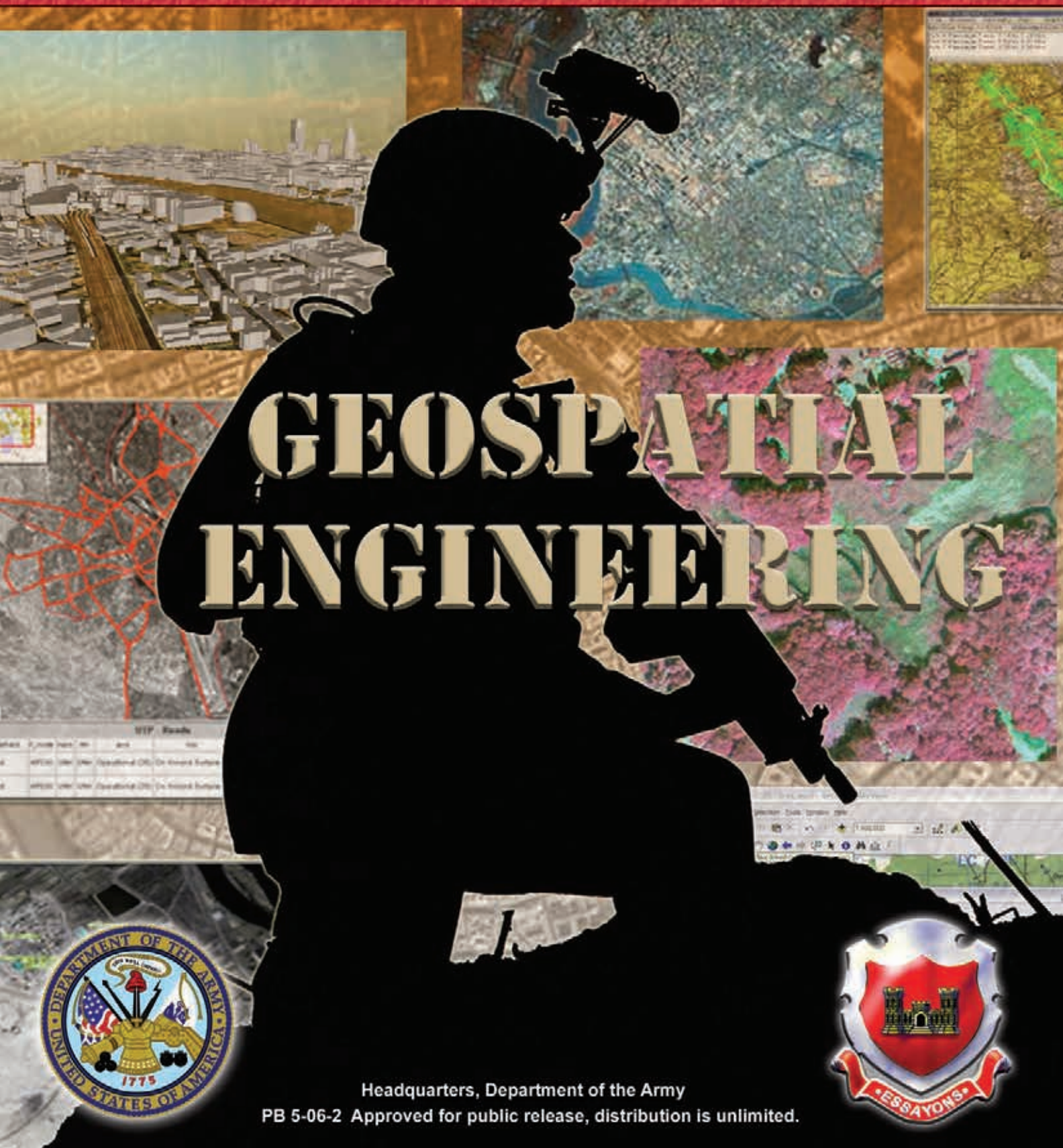
ENGINEER

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April-June 2006



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

COMMANDANT
MG Randal R. Castro
563-6116
<randal.castro@us.army.mil>

ASSISTANT COMMANDANT
BG 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 Dennis V. Smith
563-8046
<dennis.v.smith@us.army.mil>

CHIEF OF STAFF
LTC Shawn P. Howley
563-7116
<shawn-howley@us.army.mil>

TRADOC SYSTEMS MANAGER – ASSURED MOBILITY
COL Robert 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
563-4129
<rebecca.johnson1@us.army.mil>

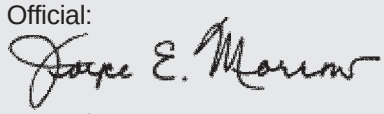
DIRECTOR OF FUTURES CENTER–ENGINEER
COL Richard M. Hornack
563-7955
<richard.hornack@us.army.mil>

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

COUNTER EXPLOSIVE HAZARDS CENTER
LTC Kent D. Savre
593-4085
<kent.savre@us.army.mil>

By Order of the Secretary of the Army:
PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:



JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0611703

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UNITED STATES ARMY ENGINEER SCHOOL

COMMANDANT
Major General
Randal R. Castro

MANAGING EDITOR
Shirley Bridges

EDITOR
Cheryl Green

CONTRIBUTING EDITORS
Karin Gan
Kathy Webber

GRAPHIC DESIGNER
Jennifer Morgan

Front Cover: Artwork by Melody E. Clanton, United States Army Corps of Engineers

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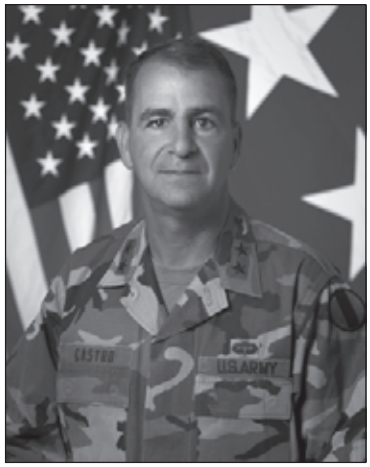
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Clear The Way

By Major General Randal R. Castro
Commandant, United States Army Engineer School

Our Vision



Welcome to our Summer issue of *Engineer*. I want to begin this issue by thanking all the great Soldiers who are serving our country each and every day. We cannot thank you enough for all the tasks you accomplish day in and day out.

I recently spoke to the leadership of the Regiment at ENFORCE and described our vision for the next two years. What I want to do in this issue is share this vision with you. I want to tell you all the great things we are accomplishing as a Regiment. If you were not able to attend ENFORCE, the slides can be found under Army Knowledge Online (AKO) files (Select the Site Map tab, then Organizational Sites, MACOMs, TRADOC, Schools [right column], Engineer, and MG Castro's ENFORCE 2006 Brief).

I have received many e-mails from across the Army telling me about all the missions you are doing every day. As you have all told me, our engineers are performing many missions outside of our Cold War-era focus of high-intensity combat operations. We are rebuilding nations, constructing base camps, conducting route clearance missions, and supporting our citizens' recovery after hurricanes Katrina and Rita—while continuing to transform to our Modular Engineer Force. These missions range across a broad spectrum of requirements for our engineers. Why are we busier than ever and supporting this broad array of missions? The reason is twofold: our contemporary operating environment (COE) has changed, and our doctrine and national security strategy are changing.

First, the environment we are fighting in has ever-increasing requirements for the capability sets we engineers bring to the battlefield while fighting an asymmetric enemy. The demands of fighting in urban and complex terrain place an increased reliance on what we engineers need to do to support our maneuver and joint commanders. Secondly, our recently published National Security Strategy captures this and, as a result, has placed stability operations on equal par and priority as combat operations. This profound change expands our mission-essential task list (METL) and is a major rebalancing of our mission set. FM 3-0, *Operations*, (2006 draft) will highlight this difference and will broaden civil support to homeland security. These increasing requirements for engineers make our Regiment more indispensable than ever to our Army and our Nation.

To take the lead in this changing landscape, I have reread our current Engineer School Vision and the Regimental Vision.

Engineer School Vision

– *A world-class center of expertise in joint engineer capabilities*

– *Recognized leader in developing doctrine, units, and equipment capable of assuring the mobility of the land force—anytime, anywhere!*

– *World's best trainer of military engineers for an Army serving a Nation at war*

Regimental Vision

– *Assure freedom of maneuver for the land force and maintain relevance to the Nation*

As you can see, the School and Regimental visions are broad, and there is a distinct gap between the two. I intend to focus on this gap and provide you a clearer road map ahead for the next two years.

I believe that there are three essential tasks we must continue to accomplish from now through FY08: We must continue to support the Global War on Terrorism (GWOT); we must complete the transformation of the Regiment; and we must posture the Regiment for the next transformation in order to remain indispensable to our Army and the Nation. These are the three major lines of operations on which we are moving forward, and I want to synchronize our efforts.

The **Regimental Vision** *through FY08 is to continue to support GWOT with trained modular organization and complete the modular force and institutional transformation, while posturing for the next transformation.*

(Continued on page 4)

Lead The Way

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



Greetings once again, and welcome to another issue of *Engineer*. This has been a very busy quarter for our Regiment. Among the many events that took place were our annual ENFORCE Conference, which included the 2d Annual Best Sapper Competition and the dedication of the Sapper Statue at the Engineer Memorial Grove. We were honored to have Mrs. Brigit Smith with us for the unveiling of the Sergeant First Class Paul Ray Smith Medal of Honor plaque at the Memorial Grove. Mrs. Smith also dedicated the Medal of Honor Flag to the Regiment; the Flag is proudly displayed in the Regimental room.

ENFORCE week ended with the Regimental dinner and presentation of the annual Regimental awards, which included the Itschner and Outstanding Engineer Platoon Leader (Grizzly) Awards, the Sturgis Medal, and the Van Autreve Award. The recipients of these awards—from the Active Army, United States Army Reserve, and the Army National Guard—are listed on page 38. The 2006 Best Sapper Competition winners are listed on page 26. The recipient of the 2006 Gold deFleury Medal was Major General Jack Waggener (Retired). This year, Lieutenant General Carl A. Strock, Chief of Engineers, awarded a second Gold deFleury posthumously to Sergeant First Class Paul Ray Smith. Mrs. Smith accepted the medal in his honor.

We continue to improve our training here at Fort Leonard Wood. A few courses that are going well include the Route Reconnaissance/Clearance Operations Course, the IED Defeat Train the Trainer (IEDD T3) Course, and the Urban Mobility Breaching Course. I need assistance from the field in supporting the Mine Dog Course. At the same time, we have taken some of the functional courses and inserted them into initial-entry training (IET), the Advanced Noncommissioned Officer Course (ANCOC), the Basic Noncommissioned Officer Course (BNCOC), the Officer Basic Course (OBC), and the Captain's Career Course (CCC). These courses will be the foundation of how we will build our forces over the next couple of years.

Today's Noncommissioned Officer Education System (NCOES) is a rigid, task-based system designed around the select-train-promote model, instead of training the NCOs for a mission and wide range of assignments that are encountered on today's battlefield. NCOES should remain focused on the core areas of leading, training, maintaining standards, caring for Soldiers, technical competencies, and tactical warrior skills, while integrating greater conceptual and interpersonal skills. We must ensure that we continue to provide first-class training to a first-class NCO Corps. We have identified the need to support the Army Force Generation (ARFORGEN) model by providing an opportunity for NCOs to receive training at home station. The goal is to continue to send NCOs to resident courses; however, when the opportunity and need arise, we will send a mobile training team (MTT) to conduct the training. We have an opportunity to send an MTT to Fort Bragg this summer to teach BNCOC, which will allow Soldiers to remain at home with their families and attend the course.

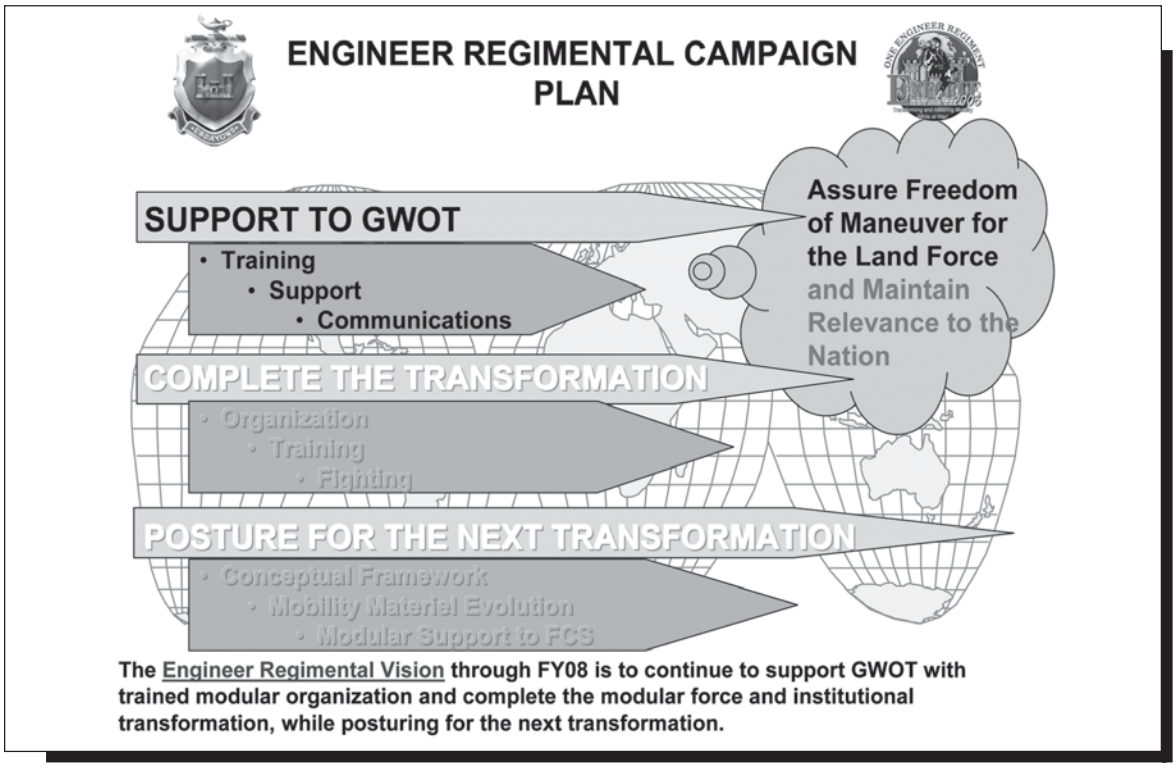
As we continue transforming to a Modular Engineer Force, we will activate the 4th Engineer Battalion at Fort Carson. In FY07, the following units will be activated: 326th Engineer Battalion, 62d Engineer Battalion, 7th Engineer Battalion, and the 11th Engineer Battalion. We reflagged the 36th Engineer Group to the 36th Engineer Brigade and will relocate the unit to Fort Hood. I would like to personally welcome the 94th Engineer Battalion advance party from Grafenwoehr, Germany, as it begins to restation here at Fort Leonard Wood. Some of these great Soldiers are here preparing their motor pool and headquarters to receive the main body. Fort Leonard Wood welcomes these great Wolverine Warriors.

I would like to congratulate Sergeant Major Terrence Murphy, who was appointed to the rank of Command Sergeant Major. It was a great honor for Brigadier General Todd T. Semonite and me to promote this great Soldier. We wish him and his family the best as he moves on to take a great battalion at Fort Hood.

Once again, I would like to say thank you for all of your efforts and contributions in supporting the Global War on Terrorism; we continue to transform the Regiment. As each day comes, let us keep in mind all the families of the Soldiers who have given their lives for this great Nation. There is no greater love than for a man to lay down his life for a friend or brother.

Essayons!

("Clear the Way," continued from page 2)



Support to GWOT

Our No.1 priority and our *first line of operation* is support to GWOT. Since 2001, we have continually captured your lessons learned from Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), brought those back to our school, and used them to change doctrine and what we teach in preparing our Soldiers and units for war. It is a significant revolution from how we conducted business since the post-Desert Storm period. This revolution begins with you and all of your Soldiers who have been there and done that! I see three subrevolutions in supporting the GWOT: *training*, *support*, and *communications*. In the next two years, I expect to bring many of our revolutionary initiatives to completion.

Training. The first revolution is in training. If you have been to Fort Leonard Wood recently and attended any school from Basic Training to the Engineer Captain's Career Course or a functional course, you have experienced part of this change. We have immersed Fort Leonard Wood into a COE where scenario-based training is the standard. At the most basic level, our training maps reflect Arabic names and scenarios in all our training. The entire post replicates a combat theater. We have surged to construct eight military operations on urbanized terrain (MOUT) sites, including Iraqi villages; nine forward operating bases (FOBs); five shoot houses; and two convoy live-fire ranges and have modified numerous ranges to reflect the COE. More than any other school in TRADOC! Our convoy live-fire range, a realistic scenario-based training opportunity for our trainees, replicates improvised explosive device (IED) and insurgent attacks. We have a weapons immersion program for our Soldiers, where they maintain their weapons with them at all times and learn the fundamentals of weapon discipline, just like our deployed Soldiers.

Another change you will find includes our initial-entry training (IET). The days of drill sergeants breaking down trainees and eliminating them immediately have passed. Drill sergeants treat everyone as a "Soldier from Day One." The focus is on maintaining the standards while using coaching, teaching, mentoring, motivating, and training to lift those who need a little extra time. This method has reduced attrition and kept young men and women in the Army who volunteered and have a desire to serve our Nation. At the same time, we have increased the rigor: five times as much field time, advanced rifle marksmanship, and total combat task focus in order for us to not just get Soldiers ready for their first unit, but to get them ready for combat!

In our Officer Education System, we have increased contingency training, integrated our transformed unit modified tables of organization and equipment (MTOEs), and significantly increased hands-on explosive hazards and IED training. This summer we will take Basic Officer Leader Course II and III into full implementation, and our new lieutenants will go to Fort Benning or Fort Sill to receive common-core training before arriving at Fort Leonard Wood for their functional training. We also have a new pilot course—the Joint Engineer Officer Course—which is an 80-hour course (distributed

learning and resident) to prepare our captains and majors to serve on joint staffs.

The most significant changes are in our functional courses. Before GWOT, we had only the Precommand Course and the Sapper Leader Course. Now we have 12 courses, including the Urban Mobility Breaching Course, the Route Reconnaissance/Clearance Operations Course (both mechanical and robotic), the IED Defeat Train the Trainer (IEDD T3) Course, the Advanced Search Course, and the Explosive Ordnance Clearance Agent (EOCA) Course. We are constantly evaluating requirements for additional training. At the same time, we are taking the critical tasks from our functional courses and inserting them into IET, the Advanced Noncommissioned Officer Course (ANCOC), the Basic Noncommissioned Officer Course (BNCOC), the Officer Basic Course (OBC), and the Captain's Career Course (CCC). This is a tremendous effort to better prepare and train our engineer Soldiers based on lessons learned in theater. These courses will be the foundation of how we train the force for GWOT over the next two years.

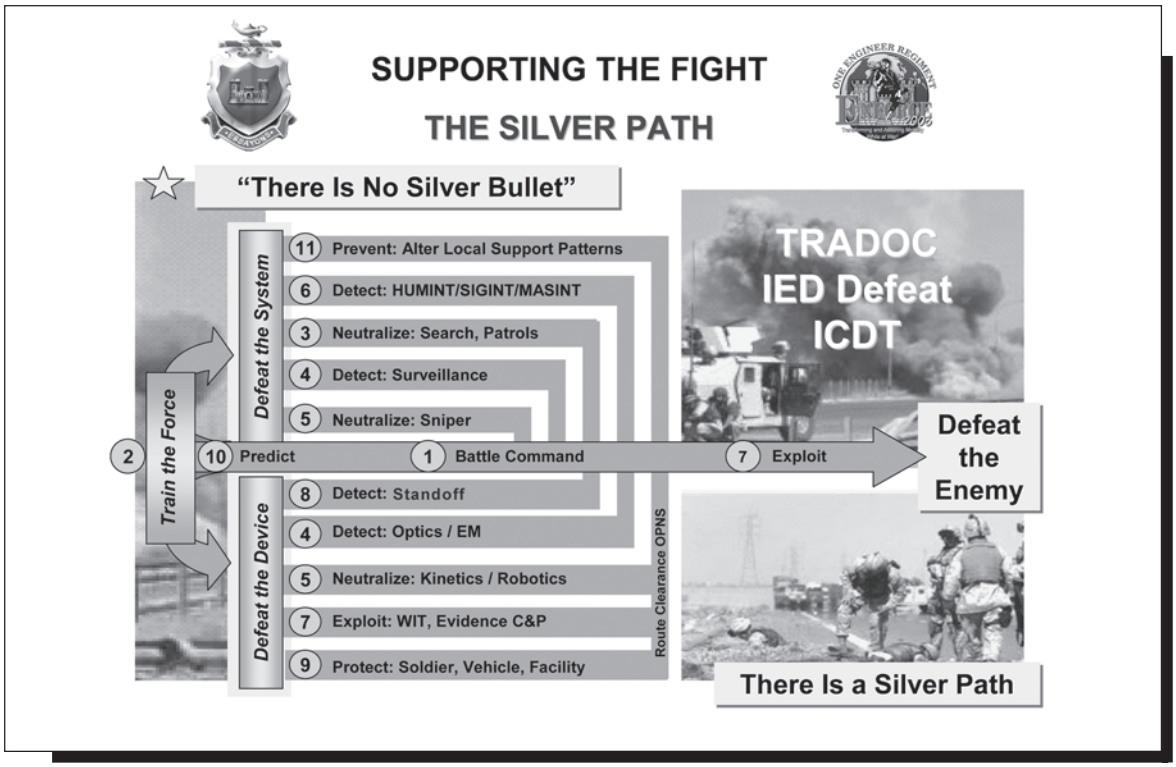
Support. The second revolution of supporting the fight has evolved significantly from pre-OIF to now. The Counter Explosive Hazards Center (CEHC) was established in 2002 to support a recognized gap in explosive hazards and work the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) integration of these solutions. With the ever-increasing IED threat in theater, the Department of Defense (DOD) has recognized the need to rapidly train and equip the force with the skills and tools to predict, prevent, detect, neutralize, and mitigate IEDs for all deploying forces (assured mobility).

There are three major pillars of support to this effort:

- The first pillar is the TRADOC Integrated Capabilities Development Team (ICDT). Over the next two years, we will continue to play a critical role in this team, integrating the various school efforts to develop, teach, and integrate individual, crew, leader, small-unit, and functional training courses.
- The second pillar is the Joint Center of Excellence, which has the mission to support units as they prepare for deployment at the training centers and to provide combined arms training for these forces.
- The third pillar is the Joint IED Defeat Organization and Army Staff that will organize, develop, synchronize, and integrate solutions across the DOTMLPF spectrum for IED defeat in urban and complex terrain for DOD and the Army.

Together, these organizations will develop systemic processes to improve training and develop technological and materiel solutions to defeat IEDs and all counter explosive hazards.

