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

COMMANDANT
BG Bryan G. Watson
563-6192
<bryan.watson@us.army.mil>

ASSISTANT COMMANDANT
COL Fabian E. Mendoza
563-6192
<fabian.mendoza@us.army.mil>

DEPUTY ASSISTANT COMMANDANT
Mr. James R. Rowan
563-4363
<james.rowan@us.army.mil>

REGIMENTAL COMMAND SERGEANT MAJOR
CSM Robert J. Wells
563-8060
<bobby.wells@us.army.mil>

REGIMENTAL CHIEF WARRANT OFFICER
CW5 Robert K. Lamphear
563-4088
<robert.lamphear@us.army.mil>

ACTING DEPUTY ASSISTANT COMMANDANT–USAR
LTC Timothy M. O'Brien
563-8045
<tim.obrien1@us.army.mil>

DEPUTY ASSISTANT COMMANDANT–ARNG
LTC Michael S. Mismash
563-8046
<michael.mismash@us.army.mil>

CHIEF OF STAFF
LTC Brian D. Slack
563-7116
<brian.slack@us.army.mil>

COMMANDER, 1st ENGINEER BRIGADE
COL Allan Webster
596-0224, DSN 581-0224
<allan.webster@us.army.mil>

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

DIRECTOR OF ENVIRONMENTAL INTEGRATION
Mr. Robert F. Danner
563-2845
<robert.f.danner@us.army.mil>

COUNTER EXPLOSIVE HAZARDS CENTER
LTC Eric A. Goser
563-3990
<eric.goser@us.army.mil>

HUMANITARIAN DEMINING TRAINING CENTER
Mr. Jonathan D. Green
563-6199
<jonathan.d.green@us.army.mil>

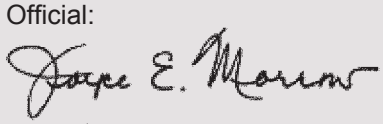
ENGINEER DOCTRINE, MSCoE CDID,CODDD
LTC Brian J. Davis
563-2717
<brian.davis6@us.army.mil>

MANEUVER SUPPORT ORGANIZATION
LTC Danielle Ngo
563-6282
<danielle.ngo@us.army.mil>

MANEUVER SUPPORT MATERIEL
LTC Chris A. Parks
563-5055
<chris.parks1@us.army.mil>

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

Official:



JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
1029403

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The Professional Bulletin of Army Engineers

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UNITED STATES ARMY ENGINEER SCHOOL

COMMANDANT

Brigadier General Bryan G. Watson

MANAGING EDITOR

Shirley Bridges

EDITOR

Rick Brunk

CONTRIBUTING EDITOR

Susan Stevens

GRAPHIC DESIGNER

Jennifer Morgan

Front cover: During Operation Unified Response at Port-au-Prince, Haiti, divers from the 544th Engineer Dive Team drill holes for emplacing rebar to reinforce a damaged pile. (See article on page 7.) (U.S. Navy photo)

Back cover: U.S. Army photos

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Clear The Way

Brigadier General Bryan G. Watson
Commandant, United States Army Engineer School



I am simply awed by the daily accomplishments of this Regiment of Engineers…the way our Soldiers serve our Army and Nation from the front and by their example. From our combat engineers clearing routes throughout Afghanistan; to our construction engineers cutting new roads, erecting bridges, and building force bed-down facilities; to our geospatial engineers ensuring that leaders from platoon- to theater-level can visualize the operating environment with the most current data. You support the fight with relentless resolve every day, understanding that the stakes are high; you never falter to accomplish what is asked. Never has there been a more exciting time to be an Army engineer, and never has the demand for engineer warriors been greater. Frankly, it is humbling to be a leader among such incredible engineer Soldiers—all of you sappers at heart!

But I've always felt that we, at Fort Leonard Wood, could do more to directly support our units that are preparing for combat and also to learn from your experience and rapidly integrate those lessons into our doctrine and leader development. This was confirmed during the last ENFORCE when our senior commanders and command sergeants major asked that we modify our Regimental Campaign Plan to include a line of effort specifically focused on "Support to Current Operations." During our recent Regimental Commander's Council, held at the Devil's Lake Regional Training Center in North Dakota, senior leaders approved our modification to the Regimental Campaign Plan to better support current operations. One of the major areas that commanders suggested we target for immediate improvement was our collection of unit lessons learned and rapid integration of those lessons into our training and leader development (Campaign Plan Decisive Point [DP] 3-10). Following is an update on this critical effort, along with a discussion of how you can do your part as members of this profession.

The Problem. In the past, unit training at our Combat Training Centers (CTCs)—predominantly by Active Army units—was the center of gravity for collecting lessons learned. The Combined Arms Lessons Learned (CALL) Office at Fort Leavenworth was the central repository and engine of change to our doctrine and leader development. CTC observer/trainers were highly sought to be instructors at our schools—and were managed that way.

Today, that is no longer the case…in fact, it hasn't been the case for 9 years! The most fertile and relevant ground for collecting lessons learned is the battlefields of Iraq and Afghanistan—albeit balanced by CTC experiences as we explore the challenges of full spectrum operations that we will face in the future. Units that recently return from combat are the new center of gravity of a learning and adaptive Army. And the former central clearing for lessons learned that would shape future doctrine, force design, and leader development has given way to a dispersed network of learning. Some examples of the new learning network are warfighting forums; assessment teams that deploy to visit units in the fight; unit post deployment after action reviews (AARs) conducted by Active Army, United States Army Reserve, and Army National Guard units; SIPR and NIPR websites; and blogs. In many cases, it is the students who recently returned from the fight who bring the most relevant instruction to our officer/warrant officer/noncommissioned officer (NCO) professional development education.

What We Must Do. This new network of learning, the bottom-up nature of relevant lessons, and the need to rapidly turn those lessons into adaptive action with the speed and urgency of war, demand that we completely "rewire" our processes within the Regimental Headquarters to better serve our profession. Here are the steps we have taken within our Regimental Headquarters:

- I've charged the Director of Training and Leader Development (DOTLD) with mission command for the "Support Current Operations" line of effort to put a single organization in charge of monitoring and orchestrating the learning network, align lessons learned with rapidly modifying doctrine and leader development, and give broad authority to alter professional military education (PME) course instruction based on lessons learned so that yesterday's combat experience is taught in tomorrow's classroom.
- We've increased the capacity of our Training Integration Office (TIO) to become the hub of adaptive education. Their job is to connect with field units, generate assessment teams, attend unit postdeployment AARs, collect the lessons learned in coordination with

Maneuver Support Center of Excellence efforts and CALL, and pass off the most relevant lessons to the Director of Instruction for integration into the classroom.

- I've moved the Counter Explosive Hazards Center (CEHC) under DOTLD so that we can begin to institutionalize counter-improvised explosive device (C-IED) training into all facets of our PME and leverage CEHC's ability to track the latest enemy and friendly tactics, techniques, and procedures (TTP) in order to keep C-IED training highly relevant to the current fight.
- I've shifted the main effort of our education Quality Assurance Element (QAE) toward ensuring that classroom instruction remains relevant and incorporates the latest lessons learned from units.
- I've established a nominative program for the selection of instructors to ensure that we have the right leaders—with the most recent combat experience—training and educating the next generation of engineers with the added incentive that their follow-on assignment will be closely managed.

