs, who have acquired very specialized skills, from staying in the detachments. Or, on the flip side, this situation develops a culture of homesteading—the tendency of personnel to find a unit and position and stay there until they are forced to retire. Given the Army Reserve/National Guard policy of promoting into slots, homesteading in these small units prevents junior enlisted personnel from being promoted to E5 without being reclassified. From my experience, the most often cited reason for 21M Soldiers leaving the Army after their initial contract ended is the inability to be promoted.

Based on my experience as fire marshal of the 369th Engineer Detachment (Firefighting) during Operation Iraqi Freedom Phase I, my recommendation is that the firefighting detachment MTOE be modified to replace the first lieutenant with a warrant officer 1 or warrant officer 2. Then provide the senior NCO in the unit an opportunity to advance by allowing him to attend the Warrant Officer Basic Course. As a warrant officer, the fire marshal would be recognized as the expert he is in his technical field and would have rank, stature, and respect during the brigade and division staff meetings that he attended.

At a minimum, the Warrant Officer Course should include the following plan of instruction:

- Senior-level firefighter courses (coordinated with the local Fire Academy)
- HAZMAT and confined spaces trainer courses (to train his Soldiers in these skills when he returns to the unit)
- Administrative duties (such as awards and NCO Evaluation Reports [NCOERs])

- Supply (accountability, supply discipline, and the forms required to maintain a multimillion dollar property book)
- Maintenance (specifically, maintenance procedures required for the specialized firefighting equipment)
- Risk assessment
- Practice in public speaking (to prepare for briefing division or brigade commanders)

With this change to the MTOE, these vital firefighting detachments would be similar in leadership structure to many geospatial mapping teams that are currently led by warrant officers. They could establish a professional detachment with capable and knowledgeable leaders and create better opportunities for advancement of junior Soldiers. This would also enable some engineer first lieutenants to fill other positions—such as platoon leader or company executive officer—which would better benefit the Army.

Captain Hanna served as Commander of the 369th Engineer Detachment (Firefighting) during its one-year deployment to Baghdad in support of Operation Iraqi Freedom Phase I.



Dedication

The following members of the Engineer Regiment have been lost in the Global War on Terrorism since the last issue of *Engineer*. We dedicate this issue to them.

Blohm, Private First Class Alan R.	425th Brigade Special Troops Battalion, 25th Infantry Division	Fort Richardson, Alaska
Bubeck, Sergeant John T.	9th Engineer Battalion, 1st Cavalry Division	Schweinfurt, Germany
Burrows, Private Joshua C.	8th Cavalry Regiment, 1st Cavalry Division	Fort Hood, Texas
Caldwell, Specialist Eric T.	8th Cavalry Regiment, 1st Cavalry Division	Fort Hood, Texas
Clevenger, Specialist Ross A.	Alpha Company, 321st Engineer Battalion	Boise, Idaho
English, Captain Shawn L.	577th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Fraser, First Lieutenant David M.	67th Armor Regiment, 4th Infantry Division	Fort Hood, Texas
Hamill, Captain Jason R.	67th Armor Regiment, 4th Infantry Division	Fort Hood, Texas
Henry Jr., Corporal Lorne E.	2d Brigade Special Troops Battalion, 10th Mountain Division	Fort Drum, New York
Holtom, Sergeant James J.	Alpha Company, 321st Engineer Battalion	Boise, Idaho
Kingman, Sergeant Jonathan P. C.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas
Love Jr., Staff Sergeant Robert L.	16th Engineer Battalion, 1st Armored Division	Giessen, Germany
McCormick, Private Clinton T.	2d Brigade Support Battalion, 2d Infantry Division	Fort Carson, Colorado
McPeek, Specialist Alan E.	16th Engineer Battalion, 1st Armored Division	Giessen, Germany
Moreno, Private Reece D.	92d Engineer Battalion, 3d Infantry Division	Fort Stewart, Georgia
Nelson, Private First Class Andrew H.	9th Engineer Battalion, 1st Cavalry Division	Schweinfurt, Germany
Phaneuf II, Staff Sergeant Joseph E.	Headquarters and Headquarters Company, 102d Infantry Brigade	Hartford, Connecticut
Preston, Specialist Aaron L.	9th Engineer Battalion, 1st Cavalry Division	Schweinfurt, Germany
Riekena, Sergeant James D.	Alpha Company, 145th Combat Support Battalion	Post Falls, Idaho
Shannon, Corporal Stephen D.	Charlie Company, 397th Engineer Battalion	Wausau, Wisconsin
Sheppard, Specialist Joshua D.	642d Engineer Support Company, 10th Mountain Division	Fort Drum, New York
Soukenka, Sergeant Richard A.	2d Brigade Special Troops Battalion, 10th Mountain Division	Fort Drum, New York
Volker, Specialist Robert J.	5th Cavalry Regiment, 1st Cavalry Division	Fort Hood, Texas
Werner, Private First Class Raymond M.	Alpha Company, 321st Engineer Battalion	Boise, Idaho
Wright, Sergeant Gregroy A.	1st Engineer Battalion, 1st Infantry Division	Fort Riley, Kansas