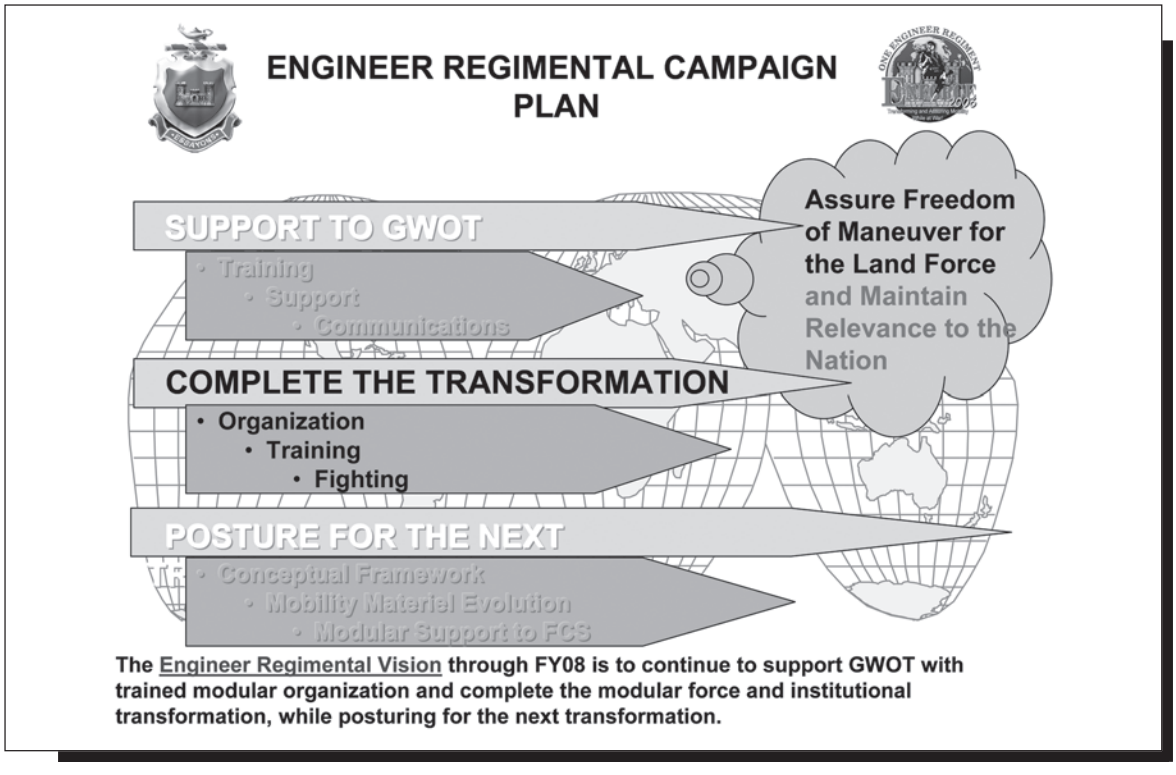
These organizations realize there is no "silver bullet" solution to solve the IED threat and that this incredibly tough mission can only be accomplished in a system-of-systems approach. Our IED Defeat Task Force and the CEHC developed a Silver Path that looks at how we train the force to defeat the "device" and also defeat the IED system. The Silver Path takes the fundamentals of assured mobility as a framework and builds on it to improve our ability to exploit lessons learned and defeat the enemy.



Integrating these lessons learned is absolutely the most important aspect of our functional courses and drives success on the core of our Silver Path. For example, the Advanced Search Course evolved from an identified gap in skills and tools for maneuver forces and engineers. The course teaches our sappers the latest tactics, techniques, and procedures for the conduct of area, route, person, and occupied and unoccupied building searches.

Another area where we are closing a gap is the engineer/explosive ordnance disposal (EOD) integration. Our engineer skills have changed focus over the years since Vietnam (booby traps), Desert Storm (mobility), the Balkans (mines/unexploded ordnance [UXO]) to now OEF/OIF (IEDs/captured enemy ammunition [CEA]). This broader spectrum of requirements and greater demands has developed a gap between EOD personnel and engineers. We are closing this gap with the EOCA Course, FMI 3-34.119, *Improvised Explosive Device Defeat*, etc. We have even exchanged officers and noncommissioned officers in critical positions between the Engineer and the Ordnance Schools. Over the next two years, we plan to close this gap completely and seamlessly conduct operations with EOD personnel on the battlefield.

Communications. The third and final revolution is in how we communicate. I want us to truly change into a collaborative community in the next two years. In the past, the Engineer School talked to units via e-mail or telephone, the United States Army Corps of Engineers® used TeleEngineering Kits, and units talked in isolated conversations between commanders and their staffs. But today, we are establishing the Battle Command Knowledge System (BCKS), which is a collaborative Web site within AKO that allows you to converse simultaneously with your peers with recent experience or instructors at schools to discuss various subjects. It should be as easy as switching between your e-mail and another screen, allowing you to converse on any range of subjects that pertain to you or your unit. BCKS will allow us to tap into everyone simultaneously and to provide the ultimate reachback capability. Implementing these dramatic changes in our support to GWOT is essential but is also directly linked to our successful transformation.



Complete the Transformation

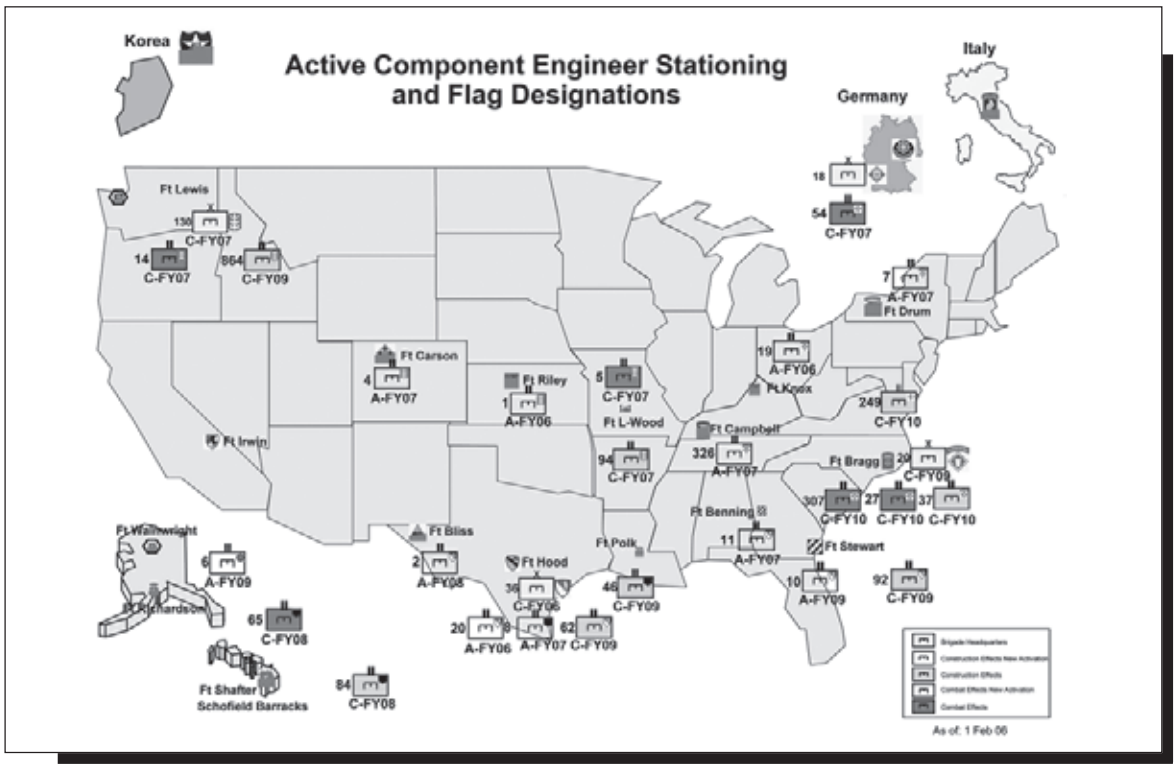
Our *second line of operation* is to complete the transformation. We began this journey a few years ago with an analysis of how we would transform as part of the Army's modular force structure. We took an offensive and aggressive look at modularizing the Regiment and reducing the number of MTOEs, military occupational specialties (MOSs), etc., while identifying the critical engineer support requirements in the brigade combat teams (BCTs) and the engineer forces that would be force-pooled above the division level. This required a paradigm shift of how we would organize, train, and fight the Engineer Regiment.

Organization. If you look at how we were organized before the transformation, you will see that the majority of our combat engineer battalions were embedded in brigades and divisions prepared to fight for a predetermined fight (symmetric or force-on-force). However, as we move through this transformation, our objective is to organize by embedding an engineer company in the BCTs and force-pooling the remaining engineers above the division for maximum flexibility in task-organizing for an undetermined type of fight.

Training. How we train will change as well. We will transition our collective training from METL focus to initially a modular capabilities focus.

Fighting. Finally, how we fight will evolve as well. We will go from fighting engineer companies with battalion-level command and control to focusing on engineer mission teams (EMTs) and engineer mission forces (EMFs) (task-organized modules at the company level [EMTs], and task-organized modules and/or EMT engineer task forces [EMFs]). These units will be fighting independently or in support of BCTs and divisions. We will also shift from our two common scenarios of Europe and Southwest Asia to having the flexibility to not only fight any enemy, anywhere in the world, but also be able to task-organize ourselves for the particular requirement of the force.

When the transformation began, I explained to many of you that we would experience a trough because several of our engineer battalions and organizations would be temporarily reduced. During a two-year period, engineer units would inactivate, waiting for BCTs to stand up within the Army personnel constraints until they would activate again as a force-pooled organization. Your school house and FORSCOM realized that this did not make sense, and they have worked diligently to convert units sooner in lieu of inactivating and then activating them. We all know this is no small feat. The result is that we were able to move a handful of battalions forward into FY06 and FY07. In fact, we stood up two engineer battalions already in FY06 and will stand up five more in FY07. The result is that instead of waiting until 2011 to get our battalions back, most of them will be in place within the next few months. We will even come out of the transformation with more engineer company command opportunities than before the transformation!



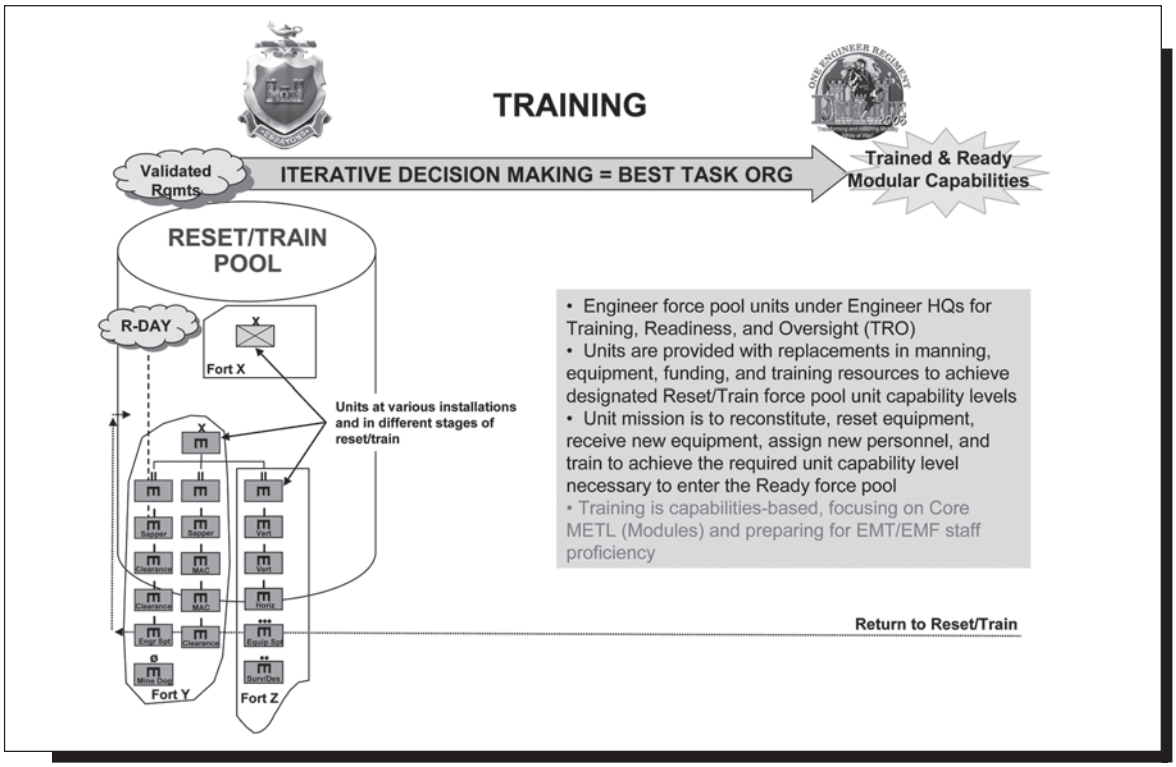
It has not been easy for this transformation to take place. As many of you know, we are trying to resource GWOT, transform units, and move organizations in accordance with Base Realignment and Closure (BRAC) requirements. Sometimes a unit gets caught trying to do all three. In response, the Engineer School has stood up a Fusion Cell to deconflict these issues. The Cell meets every Friday via telephone and video-teleconference with representatives from FORSCOM, Department of the Army, unit commanders, Army Materiel Command (AMC), etc., to work through their issues. It is working. We have a plan for all these Active Army units to transform in the next few years. But more importantly, the National Guard and Reserve have a plan that dovetails ours and complements capabilities and command and control throughout the Regiment. The National Guard transformation is led by the respective states, and the Reserve is led by the four Regional Readiness Sustainment Commands (RRSCs).

As these units come on line, we will see more of our modules being tailored for specific missions. Force-pooled engineer units will organize similar to the way maneuver company teams and task forces organize for specific missions. For example, an engineer brigade may receive a mission to perform a stability/reconstruction operation. The brigade commander assigns a battalion commander to take his battalion headquarters module to command and control a mission force. He provides him modules from other battalions that include a survey section, two horizontal companies, one vertical company, and a sapper company. We have now mission-tailored his organization into an EMF.

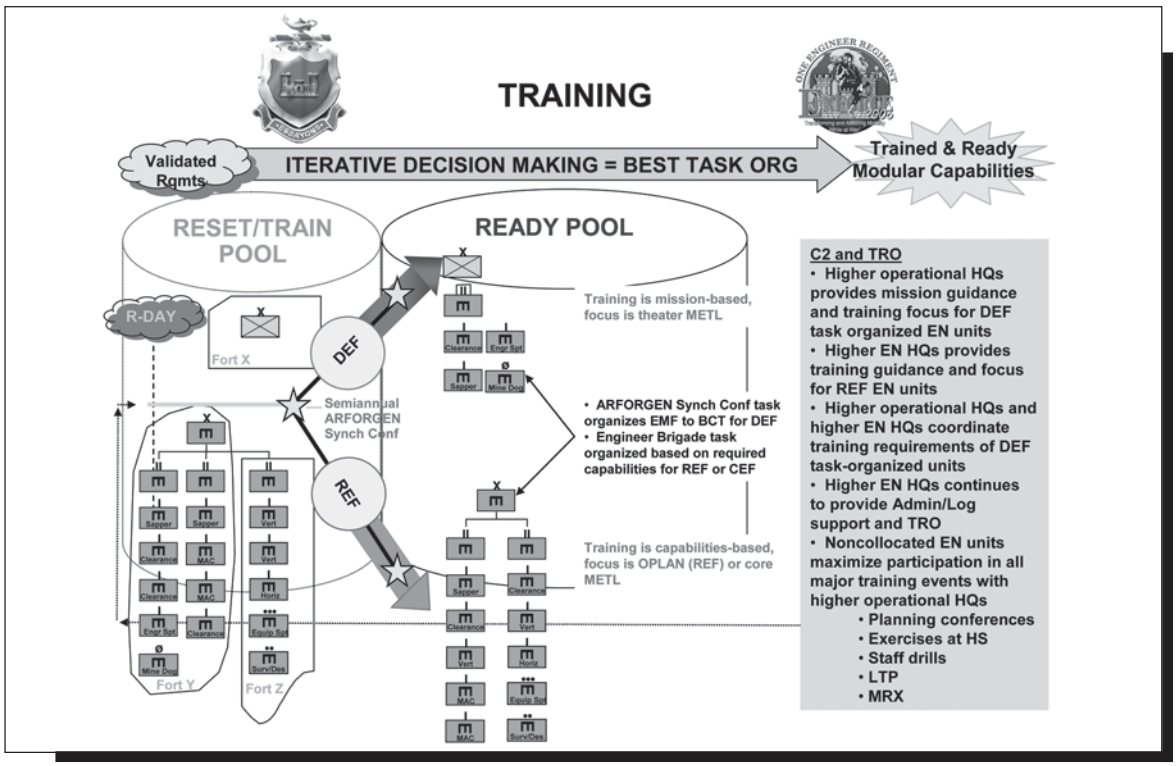
If you understand how this will occur, you will understand that the role of the engineer battalion commander at home station will be twofold: The force-pooled battalion commander will provide training, readiness, and oversight (TRO) for "training modules to excellence" and prepare his staff for fighting subordinate organizations as EMTs and EMFs. This will facilitate how we integrate into the Army Force Generation (ARFORGEN) process. Engineer brigade commanders will provide TRO over multiple battalions that may be stationed at other installations. By 2008, every force-pooled battalion and separate engineer organization will be assigned within one of our engineer brigades.

The ARFORGEN process is the objective. We are not currently organized in this manner, but that is the intent over the next couple of years. It is defined as *a structured progression of increased unit readiness over time, resulting in recurring periods of availability of trained, ready, and cohesive units prepared for operational deployment in support of regional combatant commander requirements*.

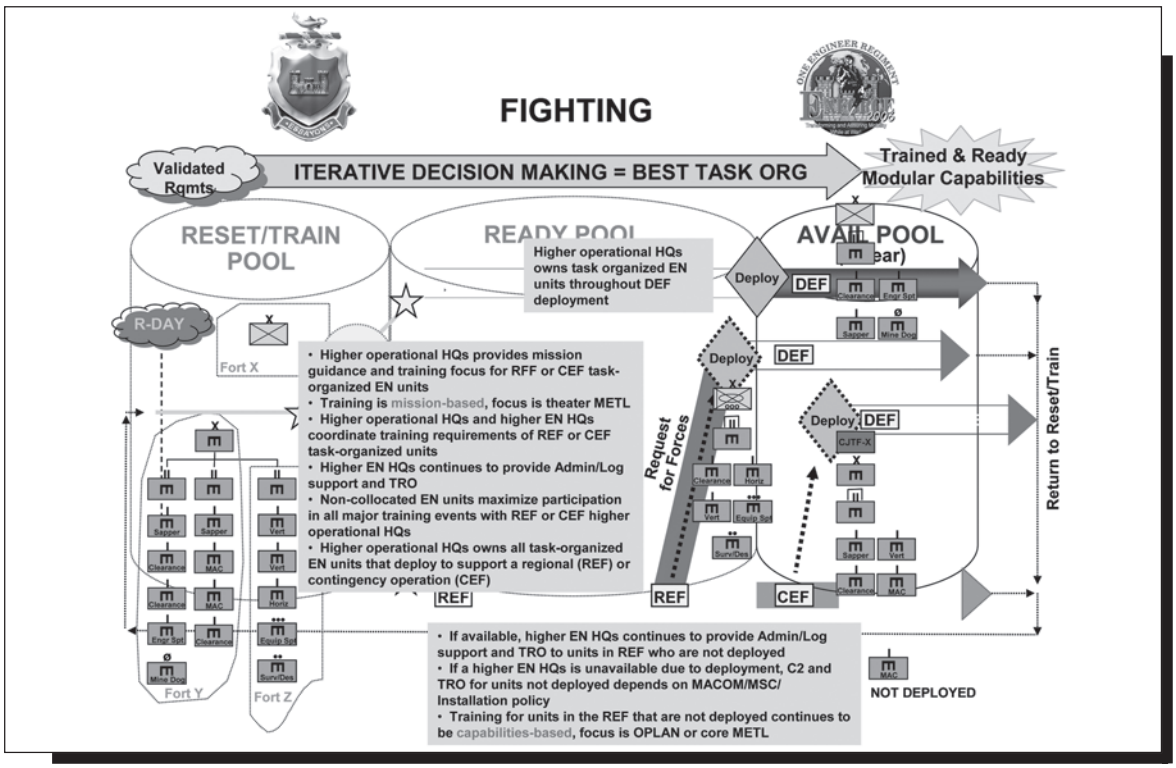
The way it will work is not difficult to understand. A unit starts in the reset/train pool. At this time, an engineer unit is force-pooled under a brigade headquarters. They will provide TRO of their subordinate engineer modules. Units during this phase will reconstitute, reset equipment, field new equipment, reassign and receive new personnel, and train. The training is capabilities-based, focusing on module METLs and preparing for EMT/EMF staff proficiency.



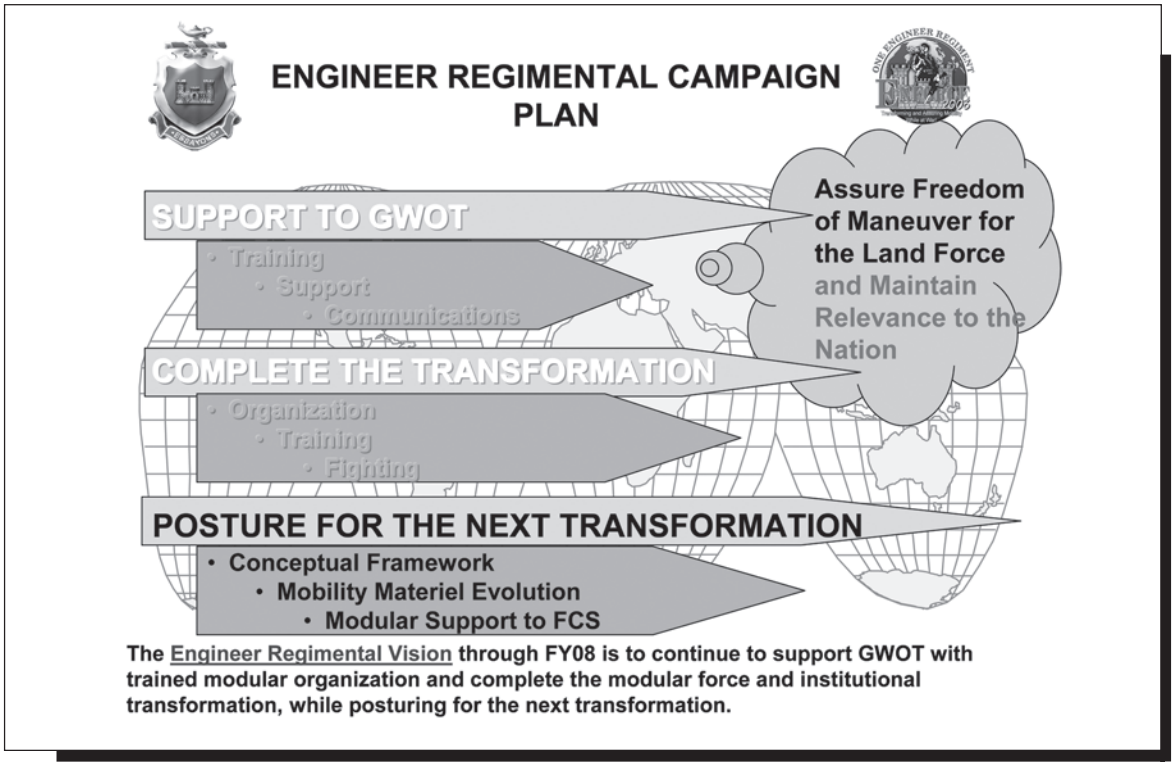
When units move to the ready pool, they will be assigned a specific deployment mission or be available as a ready force. The units assigned a deployment order will task-organize into EMT/EMFs and train with a focus on mission-based theater METL. Engineer units will be tailored for the specific mission requirements. The ready units will continue to train, focused on capabilities-based requirements of an operational plan or their core METL.



Finally, in the available pool, units with deployment orders will deploy and conduct their missions. The ready pool units may be task-organized for another deployment mission, sent on a contingency mission, or possibly not deploy but remain in a ready pool. The process is cyclic and will maintain each unit at an appropriate readiness rate depending on where it is in the process.