What Has Been Accomplished. These past few months, we have made significant gains in putting the programs in place to achieve the objectives set by field commanders in DP 3-1. CEHC is now under DOTLD, and integration of C-IED training into all aspects of officer, warrant officer, and NCO education is well underway. DOTLD has participated in the postdeployment AARs of the 372d Engineer Brigade, 412th Engineer Command, and 203d Engineer Battalion. We covered down on the full spectrum operations rotation of 3d Brigade Combat Team, 82d Airborne Division, and focused on fire support officer (FSO) lessons for the 46th Engineer Battalion. We also deployed an assessment team to Afghanistan in September to collect observations from units in the fight; the Initial Impression Report can be downloaded at <*https://call2.army.mil/toc.aspx?document=6462*>. Finally, we have begun a comprehensive relook at the program of instruction for our NCOs attending the Advanced Leader Course (ALC) and Senior Leader Course (SLC), as well as our young officers attending the Captains Career Course, to ensure that the training and education we provide is consistent with combat observations, reflects the contemporary operating environment, and challenges the student to think adaptively. I'm pleased with the progress we are making, but we are far from being finished.

How You Can Help. If you are truly a member of this profession, you will agree that we have to do a better job of being a learning and adapting organization. And if you are truly a member of this profession…if you love this Regiment…you want to know how you can help achieve this vision. It's simple:

- Actively participate in the various forums where we discuss observations and lessons learned; help us understand where we need to improve our doctrine, organization, training, materiel, and leader development for the next fight.
- Give us visibility of your unit's postdeployment AAR session and report; demand that someone from the Regimental Headquarters attend.
- Take us up on the invitation to be part of critical task selection boards or course content reviews so we can ensure that what we are teaching tomorrow's leaders is relevant and current and that it produces the leaders you need to win.
- Encourage your best and brightest leaders to come to the Engineer School as instructors for our next generation of officers, warrant officers, and NCOs; nominate them so we can manage their assignment to Fort Leonard Wood and their follow-on assignment. One instructor touches hundreds of future leaders each year; only our best should be given that responsibility.

In the next "Clear the Way" article, I hope to report on progress that we are making on another vitally important decisive point of the Regimental Campaign Plan—DP 3-12: "Execute Functional Training for ARFORGEN"—which will establish a forum and process for commanders to tell us what specific training you need to prepare for your mission, when you need it, and how we can provide the necessary expertise at key events like mission rehearsal exercises (MRXs).

Lead to Serve. Essayons!



Lead The Way

Command Sergeant Major Robert J. Wells
United States Army Engineer School

Building the Combat Outpost
Principles of Patrolling
^
Construction



Thousands of years ago, a leader on some distant battlefield yelled in frustration, *"Somebody better figure out how to bust into this fortress, or I swear to the gods that heads will roll!"* And while everyone near the leader felt the fear crawl up to their soon-to-be-severed necks, two young Soldiers look at each other knowingly, and with a slight nod to each other stepped forward and yelled, *"Sire, Let Us Try!"* And so began the field of military engineering…or something like that. That leader came to the realization that his Army needed Soldiers with the cunning and imagination combined with brute force and "ignoance" to defeat the machines of war. Whether it was breaching into a heavily fortified position or designing a fortress built to repel invaders, our roots to the military engineering profession have always been focused on figuring out how to either build something or how to blow it up. Not a lot has changed since those early years. The following is an attempt to imagine the thought process of yesterday's engineer and apply it to today's engineering using the principles of patrolling (Planning, Reconnaissance, Security, Control, and Common Sense) in building today's version of the castle—the combat outpost (COP).

Planning. I think it was a person named Murphy who said that no plan survives first contact with the enemy. Well, Mr. Murphy, you must be a civilian, because that's why we have leaders in our formation. Our leaders and their staff develop a plan and disseminate the information to all their Soldiers so that they act as one unit. Everything in the plan must support the commander's vision of where to array platforms, like COPs, to project combat power in the most efficient manner. It takes an engineer with imagination to visualize the battlefield and identify areas that best support offense, defense, and stability operations. Our geospatial engineers give us an excellent view of the battlefield with most of the data we need to give the commander several options when deciding where, and when, to build a COP. But it still takes someone to get out on the ground and verify the terrain to the commander's plan.

Reconnaissance. A good recon verifies the design and layout and allows the engineer to make modifications that will best support the commander's plan for a COP. Today's recon not only verifies the physical terrain but also verifies the human dimension of the battlefield. Are we building a COP that straddles tribal boundaries? Are we building in a flood plain or a previously mined area? In addition to observation, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA), we have to consider area, structure, capabilities, organizations, people, and events (ASCOPE) when conducting a recon (see Field Manual 3-24, *Counterinsurgency*, Appendix B). Then it's time to move out and start building, once we've verified the plan.

Security. Pretty much self-explanatory, but it has huge implications for our maneuver brothers and sisters. Every consideration must be taken into account, from moving ourselves to the proposed COP in a secure manner, to the design and construction of the COP that will provide the best protection for its inhabitants. I personally think the most dangerous part of any mission is just getting to the objective. What are the engagement criteria (rules of engagement [ROE]) while moving to the objective? Are our battle drills detailed enough and rehearsed so that our unit can respond quickly to a fluid situation? What are the disengagement criteria? And once we get to the COP, what measures do we need to take to secure ourselves while we're constructing the COP? What is the main threat to the Soldiers at the COP? Better yet, out of the seven forms of contact, which ones are most likely to be used by the enemy? Do we use sniper screens? What about the entry control point? The whole idea behind a COP is that it's a secure place close to the civilian population that our maneuver brothers can use to launch continuous, 24-hour counterinsurgency (COIN) operations without having to go all the way back to a base camp to reset. It's a castle in the countryside that demonstrates to the people that the government cares about its citizens and is willing to provide a secure and productive environment that will improve the quality of life. The castle was the precursor of today's cities. A thousand years ago, people lived near the castle to either work on the construction of the castle or provide supplies to its inhabitants. It provided a secure area that fostered trade.

(Continued on page 33)

Show The Way

Chief Warrant Officer Five Robert K. Lamphear
Regimental Chief Warrant Officer



I recently had an opportunity to attend the annual Maneuver Support Center of Excellence (MSCoE) Retention Awards Ceremony at the Pershing Community Center here on Fort Leonard Wood. What a great event! Many outstanding recruiters and career counselors were recognized for an array of accomplishments, including the Career Counselor and Retention Noncommissioned Officer (NCO) of the Year awards. As I looked around the room, I noticed that I was the only warrant officer in attendance. Now I must admit that being the only warrant officer at an event is not uncommon; however, being the only one at a retention awards ceremony got the rusty wheels spinning in my head. What is the role of the Army warrant officer in the Commander's Retention Program? Is there one? Or do we leave that to the NCOs and officers to handle once we pin on the warrant officer rank?

The more I thought about these questions, the more convinced I became that warrant officers can and should play a huge role in the Commander's Retention Program. Many warrant officers were career counselors or recruiters as NCOs and certainly have retained the skills necessary to speak with and mentor young engineer Soldiers and NCOs on the virtues of staying in the Army. The good news is that warrant officers are playing an important—although often a supporting—role in the success of the program. On a personal note, I reenlisted for six years back in 1986, largely due to the influence of a "Quiet Professional," CW4 Marvin Humble.

For those of you serving as "Quiet Professionals," keep up the good work. If you are not involved in the Commander's Retention Program, get involved. Talk with your Soldiers about their career plans—not just once, but many times—over a period of time. Nothing says you care for Soldiers' well-being more than giving your time to them. The retention rates across the Army are excellent, and here at Fort Leonard Wood, retention rates for all the major commands were more than 100 percent for the past fiscal year.

What's ahead? The Army has lowered this year's retention goals, and some Soldiers may not have the opportunity to reenlist. Be part of the process, and help identify quality and technically competent Solders to continue to serve in this great Army and Regiment. To quote Major General David Quantock, MSCoE and Fort Leonard Wood commanding general, "It is always about quality, and never about numbers." Do your part to discover the quality Soldier the commanding general refers to and the Army needs.