Engineer Update

Engineer Dog Handlers Needed! The Engineer Canine Detachment Program continues to grow. Exceptional military occupational specialty (MOS) 21B combat engineers are needed to become dog handlers and work as part of a Specialized Search Dog (SSD) or Mine Detection Dog (MDD) Team. Our Canine Detachments are a major part of the theater commander's counter improvised explosive device (IED) measures. The Engineer Regiment is constantly responding to increased requirements for dog teams in support of Operation Iraqi Freedom and Operation Enduring Freedom commanders. Interested 21Bs in the rank of specialist through staff sergeant must be physically and mentally capable of deploying and working independently for maneuver commanders. Handlers must be mature, articulate, assertive, and self-motivated Soldiers who have no fear of dogs. Initial screening for interested Soldiers will be conducted telephonically. The names of potential candidates will be forwarded to the Human Resources Command Engineer Branch for assignment consideration.

The point of contact is *<richard.villa@us.army.mil>* (573) 596-5497.

Transition From ARTEP MTPs to CATS. The U.S. Army is in the final phase of transitioning from using the Army Training and Evaluation Program (ARTEP) mission training plans (MTPs) as a collective training tool to using the combined arms training strategy (CATS). A CATS is a unit training strategy which, as an entity, takes the entire training planning process from the cradle to the grave. A CATS is developed from a unit's base table of organization and equipment (TOE) and Department of the Army-approved mission statement. They are designed using the crawl-walk-run training model. Commanders will make the final determination as to which tasks should be trained and at what level the training should begin, since they will know their unit's training status. Included in CATS are the required training resources such as Class III and Class V materials and training aids, devices, simulators, and simulations (TADSS).

The current ARTEP MTPs that are located on the Reimer Digital Library (RDL) are scheduled to be removed from the RDL in February 2007. Once this is complete, all CATS will be located on Army Knowledge Online (AKO) on their own dedicated page. The planned end state is movement of CATS to the Digital Training Management System (DTMS) once it is fully fielded. Additionally, the Collective Training Division of the United States Army Engineer School developed a Web site on the Engineer Portal which will also have links to CATS and files available for download. The following link will take you to the site: *<https://www.mwu.army.mil/portal/eng/index.php>.*

The point of contact at the Engineer School Collective Training Division is *<joseph.toth1@us.army.mil>* or call (573) 563-7821.

Center for Engineer Lessons Learned (CELL). The United States Army Engineer School CELL needs your help. To keep training, doctrine, and combat developments current and to prepare for the future, it is critical that the school continuously receive relevant engineer observations, insights, and lessons (OIL). The CELL can derive information from a variety of sources: unit after-action reports (AARs); tactics, techniques, and procedures (TTP) used by units in and returning from theater; Soldier observations/submissions to the Engineer School; and requests for information (RFIs). This information is used to conduct doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) gap analyses and to determine solutions. These solutions are distributed to the Engineer Regiment via new doctrine and training products, *Engineer* (The Professional Bulletin of Army Engineers) and other publications, and websites and by answering RFIs. (The Engineer School RFI website provides the Engineer Regiment a reachback capability.) You can help by forwarding any of these materials from your unit's deployment to the CELL. Unclassified information can be sent to *<Doctrine.Engineer@wood.army.mil>.* Classified information can be sent by secure Internet protocol, routed (SIPR) e-mail to *<reginald.snodgrass@us.army.smil.mil>*.

The point of contact is *<reggie.snodgrass@us.army.mil>* or call (573) 563-6121.

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