To complete the transformation, we will continue to improve our materiel systems. We have a great team that has increased our Program Objective Memorandum (POM) FY08 to FY13 requirements to $10.6 billion. This includes upgrades to our equipment and new purchases such as the Armored Breach Vehicle and the Joint Assault Bridge. Additionally, there has been a significant fielding plan for our route clearance missions. We have more than half of our desired end state of seven route clearance companies fielded with Buffalos, Interim Vehicle-Mounted Mine Detectors (IVMMDs), and RG-31 Mine Protected Vehicles. Our construction equipment will be entered into the Service Life Extension Program (SLEP) and reset while we work to up-armor the fleet of Deployable Universal Combat Earthmovers (DEUCEs) and High-Mobility Engineer Excavators (HMEEs). This is the largest upgrade to the engineer fleet in decades!



Posture for the Next Transformation

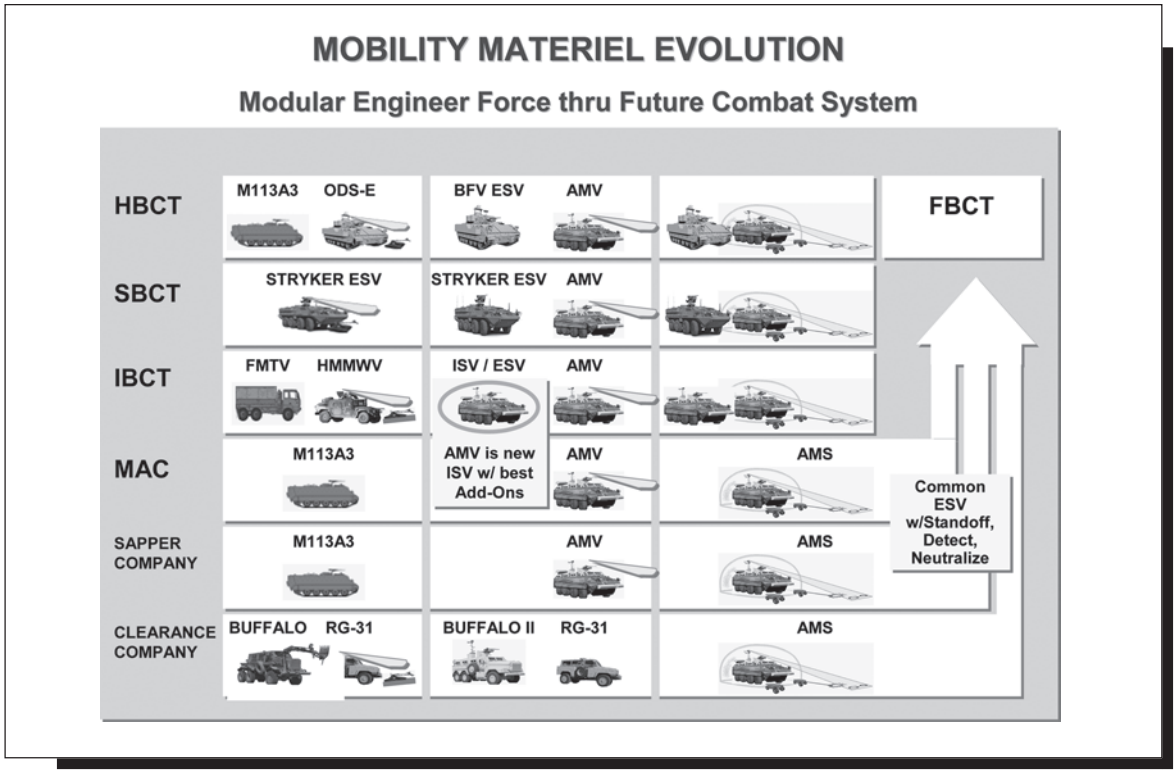
The *third line of operation* is posturing for the next transformation. We must lead our Regiment in the direction of change.

Conceptual Framework. As we examine the direction of the next transformation, we see the Army poised to include the Future Combat System (FCS). The FCS is a highly integrated structure of manned and unmanned air and ground assets, bound by a distributed network acting as a unified combat ground force in the joint environment. The intent of the FCS organizations is to increase its capabilities within this network-centric structure so that forces can conduct their missions within a larger area of responsibility, operate on longer routes, and be proactive and optimized for offensive operations, all the while linked with a common operational picture (COP).

Mobility Materiel Evolution. The assured mobility framework will be just as applicable in these organizations as today. The imperatives and fundamentals will be the foundation for offensive operations. The way we will operate is not that complex. It is a system of systems that feeds information into a single picture for all to see. Our higher headquarters and BCT assets will gather terrain data in the area of operations and report mobility impediments which will be reflected in the COP. Engineers will employ the intelligent mine system and other unattended ground sensors to extend the coverage area for updating the COP. The future Assured Mobility Vehicle (AMV) will operate embedded in BCTs and from the force pool, providing precision detection and neutralization, all the while continuously updating the COP.

The AMV will evolve from our current suite of assured mobility capabilities. Currently, our route clearance teams are a system. We have provided add-on component improvements and provided our sappers with additional add-on skills and tools. As we transition to the Modular Engineer Force, we will have dedicated clearance companies. We will spiral in GWOT technology improvements and continue to provide sappers with improved capabilities. When the Army begins to activate FCS BCTs, we anticipate that we will have a common engineer squad vehicle (the AMV) with standoff detection, neutralization, and marking capabilities integrated with all of the FCS information-sharing systems, making it the Assured Mobility System (AMS). Obviously, there are many technological

challenges, but we are making significant progress every day in these areas. Our goal is to field an AMV with all its capabilities inside the heavy brigade combat team (HBCT) engineer search section within the next few years and have it throughout our Regiment's formations by 2015.



Modular Support to FCS. The FCS BCT (or future brigade combat team [FBCT]) will still have mobility capability requirements. These requirements include high-resolution geospatial terrain data, gap crossing (wet/dry > 4 meters), neutralization of hazards on- and off-route, neutralization of explosive and nonexplosive obstacles, emplacement of countermobility obstacles, force protection/survivability construction, and stability operations. The modules to support these requirements will come from three sources: division enablers, organic assets of the FCS unit, or the force pool engineer units.

Our Modular Engineer Force organizational design well prepares us for the future and our ability to support the FBCT. Our sapper companies, mobility augmentation companies (MACs), clearance companies, and engineer support companies will be key to providing engineer capabilities to this future force. Our task for the next transformation (FBCTs) is to modernize our materiel systems in these formations. We have already discussed the AMV and AMS; we will also need to develop a lighter assault gap crossing system—a lighter assault breaching vehicle. We will also select certain engineer modules and battalion headquarters to have habitual relationships with these new FBCTs and thus also receive their command and control communications suites.

So, for example, if you need to create an organization to provide high-resolution geospatial products, you can simply reach for a topographic company module or a geospatial planning section. Or say you want to task-organize for stability operations, you could take a clearance company module, a couple of horizontal company modules, and a vertical company module to create an EMF to command and control this organization for stability operations. So what you discover is…we are already transforming to support the next transformation in support of the FCS. Other than continued technological advancements and improved survivability for our engineer equipment, we will continue to task-organize these modules for the foreseeable future. The majority of our force-pooled modules will provide the core of capabilities needed to support the FCS BCTs. These assets will be indispensable to the BCT and division commanders.

Path to Success

I know I have covered a lot of material but…*Is this great or what?!!* The next two years look bright as we move along these three lines of operation. Each path is leading to success for our Regiment, thanks to YOUR efforts. We will continue to support the war and train the force based on your lessons learned. We will continue to complete the transformation and growing the new Regiment; all the while we will be postured for the next transformation. We are almost there! My thanks to all of you who are fighting the war, who are supporting the war, and who made ENFORCE a success this year!

Carry On!

The Essayons Award

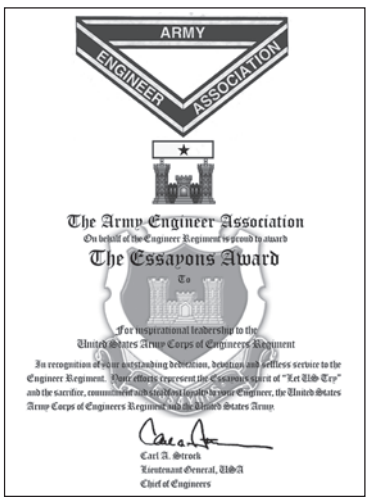
By Lieutenant Colonel Anthony C. Funkhouser

The Army Engineer Association (AEA) unveiled a new award at ENFORCE 2006 to recognize the Engineer spouses of our Regiment. For many years, the deFleury medal has been used to recognize our Soldiers for their contributions to the Regiment. Now we have the *Essayons Award* that pays homage to all the great spouses across the Engineer Regiment. The *Essayons Award* application will soon be posted to the AEA Web site.

The AEA established the *Essayons Award* to honor spouses who have voluntarily made significant contributions to the morale, welfare, and spirit of engineer units and organizations. In order to maintain the value and prestige of the *Essayons Award*, we have established criteria that must be met in order for a nomination to be approved.

- The nominee should be the spouse of an engineer Soldier or engineer Department of Defense civilian.
- The nominee's spouse should be a member of AEA.
- The nominee should be a spouse who has voluntarily provided significant contributions and support to the Engineer Corps, engineer units, engineer families, and/or multiple communities.
- Most importantly, the spouse must possess qualities that set the individual apart from other Engineer Corps spouses or their peers.
- Spouses associated with Active, Reserve, or National Guard units are eligible. Retired individuals are also eligible.

The award **will not** be presented as an "end-of-tour" award that recognizes performance/contributions made during a single assignment. The presentation of the *Essayons Award* to the recipient should be scheduled during very special events such as formal dinners, retirements, and similar affairs.





The Story of the Essayons Award

The Engineer Regiment presents the Essayons Award to acknowledge our Spouses' outstanding dedication, devotion, and selfless service to the Engineer Regiment. This award honors those who embody the "Let Us Try" spirit and have voluntarily made significant contributions to the morale and welfare of engineer Soldiers and families.

The Essayons Award is rich with symbolism. The Blue Service Star is representative of Army lineage and represents their Soldier's service to country: A blue star (loyalty, sincerity, justice) upon a white field (hope, purity, truth). The red border represents valor and hardiness.

There are three links that connect the castle to the Blue Service Bar, representing the unbreakable bond between the Spouse, the Soldier, and the Regiment.

The medieval castle is inseparably connected with fortifications and architecture. It represents the strong home foundation maintained by engineer Spouses.

The diamond in the center represents the foundation of support to our Soldier. The diamond represents steadfast love. The word "diamond" comes from the ancient Greek word "adamas," meaning unconquerable. The engineer Spouse's spirit is unconquerable and overcomes all challenges they may encounter. Most diamonds have 58 facets, to bring out their maximum sparkle, fire, and brilliance. Engineer Spouses are multifaceted as well in supporting the Soldier, their family, their unit, their community, the Corps of Engineers, and our Army.

The Essayons Award is inscribed on the back with "ESSAYONS." This keeps the Essayons motto near the Spouse's heart.

The Essayons Award is presented to the engineer Spouses who embody this award. They represent the sacrifice, commitment, and steadfastness of the United States Army Corps of Engineers Regiment and the United States Army.

Lieutenant Colonel Funkhouser is the Chief of Staff at the United States Army Engineer School, Fort Leonard Wood, Missouri.

What Is Geospatial Engineering?

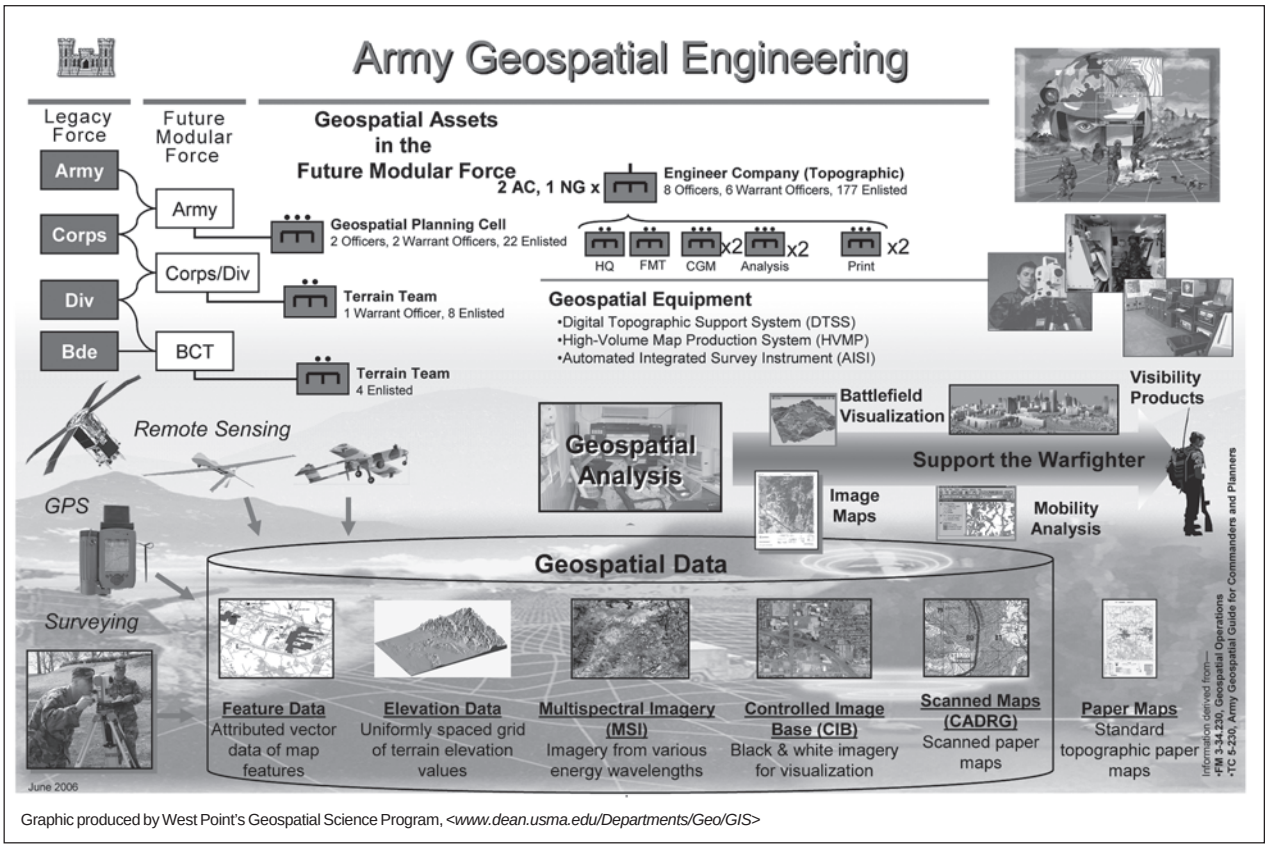
Compiled by Lieutenant Colonel Michael Hendricks, Major David P. Burris, and Master Sergeant Donald Murray

Geospatial engineering is the **art** and **science** of applied geospatial information, from raw or exploited data, about geographic (contextual or spatial) and temporal phenomena related to the earth, its subsurface, its bodies of water, its atmosphere, and immediately adjacent regions of space for military tactical operations.

Within the military decision-making process (MDMP), the **art** of geospatial engineering is the ability to understand the commander's intent, [mission, enemy, terrain and weather, troops available, time available, and civil considerations] METT-TC, and geospatial information available, in order to **evaluate and visualize the battlespace environment** (Step 2 of the [intelligence preparation of the battlefield] IPB). This is then employed to create **geospatial products** and explain the **military significance of the terrain** (Step 2 of the IBP) to the commander and battle staff, enabling operational maneuver, mission planning and rehearsal, training, and precise targeting with the full understanding of the data, including intent of use and limitations.

The **science** of geospatial engineering is the exploitation of geospatial information by the engineer terrain team's use of high-end computer workstations and software to manipulate the data to render spatially co-referenced information about the earth, with temporal tags (metadata), arranged in a coherent structure and format to support military operations, measurement, mapping, visualization, modeling, spatial reasoning, terrain evaluation, and many other applications.

Derived from the Army Geospatial Data Integrated Master Plan (AGDIMP), 29 April 2005



Graphic produced by West Point's Geospatial Science Program, <*www.dean.usma.edu/Departments/Geo/GIS*>



The Joint Geospatial-Intelligence Activity

By Lieutenant Colonel Richard E. Barrowman

The Soldier stares patiently at the military personal digital assistant (PDA) screen. Although it seems longer, almost 30 seconds have passed since he requested full-motion imagery of the building around the corner. The Soldier has received information from a reliable source that a group of men entered the building carrying material that looked as if it could be used to produce explosives. The Soldier wants the imagery to determine the number of men, which direction they came from, what they were carrying, and other details that only video can provide. The video, in near real time, will be downloaded to him based on his providing a global positioning system grid and time frame. The video—from a Marine unmanned aerial vehicle—is being processed through an Air Force Distributed Common Ground/Surface System (DCGS). After nearly a minute and a half, the video is streaming into his PDA, and he is formulating a plan to attack the building with his squad.

Sound like something out of a television episode? Maybe a futuristic experimental video game? In reality, it's a capability the Joint Geospatial-Intelligence Activity (JGA) intends to facilitate for every warrior in the fight: the timely, multidirectional collection, management, dissemination, and display of geospatial intelligence among national and tactical users.

JGA is a partnership between the United States Joint Forces Command (USJFCOM), United States Strategic Command (USSTRATCOM), and the National Geospatial-Intelligence Agency (NGA) to bring the combatant commands (COCOMs) and services and agencies (CSAs) together to aggregate joint requirements and formulate solutions for capabilities that extend and enhance geospatial support. Geospatial intelligence is the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth.

The geospatial legacy suffers from the fact that geospatial information (maps, charts, and geodetic information) has been functionally managed by "operations," while imagery was managed by "intelligence." Today's joint warfighter support needs to drive these two together. A couple of challenges exist to realizing the full capability of geospatial capabilities. Disparate staff functions are only one. Separate service systems developed without appropriate joint standards and guidance are another, as well as previously unavailable network-centric environment and adequate bandwidth. Additionally, the traditional geospatial data delivery via media (paper and compact disc [CD] or digital versatile disc [DVD]) through the Defense Logistics Agency cannot keep pace with requirements; not all theater geospatial holdings are electronically connected to national holdings; access to imagery products requires knowledge of library and database locations; and operators at the lowest tactical level have limited access to secure communications. Continuing to improve the way we train and fight jointly is now a mandate.

Seeking solutions for enhancing geospatial products, JGA has a special focus on warfighter information needs at the joint task force (JTF) level and below. The organization also ensures that geospatial intelligence collected and produced in theater can be shared effectively within theater with allies and with operational and strategic users.

(Continued on page 16)

GeoPDF Map Files

All Regional Digital Maps on One DVD

By Mr. Kenneth R. Bergman and Mr. Raymond G. Caputo

Five years ago the National Geospatial-Intelligence Agency (NGA), in conjunction with private industry, began developing a geospatial portable data format (GeoPDF)—a new Adobe® Acrobat® file format. The GeoPDF provides a more efficient way to use and print digital map displays. NGA is preparing to create GeoPDFs for every map it produces so Soldiers can access maps using the free Adobe Reader® and free third-party plug-in (TerraGo Technologies™ MAP2PDF™) for the Adobe Reader. This technology is being used to make file sizes for electronic map displays much smaller than NGA standard map display files.

The United States Army Engineer Research and Development Center's Topographic Engineering Center (ERDC-TEC) is now using this technology to build Unclassified/For Official Use Only digital map displays for regions of the world where the Global War on Terrorism is being fought. The GeoPDF files are very small (most range from two to ten megabytes per map) and are usable on any personal computer with Adobe Reader and the free plug-in software. The digital display on the computer remains crisp and clear as the user zooms in to look at the map in more detail—unlike Compressed ARC Digitized Raster Graphics (CADRG). The GeoPDF maps can also be printed on letter-size paper (not to scale) or printed to scale on a plotter.

All of the NGA standard maps for an entire country can now be loaded on a single digital versatile disc (DVD) using this technology. These products can be ordered from ERDC-TEC by mail or downloaded through ERDC-TEC's public key infrastructure (PKI) Web access, secure Internet protocol router network (SIPRNET), or the Joint Worldwide Intelligence Communications System (JWICS).

Map Display Technology in Battle Command

Digital map displays have been used for several decades to support battle command systems. Standard formats for digital map displays were developed by the Defense Mapping Agency, now part of the NGA. Geospatial software technology enabled Soldiers to use digital map backgrounds which were stored on compact disc (CD) media and hard drives. One map display format, ARC Digitized Raster Graphics (ADRG), provided a clear view of the scanned map in computer displays, but file sizes were so large that few maps could be loaded on a single CD. CADRG was developed as a new file format using compressed ADRG, with some loss in content, to load more map background files on a single CD, thereby using less hard drive space. CADRG files are much smaller than ADRG, but the digital map display becomes blurry as the user

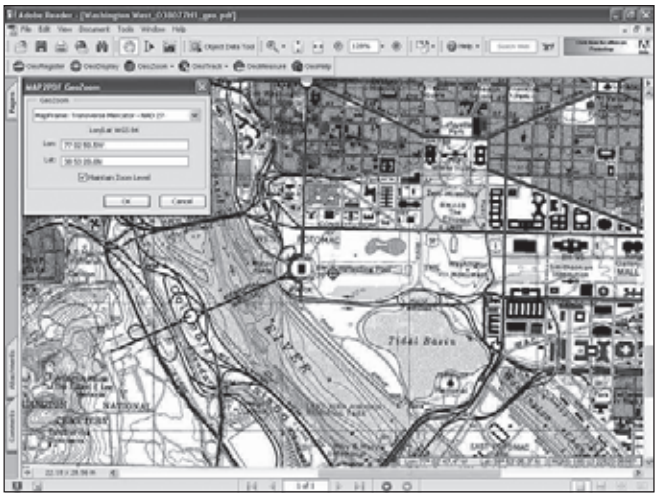


Figure 1. Adobe Acrobat GeoPDF map of Washington, D.C., with the latitude and longitude displayed, as well as the Military Grid Reference System (MGRS) coordinates

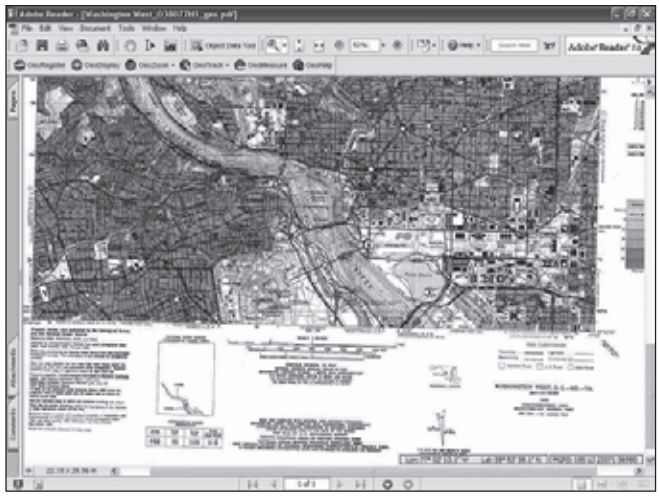


Figure 2. The same map, zoomed out with margin information such as scale, legend, and declination constant

zooms in to see more detail. Some users still require the old ADRG format because of the need for better resolution. Both CADRG and ADRG are the primary map background file formats that are used today in most automated battle command systems.

A few years ago, an NGA leader in St. Louis, Missouri, saw the potential for using Adobe Acrobat to create digital map display files that were more useful and accessible than CADRG, with better resolution when users zoom in for a closer look. GeoPDF technology was developed during this period. The resulting GeoPDF file retains the geocoordinates of the map background, as well as marginal features and legend information. GeoPDF files can be readily printed with a desktop printer or to scale with a plotter.

There are two types of GeoPDF files: raster and vector. Both file types provide a scalable display of the digital map with crisp, clear delineation of roads, rivers, contour lines, and other features. The vector GeoPDF has an added function that enables the layers to be turned on and off as needed to analyze a map display based on the user's needs.