On another note, engineer warrant officers continue to do great things across our Regiment. There's a great article in the May–August 2010 *Engineer Professional Bulletin* titled "The Theater Engineer Construction Battalion: General Engineering in Support of the Warfighter" by LTC Adam S. Roth, outlining the recent deployment of his unit as the theater construction battalion in Iraq. I was struck by the positive comments made by LTC Roth on the outstanding performance of his three construction warrant officers. The roles they played in the construction effort certainly contributed to the success of the task force. This is huge, since the integration of Construction Engineering Technicians into vertical platoons is still in its infancy in some units. The success or failure of the engineer warrant officer program is in your hands. Keep up the great work.

I'd also like to report an example of community service by engineer warrant officers. Recently, CW2 Ryan Ward and members of the 120A Warrant Officer Basic Course 02-10 traveled on their own time to Jefferson City, the Missouri state capital and site of the Missouri Veteran's Memorial, to provide some extra care to the state-maintained memorial as the class's community project.

There are literally hundreds of stories like this across our Army and Regiment. Thank you—you are making a difference!

Finally, just as the Army's retention program is about quality versus quantity, so too is the Regiment's warrant officer accessions mission. We are looking for outstanding NCOs who possess a sustained and demonstrated level of technical and leadership competency as supported by rater and senior rater comments on Noncommissioned Officer Evaluation Reports (NCOERs). For more information about how to become an engineer warrant officer, log on to the Army recruiting website at <*http://www.usarec.army.mil/hq/warrant*>.

Until next time, stay safe. Essayons!



ARMY ENGINEER DIVERS:
FIRST IN PORT-AU-PRINCE HARBOR

U.S. Navy photo

By Captain Scott Sann, Captain Jerry M. Hallman, and Dr. David J. Ulbrich

A massive earthquake measuring 7.0 on the moment magnitude scale shook Port-au-Prince in Haiti on 12 January 2010. Physical damage and loss of life reached cataclysmic proportions, with at least 200,000 Haitians dead, 250,000 injured, 500,000 homeless, and 300,000 buildings destroyed or condemned. The quake also closed Baie de Port-au-Prince and ruined its main pier and quay, leaving large sections submerged or damaged and severely degrading the ability to offload desperately needed supplies (Figure 1, page 8).

On the same day, the United States Army 544th Engineer Dive Team was aboard the auxiliary rescue and salvage United States Naval Ship (USNS) *Grasp* (T-ARS-51) on a training exercise with Belizean and Guatemalan forces in South America. Shortly after the quake hit, United States Southern Command (SOUTHCOM) diverted the USNS *Grasp* and the 544th to Port-au-Prince. Once there, the Army divers' tasks were to assess the damage to harbor facilities and then attempt to reopen the port for incoming humanitarian relief. The 544th was the first dive element to arrive on the scene in Operation Unified Response—the U.S. military's response to the earthquake. The unit came under the control of Combined Task Group 42.1, as part of Joint Task Force Haiti. This article tells the Army engineer divers' story from 18 January to 31 March, and it analyzes the lessons learned from what would become one of the most ambitious dive operations in recent Army history.

In addition to helping assure mobility of troops and equipment, and according to Field Manual 3-34.280, *Engineer Diving Operations*, "Engineers provide support to general engineering operations in and around the water." To accomplish the latter mission in Haiti, 544th divers performed many key tasks subsequently listed in the manual: hydrographic surveying, planning, inspecting, clearing, repairing, constructing, rehabilitating, and opening ports.

Phases of Operation

Efforts of the 544th could be divided into three distinct phases during 10 weeks of Operation Unified Response. Phase I entailed making assessments of damage to several harbor facilities. Phase II included more complex assessments, as well as preparing the pier for rehabilitation, delegating tasks, and creating timelines. In Phase III, the Army divers worked jointly with United States Navy elements to repair the pier's piles and thus rehabilitate the pier. Throughout all three phases, Army divers used a wide spectrum of surveying, salvage, and construction capabilities, while Navy divers brought specific knowledge about particular aspects of salvage and construction operations. The Army divers initially worked with the Navy's Mobile Diving and Salvage Unit 2 (MDSU 2) and later with the Navy's Underwater Construction Team 1 (UCT 1).

Phase I: Level I Assessment (18 to 23 January)

After taking on extra supplies at Guantanamo Bay on 15 January, the USNS *Grasp* debarked for Port-au-Prince, arriving on the morning of 18 January. Everyone in the 544th realized the seriousness of the situation after seeing a Haitian corpse floating in the ocean about 10 miles from

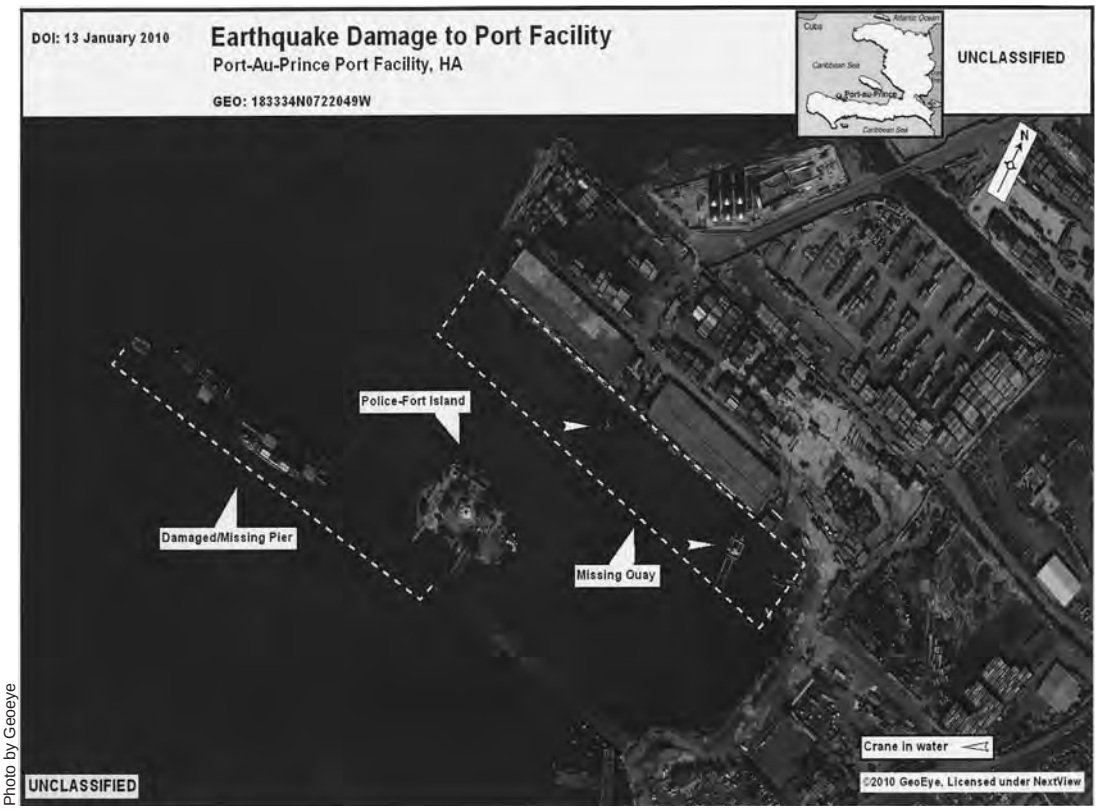


Figure 1. Satellite image of Haiti's Port-au-Prince harbor

the harbor. It was then that Army divers realized they were the first responders to this natural disaster.