Production and Availability of GeoPDF Files

NGA uses GeoPDF technology for a variety of map display applications, but this new format is still a nonstandard product so it was not mass-produced. The ERDC-TEC Operations Division has collaborated with NGA on the development and use of this technology. ERDC-TEC is presently building digital map displays in GeoPDF for required standard NGA maps in theater. ERDC-TEC now produces a series of DVDs that contain all required NGA maps in various regions.

Copies of these GeoPDF products can be obtained by contacting Ray Caputo at 703-428-6784 or <*raymond.g.caputo@erdc.usace.army.mil*> or by downloading GeoPDF files from the ERDC-TEC PKI Web site using a common access card (CAC) at <*https://tsunami.tec.army.mil/Products/MapArchive/*>. The files are also available via SIPRNET at <*www.tec.army.smil.mil/Products/MapArchive/*> and JWICS at <*www.tec.army.ic.gov/Products/MapArchive/*>. NGA GeoPDF files can be obtained via SIPRNET at <*www.nga.smil/products/echart/*> and via JWICS at <*www.nga.ic.gov/products/echart*>.

Mr. Bergman, a member of the Topographic Engineering Center, is assigned to Fort Leonard Wood, Missouri, where he supports the TRADOC Program Integration Office for Terrain Data. A former Marine, he is a Naval Academy graduate and has a master's in systems engineering from George Mason University.

Mr. Caputo is a geographer for the United States Army Corps of Engineers® in the Topographic Engineering Center's Geospatial Information and Imagery Requirements Branch, Alexandria, Virginia. He holds a bachelor's in geography from New York College, Oneonta, New York.

("Geospatial-Intelligence," continued from page 14)

JGA coordinates efforts across the enterprise and focuses on procedures (concept of operations or tactics, techniques, and procedures), data standards, architecture, requirements, and policies necessary to obtain the capabilities to provide integrated geospatial information to the lowest tactical level in the near- to midterm. JGA is following the guidance the Chairman of the Joint Chiefs of Staff provided on 1 October 2005: By changing how we employ the tools already at our disposal, transformation will progress significantly. Consequently, JGA is neither a program nor an acquisition. Rather, it seeks to collaborate among all mission partners to better connect geospatial data from the national to tactical level. The lead on the JGA project says that they are using existing capabilities and technologies to the extent possible. The services have invested a lot of money in their own architectures.

Demand for geospatial intelligence is great and becoming exceedingly more complex. JGA efforts focus on the visualization (display), analysis (value adding), and distribution (dissemination) of geospatial intelligence, following the lead set by the commercial sector to provide better awareness of a geospatial-supported common operational picture. These capabilities enable users to organize, understand, and act upon information gathered and created across the geospatial domain by enhancing the correlation of information data layers in a manipulative framework that assures the user a high degree of geopositional accuracy and flexibility in display.

JGA efforts are based on requirements identified from engagement with COCOMs and services, as well as information from other governmental agencies. The partnership on paper is between USJFCOM and NGA, but in reality, the partnership is broader—involving all the services and COCOMs, as well as supporting agencies like Defense Information Services Agency.

The solution may lead to doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) changes, or it may lead to focusing the efforts of existing programs. JGA is collaborating with existing capability demonstrations within the USJFCOM Joint Experimentation Directorate (J9) and engaging in discussions about future training, optimal architecture, and the necessary data standards for ensuring interoperability and usability of data on different customer sets.

It all goes back to the Soldier outside the building. He needs current, accurate, and competent information. He shouldn't have to worry about source, timeliness, or compatibility of his system. He should focus on the accomplishment of his mission and the prevention of loss of life.

Lieutenant Colonel Barrowman is assigned to the United States Joint Forces Command, Norfolk, Virginia, as the geospatial information and services (GI&S) officer. He works in the J3/44 Engineer Section.

DEVELOPING IGRS

ENGINEERS CREATE THE IRAQ GEOSPATIAL REFERENCE SYSTEM

By Colonel Mark Yenter, Lieutenant Colonel Tedd A. Wheeler, Captain Juan R. Mejia, First Lieutenant Kenneth R. Joyce, and Mr. Michael Cline

A critical component of national infrastructure is an accurate spatial reference system—a reliable network of permanent survey marks that have established horizontal coordinates and/or elevations that are referenced to a defined coordinate system. These survey control stations form the basis of a nation's Geographic Information System (GIS) databases, navigation systems, cadastral records, horizontal and vertical construction surveys, and resource management programs.

Even after the establishment of the global positioning system (GPS), control networks continue to be an essential component to the complicated science of positioning objects on, above, and below the Earth's surface. Surveys must be based on an accurate set of reference stations in order, for example, to lay out a bridge that successfully joins in the middle, or to position a runway on which planes conduct precision approaches.

The 175th Engineer Company (Topographic) (Airborne Corps) arrived in Baghdad in December 2004 to provide geospatial engineering support—including terrain analysis, geodetic survey, and map production—to Operation Iraqi Freedom. While preparing for its first mission in Iraq, the 175th Survey Section discovered that Iraq did not have an established spatial reference system; what data did exist was outdated.

The 175th took the leading role in developing a modern, GPS-based geodetic control network—the Iraqi Geospatial Reference System (IGRS). With technical guidance from the United States National Geodetic Survey (NGS), the 175th engineered IGRS in the likeness of the National Spatial Reference System (NSRS).

CORS Network

The foundation of IGRS is a series of GPS continuously operating reference stations (CORS), spread geographically throughout the country. The CORS network supports postprocessed differential GPS (DGPS) positioning in all regions of Iraq. Given a complete CORS network, a survey crew working to position critical infrastructure features could conduct its survey using GPS with meter-level accuracy. The crew could then download appropriate CORS data from other stations and use it to correct differentially the field data to obtain centimeter-level accuracies for the final product.

Each CORS site consists of a Trimble NetRS® dual-frequency GPS receiver with a permanently mounted antenna that logs position and time data 24 hours a day, 7 days a week. The stations are located at secure installations, and their data transmits through the Internet to a server in Iraq. Trimble's GPS Net® software controls the server, which stores and compresses the incoming data and then sends it via the Internet to NGS for analysis and publication. The dataset also is transferred to the public archives of the International GPS Service (IGS), a global network of geodetic reference GPS and Global Orbiting Navigation Satellite System (GLONASS) (a Russian satellite positioning constellation) reference stations



Photo by First Lieutenant Kenneth R. Joyce

A Soldier installs one of the CORS antennas that is part of the IGRS.

formed by the voluntary cooperation of many worldwide agencies.

NGS calculates the positions of the Iraqi CORS by processing data from each new station with data from a set of "hub" stations that are part of the existing global reference network. Geodesists produce the coordinates with Program for the Adjustment of GPS Ephemerides (PAGES) software that uses the method of "double differences" to remove clock errors in the GPS satellites and the ground stations. Once synchronized time is established, the precise locations of the satellites along their arcs of orbit may be calculated epoch by epoch. The positions of the Iraqi stations are then determined through triangulation by distance to the solved locations of the satellites.

However, GPS satellites circle the Earth's center of mass; therefore, their locations in space, and the resulting triangulation of points on the Earth, are determined in an X, Y, Z Cartesian coordinate system whose origin is located at the Earth's center of mass. Because site coordinates are determined in the reference frame of the GPS orbits, the mathematical Earth model for satellite orbit calculation is all-important, including the slow rate of drift of the Earth's tectonic plates and the features embedded on those plates, such as CORS antennas.

The NNR-NUVEL-1A model is perhaps the best-known model for predicting horizontal plate tectonic velocities for locations outside the United States, usually with an accuracy of a few millimeters per year for locations within stable plate interiors. This model, however, does not make allowance for deformable plate boundaries, such as the boundary between the Eurasian Plate and the Arabian Plate upon which Iraq lies. So the velocities of Iraqi CORS will need to be predicted periodically.

To supplement CORS, the 175th designed a nationwide high-accuracy reference network (HARN) of permanently monumented survey control stations. The goal is to achieve a station spacing of not more than 50 kilometers, which will equal a total network of 200 to 300 stations. Each HARN station consists of a stainless steel rod monument that is driven to refusal with a jackhammer. Stations are positioned with DGPS using as control the nearest active control station—either an established HARN running simultaneous GPS data collection or an Iraqi CORS.

All HARN positions are referenced to the International Terrestrial Reference Frame 00 (ITRF00), which is considered virtually identical to the World Geodetic System 1984 (WGS 84) (G1150) coordinate system.

Aside from various technical hurdles, developing the Iraqi HARN presents a formidable logistical operation. Field teams require constant resupply and protection in order to survive and complete their missions while spread throughout a desert that is extremely hostile. To supplement limited manpower, the 175th partnered with the 42d Engineer Regiment (Geographic), British Royal Engineers.

The American and British surveyors were split into autonomous teams that surveyed the first phase of the HARN, which covers the southern portion of Iraq. Each crew was led by a noncommissioned officer who was responsible for all aspects of his team's safety and completion of technical tasks for the survey. The IGRS Operations Cell synchronized the survey plans and coordinated the task force movements and logistics support. The CORS data are available on an interactive Web page. See <*http://www.ngs.noaa.gov/index.shtml*> and <*http://igscb.jpl.nasa.gov*>. Iraqi HARN data were published on compact disc and distributed throughout the coalition and to the Iraqi ministry of Water Resources, Surveying, and Mapping Center.

Global Outlook

Beyond Iraq's borders, many other developing nations require help with developing modern spatial reference systems. Through progressive outreach programs, NGS has provided equipment and expertise in Central and South America, the Caribbean, and Africa and Eastern Europe to nations that are establishing CORS and HARNs. These efforts have proven particularly effective in nations recovering from natural disasters. War-torn countries require the same geospatial reconstruction, and military engineering units are well-equipped to operate in these regions. By using IGRS as a model to create similar programs in nations like Afghanistan and Somalia, the Army could effectively package what NGS developed as a successful multination technical assistance program into a military reconstruction effort.

Colonel Yenter is the Commander, 20th Engineer Brigade (Combat) (Airborne Corps), and was the director of the Multinational Corps–Iraq (MNC–I), Staff Engineer Section, during Operation Iraqi Freedom, 2004-2006.

Lieutenant Colonel Wheeler is the Commander, 30th Engineer Battalion (Topographic), and senior Iraqi theater geospatial engineer during Operation Iraqi Freedom, 2004-2006.

Captain Mejia was the Commander, 175th Engineer Company (Topographic) (Airborne Corps), during Operation Iraqi Freedom, 2004-2006.

First Lieutenant Joyce was the Executive Officer, 175th Engineer Company (Topographic) (Airborne Corps), and project manager of the Iraqi Geospatial Reference System during Operation Iraqi Freedom, 2004-2006.

Mr. Cline is a geodesist with the National Oceanic and Atmospheric Administration in Silver Spring, Maryland.

Note: A similar version of this article was published in the Society of American Military Engineers publication, *The Military Engineer*, October 2005, and *The American Surveyor*, November 2005.



Speeding Intel to Mapmakers on the Battlefield

The BAS in Iraq

By First Lieutenant Bridget Strom

The Big Agile Server (BAS) is a system created by the Air Force that provides the latest and most accurate map data and imagery to Iraq. The National Geospatial-Intelligence Agency (NGA) is in the process of turning over the server to engineer Soldiers in the Victory Corps, 320th Engineer Company (Topographic), Terrain Platoon. The server will soon be run primarily by engineer Soldiers instead of NGA.

BAS Components

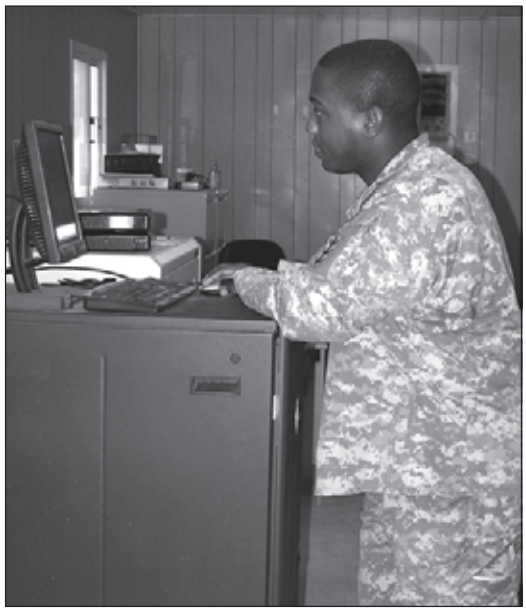
The BAS works by transmitting data, through satellites, from the NGA headquarters in St. Louis, Missouri, to Multinational Corps–Iraq (MNC–I) headquarters in Baghdad. When NGA headquarters receives new map data and imagery, it directly updates the server in Iraq. The ultimate goal of this server is to become the fastest way possible to get map data and imagery to Iraq.

The capacity of the BAS allows users to not only store the most up-to-date imagery and products but also to keep a sizeable amount of data on hand, creating a large directory of map data and imagery to pull from. This is important because it gives geospatial analysts the ability to track progress and change in Iraq, and it builds a comprehensive historical database for future operations.

BAS History in Iraq

The BAS arrived in Iraq in 2005, and it has been an asset used primarily by the NGA. This year, for the first time since its introduction, engineer Soldiers will play a key role in running the server. Currently, NGA is transitioning the BAS to Soldiers in the 320th. This transition allows the terrain platoon to provide leaders at the highest levels the most accurate map products available to the military.

The BAS has been instrumental in the planning and mission execution of most corps sections that frequently request updated products. As a terrain platoon asset, the BAS provides ground commanders with the latest imagery and data on locations across Iraq. The data, transferred from the server to a customer's hard drive, is easily loaded by its users. This technology has been growing since 2003, and to date, the BAS has proved an invaluable asset in the planning and execution of many missions across Iraq.



A terrain platoon Soldier works at the BAS.

BAS Operations – Present and Future

Currently, the 320th Terrain Platoon gets the majority of its data from NGA. And by putting the BAS under the control of the platoon, Soldiers who use the data to make corps-level products will now have complete access to the best data and imagery available. The BAS is quickly on its way to becoming the fastest, most accurate, and most effective way for NGA to get data and imagery to Soldiers in the field. And with Soldiers running the system, it will become an even sharper tool for covering all areas of the battlefield.

First Lieutenant Strom is the terrain platoon leader for the 320th Engineer Company. Her previous assignments include production platoon leader for the 320th Engineer Company and battalion S3 for the 565th Engineer Battalion, Hanau, Germany. Her platoon provides corps-level topographic products and analysis and provides smaller satellite teams across Iraq to the 2d Brigade Combat Team, 28th Infantry Division, Corps Support Command, and the 130th Engineer Brigade.

Winning the Economic Firefight:
Translating Reconstruction Into Combat Power

By Colonel Christopher J. Toomey

As our Army deals with insurgencies in Iraq and Afghanistan, it is becoming ever more apparent that the precise application of infrastructure development and reconstruction can markedly contribute to the overall success of our operations. This becomes extremely important as operations transition from military to nonmilitary centers of gravity; at some point, the traditional military effort becomes subordinate to more inherently nonmilitary tasks. Then it becomes more than just winning the fight on the battlefield, but also about winning hearts, minds, and even pocketbooks. It is about winning the "economic firefight."

While conducting operations in Iraq and Afghanistan, our forces are continually exposed to crumbling and dysfunctional infrastructure that inhibit both establishing effective democratic governance and producing the economic revitalization necessary to ensure secure and stable environments. Inextricably linked, governance, economic revitalization, and security impact each other and together spiral upward or downward. As we face an enemy that exploits any weakness in our own forces and leverages dissatisfaction and hesitation in the civilian population, all of our tools are needed to create effects—outcomes—along these three lines of operations. The interrelationship of each capability—kinetic and nonkinetic, inherently military or not—must be both understood and exploited for maximum effect.

Considered long overdue by many, Department of Defense Directive 3000.05[1] elevated stability, security, transition, and reconstruction (SSTR) operations and propelled what was often regarded as secondary military roles into the mainstream of military operations—no longer the isolated purview of civil affairs, engineers, and military police units. Indeed, SSTR operations are both combined arms and interagency operations that require a degree of effects coordination that are arguably as complex as more traditional combat operations.

Terrestrial infrastructure—roads, bridges, power, and water resources—is in many ways the physical embodiment of a mature and functioning society. Their development facilitates economic revitalization and security. Coupled with good governance and reinforcement of rule of law, a sound infrastructure can promote trade and instill confidence in a nation's populace. By doing this, it can work with other more traditional capabilities to help defeat the enemy. Infrastructure development erodes support for the enemy by instilling a sense of material confidence in the ability of the legitimate government to deliver services. If the government can provide improved roads and reliable power, then the enemy's message that they offer "something better" becomes measurably less credible.



Afghan workers are an integral part of all reconstruction operations.

Infrastructure development also presents an attractive economic alternative to the population—a population that the insurgency needs for support. If power systems bring light industry and irrigation promotes greater crop yield, then the local populace is less inclined to either support insurgent forces or engage in illicit activity. Improved road networks extend and promote commerce and serve as direct economic stimuli and reduce the conditions where an insurgency can gain recruits.

When people have a stake in their community, they are less inclined to take action that will set them back. Carefully executed with an eye on building local buy-in and promoting ownership, infrastructure development serves to engender a greater democratic community spirit.

With a destroyed road network, minimal reliable power, dysfunctional water management, and a retarded internal capacity for development and sustainment, Afghanistan, perhaps more than Iraq, represents a country with a devastated infrastructure. Immature to begin with, it shows the pain of more than 25 years of near continuous conflict. While combating an active insurgency, U.S. and coalition forces are taking advantage of an excellent opportunity to effectively win the economic firefight and establish protocols for developing infrastructure as a complement to more traditional forms of combat power.

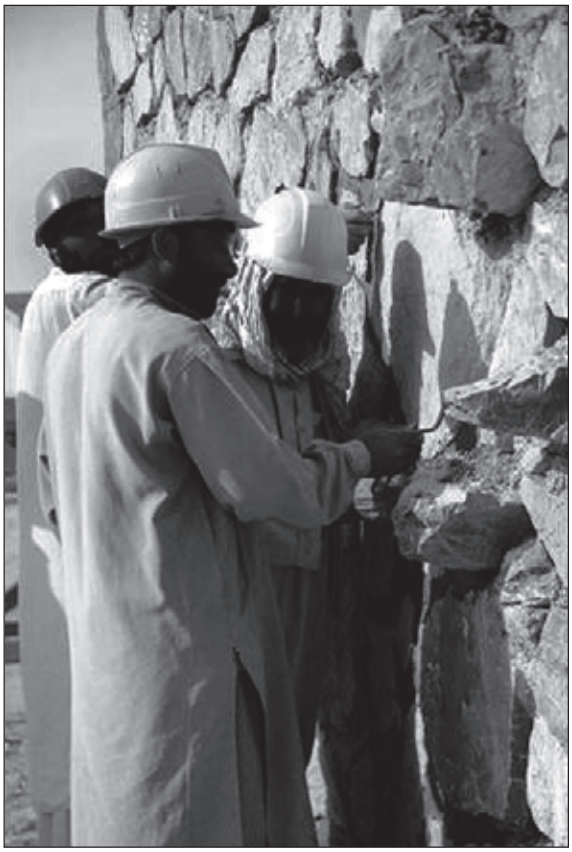
In approaching reconstruction in Afghanistan, U.S. and coalition forces of Combined Forces Command–Afghanistan (CFC-A) are employing a mix of assets—to include Provincial Reconstruction Teams, funding from the Commander's Emergency Response Program (CERP), and military engineers—while following four broad principles to getting the most out of their efforts:

- Maintain a coordinated, precision approach to selecting projects.
- Win local consensus and ownership while planning projects.
- Build local capacity as a key residual of project execution.
- Synchronize with kinetic and information operations throughout.

Working with the United States Embassy, the United States Agency for International Development (USAID), and other United States Government agencies within the context of a broader international effort—to include governmental donors, as well as a multitude of others—it is imperative that CFC-A's efforts are coordinated in order to minimize duplication of effort and to make sure the right area is targeted at the right time with the right effort. Given that not all ministries within the Afghanistan government are currently capable of providing direction and focus to the international community and that no one single body oversees coordinating infrastructure development in the country, CFC-A must aggressively work to deconflict its efforts with others. Through a series of forums such as CFC-A's Strategic Infrastructure Joint Planning Group, the development of an accepted infrastructure common operating picture (COP), to include a common infrastructure database format, was an essential step. By maintaining this dialogue across the international community, CFC-A can influence the time and location of stakeholder activity. Deliberately, CFC-A looks to directly engage in those areas where sizeable donor activity is absent, while focusing on high-payoff targets in contentious areas that will most benefit from reconstruction efforts with a residual contribution to enhancing security. For example, much of the international donor community is focused on improving the more than 6,000 kilometers of paved, national-level roads. However, there is only marginal activity in addressing the roads heading toward



Active mentoring of Afghan firms brings new skills, such as surveying.



Local construction techniques by local firms help ensure community buy-in.

the provincial capitals and district centers. CFC-A is targeting improving these roads while focusing on volatile areas that need the economic benefit derived from improved roads and simultaneously improving the access for security operations.

Ensuring local consensus and ownership dramatically enhances the impact of the reconstruction effort and its ability to deliver the effect. Working through the local Provincial Reconstruction Teams that are tied into the provincial and district leadership, CFC-A looks to engage the leadership at all levels, determining what needs to be done and where it needs to be done. Key stakeholders include the Community Democratic Councils that are formed under the Government of Afghanistan's National Solidarity Program to provide grass roots input to community and infrastructure development while advancing democratic government. Local buy-in not only ensures that the community accepts the work, but it also greatly assists in increasing the likelihood that the community—often through the use of local firms—actually contributes to the execution of the particular project. Even in contentious areas, project security is enhanced if the community believes that they have a stake in its success and if locals are employed. By maintaining an "Afghan face" on any project, it gains greater overall acceptance.

Both in direct action and as a residual of the infrastructure development, capacity building—the capability of the government, community, and people to sustain themselves—must be considered. This includes everything from human capital (training and education) to corporate development to local governmental reform. Each and every project in CFC-A is seen as an opportunity to build capacity. This is done by employing local Afghans and establishing construction training programs, either on the job or as deliberate efforts. Additionally, the use of local firms requires a good degree of mentoring and training at the commercial level. Local companies are guided in construction estimates, scheduling, quality control, and safety standards. Using expertise found in the United States Army Corps of Engineers®, CFC-A is willing to accept a degree of inefficiency in construction practices while building this capacity. At the governmental level, CFC-A is helping build the governmental wherewithal to sustain what's been built and forecast for the future.

In seeking an outcome with the enemy, effects-based operations encourage the synchronized impact of both military and nonmilitary capabilities in achieving the commander's intent. Synchronizing reconstruction efforts with both information and kinetic operations optimizes their impact in contributing to the overall effect. The effects community within CFC-A is developing a marketing strategy to leverage reconstruction to promote many of the command's key themes and messages. In synchronizing with kinetic operations, reconstruction timing and placement is aligned to not only deconflict the battlespace but also to present reconstruction efforts as an attractive alternative to those who may be the direct or indirect targets of combat power. The use of well-validated vehicles such as a joint effects working group contribute markedly to delivering the necessary synchronization.

Looking toward the future, it is clear that the line between combat and reconstruction operations will continue to become ever more indistinct. It is necessary that our Army continues to improve how it conducts reconstruction operations so that it can stay relevant to the nation's needs. In doing this, it will draw on the lessons of both the past and today to improve for the future and ensure that it is ready for any test. In Afghanistan, CFC-A is pushing to increase the significance of reconstruction operations in order to take the campaign to the next level and win the economic firefight.

Colonel Toomey commands the Afghanistan Engineer District in Kabul. He commanded the 555th Combat Engineer Group and 555th Maneuver Enhancement Brigade (Provisional) from 2003 to 2005.

Endnote

[1]Department of Defense Directive 3000.05, *Military Support for Stability, Security, Transition, and Reconstruction (SSTR) Operations, 28 November 2005.*

Military Transition Teams

By Captain Andrew D. Swedberg

Since the beginning of Operation Iraqi Freedom, the United States has been searching for an exit strategy from Iraq. The withdrawal of U.S. forces must be timely, but must not be premature and allow the failure of the new Iraqi security forces. The military transition team (MiTT) concept is a method to meet both goals. A MiTT consists of 10 to 12 Soldiers embedded with an Iraqi army division, brigade, or battalion. Each team is led by a field grade officer—usually a colonel for a division, a lieutenant colonel for a brigade, and a major for a battalion. The remaining team members are a mix of officers and noncommissioned officers (NCOs) from varying branches and experiences. All MiTT members teach, mentor, and operate with the Iraqi army unit that they are attached to. As the Iraqi army gains combat power and logistical support, it assumes more of a role in counterinsurgency operations.

Each team covers all warfighting functions. MiTT members are chosen as subject matter experts in their field, to teach the Iraqi army our techniques. These positions include a team chief and experts in maneuver; mobility, countermobility, and survivability; intelligence; logistics; and communications, as well as various assistant positions. However, as the teams began working with new Iraqi units, it became apparent that a conventional staff would be more effective and realistic than teaching skills from the respective branches. One team had the following staff positions:

- A field artillery lieutenant colonel (team chief)
- A field artillery major (executive officer)
- An engineer captain (S1)
- A military intelligence major (S2)
- A military intelligence captain (assistant S2)
- An infantry major (S3)
- A field artillery captain (assistant S3)
- A quartermaster captain (S4)
- A signal corps sergeant (S6)
- A field artillery staff sergeant (noncommissioned officer in charge [NCOIC])

Training Phases

Training consisted of four main phases, after which each team would become a MiTT, a Special Police Transition Team (SPTT), or a Border Transition Team (BTT). A MiTT would be embedded with the Iraqi army anywhere throughout the country. An SPTT would be embedded with the Iraqi special police force and would have a vital role in transforming the newly formed Iraqi police into a capable fighting force. A BTT would be stationed along the borders of Iran, Jordan, and Syria. They would be pivotal in securing Iraq's borders against terrorists from other countries. Team members came from all over the Army. Their command—the Iraqi Assistance Group—is a newly formed U.S. unit.

Phase One

The first phase, a fast-paced 15-day program at Fort Carson, Colorado, focused on learning the latest tactics, techniques, and procedures (TTP) from Iraq. The training included close quarters combat, room clearing procedures, improvised explosive device (IED) identification, and convoy procedures.

Phase Two

The MiTTs went to Kuwait for the second phase, where they continued training while acclimating to the hot climate. The 10-day training focused on advanced rifle marksmanship, traffic control point and entry control point operations, convoy operations, and the latest IED trends.

Phase Three

For the third phase, all of the teams flew to Taji, Iraq, for a 5-day cultural awareness program. They were introduced to the Arabic language and Iraqi customs, food, beliefs, and history. The complexity, risk, and importance of the mission became very apparent and more understandable. (The United States had a similar advisory program during the Vietnam War when U.S. Soldiers coached the South Vietnamese army on operations.) The success of this mission will be the Iraqi army's success, which will lead to U.S. withdrawal from Iraq.

Phase Four

The fourth phase was at Camp Victory in Baghdad. All MiTTs received final briefings and prepared for departure to their Iraqi army units. They received some guidance from General George W. Casey Jr., the commander of all coalition forces in Iraq. He referenced T.E. Lawrence (Lawrence of Arabia) in saying: *"Do not try to do too much with your own hands. Better the Arabs do it tolerably than that you do it perfectly. It is their war, and you are to help them, not win it for them."* Some teams stayed close to Baghdad, while others

traveled far north to the Mosul area. Upon arriving on location, each team was assigned as many as three interpreters. The interpreters, usually from Iraq, learned English from various sources, ranging from American movies to studying at a university. They were paramount to success in advising the Iraqi army.

Iraqi Training

One MiTT was attached to the Iraqi 1st Brigade, 7th Division. Known as the "Defenders of Baghdad," the unit consists mostly of Shias who supported Saddam Hussein's removal from power. By far, most Iraqis wanted Saddam gone from power; only a few of his close supporters wanted him to stay and control the country. Imagine living where an invading army would not be considered an enemy, but welcomed and supported.

During the team's stay in Fallujah, it instituted a basic training program, a junior officer course, and a staff-focused training course. Marching, marksmanship, teamwork, and discipline were topics in the basic training program. The junior officer course highlighted troop-leading procedures, the importance of planning, and leadership. The staff course focused on teamwork, how to conduct a meeting, the duties of each staff section, and a general introduction to the military decision-making process.

While many new Iraqi soldiers had no experience in the military, many higher-ranking officers served under Saddam's regime for more than 20 years. In a brigade or battalion staff section in the old Iraqi army, very little authority was given to NCOs. Furthermore, staff sections did not hold thorough planning sessions for any upcoming operation. Most of the time, a brigade commander or higher would have supreme decision-making authority, and the staff sections would have very little input into decisions. This system is essentially the opposite of ours where NCOs are empowered to train and mentor Soldiers, and all staff sections have the ability to weigh in on a command decision. This concept was introduced to the Iraqi staff, and guidance continued throughout the year. After training for three months, the 1st Brigade, 7th Division—along with the MiTT—relocated to Ar Ramadi, a hotbed of insurgency in the western Al Anbar province.

In Ar Ramadi, the Iraqi brigade was partnered with a U.S. brigade combat team, and three subordinate Iraqi battalions were partnered with U.S. battalions. Each Iraqi battalion also had an attached MiTT. Each MiTT and its Iraqi unit were under the tactical control (TACON) of a U.S. division, brigade, or battalion. The attached MiTT was under the administrative control (ADCON) of a higher or lower MiTT. Orders would come through the U.S. brigade to an Iraqi unit for execution. In time, the Iraqi army will be capable of issuing orders to its own subordinate units without U.S. involvement.

A MiTT literally lives with the Iraqi army—often eating Iraqi food, sleeping in close proximity to the Iraqi soldiers, and teaching them our work ethic and problem-solving methods. Some teams have a separate building close to the Iraqi unit headquarters and work with the Iraqis during the day, but have time away during the evening. Each MiTT has similar experiences. Most Soldiers who have deployed know about forward operating bases (FOBs). The Iraqi army also has FOBs, usually sharing a common wall with a U.S. Army FOB. While most U. S. forces in Iraq never enter an Iraqi FOB, a MiTT considers it home.

Cultural Differences

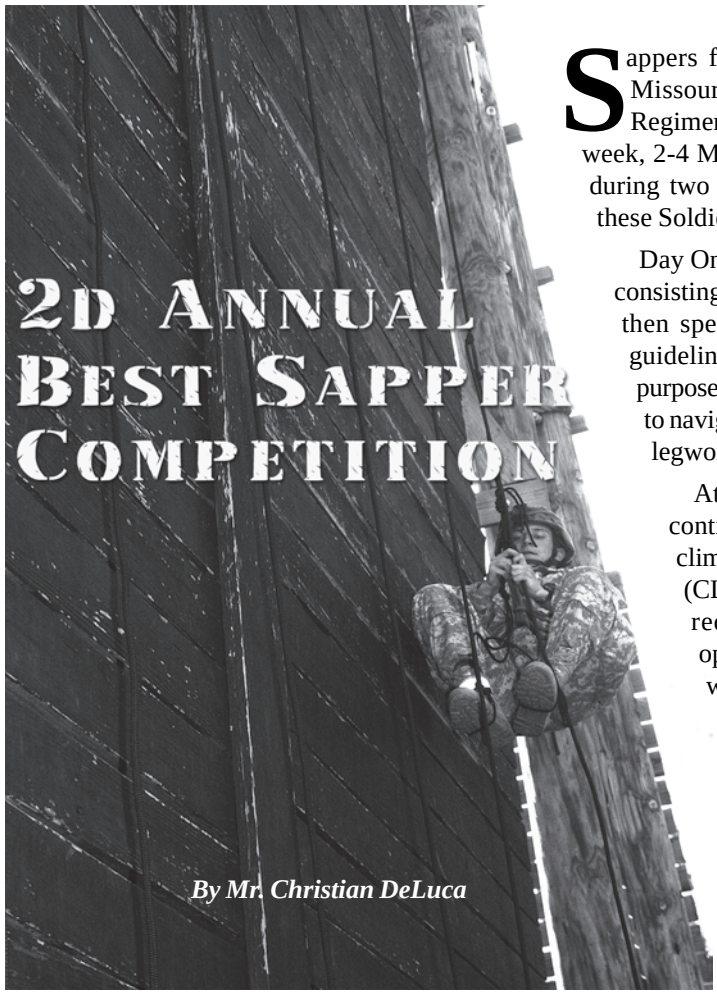
Although we had learned of cultural differences between the Arabic and American cultures, we could not imagine these differences until we experienced them firsthand. While most business meetings in the American culture (and especially the U.S. Army) are quick, with few digressions, meetings in the Iraqi army are nearly the opposite. It has the same structure, such as in a command and staff meeting, but the method of business is much different. The Iraqi culture puts emphasis on personal relationships and respect, often considering relationships over professional qualities. Iraqis are influenced by religious, tribal, ethnic, and political allegiances, unlike most cultures found in America. Timeliness is also not an issue. If a meeting is scheduled for 0900, the Iraqi officers might arrive between 0855 and 0920. When one officer enters, all the others stand and greet him, which usually involves kisses on each cheek. This severely disrupts the continuity of a meeting. We learned that these acts were not intended to be disrespectful, nor were they bad, but were simply different. Many similar customs permeate their culture.

We soon discovered a fine line between advising the Iraqis to change their army to our model and adapting our own techniques to better fit their customs and formats. The appropriate action was often an opportunity for each culture to learn more about the other. The Iraqi soldiers and staff were very respectful and impressed with MiTT members; simply being an American Soldier assigned to work with them carried a lot of weight. The two armies have never worked closely together before; we are paving the way toward preparing the Iraqi army to be capable of securing its country. Iraqi army and police units now control large portions of the country, run checkpoints, and conduct raids and searches. The Iraqi ability and capacity to control subordinate units has progressed in the last three years.

Iraqi Capabilities

Before the teams began helping the Iraqi army, it conducted business as we did many years ago. The brigade had one desktop computer, but no Internet capability or telephone connectivity. They relied on hand-written documents sent by courier. On payday, Iraqi soldiers lined up to receive their pay. The MiTT concept allows team members to be a liaison between Iraqi units that are otherwise unable to communicate. A brigade S1 advisor can assist on

(Continued on page 27)



2d Annual Best Sapper Competition

By Mr. Christian DeLuca

Sappers from around the globe traveled to Fort Leonard Wood, Missouri, to see who was the best of the best at the Engineer Regiment's 2d annual Best Sapper Competition, during ENFORCE week, 2-4 May 2006. Ten 2-man teams traversed through post terrain during two and a half days of the most strenuous training many of these Soldiers had ever experienced.

Day One began at first light, with a modified physical fitness test consisting of sit-ups, push-ups, pull-ups, and a 3-mile run. The teams then spent 30 minutes packing their gear; were briefed on the guidelines and boundaries; and set loose lugging 65-pound all-purpose, lightweight, individual, carrying equipment (ALICE) packs to navigate to 16 checkpoints, culminating in more than 20 miles of legwork within 24 hours.

At eight of the checkpoints, teams completed tasks before continuing on their route. These tasks consisted of a Prusik climb and buddy rappel, weapons assembly, a combat life-saver (CLS) assessment and 9-line medical evacuation (MEDEVAC) request, demolition calculations, grenade toss, military operations on urbanized terrain (MOUT) breach, and various weapons firing.

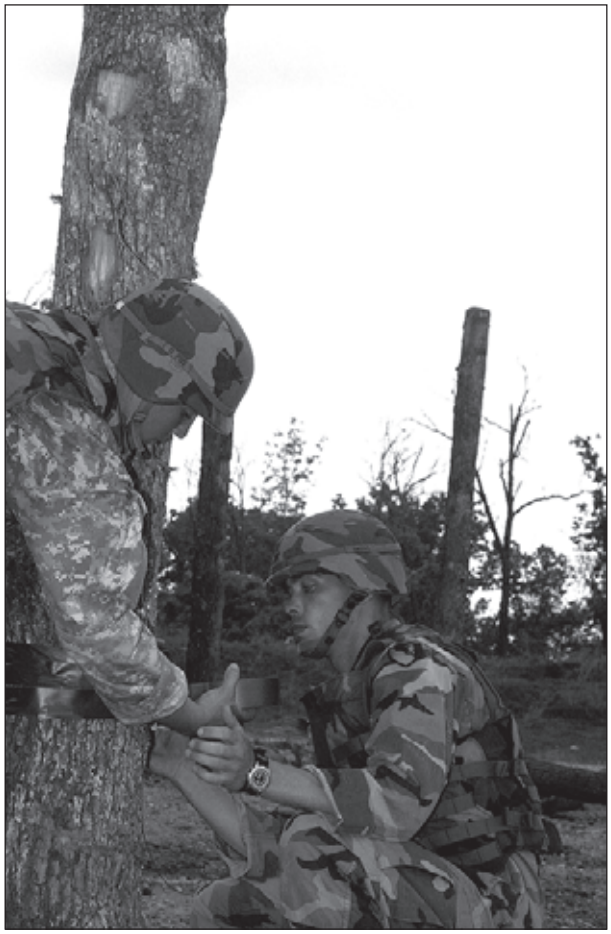
Day One ended for all teams with a 500-meter swim across Bloodland Lake after constructing a poncho raft from equipment in their packs. The last team finished the swim around 0730 the next day. According to one 20th Engineer Battalion Soldier from Fort Hood, Texas, after only one day of the competition, it had been a hard experience.



Top: **A Soldier from the 20th Engineer Battalion uses the Prusik technique to ascend a tower.**

Left: **A team from the 66th Engineer Company finishes a swim across Bloodland Lake after constructing a poncho raft.**

2006 Best Sapper Competition Winners		
First Place	Second Lieutenant Joseph Byrnes Staff Sergeant Jeffrey Goodman	66th Engineer Company Schofield Barracks, Hawaii
Second Place	Second Lieutenant Christopher Bolz Sergeant Peter Allen	Echo Company, 2-9th Infantry Battalion Camp Casey, Korea
Third Place	Second Lieutenant Casey Eckart Specialist David Roberts	20th Engineer Battalion Fort Hood, Texas
Physical Fitness Test	Second Lieutenant Travis Brown Sergeant First Class Marcus McClain	82d Engineer Battalion Germany
CLS 9-Line MEDEVAC Evaluation	Second Lieutenant Travis Brown Sergeant First Class Marcus McClain	82d Engineer Battalion Germany
MOUT Breach (Tie)	Second Lieutenant Christopher Bolz Sergeant Peter Allan Second Lieutenant Joseph Byrnes Staff Sergeant Jeffrey Goodman	20th Engineer Battalion Fort Hood, Texas 66th Engineer Company Schofield Barracks, Hawaii
Steel Cutting Charge Evaluation	Second Lieutenant Joseph Byrnes Staff Sergeant Jeffrey Goodman	66th Engineer Company Schofield Barracks, Hawaii
Timber Cutting Charge Evaluation	Second Lieutenant Joseph Byrnes Staff Sergeant Jeffrey Goodman	66th Engineer Company Schofield Barracks, Hawaii
Grenade Range Qualification	Specialist Jeron Pilger Specialist Jack Ramthum	20th Engineer Battalion Fort Hood, Texas
Demolition Calculation	Second Lieutenant Christopher Bolz Sergeant Peter Allan	20th Engineer Battalion Fort Hood, Texas
Mine Identification	Second Lieutenant Christopher Bolz Sergeant Peter Allan	20th Engineer Battalion Fort Hood, Texas
Prusik Rappel Knots Evaluation	Second Lieutenant Casey Eckart Specialist David Roberts	20th Engineer Battalion Fort Hood, Texas
Counter Force Evaluation	Staff Sergeant Jason Beals Specialist Matthew Wienczowski	Echo Company, 2-9th Infantry Battalion Camp Casey, Korea
9-Mile Run	Second Lieutenant Colby Krug Staff Sergeant Erasmo Flores	66th Engineer Company Schofield Barracks, Hawaii
AN/PSS-12 Mine Detector Evaluation	Second Lieutenant Colby Krug Staff Sergeant Erasmo Flores	66th Engineer Company Schofield Barracks, Hawaii
Poncho Raft Swim	Sergeant William Stanley Private Gilbert Cunningham	Bravo Company, 1st Engineer Battalion Fort Riley, Kansas
Weapons Range Qualification	Sergeant William Stanley Private Gilbert Cunningham	Bravo Company, 1st Engineer Battalion Fort Riley, Kansas
Weapons Assembly/ IED 9-Line MEDEVAC Evaluation (Tie)	Staff Sergeant Jason Beals Specialist Matthew Wienczowski Second Lieutenant Christopher Bolz Sergeant Peter Allan	Echo Company, 2-9th Infantry Battalion Camp Casey, Korea 20th Engineer Battalion Fort Hood, Texas



A team from the 1st Engineer Battalion tapes C4 to a piece of lumber during a demolition event.

Two and a half hours later and two teams smaller, Day Two began. With packs back on their backs and boots back on the trail, the teams began another 20-mile-plus trek, stopping at six more checkpoints to complete tasks. The chief of training of the Sapper Leader Course stated that the lack of downtime was intentional due to wanting to achieve more of a continuous 24-hour operation to make it more realistic.

The competition ended on Day Three with a 9-mile run. Teams carried sandbags and water jugs during parts of the run, adding to the strain. One Soldier from the 66th Engineer Company, Schofield Barracks, Hawaii, remarked that the event was fun, but that it was an extremely challenging experience.

Mr. DeLuca is a photojournalist with the Fort Leonard Wood newspaper, the Guidon. He served as a combat correspondent with the United States Marines from 1997 to 2001. He is a graduate of the Basic Journalism Course and the Intermediate Photojournalism Course at the Defense Information School, Fort Meade, Maryland, and holds a bachelor's in film studies.

Photos by Mr. Christian DeLuca

("Transition Teams," continued from page 24)

payday and report discrepancies to the higher headquarters via telephone or e-mail.

Each MiTT had two field ordering officers who bought items for the team and, more importantly, the Iraqi unit they were partnered with. Throughout the year, the Iraqi unit received new laptop computers, new weapons, and up-armored high-mobility multipurpose wheeled vehicles (HMMWVs). With each new equipment shipment, it became important to train Iraqi soldiers to use the items correctly. One big task was to teach the Iraqi staff to use Microsoft® Word®, PowerPoint®, and Excel®. They began to use these programs in command and staff meetings, much like the U.S. Army does. Furthermore, weapon ranges and driver training programs were arranged to train the troops on weapons and vehicle safety and operation.

Conclusion

As Iraqi army units learn to successfully command and control their subordinate units, they will be given greater ownership of their operational environment. This power shift is vital to the U. S. drawdown in Iraq. Much like any deployment, there were low points and high points, but all were memorable. Witnessing Iraqi soldiers vote in the December 2005 Iraqi election was truly an unforgettable day. More somber memories will remain, however, including the effects of suicide bombers, IEDs, and insurgents.

The MiTT experience is unlike any other military assignment. Iraqi soldiers are motivated to make a difference in their country. As more Iraqi divisions, brigades, and battalions stand up and take over, more U. S. forces will be relieved of their duties in Iraq. It is a tough fight, but challenges are overcome every day. Iraqi units throughout their entire army are learning about the work ethic, professionalism, and prowess of the U. S. military. Their army and police force are growing tremendously and continue to gain greater control of the country. Through the training the Iraqi army has received—and will continue to receive—from the U.S. Army, Iraq will be able to mitigate the difficult insurgency.

Captain Swedberg is the commander of Alpha Company, 169th Engineer Battalion, Fort Leonard Wood, Missouri. He has served two tours in Iraq, the most recent as a member of a MiTT in Ar Ramadi. He holds a bachelor's from the United States Military Academy and a master's from the University of Missouri-Rolla in Rolla, Missouri.



CONTINGENCY BASE CAMP WORKSHOP

By Mr. Michael Wolford

In early May 2006, the United States Army Engineer School and the United States Military Academy (USMA) cohosted the 3d annual Contingency Base Camp Workshop in St. Louis, Missouri. The workshop was held during ENFORCE week to emphasize the importance of contingency base camps to the engineer mission. Participants were divided into one of three focus areas for the workshop: the Base Camp Knowledge Management System, Initiative 18, or Infrastructure Assessment.

Base Camp Knowledge Management System

The Base Camp Knowledge Management System, designed to be a Web-based knowledge portal for base camp planners and managers, was developed by the USMA using input from previous base camp workshops as a guide for management system requirements and capabilities. The system was developed to address the lack of a secure, fully integrated means of sharing information and transferring knowledge with other members of the base camp management community. The knowledge management system for base camps will provide an expeditious means for planners, designers, operators, and managers of base camps to share their knowledge. It will provide the process to develop and enforce methods for sharing operational information and conversion of data and information to actionable information, as well as eliminating or reducing information stovepipes among operational elements.

Initiative 18

Initiative 18—from the Chief of Staff of the Army's task force on stability and reconstruction—establishes and provides base operation capabilities to support the operational Army in a contingency environment and city management expertise to support the host nation. The base camp workshop addressed the base operations support aspect of the initiative, specifically addressing the recommended course of action from the Initiative 18 Working Group that was sponsored by the United States Army Corps of Engineers® (USACE). The course of action discussed the establishment of a proponent for contingency base camps. The Army has 303,000 Soldiers deployed to 120 different countries to support the Global War on Terrorism. Department of Defense Directive 3000.05, *Military Support for Stability, Security, Transition, and Reconstruction (SSTR) Operations,* states that stability operations are a core U.S. military mission that the Department of Defense shall be prepared to conduct and support. Critical in the support of SSTR operations is that deployed contingency operations will require base camps. While doctrine developers often think in terms of deployed forces being at the "tip of the spear," the fact is that the tip of the

spear needs to be correctly joined to the shaft. That joining point for Soldiers currently deployed is the base camp, where at the end of the day's fight, they link back into the logistics and support systems that prepare them for the next mission.

Currently, the process to address base camp issues is done on an ad hoc basis, depending on the mission, operational area, and scale of operations. Combatant commanders divert their energy and resources to addressing base camp planning, design, and functionality—which are often outside the scope of their mission emphasis and in many cases should have been completed before establishment of the base camp. The present system is a sum of several parts controlled by different organizations, including—

- Research, Development, and Engineering Command (RDECOM) (United States Army Natick Soldier Center)
- United States Army Combined Arms Support Command (CASCOM) (Quartermaster)
- United States Army Materiel Command (AMC) (Logistics Civil Augmentation Program [LOGCAP])
- USACE (Forward Engineer Support Team [FEST], Environmental Support Team [EnVST], Contingency Real Estate Support Team [CREST])
- Engineer Command (ENCOM) (Facility Engineer Detachment [FED]/Facility Engineer Group [FEG]/Facility Engineer Team [FET])

Without an overarching proponent, coordinating resource challenges can result in insufficient preplanning, design shortcomings, operational issues, and the lack of an established research and development program to seek solutions proactively and quickly as operational gaps are identified. These factors can be compounded by extended operational requirements. Currently there isn't a base camp proponent. The Initiative 18 course of action recommends to the Chief of Staff of the Army that the Engineer School be the proponent for contingency base camps. This would include the formation of an integrated concept development team, with representatives from all organizations that provide support for the individual systems that make up base camps. Workshop participants agreed with the recommended course of action and provided additional recommendations for participation in an integrated capabilities development team (ICDT) to be developed by the proponent.