Once anchored in the harbor, the 544th found no existing infrastructure and no command and control (C2) node. Without waiting for C2 to be established, the divers started conducting triage-style Level 1 Assessments of all affected port facilities. They made visual inspections and photographed the north quay wall and the south pier. They logged several hours of "bottom time"—time from when a diver leaves the surface of the water until he begins ascent back to the surface. Their inspections of the piles and bents supporting the southern pier revealed extensive damage. Concurrently with the Level 1 Assessment, they made hydrographic surveys to determine the harbor's contour lines of depth (using sonar) and location (using the Global Positioning System [GPS]).

MDSU 2 divers worked to locate submerged hazards north of the pier. Thereafter, the Navy's fleet survey team marked off clear channels with buoys to aid that landing craft, utility/landing craft mechanized (LCU/LCM) in offloading of supplies—albeit in relatively small amounts—directly onto the beach as part of joint logistics over-the-shore (JLOTS) operations.

The 544th divers submitted their Level 1 Assessment to the Naval Facilities Engineering Command (NAVFAC) engineer for analysis and guidance regarding subsequent activities. The 50-foot-wide by 1,000-foot-long north quay wall was damaged beyond repair, because so much of that wall crumbled or collapsed into the water. Although a 400-foot-long span of the south pier completely disintegrated during the earthquake without possibility of reconstruction, the south pier's 800-foot span remained standing and could be rehabilitated. No substantive repairs, however, could begin until salvage equipment and an underwater hydraulic tool package arrived from the 544th's home post of Fort Eustis, Virginia.

Early in the morning of 20 January, the first of several setbacks occurred when a 6.1 tremor hit Port-au-Prince. This caused divers to postpone repairs to the southern pier until the aftershock's effects were known. The NAVFAC engineer and the divers conducted a reassessment and found that the tremor caused no significant damage. Meanwhile, UCT 1 helped coordinate reception, staging, onward movement, and integration (RSOI) because additional equipment and personnel arrived in the harbor every day.

Phase II: Level 2 Assessment and Preparations (24 to 30 January)

On 24 January, the completion of Combined Task Group 42.1's laydown area in the Port-au-Prince main terminal established a C2 node for the entire operation. Beginning that same day, Army divers made a Level 2 Assessment, which more comprehensively surveyed the structural integrity of the pier. They also consulted with the NAVFAC engineers on how best to strengthen the 800 feet of the south pier still above water. No less than 39 bents (each with 6 piles) needed either minor repairs or complete replacement. The pier was supported by several dozen bents reaching along the length of the pier to the harbor floor.

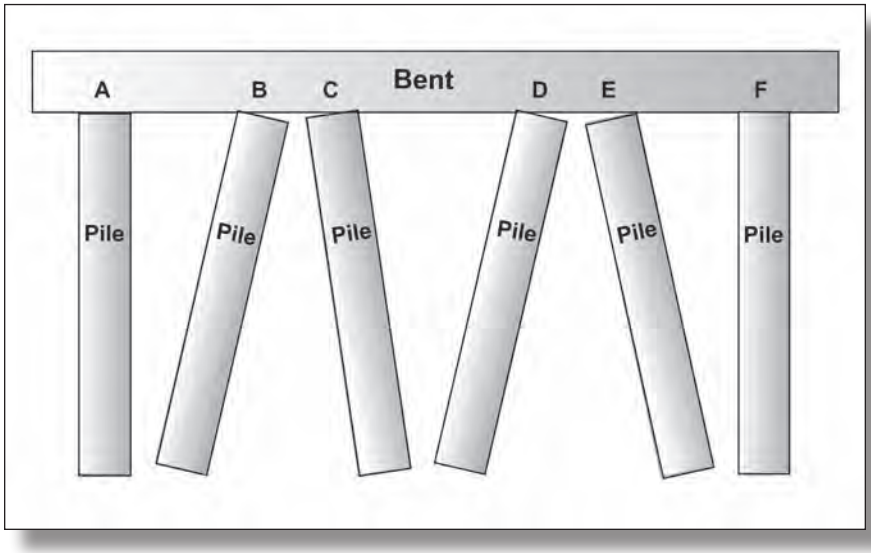


Figure 2. Diagram of bent/piles before earthquake

Each of these bents consisted of 6 piles in a row across the width of the pier. The 2 outermost piles stood vertically at 90-degree angles, while the 4 inner piles alternated at steep angles (Figure 2).

Throughout Phase II, divers from UCT 1 and the 544th painted marks on the top side of the south pier, identifying the degree of damage and the corresponding repairs. The Army divers then used hammers and chisels to clear marine life and loose materials from the south pier's piles. Though tedious, cleaning all 234 piles (of the 39 bents) took several divers only 2 or 3 days. The preparatory work would ensure that pile caps could be added quickly when the Phase III started.

On many days, the divers encountered a serious problem—poor visibility, sometimes as low as 2 feet—due to the debris and filth in the water. Limited visibility was one of several environmental challenges for the 544th, who experienced some of the worst imaginable diving conditions in Port-au-Prince harbor. Petroleum floated on top of the water, and numerous marine hazards like jellyfish, human waste, and debris floated beneath the surface. Adding to the perilous conditions, crews on Haitian tugboats routinely discharged their septic tanks into the harbor. Brown clouds of refuse could be seen moving from the tugboats under the pier to where the Army and Navy divers were working. Making the situation more dangerous, the high water temperatures caused heat casualties among the divers.

Phase III: Repairs and Rehabilitation (31 January and 27 March)

With the assessments and other shaping actions completed, the 544th spent part of 31 January resting and part of it determining the composition of dive teams, while prioritizing tasks to streamline work flow. Some piles retained partial structural contact with the pier above, and thus small gaps could be easily and quickly reinforced by filling them with grout spread by divers using hand trowels. However, most piles in most bents were sheared completely away from the pier above, requiring complete reconstruction to the upper portions of the piles (see photo below). Rehabilitation work on the south pier began on 1 February and lasted for the next 7 weeks. A multistep process developed over time, in which the 17 Army and 7 Navy divers worked together closely and effectively.

Once repairs began, divers of the 544th, wearing wet suits and masks, drilled about a dozen vertical holes for the 2 outermost vertical piles and another dozen diagonal holes for the 4 inner piles on each bent. They drilled holes for 3 bents (18 piles) per day, so the entire drilling operation took about 2 weeks. This exhausting task required 2 divers for each 45-pound hydraulic drill, alternating their drilling every few minutes into the pier above. Other divers in scuba gear remained nearby to retrieve any



U.S. Navy photo

Divers found many severely damaged piles like this one.



U.S. Navy photo

This prefabricated wooden form was emplaced around a rebar cage at the top of damaged piles to hold concrete until it cured. This created the pile caps reinforcing the structure.

dropped tools in the 20-foot-deep water, to assist if any accidents occurred, and to emplace friction clamps on which the divers stood while operating the drills.

Once holes were drilled, another set of divers injected epoxy into the holes and inserted 6-gauge rebar, which extended downward and overlapped with the tops of the piles below. Next, the divers wrapped 3-gauge rebar horizontally around the vertical rebar to create a cage that would give strength to the pile once the concrete was poured. This step was completed in a few minutes for each pile. Last, a prefabricated wooden form was emplaced around each cage on the piles, and concrete was pumped into the form. After 24 hours, the concrete had sufficiently cured, connecting the new pile to the cap above. The wooden form could then be removed and used again on other piles and bents. The process of pumping the concrete was by far the most time-consuming, because it required half a workday for each bent.

Meanwhile, divers operating the drills moved on to the next bents and began the incremental process again—as long as the equipment continued to function and the weather continued to be favorable. The 544th and UCT 1 divers continued drilling holes, emplacing rebar, attaching forms, pumping concrete, and removing forms for all the severely damaged bents. The last bent was completed on 24 March after about 7 weeks of work. At that time, NAVFAC engineers evaluated the structural strength of the south pier, and they determined its load capacity to be 500 pounds per square foot, as opposed to the pre-earthquake load capacity of 750 pounds per square foot. On 27 March, when the south pier was fully able to receive offloaded humanitarian supplies along its 800-foot span, the 544th Engineer Dive Team secured its equipment and departed for Fort Eustis.

Problems Faced—Solutions Found

As the 544th's situation report for 9 February states, "Good rhythm [was] established on the dive side between UCT and Army crews; pace should start picking up now that concrete form templates have been established. Pile preparation continues ahead of schedule." (See photo, page 11.) However, good rhythm was maintained only as long as equipment functioned, weather cooperated, and the logistical system kept pace. The realities of the operational environment in Port-au-Prince harbor stretched the capabilities of the 544th Engineer Dive Team, UCT 1, and the crew on the USNS *Grasp*.

With no infrastructure in Haiti, the 544th was left to maintain work timelines with only resources immediately onboard the USNS *Grasp* or what was transported in by the Army or Navy. The lag time for bringing supplies to Haiti stood as one of the most vexing challenges. To reduce bottlenecks, the 569th Engineer Dive Detachment Headquarters and the 6th Transportation Battalion S-4 at Fort Eustis allotted funds for unexpected expenses and tracked maintenance on equipment. The 569th and the 6th also shuttled supplies to Navy ports of debarkation and piggybacked on the Navy's logistics system. UCT 1 controlled the flow of resources through the Navy's tracking process and procurement path that ran from Florida, a shorter transit than from Fort Eustis.

The 544th and UCT 1 required a constant influx of replacement equipment, spare parts, and other materials because of failures and malfunctions in the harsh conditions of Port-au-Prince harbor. No doctrine had been written to outline how to maintain continuous dive operations in this austere environment. For instance, when one hydraulic

drill broke down, its parts were cannibalized to keep another "Frankenstein" drill functioning. The 544th eventually used every hydraulic drill in the dive teams' inventories at Fort Eustis. Other equipment also failed from wear or damage and needed to be replaced. Malfunctions or breakdowns frequently interrupted the entire rehabilitation process. They required stopgap solutions on-site, or delays until new equipment or additional spare parts could be procured from Guantanamo Bay or the continental United States.

One of the stopgap solutions illustrated the flexibility and ingenuity of the 544th, UCT 1, and their support personnel. The hose filling the wooden forms with concrete-aggregate mixture clogged on 15 February—only its second day in use. The dried and caked aggregate in the hose needed to be chipped away by hand, causing an unacceptable single point of failure. Either this chipping would slow progress for hours each day, or procuring a new hose would take several more days, and the clogs might reoccur. Neither option was practical. As a way of reducing the number and severity of clogs, it was decided that no aggregate would be added to the concrete; therefore, the hose did not clog anymore. This solution, according to the NAVFAC engineer, actually strengthened the pour, which stood at 12,000 pounds per square inch for pure cement. The only downside to this solution was the subsequent requirement for more concrete to be ordered. Countless other on-site fixes demonstrated knowledge and expertise of the 544th, UCT 1, the NAVFAC engineers, and the carpenters and mechanics working in the staging area and on the USNS *Grasp*. They fabricated or cannibalized whatever was needed with material on hand until long-term solutions could be realized.

Apart from logistical challenges, numerous environmental problems frequently stalled progress. Every time it rained, the already filthy water became almost impossible to work in because refuse washed off the mainland into the harbor. Waste from tugboats and sewage from the mainland compounded ecological hazards. The only alternative for the Army and Navy divers came in initiating preventive measures—including constantly testing the water's toxicity, monitoring divers' vital statistics, and giving regular doses of antibiotics. No diver with an open wound was allowed in the water. Even with these precautions, one diver developed a rash and was sent to the hospital ship USNS *Comfort* for observation and treatment. Because these hazardous conditions made entering the water daily a mental challenge, the Army and Navy divers should be commended for making their dives without complaints, doing their duty, and completing the mission.

Lessons Learned

Many lessons can be learned from the dive activities in Operation Unified Response. First, equipment breakage or extreme wear slowed the 544th Engineer Dive Team's best efforts to rehabilitate the pier in Port-au-Prince harbor. In the future, Army dive units can avoid or minimize delays by maintaining severe redundancy of equipment and spare parts on the construction sites. In fact, having three or four extra pieces of "no-fail" equipment—the drills and the concrete-pumping equipment, in the case of Haiti—could be particularly critical to reducing lag times in waiting for fabrication, repair, or procurement.

Second, whereas dive-qualified Navy corpsmen served in MDSU 2 and UCT 1, the 544th's Army medic had neither completed the diving course at the Naval Diving Salvage and Training Center nor received certification as a dive medical technician (DMT). While competent in treatment techniques for land operations, that Army medic was not prepared for injuries or complications dealing with respiration or decompression that are unique to underwater operations. In these cases, the 544th needed to rely on the Navy's medical assets. The Soldiers in the 544th thus realized that an Army dive team should add a qualified DMT to its table of organization and equipment (TOE). This would make specialized medical treatment intrinsic to an Army dive team and thereby increase the autonomous functionality of the team.

Third, the experiences in Haiti taught the Soldiers in the 544th that no Army or Navy dive unit can do everything independently in such a complicated operation. To improve effectiveness, joint training exercises between Army divers at Fort Eustis and Navy divers at Norfolk, Virginia, should extend long after Dive School and entail as



U.S. Navy photo

Using a prefabricated wooden form, divers constructed pile caps to reinforce the connection between the piles and the pier.

wide a spectrum of operational scenarios as possible. Merchant Mariners should participate in these joint training exercises to facilitate better communication and coordination between divers and their shipboard support. Likewise, bureaucratic snags—such as the Navy divers not being authorized to use the Army's Extreme Light Dive System—should be resolved in home ports by thoroughly cross-training and completely cross-certifying divers. Consequently, each Service's divers would become more familiar with the other divers' capabilities, equipment, and command structures. These actions would pay dividends in the future when natural disasters occur or humanitarian operations are undertaken. Joint dive operations would never again need to start at the zero-square as they did in Haiti. Increasing joint training exercises is not a recommendation offered only by the authors of this article; one Navy officer from MDSU 2 expressed the same desire to start scheduling Army–Navy dive exercises.

Fourth, rehabilitating the pier in Haiti pointed to the significance of one of the Army divers' key missions. Personnel need to be able to execute port opening and harbor clearance. It matters little if their deployment is in a combat operation or a humanitarian operation; either way, Army divers must be able to give commanders accurate surveys of what is beneath the water's surface and make timely repairs to underwater structures. By maintaining proficiency in these mission-essential tasks, divers help assure mobility and enhance sustainment.

Last, from a rear-detachment commander's perspective, communication and coordination posed the greatest challenges. Communication was extremely difficult at times and was best achieved via e-mail. However, using e-mail created as much as a full day of lag time in sending and receiving messages. Coordinating shipment of goods to earthquake-ravaged Haiti proved no easy task because of the complete lack of logistical infrastructure there. The U.S. military has initiatives in the disaster-response arena that are being designed to pull talent from across the armed services. Ensuring that Army engineer divers are integrated into these initiatives will be a key to success in future disaster-response missions using their diving assets.