Infrastructure Assessment

The infrastructure assessment group discussed several topics. Workshop participants stated that units want a capability to go to a possible base camp site, obtain critical information, and pass this information back to planners. Two equipment kits were discussed in detail: the Handheld Apparatus for Mobile Mapping and Expedited Reporting (HAMMER™) and the Engineering Field Planning, Reconnaissance, Surveying, and Sketching Set (ENFIRE). Both have the capabilities to provide the necessary support to assessment teams.

HAMMER

HAMMER is a ruggedized, handheld field computer for collecting geospatial data with high-resolution digital instrumentation. The device is a product of a cooperative research and development agreement between the Construction Engineering Research Laboratory and Surveylab, Ltd. The product seamlessly integrates and synchronizes a global positioning system, laser distance meter, digital camera, compass, inclinometer, geographic information system (GIS), and handheld computer. This allows users to quickly capture a rich array of geospatial and attribute data, annotated with images and text, such as capture and review a target position and photo, add attribute data to the feature, review and add photos, and view the new feature on a map. The instrument's database stores and shares data, and the automated GIS-based system facilitates data analysis, interpretation, and reporting. HAMMER will be demonstrated and field-tested this year.

ENFIRE

ENFIRE is a prototype system focused on enabling Soldiers to conduct reconnaissance on routes, bridges, and minefields by replacing the current surveying sketch kits with digital reconnaissance forms that match currently used hard-copy forms to facilitate data collection. ENFIRE supplies Soldiers with software and hardware tools to gather reconnaissance and reporting information, project management tools, a digital library of field and technical manuals, construction project building-design software, construction site terrain-modeling tools, an inventory management package, and tools to disseminate information to the Army Battle Command System battlefield functional areas. ENFIRE was demonstrated at Fort Leonard Wood, Missouri, in May 2006.

Conclusion

Overall, it was a very successful base camp workshop with much being accomplished in the breakout sessions. Several issues and actions were raised and will be addressed. Results and follow-up actions will be posted to the Base Camp Knowledge Management System Web site. The next base camp workshop will be held during the next ENFORCE. For information concerning the 2006 Annual Contingency Base Camp Workshop or future workshops, contact Mike Wolford at (573) 329-1927 or <*michael.wolfford1@us.army.mil*>.

Mr. Wolford is an environmental training specialist for the Directorate of Environmental Integration at the United States Army Engineer School, Fort Leonard Wood, Missouri. He recently retired from the Army after more than 24 years of service. He holds a bachelor's in environmental science from Drury University, Springfield, Missouri, and is currently working on a master's in environmental management from Webster University, St. Louis, Missouri.



Bridging the Canals

By First Lieutenant Waukemsha Kirkpatrick

The traffic pattern of civilian dump trucks delivering gravel to the Logistics Support Area (LSA) Anaconda's north entry control point (ECP) proved to be a constant problem. The trucks blocked the guards' field of vision and posed a serious threat of vehicle-borne improvised explosive devices (VBIEDs).

To solve this problem, the force protection team of LSA Anaconda's mayor cell and the 2d Battalion (Air Assault), 44th Air Defense Artillery, developed a plan to reorganize the gravel stockpile area and reroute dump trucks by upgrading two access roads and building bridges across two parallel canals south of the north ECP. The canal water, used by Iraqi farmers to irrigate their crops, would need to be blocked in order to complete the project.

The Project

The Horizontal Platoon and 2d Platoon of Bravo Company, 84th Engineer Battalion, were assigned the mission with the provision that it must be completed in two weeks in order to restore the water to the canals for the Iraqi farmers.

The Horizontal Platoon was assigned the excavation portion of the project—to design and upgrade the existing roads, providing an entrance and an exit road to the stockpile area. The 2d Platoon took charge of the construction portion of the project—to construct the headwalls for the culverts and timber bridges. Before the platoons could begin, the battalion commander required a solid plan for the project and that 100

percent of the materials be on hand. The plan developed by the platoons' leadership called for three teams of Soldiers to place culverts, the road surface, and a timber bridge at each of the sites.

The Challenges

From the beginning of the project, the platoons faced several challenges involving the availability of materials, submerged project sites, emplacement of the culverts, and construction of the bridges.

Materials

The availability of materials proved to be a challenge throughout the project. After requesting the bill of materials, the platoon discovered that some of the critical materials were not available on LSA Anaconda. Once all materials were gathered, the 2d Platoon began the construction portion.

Submerged Sites

Initially, the excavation portion of the project consisted of site preparation and surveyor support to emplace grade stakes. The Horizontal Platoon finished the excavation and site preparations, and the day before construction was to begin, the local farmers opened a valve to increase the canal's water flow. As a result, the project sites and the preparation work lay submerged, setting the project back with a new requirement to pump out the excess water.

The leadership called on local contracting support for assistance. Once the contractors pumped out the water, the Horizontal Platoon again excavated the sites, and the surveyors came out to place grade stakes. At the same time, the bridge team set up site security, dug footers, and set rebar and bolts for concrete placement. The Horizontal Platoon also prepared the ground by filling and compacting the earth canal. The ground was still spongy after the site preparation, so Soldiers tamped the ground with hand tampers until it was sufficiently compacted.

Culvert Emplacement and Bridge Construction

To continue placing the culverts and building headwalls, the Horizontal Platoon made a breach from the earth canal to the concrete canal, allowing water to flow without hindering the project (see article on page 31), and the initially inflexible timeline became somewhat flexible. From the beginning, the Soldiers had pushed to complete the project within the allotted two weeks. But since Iraqi farmers restored water to the canal before the project began, the leadership decided to divert the water instead of blocking it, so they no longer were challenged by the two-week time constraint.

The culvert teams prepared the sites by tamping the ground, squaring off the forms, and placing a rebar cage in the prepared site. While waiting for the concrete to cure, they prepared for the placement of steel culverts.



An M1114 HMMWV and an M917 20-ton dump truck cross one of the newly contructed bridges across the two canals at LSA Anaconda.

The Horizontal Platoon loaded the prefabricated culverts onto a trailer and hauled them out to the sites. Once the 2d Platoon placed mortar onto the concrete footers, the Horizontal Platoon used the crane to lower the culverts into position on top of the mortar, and Soldiers firmly packed in the mortar for culvert stability.

The next task included building the formwork for the headwalls and tailwalls. The culvert teams completed the formwork for the lower lift and placed concrete for the culverts, while the bridge team cut timbers and predrilled holes for placement on the bridge footers.

Building the formwork for the second lift took a little more time than the first lift. To prevent the forms from separating, causing a concrete blowout, the platoon sergeant ensured that the culvert teams did not rush building the formwork. They assembled four rebar cages (which required a lot of cutting and tying wire), connected the cages to the first lift, and built the formwork with plenty of bracing for the second lift. Meanwhile, the bridge team placed timbers onto the bridge footers and bolted them down. The bridge team also predrilled holes in the timbers to be used as girders on the bridge.

After removing the formwork from the headwalls and tailwalls, the culvert teams constructed the formwork for the wingwalls and farside bridge approach ramps. The bridge team placed decking and fascia onto the bridge. The Horizontal Platoon filled and compacted between the culverts and headwalls and tailwalls at both sites to prepare for the road surface, and then the 2d Platoon placed the final concrete for the road surface and nearside approach ramps.

The 2d Platoon finalized the cosmetic work on the bridges, which completed the construction portion. The Horizontal Platoon compacted and graded the approaches and began work on the final phase of the excavation portion—building up the existing road. The Horizontal Platoon filled and compacted the existing road and placed a gravel cap to meet the height of the bridge at each site.

Summary

Placing two culverts in an earth canal and building two timber bridges required attention to detail and a lot of hard work to ensure that the project was successful. But the water flows in the earth canal once again, while dump trucks have a new entrance and exit to the gravel stockpile area. The Soldiers of the 84th Engineer Battalion were able to positively impact both the Army and the Iraqi communities without disturbing the Iraqi way of life.

First Lieutenant Kirkpatrick is a platoon leader for the Vertical Platoon in Bravo Company, 84th Engineer Battalion. Her previous assignments include direct support platoon leader for Headquarters Support Company, 84th Engineer Battalion. She is a graduate of the Officer Candidate School.



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.

Corporal J. Adan Garcia	1st Brigade Special Troops Battalion, 10th Mountain Division	Fort Drum, New York
Private First Class Caleb A. Lufkin	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Specialist Bryan L. Quinton	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Staff Sergeant Gavin B. Reinke	5th Engineer Battalion, 1st Engineer Brigade	Fort Leonard Wood, Missouri
Private First Class Joseph I. Love	84th Engineer Battalion, 8th Sustainment Command (Theater)	Schofield Barracks, Hawaii
Private First Class Alva L. Gaylord	Charlie Company, 110th Engineer Battalion	Kansas City, Missouri
Specialist Michael L. Hermanson	Alpha Company, 164th Engineer Battalion	Minot, North Dakota
Sergeant Kevin D. Akins	Alpha Company, 391st Engineer Battalion	Asheville, North Carolina
Specialist Joshua L. Hill	Alpha Company, 391st Engineer Battalion	Asheville, North Carolina
Staff Sergeant Joseph R. Ray	Alpha Company, 391st Engineer Battalion	Asheville, North Carolina



Command and Control of a Heavy Engineer Task Force

By Second Lieutenant Joseph P. Morsello

When the 505th Engineer Battalion deployed to Iraq in October 2005, it was attached to the 555th Engineer Brigade under the 101st Airborne Division (Air Assault). The 505th's missions were throughout north-western Iraq, resulting in decentralized employment of elements into a multidisciplinary task force—Task Force Morsello (TFM). The process for requesting engineer support did not allow for an immediate response to the needs of the warfighter. Due to enemy action, the warfighter was unable to wait for mission directives to reach the task force in the field. TFM incorporated three command and control techniques that allowed effective response to the needs of the Soldier on the ground: task force organizational structure, a mission-oriented approach, and freedom of action.

Organizational Structure

The executing elements were organized for specific missions, and tasks and equipment were anticipated for the accomplishment of these missions. TFM was composed of horizontal and vertical elements with maintenance and medical support. Personnel consisted of heavy equipment operators, truck drivers, battalion medical support personnel, and mechanics. The traditional hierarchical structure of the Army was flattened, establishing a high degree of flexibility and responsiveness.

Mission-Oriented Approach

In November 2005, TFM was sent to Forward Operating Base (FOB) Summerall to construct a new entry control point (ECP) and provide general force protection support. The task force acted according to a mission-oriented approach rather than a mission-directed approach to provide effective support to the warfighter in the field. Having direct contact with the customer, it was able to respond to the request for engineer support with elements ready to execute within hours of receiving the task. As new FOB mission tasks—outside the original ECP mission directive—were executed, they were included in daily status reports to company and battalion commands.

Joint planning with Headquarters and Headquarters Company (HHC), 187th Infantry Regiment, ensured that existing project plans were modified and the customer's requirements were met. More importantly, TFM's fluid response had a direct impact on supporting warfighters on the ground in the Bayji area. The task force succeeded in accomplishing seven simultaneous missions and still completed the north ECP ahead of the original schedule.



TFM places barriers around the Muhallabiyah Police Station perimeter.



TFM Soldiers patrol the streets near the Biaj guard towers using M1 Abrams tanks.

Carrying this mission-oriented approach into FOB Sykes, TFM became a highly autonomous unit because the 3d Armored Cavalry Regiment (3ACR) was very receptive to this type of operational technique. The 3ACR regimental engineer informed them of requested engineer assets from units in the field and gave his intent based on the requests. TFM then conducted a reconnaissance of the project site, gathered the customer's requirements, and wrote the statement of work (SOW). The SOW and the request for engineer support were reviewed by the regimental engineer and submitted to the 555th through the 101st.

Modifications to the original SOW for ongoing and follow-on missions followed the usual process for requesting engineer support. Under the 3ACR, the process was executed quicker. The SOW was then written, in cooperation with the customer, for the new requirements. Written directives were ready within a few days, allowing planning to begin on future projects. The usual project management administrative needs were addressed as engineer assets were diverted for immediate-need missions and SOW modifications. The schedule was quickly updated and passed up the chain of command and, most importantly, the customer understood the impacts on existing projects, such as time delays and assets diverted for other missions.

Freedom of Action

The efficient execution of TFM's mission pipeline at both FOB Summerall and FOB Sykes was greatly facilitated by its freedom of action at the task force level. Task force personnel knew the intent of their leader and customer, allowing them freedom to overcome design and on-site work issues as projects progressed. Work never stopped because their leader was unavailable when questions or problems arose. Inclusion of the senior E5s and select E4s in the reconnaissance and planning process provided invaluable technical expertise. Select personnel were also part of the development of the SOW and design process, enabling task force personnel to have a personal stake in the project's objectives and schedule. This allowed junior NCOs to have significant freedom of action. They knew the project's goal, final product, and intent.

TFM's decentralized operation methods contributed to its ability to improvise. The task force always performed its own reconnaissance and, through on-site inspections, determined equipment needs and potential problems.

Conclusion

The task force organizational structure, mission-oriented execution, and multiechelon freedom of action allowed many tasks and projects to be executed in parallel. Task force organization allowed the custom building of a tailor-made force that met specific mission requirements, ensuring that the right equipment, operators, and support were available when needed. Additionally, TFM was able to integrate elements from the 43d Engineer Battalion, 3ACR, and 425th Transportation Company during the Muhallabiyah Police Station project. Acting according to the mission intent to provide effective support to the 187th and 3ACR, rather than specific written mission directives, allowed an immediate response to the needs of the Soldiers on the front lines of the counterinsurgency. Accomplishing this was a direct result of joint planning with the customer. TFM's joint planning and responsiveness to the customer's needs eliminated any fears that directed operations would derail. The task force operated with a considerable amount of freedom to conduct reconnaissance and execute missions. The reconnaissance pull methodology, in combination with conducting its own recons, allowed detailed planning and the efficient flow of work through the project pipeline.

Second Lieutenant Morsello is the direct support and company maintenance platoon leader, Headquarters Support Company, 505th Engineer Battalion, Gastonia, North Carolina. He was previously the engineer equipment platoon leader, Headquarters Support Company, 505th Engineer Battalion. He holds a bachelor's in managerial accounting from Pace University, Pleasantville, New York, and a master's in liberal studies from North Carolina University, Raleigh, North Carolina.



Photo by Specialist Spencer J. Case

Bosnian Troops Assist With UXO Removal in Iraq

By Specialist Spencer J. Case

A decade after civil war left thousands of unexploded bombs scattered throughout their homeland, troops from the newly consolidated army of Bosnia and Herzegovina are helping coalition forces dispose of unexploded ordnance (UXO) in southern Iraq. Just last year, two separate armies functioned in Bosnia and Herzegovina—the Army of the Federation of Bosnia and Herzegovina and the Army of the Republic of Serbia.

Last year also saw the birth of explosive ordnance disposal (EOD) as a career field in the Bosnian army after the troops completed training with contractors. Despite the fact that they are relative newcomers in the world of EOD experts, U.S. military leaders have been impressed by the Bosnians. They are safe, productive, and professional in the way they perform their mission.

In Iraq, the mission of the Bosnian unit is to supplement civilian contractors in identifying, removing, and safely detonating UXO in an area where a weapons stockpile was hastily destroyed by exploding it. The initial explosion destroyed most of the weapons; however, it flung miscellaneous bits—called *kick-outs*—over a 13-square-kilometer area. These kick-outs pose a threat to the local population and coalition troops.

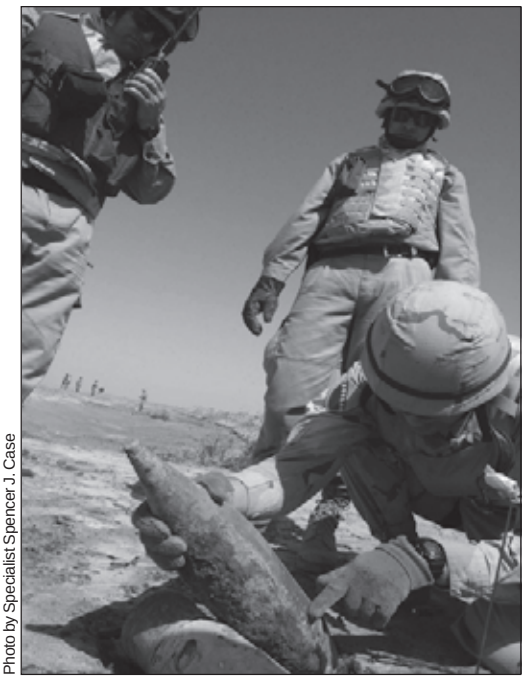


Photo by Specialist Spencer J. Case

Explosive ordnance detonation specialists with the army forces of Bosnia and Herzegovina uncover an artillery round during their munitions sweep.

As citizens of a war-torn country, the Bosnian troops have seen—firsthand—the devastation wrought by UXO. This gruesome knowledge makes their mission intensely personal. Several Bosnian children have lost their lives or their limbs because they were playing with items such as the scattered kick-outs. Every mine and UXO removed and destroyed is potentially a life or a limb saved.

In March, the Bosnian EOD unit dismounted from their vehicles to form a semicircle around the deputy commander of the mission. They listened attentively as he gave a briefing, running through a list of security and safety procedures in their native language. When the briefing was over, the troops formed a line that resembled a standard police call for trash, scouring the ground for anything resembling a bomb. Some of the shells were obvious, while with others, only the tip of a cone or a bent fin protruded from the soil to warn the Bosnians to step carefully.

The fact that the explosives had been exposed to the elements for so long also made the Bosnians' job more hazardous. The molecular structure of the explosives could have changed over time, with the exposure to sunlight, moisture, and other conditions. As that process occurs, the explosives can become more stable or unstable than they were originally.

As the Bosnians comb the desert, U.S. Soldiers stand lookout to prevent children and sheep-herding Bedouins from entering areas that have not been cleared. This scene shows the tremendous progress of the Bosnians in the last few years and gives hope to Iraq following the same path to a unified and independent country.

Once a sector was cleared, the UXO was transported by the Bosnians to a blasting area nestled between two dirt hills and placed on the ground beside a crater. The detonations are spectacular, creating mushroom clouds that resemble atomic explosions. The smell of burning phosphorous is a pungent, biting scent that becomes pleasant over time with the realization that there will be—at least from those explosives—no loss of life or limb.



Specialist Case is a public affairs specialist for the 207th Mobile Public Affairs Detachment. He is a graduate of the Basic Public Affairs Specialist-Writer course at the Defense Information School, Fort Meade, Maryland.

Regimental Awards

Each year, we recognize the best engineer company, lieutenant, noncommissioned officer, and enlisted Soldier—in each of the components—for outstanding contributions and service to our Regiment and Army. Every engineer unit in the Regiment can submit the name and achievements of its best of the best to compete in these distinguished award competitions. Only the finest engineer companies and Soldiers are selected as recipients of these awards. The Soldiers will carry throughout their careers the distinction and recognition of being the Engineer Branch's best and brightest Soldiers and leaders. Following are the results of the 2005 selection boards for the Itschner and Outstanding Engineer Platoon Leader (Grizzly) Awards, the Sturgis Medal, and the Van Autreve Award:

Active Army

Itschner Award: Echo Company, Task Force 4-64 Armor Brigade, 3d Infantry Division, Fort Stewart, Georgia.

Outstanding Engineer Platoon Leader (Grizzly) Award: First Lieutenant Patrick Sullivan, Alpha Company, 864th Engineer Battalion, Fort Lewis, Washington.

Sturgis Medal: Sergeant First Class Roderick Jones, Bravo Company, 864th Engineer Battalion, Fort Lewis, Washington.

Van Autreve Award: Specialist Jonathan T. Lapage, Echo Company, 2d Battalion, 69th Armor Regiment, Fort Stewart, Georgia.

United States Army Reserve

Itschner Award: Headquarters Support Company, 844th Engineer Battalion, Knoxville, Tennessee.

Outstanding Engineer Platoon Leader (Grizzly) Award: No nomination.

Sturgis Medal: Sergeant First Class John L. Krell, Headquarters Support Company, 844th Engineer Battalion, Knoxville, Tennessee.

Van Autreve Award: Specialist Mark R. Olson, Headquarters Support Company, 844th Engineer Battalion, Knoxville, Tennessee.

Army National Guard

Itschner Award: Alpha Company, 224th Engineer Battalion, Burlington, Iowa.

Outstanding Engineer Platoon Leader (Grizzly) Award: Second Lieutenant Nicholas P. Jones, Bravo Company, 224th Engineer Battalion, Ottumwa, Iowa.

Sturgis Medal: Sergeant First Class David R. Zulaica, Alpha Company, 224th Engineer Battalion, Burlington, Iowa.

Van Autreve Award: Specialist Brandon T. Layne, 201st Engineer Battalion, Ashland, Kentucky.

The award recipients were recognized at ENFORCE 2006, 1-4 May 2006, at Fort Leonard Wood, Missouri.



Photos by United States Army Corps of Engineers

Need Engineering Help?
Contact the EI2RC

By Lieutenant Colonel Joseph K. Miller

You are the engineer for your deployed unit and are tasked, for example, with rebuilding the infrastructure, power grid, road network, and water and wastewater treatment systems for a destroyed town in Iraq or with providing a design for a high-altitude river crossing in Afghanistan. Or perhaps you are supporting a maneuver unit at a training center, or deploying to assist after a natural disaster and you need designs, cost estimates, geographic information system (GIS)-interactive maps, or flood analyses in a short suspense and do not have the staff on hand to handle the request. What can you do to get the mission accomplished?

The Engineering Infrastructure and Intelligence Reachback Center (EI2RC), a United States Army Corps of Engineers® (USACE) asset located in Mobile, Alabama, has managed more than 1,000 requests from deployed engineers since 2003. Under field-force engineering (FFE) doctrine, USACE harnessed the expertise of 35,000 non-deployed engineers in order to support deployed engineers around the world.

Customers who contact the EI2RC include Army, Navy, Marine Corps, and Air Force personnel and members of the Federal Emergency Management Agency (FEMA) and the United States Department of State. The EI2RC supports the Global War on Terrorism, civil-military deployments worldwide, relief efforts for natural disasters (such as Hurricane Katrina), and combatant commander (COCOM) training exercises.

So how does this "reachback concept" work? Customers submit a request for information (RFI) to the EI2RC via unclassified or classified Web site, e-mail, video teleconference (VTC), or telephone. An RFI is a request for technical assistance that requires FFE funding and approval. RFIs include—but are not limited to—infrastructure assessment; GIS; base camp design; entry control point (ECP) design; environmental assessment; antiterrorism/force protection design; water and wastewater treatment system design; electrical design and analysis; route analysis and bridge military load classification; bridge and dam repair; dam breach/flood analysis; intelligence analysis; disaster relief support; and airport, port facility, railroad, and roadway design/repair.

Upon approval of the RFI, the EI2RC gives it a tracking number and assigns it to a Base Development Team (BDT), laboratory, school, private sector organization, design center, or Mandatory Center of Expertise for resolution. A BDT is a multidisciplined team of engineers from the Baltimore, Tulsa, Louisville, Alaska, Mobile, Little Rock, New England, Seattle, Fort Worth, and Honolulu districts who are on call on a weekly rotational basis. Laboratories consist primarily of the United States Army Engineer Research and Development Center (ERDC) and the TeleEngineering Operations Center (TEOC) located in Vicksburg, Mississippi. An EI2RC staff member serves as a project manager for the RFI until the customer is satisfied with the delivered product.

Customers can submit an RFI through the EI2RC unclassified Web site at <*http://ei2rc.usace.army.mil*> or classified Web site at <*http://ei2rc.usace.army.smil.mil*>. If Internet connectivity is unavailable, customers can use nonsecure Internet protocol router network (NIPRNET) e-mail to <*CEEI2RC@usace.army.mil*> or secure Internet protocol router network (SIPRNET) e-mail to <*OrgMbox CEEI2RC@usace.army.smil.mil*>. They can also submit an RFI via unclassified or classified VTC or call us at commercial (251) 690-2039 or DSN (312) 457-2039.

Lieutenant Colonel Miller is the operations officer for the USACE Reachback Center. A graduate of Texas A&M University, College Station, Texas, he is an infantry officer who served in Iraq in 2004-2005 and was awarded the Combat Action Badge.

2006 Army Deployment Excellence Awards

By Mr. Charles K. Ledebuhr

Competitive year 2006 proved to be another stellar performance of the Deployment Excellence Award (DEA) Program, with great units and installations setting the pace in deployment operations. The Army's operational tempo, coupled with increased awareness of the DEA program, resulted in the largest level of participation ever. The program saw significant gains, particularly in the operational, supporting, and installation categories.

This year's award ceremony was held at the Hilton Alexandria Mark Center on 18 May 2006. Army Deputy Chief of Staff, G4, Lieutenant General Ann E. Dunwoody presented the awards to all of the honored units. The Army Assistant Deputy Chief of Staff, G3, Major General Michael W. Symanski, and the Commanding General, United States Army Transportation Center, Brigadier General Mark Scheid, assisted in the presentation of awards.

General Benjamin S. Griffin, Commanding General, United States Army Materiel Command, provided remarks at the banquet and challenged units and installations to maintain their high deployment standards. Before the ceremony and banquet, unit representatives had the opportunity to tour the Pentagon, the Capitol, and the National Mall.

In the DEA program, Army units compete by component (Active Army, United States Army Reserve, and Army National Guard) in categories of large unit (battalion and above), small unit (company and below), and supporting unit. Installation and operational deployment categories are Armywide. The operational deployment category is open to all Army units that deploy on operational missions like the Global War on Terrorism and peacekeeping. Units can contend for either the large-unit or small-unit award. The Army's up-tempo and strong major command (MACOM) involvement brought a number of new units and installations into the competition.

The Installation Management Agency had the best showing ever with the largest number of installations competing. The winner for the second year running was Fort Hood, Texas. Its outstanding support to nine overlapping deployments, coupled with the challenges of dealing with Hurricane Katrina and Hurricane Rita, resulted in an extremely strong showing.

In a very close competition, Fort Bragg, North Carolina, a newcomer to the competition, was the runner-up in the installation category. The Fort Bragg installation team received strong endorsements from its diverse customer base and demonstrated its outstanding capabilities to support scheduled and no-notice deployments.

The Military Surface Deployment and Distribution Command swept the Active Army supporting-unit category with the 832d Transportation Battalion, Jacksonville, Florida, winning and the 838th Transportation Battalion, Rotterdam, Netherlands, coming in a close second.

Eighth United States Army, Korea, a winner last year in the operational deployment category, continued to excel with the 305th Quartermaster Company, Yongsan, Korea, winning the Active Army small-unit category and the 728th Military Police Battalion, Daegu, Korea, being selected as runner-up in the Active Army large-unit category.

The United States Army Network Enterprise Technology Command had its first winner with the 40th Signal Battalion from Fort Huachuca, Arizona, winning the Active Army large-unit category.

The Army Reserve had a number of outstanding entries, including Headquarters and Headquarters Company (HHC), United States Army Civil Affairs and Psychological Operations Command at Fort Bragg, which was recognized as the best Reserve supporting unit. The command formed movement support teams with internal assets and supported a complex operation involving 19 different special operations units, 1,200 Soldiers, and 160 short tons of cargo. The teams ensured that deploying Army Special Operations Forces met deployment timelines, prepared timely and accurate movement data, and properly used transportation assets.

The National Guard also had some standout units, including Joint Force Headquarters, Florida National Guard, St. Augustine, Florida. The headquarters, selected as the National Guard's best supporting unit, supported the deployment of 29 units and 1,800 Soldiers in support of the Global War on Terrorism, while simultaneously conducting military support to civil authorities during four major hurricane recovery operations.

The 2007 DEA competition is now open for Active Army, United States Army Reserve, and Army National Guard units and installations. To participate in the DEA program, a unit is required to have executed or supported a training or contingency deployment during the competition year. All units and installations are encouraged to plan now to compete in

2006 Deployment Excellence Award Recipients		
Category	**Winner**	**Runner-Up**
Active Army Large Unit	40th Signal Battalion Fort Huachuca, Arizona	728th Military Police Battalion Daegu, Korea
Active Army Small Unit	305th Quartermaster Company Yongsan, Korea	HHC, 5th Special Forces Group Fort Campbell, Kentucky
Active Army Supporting Unit	832d Transportation Battalion Jacksonville, Florida	838th Transportation Battalion Rotterdam, Netherlands
United States Army Reserve Large Unit	483d Transportation Battalion Vallejo, California	1190th Deployment Support Brigade Baton Rouge, Louisiana
United States Army Reserve Small Unit	828th Quartermaster Company Wilkes Barre, Pennsylvania	401st Transportation Company Battle Creek, Michigan
United States Army Reserve Supporting Unit	HHC, United States Army Civil Affairs and Psychological Operations Command Fort Bragg, North Carolina	643d Area Support Group Fort Polk, Louisiana
Army National Guard Large Unit	1st Battalion, 151st Infantry Regiment Indianapolis, Indiana	224th Engineer Battalion Fairfield, Iowa
Army National Guard Small Unit	D Company, 113th Aviation Regiment Reno, Nevada	41st Adjutant General Company Salem, Oregon
Army National Guard Supporting Unit	Joint Forces Headquarters - Florida St Augustine, Florida	Camp Atterbury Edinburgh, Indiana
All-Army Installation	Fort Hood, Texas	Fort Bragg, North Carolina
Operational Deployment Large Unit	426th Brigade Support Battalion 101st Airborne Division (Air Assault) Fort Campbell, Kentucky	NA
Operational Deployment Small Unit	B Company, 1-35 Armor Battalion 1st Armored Division Baumholder, Germany	NA

this elite competition. What's the prize? Two representatives from each winning and runner-up unit—in each category—will receive an all-expenses paid, four-day trip to the Washington, D.C., area to accept the unit's award. The trip includes travel, per diem, lodging, and ground transportation, as well as time for shopping, tours of the area, and a photograph taken with the Army Chief of Staff.

Significant dates for the 2007 competition are as follows:

- Competition period: 1 December 2005–30 November 2006. Submit packets through command channels.
- MACOM nomination packets are due to the DEA evaluation board: 31 January 2007.
- DEA board screens MACOM unit packets to select semifinalists: 5-16 February 2007.
- DEA teams visit selected semifinalists and conduct on-site observation of deployment practices: 1-25 March 2007.
- Army G4 selects and announces the winners via a Headquarters, Department of the Army, message: 9 April 2007.
- DEA awards are presented at the Chief of Staff, Army (CSA) Combined Logistics Excellence Award Ceremony/ Banquet: 17 May 2007.

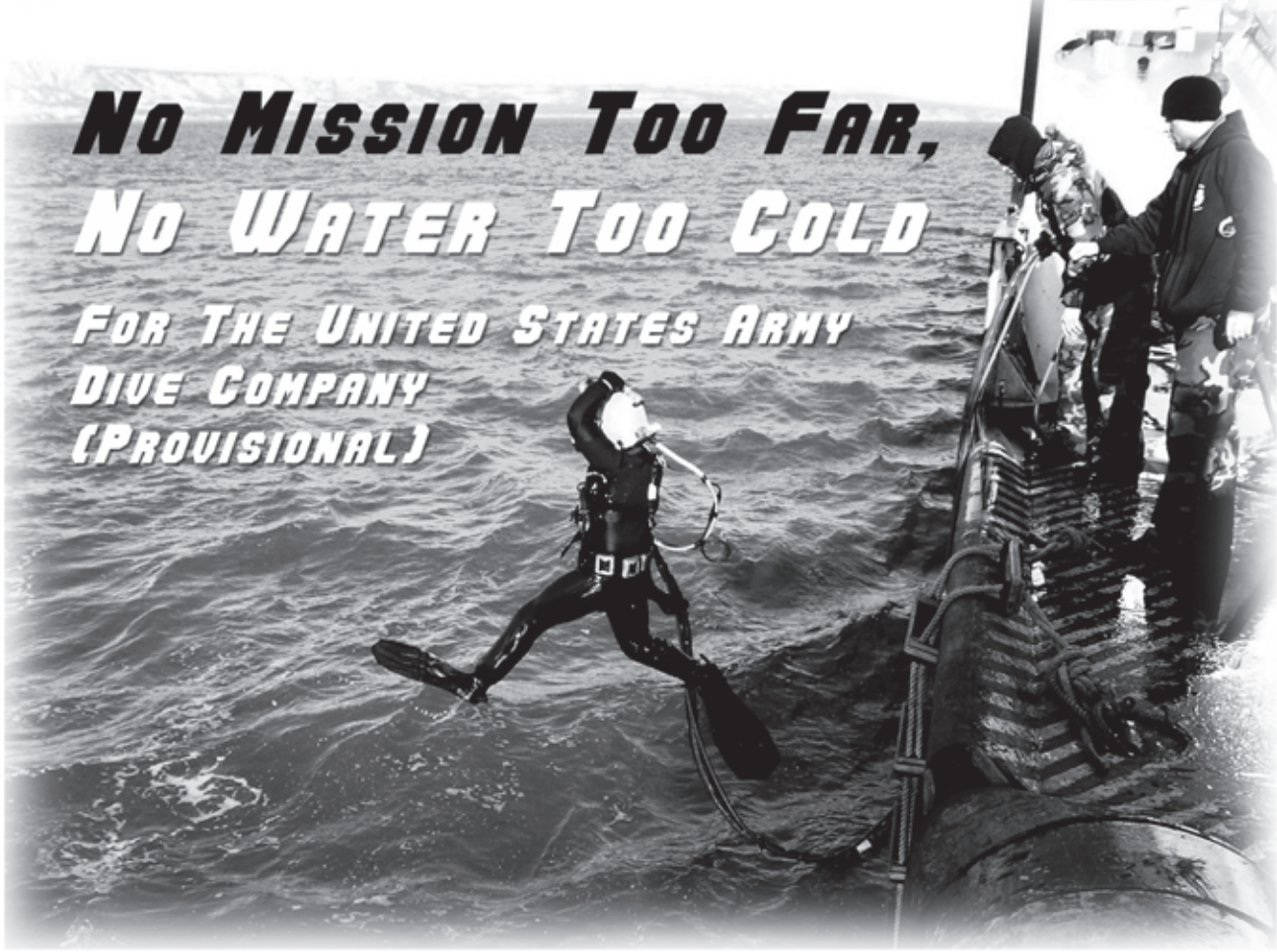
The 2006 DEA winners did a number of things to stand out in the competition. First, they selected an appropriate category—the category that best fit the deployment event. Units planning to compete in 2007 should consider the deploying unit categories that historically have the fewest number of units competing and may offer the greatest opportunity. The 2006 winners also fully documented and explained their deployment event. Remember that the board only knows what you tell them, so include a complete description of what your unit accomplished during the deployment phase. Each packet has specific requirements. Make sure you address all of them, and support the verbiage with pictures—they really help. The DEA program guidance and evaluation criteria are available on the DEA Web page at *<http://www.deploy.eustis.army.mil/Default.html>*. For additional information, contact the DEA Program Manager, Mr. Henry Johnson, at commercial (757) 878-1833 or DSN 927-1833.



Mr. Ledebuhr is chief of the Operations and Training Branch of the Deployment Process Modernization Office at Fort Eustis, Virginia. Retired from the Army, his service as a Transportation Corps officer included assignments with the 3d Armored Division, III Corps, Training With Industry, and 1st Armored Division.

No Mission Too Far, No Water Too Cold

For The United States Army Dive Company (Provisional)



By Sergeant Tyler Dodd and First Lieutenant Timothy Mitroka

It was 0345 on 23 February 2006 when two divers from the 86th Engineer Team (Dive) (based out of Fort Eustis, Virginia) departed in a 26-foot moving truck packed with scuba and surface-supplied diving equipment for a cross-country trip to Astoria, Oregon. The two reached their destination after four days of driving and met up with seven other divers from the 86th Engineer Team (Dive) who flew in the day before. The team was on a mission in support of the Mid-Atlantic Regional Maintenance Center to inspect the hull of a United States Coast Guard vessel called the *Fir*, a 225-foot seagoing buoy tender.

The air temperature was cold and the water temperature even colder, topping off around 40 degrees Fahrenheit. For the next five days, the divers had to overcome less than optimal diving conditions to complete the job. Work consisted of removing, cleaning, and replacing metal grates on the vessel's hull (which weighed 70 to 80 pounds); inspecting the entire hull and running gear (which consisted of the propellers, shafts, and stave bearings) for any damage; documenting specific areas of the hull with underwater video and photography; and conducting a paint thickness analysis along the entire hull. The team spent nearly 75 hours working underwater to complete the job. The low visibility underwater increased the difficulty level, but the cold water was the limiting factor of each dive evolution. On average, the most a diver spent in the water at one time was around 90 minutes.



A diver is unhatted after conducting a dive in the cold water surrounding the *Fir* in Astoria, Oregon.



Divers inspect the water around the *Hickory* before jumping in to conduct a hull inspection.

By 4 March, the work was completed on the *Fir*. But a similar Coast Guard vessel, the *Hickory*, was docked 2,700 miles away in Homer, Alaska. The *Hickory* was scheduled to have the same hull inspection. This time, all nine divers spent four days driving north through Washington, Canada, and Alaska. Once they arrived on the jobsite, they were faced with working in 26- to 28-degree-Fahrenheit water with small ice sheets floating nearby.

To combat the effects of the freezing water, one of the divers put his engineering skills to work and devised a system that would pump hot water into their wet suits. Using a garden hose, plumbing fittings, and aquarium tubing, the divers were supplied with a constant flow of hot water—pumped from the vessel's water supply—to surround their entire body while they worked in the cold water. This invaluable system allowed the divers to double, even triple, the average time they had spent underwater while in Astoria. One of the divers spent a total of 410 minutes in the water during one working dive.

When inspecting the *Hickory*, the team supervisors implemented lessons learned from the work they did on the *Fir*. The divers also knew exactly what needed to be done and how to do it more efficiently the second time around. The knowledge gained, combined with the newly implemented work strategies, greatly reduced the total time required to complete the mission. It took the divers only 30 hours of combined diving time to complete the hull inspection on the *Hickory*.

The scenery surrounding the bay was one of a kind, from the snow-covered mountains to the dozens of bald eagles flying around the area. Having the opportunity to dive in Alaska is a once-in-a-lifetime opportunity for most divers, but for one dive supervisor, it was the second trip to Alaska for a dive mission, and he was able to take what he learned from diving in cold water and share it with the rest of the team.

This type of work is fairly routine for Army divers. These missions reinforced the team's ability to work underwater (particularly the ships husbandry aspect), but more importantly, it reinforced the importance of working relationships with other services and agencies—not only the Coast Guard but also the Navy, Marines, Air Force, and any other government agency having a need for divers, both stateside and overseas.

Sergeant Dodd is a team leader/lead diver (salvage diver) with the United States Army Dive Company (Provisional)–86th Engineer Team (Dive). Previous assignments include Delta Company, 577th Engineer Battalion, Panama City Beach, Florida (Second-Class Diver School), and he has 3 1/2 years experience as an Army diver.

First Lieutenant Mitroka is a platoon leader with the United States Army Dive Company (Provisional)–86th Engineer Team (Dive). Previous assignments include Delta Company, 577th Engineer Battalion, Panama City Beach, Florida (Basic Diving Officer Course), and he has 14 months experience as a diving officer. He is a graduate of the United States Military Academy.

Task Force Ripper

Rapid Pothole/Pavement Repair

By First Lieutenant Christopher T. Dening

After years of anti-Iraqi forces activity, the main supply routes (MSRs) and alternate supply routes (ASRs) of Iraq have become riddled with craters. Insurgents have staged and detonated improvised explosive devices (IEDs), which have created various-sized craters in the pavement. These craters are a problem for convoys traveling across theater because they reduce mobility and provide the insurgency with additional places to conceal IEDs.

For this reason, theater engineers initiated the rapid pothole/pavement repair (RPR [pronounced *ripper*]) mission. Soldiers from Bravo Company and Headquarters Support Company, 84th Engineer Battalion (Combat) (Heavy), were tasked with the RPR mission and have worked hard to ensure that MSRs and ASRs in the battalion's area of operations are crater-free. Known as Task Force Ripper, the RPR teams travel the roadways of Iraq, patching damaged routes.

The 84th cannot claim all the credit for the completed work, because various maneuver units provided security to support these engineers. The RPR teams fill and repair the holes while the security units direct traffic and provide protection. The coordination of a RPR team and a security unit requires intense and thorough planning by the leadership of both units. Despite working in a potentially hostile environment with the threat of insurgent activity, the two elements finished the job quickly and safely.

Repairing a Crater

Before an IED crater is deemed repaired, several deficiencies must be corrected. The damaged and cracked asphalt is cut and jackhammered out from the craters edge, creating a new surface to bond with the concrete. If the concrete is just placed on top of old asphalt, the asphalt



Soldiers prepare an IED crater for the placement of concrete.

will expand as the temperature rises and eject the concrete from the patch, rendering the repair useless.

During the wet season, the craters are often full of water, which interferes with the curing of the concrete. Prior to any placement of concrete, all water is pumped out of the crater. After the water is removed, the crater is cleared of debris and backfilled. The backfill is then tamped to compact the soil. The compaction of soil increases its bearing capacity, ensuring that the concrete patch does not sink and form a pothole under the weight of the traffic. Lastly, concrete is placed in the hole and troweled to match the road's surface. This increases the trafficability of the road and reduces wear and damage to vehicles.

Equipment and Methods

The Soldiers of the 84th have a number of tools in their arsenal, or that are easily accessible, to facilitate the RPR process: a 250-cubic-feet-per-minute (CFM) compressed air trailer, a pneumatic concrete saw, a pneumatic jackhammer, a sump pump, a dump truck, a civilian concrete truck, a magnesium trowel, hand trowels, and shovels.

The methods used by the RPR teams have adapted and improved greatly since they first began executing missions. To save on time and resources, the teams now bring their own backfill. Several safety precautions have been implemented to increase Soldiers' safety during operations, to include various methods to mitigate the threat of IED attacks. The teams continue to improve tactics, techniques, and procedures to gain proficiency at filling the many craters that litter the country.

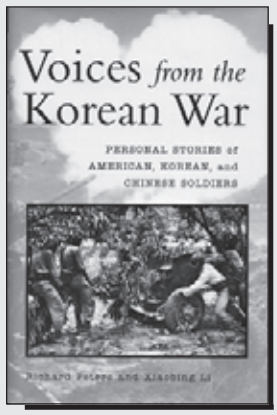
Summary

Task Force Ripper has made it much harder for insurgents to place buried or subgrade IEDs. The RPR teams' goals are to force insurgents to surface-lay IEDs, making them easier for coalition forces to spot and disarm, and to ensure that the crater repair will last.

First Lieutenant Dening is the platoon leader for 1st Platoon, Bravo Company, 84th Engineer Battalion. Previous assignments include working as a project engineer for the Honolulu District, United States Army Corps of Engineers®. He is a graduate of Rutgers College of Engineering with a bachelor's in civil engineering.



Book Reviews



Voices from the Korean War: Personal Stories of American, Korean, and Chinese Soldiers, by Richard A. Peters and Xiaobing Li, University Press of Kentucky: Lexington, November 2004, 288 pages, ISBN: 0813122937, $35 (hardcover).

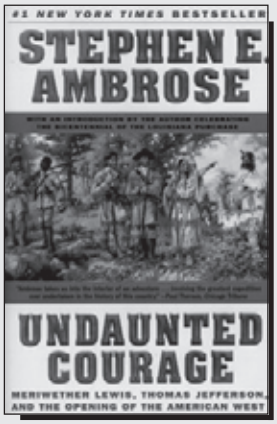
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Most books we Americans read on the "Forgotten War" are written from the American perspective. There are a couple from South Korean authors, such as *From Pusan to Panmunjom* by General Paik Sun Yup, but Peters and Li provide an opportunity to see the Korean War from the North Korean and Chinese perspectives.

This book offers firsthand accounts of the suffering of the Chinese forces during their engagements with United States Marines from the "Frozen Chosin" to the harbor city of Hungnam. *Voices* covers the suffering of the civilians and the Soldiers' families, as well as the Soldiers. The book provides insights on the Koje-Do prison riots, reported by both a guard and an organizer within the camps. They believed that the Americans were naïve, which made it easy for the North Korean and Chinese to run the camps, and that many lives on both sides were lost inside the camps due to that naiveté.

Voices from the Korean War also covers a number of campaigns. At times, the stories you are hearing could just as well be from an American, a South Korean, or any of the United Nations service members. This book creates a vivid and multidimensional portrait of the three-year-long conflict told by those who experienced the ground war firsthand.

As Paul Harvey would say, *Voices from the Korean War* tells you "the rest of the story," a story few Americans have heard.



Undaunted Courage: Meriwether Lewis, Thomas Jefferson, and the Opening of the American West, by Stephen E. Ambrose, Simon & Schuster: New York, 1997, 528 pages, ISBN: 0684826976, $30 (hardcover).

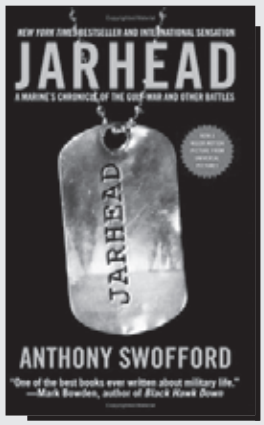
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Most Americans think they know the story of Lewis and Clark's expedition with their crew, which they called the "Corps of Discovery." Once you read *Undaunted Courage*, you will really know that story, as well as the story of Meriwether Lewis. The book gets off to a somewhat slow start, because many pages describe the preparations and supplies obtained for the adventure. But imagine packing for a trip where you don't know the route, the length of the trip, or how long it will take to complete. (In comparison, we knew more before we sent a man to the moon.) But once all the preparations are completed, the story begins to move us west, to the start of the expedition in Missouri.

Ambrose makes you feel as if you are a member of the expedition. He introduces you to William Clark and the other members of the Corps of Discovery. You learn of the daily drudgery of the crew as they pull the boats up the Missouri River past many landmarks, many of which are now cities. In addition to having no maps, they had to deal with things such as hostile Indian tribes, constant hunger, wild animals, insect infestation, and bitter weather. This was a true adventure into the unknown. On the expedition, Lewis proves himself to be a first-rate mapmaker and nature writer, with his descriptions of the flora, fauna, and physical beauty of the American Great Plains, Rocky Mountains, and Pacific Northwest.

This was the first real interaction of the United States with the great Native American tribes of the plains and beyond. Again Lewis proves himself to be a first-rate leader and a diplomat with the Native American tribes. Most meetings were peaceful and educational. The Corps of Discovery learned that the different tribes were like different nations and had to be so treated.

Once you have completed this book, you hardly realize you were reading history. It is a very exciting and well-written piece of nonfiction.



Jarhead: A Marine's Chronicle of the Gulf War and Other Battles, by Anthony Swofford, Scribner: New York, March 2003, 260 pages, ISBN: 0743235355, $24 (hardcover).

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This book, from the perspective of a young Marine, is written by a young Marine combat veteran. Swofford takes you through Boot Camp, his first assignment, the build-up for war, life on the battlefield as a sniper, and back to civilian life. *Jarhead* describes the physical and mental stresses associated with the profession—the good times as well as the bad.