Conclusion

Despite many setbacks, the 544th Engineer Dive Team achieved its goal of rehabilitating the south pier in Port-au-Prince harbor and opening it for large vessels offloading great quantities of aid into Haiti. Each of the seventeen divers in the 544th logged at least 350 hours of bottom time over their 10-week deployment in Operation Unified Response. As tangible recognition for their efforts, the Soldiers received two Navy Commendation Medals, four Navy Achievement Medals, five Army Commendation Medals, and six Army Achievement Medals. Each member likewise received the Humanitarian Service Medal as part of Operation Unified Response.



Captain Sann commanded the 544th Engineer Dive Team from December 2009 until its return from Haiti in April 2010. He has completed the Marine Engineer Dive Officer Course, the Sapper Leader Course, Airborne School, Air Assault School, and the Engineer Captains Career course. He holds a bachelor's in integrative biology from the University of California in Berkeley.

Captain Hallman is the commanding officer of the 569th and 74th Engineer Dive Detachments at Joint Base Langley-Eustis, Virginia. He has completed the Primary Leadership Development Course, the Basic Noncommissioned Officer Course, Engineer Officer Basic Course, Engineer Captains Career Course, Czech and Slovak Basic Courses at the Defense Language Institute, Basic Diving Officer Course, Salvage Diver Course, Construction Demolition Diver Course, Instructor Training Course, and the Systems Approach to Training Course. He holds a bachelor's in business administration from Old Dominion University in Norfolk, Virginia, and a master's in geological engineering from the Missouri University of Science and Technology in Rolla, Missouri.

Dr. Ulbrich is a historian at the United States Army Engineer School (USAES), Fort Leonard Wood, Missouri. He received his doctorate in history at Temple University. Before assuming his duties at the Engineer School in 2009, Dr. Ulbrich served as codirector of the Cantigny First Division Oral History Project, which is Web-streamed by Ohio University at <http://media.library.ohiou.edu/cantigny/>.

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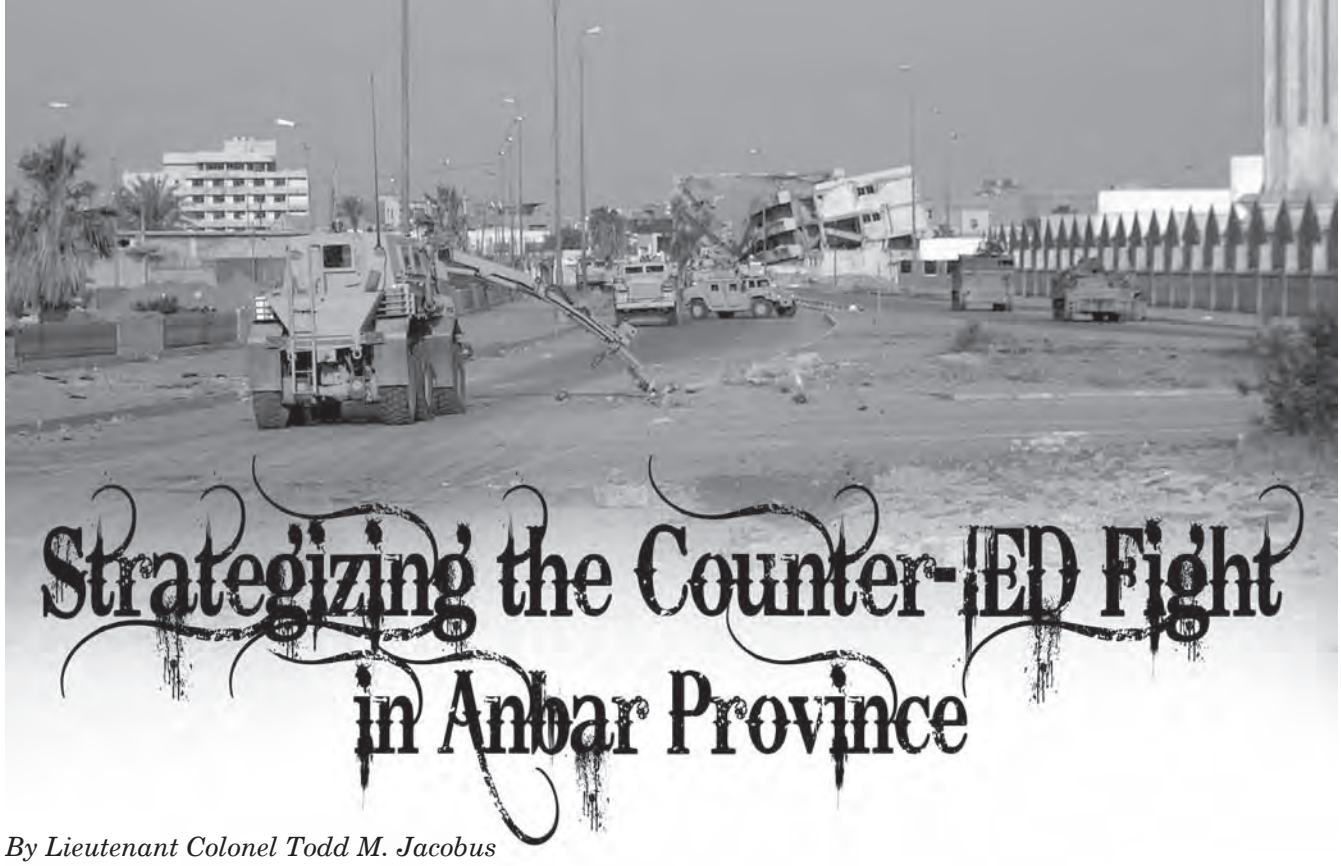
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Strategizing the Counter-IED Fight in Anbar Province

By Lieutenant Colonel Todd M. Jacobus

Early in 2005, Iraq was preparing for the first of three elections. While Kurds in the north and Shiites in the south rejoiced at the opportunity to vote for the Iraqi National Assembly, the Sunnis of Anbar Province were not so positive. They saw this vote as the initial step toward their loss of influence. There was a robust insurgent presence in the province, estimated at 12,000 to 20,000 strong. They based their campaign against the coalition in the urban areas of Ramadi, Haditha, Anah, and Al Qaim, and there was a consistent increase in the number of U.S. forces killed by improvised explosive devices (IEDs).

After supporting the 1st Marine Division (MarDiv) and 11th Marine Expeditionary Unit (MEU) during the election in Najaf in January 2005, the 224th Engineer Battalion, Iowa Army National Guard, relocated to Ramadi to conduct a relief in place of the 2d Battalion, 11th Marine Regiment, accepting responsibility for five convoy security escort teams. Augmented with a United States Marine Corps company, the battalion's mission was to reduce the 70 percent success rate of IED attacks against coalition forces in Anbar. Route clearance, or mobility operations, would become the 224th's main effort throughout the deployment.



A Buffalo arm investigates an IED buried on the shoulder of a road.

The area of operation (AO) was about the size of North Carolina, including a 200-mile road network that stretched from the western outskirts of Baghdad to the eastern borders at Jordan and Syria and a dozen cities of significant size. Many of the cities had a strong insurgent presence. The 224th had also replaced the 153d Engineer Battalion and immediately began receiving additional route clearance equipment. The situation in Anbar had gotten significantly worse over the previous four months, and IEDs were without question the preferred weapon of Al Qaeda. Upon transfer of authority, the 224th had only one route clearance team, headquartered in Habbaniyah, to counter the IED fight. But within six weeks, the unit had fielded two "visual" teams (which operated in rural areas) and two "mechanical" teams (which operated in urban areas).