As I read *Jarhead*, I had a hard time believing all the crazy, vulgar, and disturbing things that happened. I thought about putting the book down, but couldn't. Then it dawned on me that a large part of this story is how young men deal with the stresses of growing up. Then add the fact that they are going to war and their lingering doubts from that experience. Today, as in the past, it is during the waiting that Soldiers are made.

This book provides a portrait of the brutality and loneliness of today's sophisticated, yet horrendous, battlefield. It reminds Soldiers that they are not the first to experience the doubts, the what-ifs, and the could-have-beens. They learn that it is their buddies who help keep them alive on the battlefield and off, and it is their buddies who help them get back home. *Jarhead* may help Soldiers come to terms with their experiences.

Many military members have a love/hate relationship about their service, and that is how I feel about *Jarhead*.

These three book reviews are provided by Mr. Jeffrey L. Rosemann, an instructional systems specialist with the Officers Education Branch, Department of Training Development, United States Army Engineer School. A retired infantry Soldier, he also served as the 2d Infantry Division historian during the beginning of the 50th Anniversary of the Korean War.

Air Base Dorm Takes Off in Arctic

By Dr. JoAnne Castagna

During the 1940s, Greenland was barely an inhabitable area of the Arctic and was under exploration. Today, the United States has a fully operational air base at Thule that was made possible by the United States Army Corps of Engineers® (USACE), who constructed several of Thule's facilities, often under extreme Arctic conditions (see article in *Engineer,* April-June 2005, page 15).

The United States has maintained a military presence in Greenland for more than half a century. Thule Air Base is located in a coastal valley in northwest Greenland, a province of Denmark, which is located above the Arctic Circle between northeastern Canada and Europe. The air base is home to the United States Air Force, U.S. and Danish contractors, and Greenlandic personnel.

The existing housing is substandard, and lodging for visitors is limited as well. To improve the housing and lodging conditions, USACE designed and is constructing a three-story dormitory, which will withstand the harsh Arctic climate. Construction, which began in March 2005, is being performed by MT Hojgaard, a Danish firm, under the supervision of USACE. The project will be completed sometime in the summer of 2006—one winter season ahead of schedule and within budget.

When completed, the dormitory will have 72 rooms for junior and senior noncommissioned officer visitors. A number of rooms will be divided into four-bedroom modules (with individual bathrooms and walk-in closets) that include a shared social space, a housekeeping area, and a laundry room. In the center of each floor is a common area with a kitchen and appliances. The common areas provide the occupants a place to relax and socialize.

The dormitory project is in the center of the air base, and the bright red and blue exterior stands out against the Arctic snow-covered landscape. The steel superstructure stands on concrete footings and has an insulated metal panel system exterior and a pitched standing metal panel system roof. The interior mechanical, electrical, plumbing, and fire protection systems are all designed to withstand extreme subzero temperatures, and the walls are constructed with a typical metal stud and gypsum board assembly.

Constructing the dorm can be a challenge, considering the severe weather conditions and limited exterior-construction



Photo by Sterrett Daniels, USACE, New York District

A contractor inspects the installation of the dorm's metal decking flooring system.

timeline. Due to the weather, outside construction at Thule is limited to a 3-month time frame—the summer and fall months (June to mid-September)—because the weather during the winter season is too severe to work outdoors, with the extreme temperatures ranging from -30 to -40 degrees Fahrenheit. The exterior must be enclosed within this window of time.

Outside construction is also limited by daylight cycles. Because of Thule's proximity to the North Pole, it has 24 hours of sunlight from May through August and 24 hours of darkness from November through February.



Photo by Sterrett Daniels, USACE, New York District

The dorm is closed in from the severe Arctic weather, 1 October 2005.

Once the building shell is completed, interior work can continue uninterrupted during the winter months. The construction team worked 12-hour days during the summer months and worked inside throughout the long winter months, which contributed to the project being ahead of schedule.

Also, it is during the summer months that building supplies are received. Greenland is locked in by ice 9 months out of the year. During the summer months—with temperatures about 40 degrees Fahrenheit—the island's frozen shipping lanes can be broken up to allow supply ships in.

Because of the limited construction time, most of the building materials are prefabricated before being shipped in, which helps the workers to rapidly perform the construction. Some of the materials that were prefabricated for the dormitory include the concrete foundations, the structural steel, and the insulated metal panel systems for the walls and roof.



Thule Air Base, Greenland, is the northernmost U.S. military installation.

One of the most significant differences in constructing in the Arctic region is with the unique foundation of the buildings. The land is primarily composed of permafrost—permanently frozen ground below the earth's surface ranging from 6 feet in some areas to 1,600 feet in others. Because of this terrain, building foundations need to be elevated. Buildings must sit on concrete supports, allowing air corridors to separate the building from the ground. One meter of air clearance is required between the ground and the bottom of the building. This prevents heat that is generated from the building from melting the permafrost and causing the building to sink.

Engineers who are working on projects with limited construction time due to the elements should consider—

- Minimizing construction delays by resolving contractor requests for information as soon as possible by thoroughly reviewing contract plans and specifications prior to construction.
- Resolving contractor issues promptly by being flexible and available.

For additional information about Thule Air Base, visit its Web site at <*www.thule.af.mil*>. For information on the USACE military construction program, contact the author via e-mail at <*joanne.castagna@usace.army.mil*>.

Dr. JoAnne Castagna is a technical writer with the USACE New York District.

Robert E. Lee and the Importance of Engineer Reconnaissance

By Lieutenant Colonel Kevin Dougherty (Retired)

Emory Thomas writes of the Mexican War that "for the first time in American history, United States armies marched on foreign soil and fought battles in an alien land. Maps were few and often unreliable, and Mexican guides for obvious reasons were even fewer and even less reliable. What... commanders required of the engineers was reconnaissance—accurate information about roads, rivers, terrain, and the enemy. Consequently, engineer officers very quickly made themselves indispensable and found themselves not only recommending routes and evaluating enemy positions but also offering informed advice about strategy and tactics."[1] British Major General Sir Frederick Maurice echoes that "at that time picked officers of the Engineers' Corps, itself a *corps d'elite*, performed many of the functions which today are assigned to the General Staff. They made reconnaissances, undertook the selection of positions, and prepared plans and orders for their general."[2]

One of these noble engineers was Captain Robert E. Lee. Lee's contributions to the American war effort in Mexico were phenomenal. The American commander General Winfield Scott described Lee as "the very best soldier I ever saw in the field" and suggested that in the event of war, the government should insure Lee's life for $5 million a year.[3] But if Lee's contribution to the war was great, the war contributed to Lee as well. Douglas Southall Freeman concluded the following with regard to the Mexican War's impact on Lee: "The relation of careful reconnaissance to sound strategy was impressed on Lee by every one of the battles he saw in Mexico... . Lee had shown special aptitude for this work, and he left Mexico convinced for all time that when battle is imminent, a thorough study of the ground is the first duty of the commanding officer. Reconnaissance became second nature to him."[4] This lesson is still true today.

Cerro Gordo

One of the most famous of Lee's Mexican War reconnaissance exploits was at Cerro Gordo, the name of both a 1,000-foot round hill and the town that lay behind it. Seven miles to the east was another town named Plan del Rio. Both are on the left or north bank of the Rio del Plan, a river that runs east-west in a straight line. The National Road joins the two towns but does not follow the banks of the river. Instead, it meanders off to the northeast immediately after leaving Plan del Rio and only later does it return and run along the river before reaching Cerro Gordo.



Robert E. Lee as a captain in the Corps of Engineers

Along that stretch where there was considerable space between the National Road and the river bluffs, Mexican commander Antonio Lopez de Santa Anna had positioned three artillery batteries on prominent cliffs to command the National Road approach. Santa Anna's main defensive position was on the hill of Cerro Gordo, a couple of miles behind these artillery batteries. Americans approaching Santa Anna along the National Road would be exposed to deadly fires.

The defense however had one weakness. To Santa Anna's left or north flank there was an extensive tract of wilderness, the vegetation being so thick that Santa Anna had no reasonable observation in that direction. His flank was thus vulnerable, but he was willing to accept this risk because he considered the tangled woods impassable. Santa Anna's subordinates did not share this confidence, but in spite of their pleas to defend the flank, Santa Anna sent only an observation post.

General Scott wanted to avoid a costly frontal attack down the National Road. He had the benefit of earlier reconnaissance

of the area along the National Road and of the Mexican artillery positions between the road and the river that had been performed by Lieutenants Joe Johnston, P. G. T. Beauregard, and Zealous Tower. What he needed now was information about the potential route around Santa Anna's left flank. Thus he dispatched a second reconnaissance mission led by Major John Smith, chief engineer, and Captain Robert E. Lee.[5]

Lee summarized the problem, writing that "the right of the Mexican line rested on the river at a perpendicular rock, unscalable by man or beast, and their left on impassable ravines; the main road was defended by field works containing thirty-five cannon; in their rear was the mountain of Cerro Gordo, surrounded by entrenchments in which were cannon and crowned by a tower overlooking all—it was around this army that it was intended to lead our troops."[6] Slowly Lee worked his way up the ravines north of the river. The terrain was difficult, but Lee thought it would not be impossible to construct a crude road over it.

At one point Lee stopped at a spring to which a path led from the south. From the evidence of much traffic, Lee concluded that he was at the rear of the Mexican left flank. Before long, he heard Spanish voices and saw a group of Mexican soldiers coming forward toward the spring. With just an instant to react, Lee dropped down behind a large brush-covered log close to the water. More and more Mexicans came and went, some sitting on the very log behind which Lee hid. Lee remained in this precarious position the remainder of the day. Not until darkness came did the last Mexican leave and Lee was able to steal away.[7]

Upon returning to American lines, Lee compared notes with Major Smith who, on his own reconnaissance, had come to similar conclusions as Lee. While both recognized the possibility, they were not completely sure whether the Army could maneuver around the Mexican left. Scott directed them to continue their reconnaissance the next day and detailed to Lee a work party to cut a trail. By the end of that day, Lee and his crew had prepared a passable new trail up the ravine.[8]

Not only was Lee responsible for finding the route and building the road, but Scott also entrusted him with serving as guide for Brigadier General David Twiggs' division in the conduct of the attack. Freeman refers to this latter mission as "two days of the heaviest responsibility [Lee] had ever known." Lee led Twiggs' men up the ravines that passed around Santa Anna's left, emplaced an artillery battery, and guided a brigade around the northern flank of Cerro Gordo with the intention of cutting off the enemy retreat.[9]

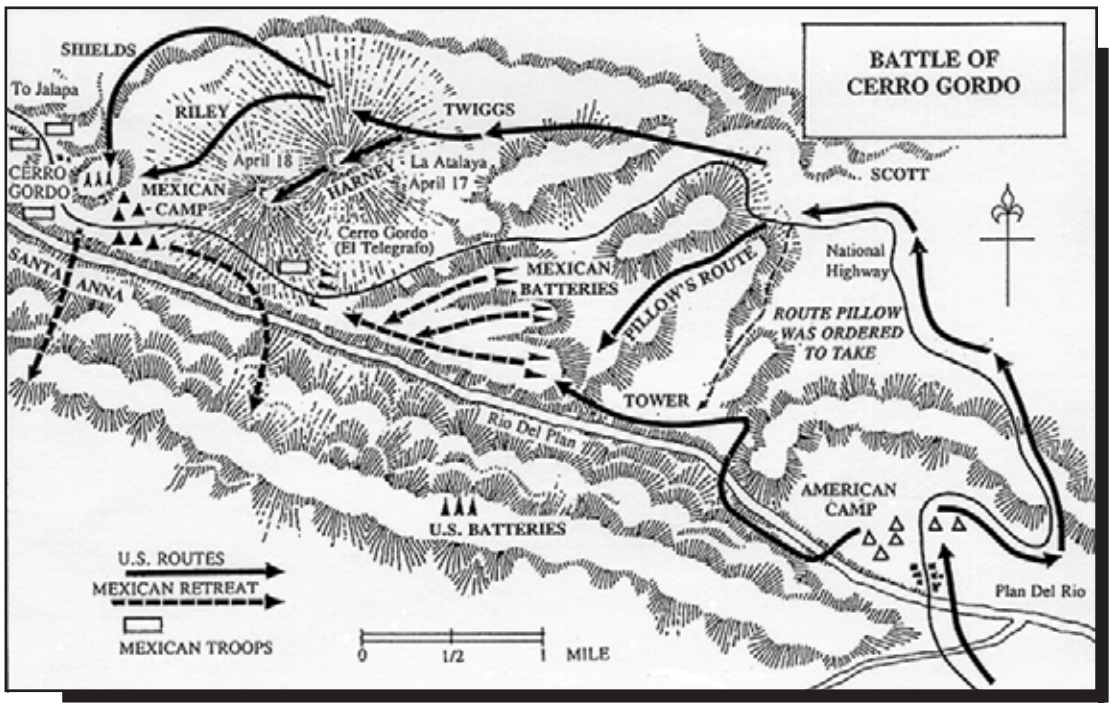
Lee performed all these tasks with distinction. Scott wrote that Lee was "indefatigable during these operations, in reconnaissance as daring as laborious, and of the utmost value." Lee was brevetted to major "for gallant and meritorious conduct in the Battle of Cerro Gordo." Freeman summarizes that "No other officer of the army received such high praise; none gained so much in prestige by the action."[10]

Impact on Lee

Thus, as an engineer, Lee developed the genius for intelligence, reconnaissance, understanding the terrain, and turning the enemy that marked his generalship as commander of the Army of Northern Virginia during the Civil War. Emory Thomas notes that it was in Mexico that Lee learned to "act upon accurate reconnaissance,"[11] and Freeman notes that it was there that Lee "had disclosed a

Battle of Cerro Gordo during the Mexican-American War, painting by Carl Nebel





special aptitude for reconnaissance."[12] These lessons were borne out in the Civil War. It was there that Freeman concludes Lee's "offensive strategy rested upon thorough study of the terrain."[13] Whether in Mexico or in Virginia, Burke Davis observes that "Lee, somehow, always found a route to the vulnerable flank of the enemy."[14] It was a skill he had learned as an engineer.

Applicability Today

Captain Matt Pasvogel documents this applicability in his article in the April 2000 *Engineer* entitled "Route Reconnaissance: A Lost Art." In it, Captain Pasvogel notes that in support of Allied operations in Kosovo, his "company eventually reconnoitered more than 500 kilometers of roads and several tunnels and ferry sites and classified more than 90 bridges in Albania. Because many of today's military missions initially occur in countries with underdeveloped lines of communication, engineers must be well-trained in the vital mission of route recon."[15] He also records that "while performing initial route-reconnaissance missions, we realized they were very different from the heavily rehearsed and trained engineer obstacle-reconnaissance missions."[16]

Captain Lee may have entertained similar musings while hiding behind a log by a spring outside of Cerro Gordo. Pasvogel concludes that the Army's existing doctrine on route reconnaissance is sound, but more training emphasis on this task is required.[17]

As Supreme Allied Commander, Europe, during the operations in Kosovo, General Wesley Clark would agree with Captain Pasvogel's assessment. In studying the various options for ground attacks, General Clark was drawn to avenues of approach through northeast Albania. Such an avenue would bypass the Serb's main defenses,[18] just as Scott had sought to do in Mexico. Clark assessed the situation as "tough terrain, yes; impossible, no."[19] Again, it was the same situation that Scott had faced. Like Scott, Clark relied on further reconnaissance to develop the situation. As planning continued, Clark learned that there were bypasses.[20] He even references "the brilliant work by a British engineer who had planned the full use of the river and lake system to transport heavy equipment into northeast Albania."[21] Bypasses were possible. Clark was confident the mission could be done, writing that "we had looked at roads, calculated repair requirements.... We had made the on-the-ground reconnaissance and double-checked it."[22]

As had been the case in Mexico, few details were known of the terrain in Albania and Kosovo prior to the crisis. These details were provided to a large extent by engineer reconnaissance. It was this reconnaissance that allowed General Scott to turn Santa Anna at Cerro Gordo. It also gave General Clark the confidence to push for a ground attack option in Kosovo. Without a doubt, engineer reconnaissance is an indispensable combat multiplier.

Lieutenant Colonel Dougherty (Retired), who now teaches in the Department of History, University of Southern Mississippi, was formerly a Professor of Military Science there. Other assignments include Commander, 2d Battalion (Training Support) (Infantry), 393d Regiment, Fort Chaffee, Arkansas. He is a graduate of the United States Military Academy and the author of The Peninsula Campaign of 1862: A Military Analysis *(see review on page 52).*

Endnotes

[1]Emory Thomas, *Robert E. Lee*, W. W. Norton, New York, 1997, p. 115.

[2]Frederick Maurice, *Robert E. Lee: The Soldier*, Bonanza Books, New York, 1925, p. 25.

[3]Thomas, p. 140.

[4]Douglas Southall Freeman, *R. E. Lee*, Volume 1, Charles Scribners' Sons, New York, 1934, pp. 296-297.

[5]John S. D. Eisenhower, *Agent of Destiny: The Life and Times of General Winfield Scott*, The Free Press, New York, 1970, pp. 251-252.

[6]Freeman, p. 239.

[7]Ibid., pp. 239-241.

[8]Ibid., p. 241.

[9]Ibid., pp. 242-244.

[10]Ibid., pp. 247-248.

[11]Thomas, p. 140.

[12]Freeman, pp. 246-247.

[13]Stuart Smith, *Douglas Southall Freeman on Leadership*, White Mane Publishing, Shippensburg, 1993, p. 168.

[14]Burke Davis, *Gray Fox*, Rinehart, New York,1956, p. 40.

[15]Matt Pasvogel, "Route Reconnaissance: A Lost Art," *Engineer*, April 2000, p. 14.

[16]Ibid.

[17]Ibid., p. 16.

[18]Wesley Clark, *Waging Modern War*, Public Affairs, New York, 2001, pp. 308-309.

[19]Ibid., p. 281.

[20]Ibid., p. 302.

[21]Ibid., p. 350.

[22]Ibid., p. 311.

Works Cited

Clark, Wesley, *Waging Modern War*, Public Affairs, New York, 2001.

Davis, Burke, *Gray Fox*, Rinehart, New York, 1956.

Eisenhower, John S. D., *Agent of Destiny: The Life and Times of General Winfield Sco*tt, The Free Press, New York, 1997.

Eisenhower, John S. D., *So Far From God: The U. S. War with Mexico, 1846-1848*, Random House, New York, 1989.

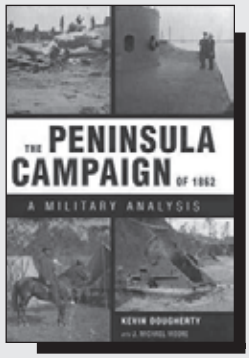
Freeman, Douglas Southall, *R. E. Lee*, Volume 1, Charles Scribners' Sons, New York, 1934.

Maurice, Frederick, *Robert E. Lee: The Soldier*, Bonanza Books, New York, 1925.

Smith, Stuart, *Douglas Southall Freeman on Leadership*, White Mane Publishing, Shippensburg, 1993.

Thomas, Emory, *Robert E. Lee*, W. W. Norton, New York, 1997.

Book Review



The Peninsula Campaign of 1862: A Military Analysis, by Kevin Dougherty with J. Michael Moore. University Press of Mississippi, July 2005, illustrated, index, bibliography, appendixes, 192 pages, ISBN 1-57806-752-9, HIS027060, HIS036050, $45 (hardcover).

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A military history of McClellan's ambitious drive on Richmond and the genius and fortune by which Lee foiled it inspired many history books. No previous work, however, analyzes Union General George B. McClellan's massive assault toward Richmond in the context of current and enduring military doctrine. *The Peninsula Campaign of 1862: A Military Analysis* fills this void. Background history is provided for continuity, but the heart of this book is military analysis and the astonishing extent to which the personality traits of generals often overwhelm even the best efforts of their armies.

The Peninsula Campaign lends itself to such a study. Lessons for those studying the art of war are many. On water, the first ironclads forever changed naval warfare. At the strategic level, McClellan's inability to grasp Lincoln's grand objective becomes evident. At the operational level, Robert E. Lee's difficulty in synchronizing his attacks deepens the mystique of how he achieved so much with so little. At the tactical level, the Confederate use of terrain to trade space for time allows for a classic study in tactics.

Moreover, the campaign is full of lessons about the personal dimension of war. McClellan's overcaution, Lee's audacity, and Jackson's personal exhaustion all provide valuable insights for today's commanders and for Civil War enthusiasts still debating this tremendous struggle. Historic photos and detailed battle maps make this study an invaluable resource for those touring the many battlegrounds from Young's Mill and Yorktown through Fair Oaks to the final throes of the Seven Days' Battles.

Kevin Dougherty, a retired infantry officer, teaches in the Department of History at the University of Southern Mississippi. He has also authored The Coastal War in North and South Carolina. *J. Michael Moore is the registrar of Lee Hall Mansion, Newport News, Virginia.*

ENGINEER UPDATE

Commercial numbers are (573) 563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Urban Mobility Breaching Course (UMBC). The UMBC is a 3-week course conducted at Camp Lejeune, North Carolina, by the United States Marine Corps, with assistance from three United States Army engineers. Two weeks of the course are consolidated training, and the remaining week is Army-unique. The maximum Army course load for the UMBC is 15 students. Slots for the course can be reserved through the Army Training Requirements and Resources System (ATRRS).

The UMBC provides advanced information on urban breaching operations. The course consists of in-depth explosive theory; detailed planning that combines operational and training safety issues; urban reconnaissance; and employment of urban breaching assets, including explosive, manual, and ballistic breaching techniques for urban operations. The UMBC teaches the use of Current Force equipment that supports mobility operations in support of the maneuver force.

Students must meet requirements listed in Department of the Army Pamphlet 611-21, *Military Occupational Classification and Structure,* and Army Regulation 600-9, *The Army Weight Control Program;* be a combat engineer noncommissioned officer in the grade of E-5 (P) through E-7 and a graduate of the combat engineer Basic Noncommissioned Officer Course (BNCOC); have no pending Uniform Code of Military Justice (UCMJ) actions; and have no limiting profiles.

Fiscal Year 2006 Class Schedule		
Class Number	Report Date	Graduation Date
CLS 06	13 Aug 06	1 Sep 06
CLS 07	10 Sep 06	29 Sep 06
Fiscal Year 2007 Class Schedule		
Class Number	Report Date	Graduation Date
CLS 01	15 Oct 06	3 Nov 06
CLS 02	26 Nov 06	15 Dec 06
CLS 03	21 Jan 07	9 Feb 07
CLS 04	25 Feb 07	16 Mar 07
CLS 05	15 Apr 07	4 May 07
CLS 06	3 Jun 07	22 Jun 07
CLS 07	5 Aug 07	24 Aug 07

The point of contact for this course is the Directorate of Training and Leader Development (DOTLD) Sergeant Major at (573) 563-4094 or e-mail <*atsedot@wood.army.mil*>. *The* DOTLD Web site is <*http://www.wood.army.mil/dotld/*>.

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 Web sites and by answering RFIs. (The Engineer School RFI Web site 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*> or <*reggie.snodgrass@us.army.mil*>. Classified information can be sent by secure Internet protocol, routed (SIPR) e-mail to <*snodgrassrg@monroe.army.smil.mil*>. For more information, call (573) 563-4117.

Visual Archive. The History Office at the Engineer School is developing a visual archive. It currently has more than 18,000 photographs, largely from World War II and Korea. Units that would like to contribute photographs (copies) or other visual material should contact Dr. Larry Roberts, Historian, United States Army Engineer School, Fort Leonard Wood, Missouri 65473. Where possible, caption information should accompany the images. If you have questions, call Dr. Roberts at (573) 563-6109.



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