Using Engineer Resources

While there was a 400 percent increase in engineer equipment in Anbar between 2004 and 2005, there was an even more urgent and persistent need for these precious resources throughout Anbar Province during the deployment of the 224th. Initially, engineer resources were pushed to locations where IEDs were found more frequently. While this strategy allowed commanders who had suffered recent attacks to verify that routes in their areas of responsibility (AORs) were cleared, it was a reactionary strategy. It was the responsibility of engineers to design and recommend a strategy that would make the best use of their limited resources and capitalize on their capabilities. The battalion's intelligence officer was an industrial engineer who managed a paper company in civilian life.[1] He considered the enemy's tactics, analyzed the impact they had on coalition forces, and implemented a strategy based on his civilian Lean Six Sigma® training. He pulled from Multinational Corps–Iraq and 2d MarDiv databases all IED-related activities in the Multinational Forces–West (MNF–W) AO for analysis with the division and II Marine Expeditionary Force (MEF) staffs. The aim was to determine where the enemy was having the most success with IEDs—which routes had the largest quantity, the most density, and the highest success rate against U.S. personnel and destroying U.S. equipment.

Route analysis of MNF–W provided the five most dangerous routes in Anbar Province:

- Alternate Supply Route (ASR) Michigan *(Ramadi to Abu Ghurayb)*
- Main Supply Route (MSR) Mobile *(Ramadi to Ar Rutbah)*
- MSR Mobile *(Ramadi to Abu Ghurayb)*
- ASR Tin *(Haditha to Al Qaim)*
- ASR Uranium–MSR Mobile *(Ramadi to Haditha)*

While it was important to maintain open lines of communication by clearing MSRs and ASRs, it was equally important in the fight against Al Qaeda to provide freedom of maneuver throughout MNF–W. Analysis of the same data determined which city had the most IEDs and land mines, which city had the highest density of IEDs and land mines, which city had the lowest IED "find" rate, and which city had the highest rate of insurgency success against U.S. forces and equipment through the use of IEDs and land mines. The answers to these questions led to recommendations to the 2d MarDiv on urban route clearance support. Not surprisingly, the most dangerous urban areas were Al Qaim, Ramadi, Fallujah, Haditha, and Hit. After identifying these hot spots, the same data helped determine where to focus U.S. engineer resources.

Anbar Province AORs

While route clearance recommendations were made to the 2d MarDiv operations, plans, and training (G-3) staff, the brigade and regimental command teams in MNF–W also requested 224th route clearance resources—known as Task Force Ironhawk—through the division G-3. The 2d MarDiv operated with three maneuver brigades, including the 2d Brigade Combat Team, 2d Infantry Division (Ramadi–AO Topeka); Regimental Combat Team 2 (Al Asad–AO Denver), and Regimental Combat Team 8 (Fallujah–AO Raleigh). In addition, the 155th Brigade Combat Team, Mississippi Army National Guard, attached to the II MEF, also was allowed to request Task



A "mechanical" route clearance team operates on MSR Mobile in Anbar Province.



A 224th Engineer Battalion officer gives a briefing at Fort Hood in 2004.

Force Ironhawk support throughout the MEF. Commanders of all these units asked for engineer support with great frequency. The 2d MarDiv commanding general made the final approval on who received which resources.

Urban Route Clearance in Ramadi

The fight inside the city of Ramadi (AO Topeka) was the 2d MarDiv's main effort and included the most intense insurgent activity in the province. Al Qaeda blended in with the local population and enjoyed freedom of maneuver throughout the city, resulting in the most challenging urban route clearance fight in recent history. While Task Force Ironhawk consistently operated in a number of cities, it had at least one route clearance team supporting AO Topeka at all times. As with Anbar Province as a whole, data on IED strikes were analyzed; it was determined whether routes would best be cleared by mechanical or visual means; and recommendations were made to the brigade on which routes should be cleared. The maneuver commanders could weigh in with their mission requirements that needed route clearance support, and sometimes their needs resulted in a change of mission for route clearance teams. All areas of the city were dangerous, but certain routes—such as the main thoroughfare across the city and several routes in central Ramadi—were covered routinely. As a rule, leaders tried to lock in plans several days in advance in order to provide plenty of time for preparations.

A major problem was that with a population of approximately 500,000, Ramadi was a perfect destination for insurgents who were fortunate enough to get out of Fallujah alive. It was quite easy for them to blend in with the local population and continue their fight against the coalition through irregular warfare. Due to violence in the area, many factories closed, including the glass factory that was the largest employer in the province. As a result, the unemployment rate skyrocketed, and many young men were looking for ways to support their families. In 2005, members of Al Qaeda could maneuver throughout the city virtually at their discretion. Along with this freedom of maneuver came the opportunity to threaten, coerce, and influence the local populace and to emplace complex subsurface IEDs, with devastating effects.

The tactical fight in Ramadi lacked the continuous kinetic nature that resulted in the demise of thousands of insurgents in Fallujah; this was a battle against an enemy with no face. U.S. combat engineers cleared the same routes each night to open up the lines of communication throughout the city in order to allow freedom of maneuver to Soldiers and Marines of the 2d BCT. This urban route clearance effort was incredibly frustrating for the engineers, since frequently they would clear a route and remove an IED, then proof the route a few hours later, only to find another IED in the same hole. While it was frustrating work, it was also necessary work; if the insurgents had the will to emplace IEDs, then the engineers needed to match that will with the effort to quickly locate and remove them. U.S. combat engineers performed magnificently at this task.

Evolution of IED Initiation Systems

Technology played a significant role in the counter-improvised explosive device (C-IED) fight, and the division and battalion information management resources were integrally involved in the incorporation of frequency technology into the tactical fight. Initially, insurgents in Ramadi used command-detonated initiation systems, which used signals from key fobs, garage door openers, toy remote-control units, and two-way radios. Engineers counteracted this signal using IED countermeasure equipment that jammed the signals intended to detonate the device. As U.S. forces became more proficient at locating

IEDs and preventing their detonation, the insurgents transitioned to using long-range cordless telephones, which had a much more powerful signal, to initiate detonations. U.S. forces countered by using a stronger jamming signal. The C-IED fight escalated and the insurgents transitioned to using pressure-activated and passive/active infrared initiating systems, which are as easily activated by innocent civilians as they are by coalition forces. This tactic began to telegraph to the local population the "win by all means, at all costs" philosophy of Al Qaeda, who explain away the injury and death of innocent civilians as "the will of God."

Going After the Emplacer

Targeting the IED itself was not resolving the bigger problem. To truly engage the problem at a higher level, it was necessary to get inside the decision-making process of the individuals who emplaced the IEDs. Specifically, answers were needed to three questions:

- Where was the enemy?
- When would he be there?
- How could he be attacked?

Information from an existing database helped to locate the enemy and plot his locations on a map by using commercial off-the-shelf (COTS) software. It was a bit more challenging to determine when he would be at each location. Using another COTS system, the amount of time between attacks and finds at each location was calculated. The IED emplacers had a system: they located a place and time when they could safely drop off the components and set up an IED. Once the IED detonated, they would go back and reseed the same general location with another IED at the same time of day. Once the location and reseed time were identified, it could be determined which areas were likely to be reseeded soon. This became part of the battalion's information exchange with the maneuver commanders, who in turn pushed this data out to their respective task forces as actionable intelligence against which they could direct combat power. This engineer effort allowed the commanders to implement their skills and military art in taking out the IED emplacers, a mission that was accomplished with great success across Anbar Province—particularly in Ramadi—as 2005 progressed. Engineers who followed in the route clearance effort, including the 54th and 321st Engineer Battalions, built on this effort.

The enemy in Anbar Province was influenced by human nature, which meant that he found and frequented favorite spots to emplace IEDs. While some of these spots merited continuous clearance operations, others did not. The 244th had a tool to help it focus on where the enemy would be and when he would be there. Human nature led him back to locations where he'd had success, until he was either interdicted (which we controlled) or until he changed his mind (which he controlled). For an enemy that was hard to see, we had an opportunity to meet him by following him to his favorite locations, watching his patterns through collected data, and calculating when we would have our meeting. The C-IED fight was challenging, dangerous, and frustrating, but determined combat engineers—armed with the tools and intelligence of the battalion, brigade, and division staffs—succeeded in turning the trend established in October 2004, when 70 percent of IEDs were located when they successfully detonated on a vehicle. By December 2005, more than 70 percent of the IEDs in the province were located by mechanical or visual means and only 30 percent were successful in engaging targets. While the commanding general's objective was achieved, this was but the first step of a long campaign.



Leaders of the 1st and 2d Marine Divisions pose during their transfer of authority conference.

News of the 224th Engineer Battalion's use of COTS software to analyze data from existing databases arrived at the Joint IED Defeat Task Force in midsummer 2005, and the task force commander visited the 224th in Ramadi. After participating in a route clearance mission there, using the battalion S-2's projection tools and operating picture, he said that the S-2 section provided more real-time, usable, and actionable intelligence than any other S-2 section he had ever seen. An overview of the process was briefed for the staffs of the 101st Airborne and 3d Infantry Divisions, the 130th Engineer Brigade, and other organizations.

(Continued on page 19)

21st Century Battle Command Training Is "InField Practice"

By Mr. Joshua L. Hutchison

Information technologies have permeated every echelon of today's United States Army formations. This reality requires a persistent and reliable training methodology on which to build. In 2003, the Army established the concept of the Battle Command Training Center (BCTC). Today, more than thirty BCTCs have established training programs to meet the digital training needs of Army customers. These home station facilities are organized to provide on-demand training via battle command systems, simulations, virtual trainers, and gaming systems.

Anyone who has ever participated in team sports understands the basic tenets of battle command training. Individual skills development and repetitive and specific situational drills comprise the foundation for success. Baseball is fundamentally a team sport, yet it relies on the skill and knowledge of individual players who work to sharpen specific fundamental skills—throwing, catching, fielding the ball, batting, and running. Players then train in team drills to develop an understanding of the game strategy, situational awareness, and precise knowledge of what to do when the ball is hit to them or to someone else; for example, when should they force? When should they tag? Collective drills, such as infield and outfield practice—as well as situational scrimmages—ensure teamwork based on solid individual player skills. Specificity and repetition are the keys to making those game-winning, split-second decisions. On game day, the team will be confident and ready to play their game.

Today's battle command atmosphere within a digital tactical operations center (TOC) can be very much like baseball. A decision will be made in a split second, and execution of the play will decide the game. Decisions in battle have the same sort of split-second timing. Winning in battle saves lives and can change the course of history. The individual operators of battle command systems—such as Blue Force Tracker (BFT), Command Post of the Future (CPOF), and the Advanced Field Artillery Tactical Data System (AFATDS)—are the shortstop, second baseman, and first baseman. The TOC battle drills and unit staff processes/reporting are the team play expectations. Operators must train using specificity and repetition in responding to the ever-changing battle as directed by the TOC staff/team.



Photo by CC Lopez

A brigade staff hones battle command systems skills and validates staff processes during a multiechelon CPX in the Fort Bragg BCTC Brigade RTOC.



Photo by CC Lopez

A platoon element executes small-unit and convoy tactics training in the Fort Bragg BCTC gaming facility.

Operators possessing solid individual skills and TOC staffs/teams must understand what to expect as "the ball is hit." Battle command, just like baseball, is a collective effort in which winning happens often in the myriad of split-second "plays" executed by staffs who have honed their individual and team skills—which are only achieved through specific drills repeated frequently.

The XVIII Airborne Corps BCTC system includes a hub at Fort Bragg, North Carolina, and spokes at Fort Campbell, Kentucky; Fort Drum, New York; Fort Polk, Louisiana; and Fort Stewart, Georgia. The center understands today's battle command environment and has developed a home-station training solution to support individual Soldiers, teams, unit staffs, and commanders. The BCTC Training Program (BTP) provides a battle command training system that uses specificity and repetition to build a core of fundamental skills on which battle staffs can build their teams and "game strategy." Staff teams have the opportunity to practice individual and collective tasks many times and with many different scenarios to learn how their split-second decisions affect the outcome of the "game" and how they win or lose battles based on their decisionmaking and their execution of "plays." In this environment, staffs have the opportunity to see a scenario run in a number of situations and can apply their battle drills to suit the specific situation at hand, using the fundamentals they learned as they worked their way through progressive training levels at the BCTC. The BTP solution bridges the gap in battle command training that has long existed between unit set fielding (USF) at fielding and mission rehearsal exercises (MRXs) prior to deployment.

The BTP consists of two types of progressive battle command training: the foundation and command post exercise (CPX). This simplified approach is agile enough to rapidly incorporate new technologies and offers training solutions that are flexible and scalable enough to support any type of unit or mission. The BTP is battle command-focused and allows Soldiers, teams, TOC staffs, and commanders to sharpen and sustain their individual and collective digital skills—by tailoring the training program to their specific needs and then affording them the opportunity to practice those skills in a realistic "game environment" on a frequent basis. The Vice Chief of Staff of the Army has emphasized that a "focused approach to training" yields "unit agility and versatility"—and the BCTC executes this mandate.

Building the foundation takes varying forms of training. Operator courses conducted in a classroom environment provide individual Soldiers competencies on current battle command capabilities. The TOC Staff Workshop may be likened to "TOC 101": Conducted in a reconfigurable tactical operations center (RTOC) environment, it is collective training that consists of fundamental digital staff/team skills and competencies. Small-unit gaming is collective training for platoons and below to practice specific tactics and mission rehearsals.

A CPX builds on the foundation. Through these progressive and iterative training events, the elements are afforded the opportunity to train within the Army's

long-established crawl-walk-run methodology. This is when "infield practice" occurs as staffs/teams work through standard battle drills, staff processes, and knowledge management practices. These tailored training events may be single or multiple echelons and are supported by the BCTC's unique set of training enabler capabilities, including the Joint Land Component Constructive Training Capability (JLCCTC), Battle Command Staff Trainer (BCST), and virtual and gaming systems—such as HUMINT (human intelligence) Control Cell (HCC) and Virtual Battlespace System 2 (VBS2™). An example of a highly integrated multiple echelon CPX may include a brigade TOC, several battalion TOCs, and several company command posts/company intelligence support teams (CoIST) executing their mission with a full complement of battle command technologies to provide communications and situational awareness—as well as a platoon or squad performing missions within a VBS2 scenario. These CPX solutions serve to guarantee success of staffs and teams in their culminating training event (CTE) and ultimately in their downrange mission.

The Army's evolving battle command training requirements are no different than the age-old individual and collective common task training (CTT)—the shortstop needs to know how to field the ball and what play to make, and the team must know what to expect. The BTP developed at the Fort Bragg BCTC provides the training solutions necessary to bridge the current gap in battle command training and serve as the home station nucleus of the Army's current live, virtual, constructive, and gaming (LVCG) and future integrated training environment (ITE) initiatives. BCTCs are poised to continue leading the way as the Army faces the daunting task of delivering relevant and realistic training for its ever-expanding "digital tool kit" in the 21st century.

It is "game time," the final phase of an operation: Two of three objectives have been achieved; the enemy is neutralized, and remaining threats are in retreat; a size, activity, location, and time (SALT) report on a possible vehicle-borne improvised explosive device (VBIED) is received via BFT; and this is a commander's critical intelligence requirement (CCIR). What does the operator do, and how does he do it? What is the battle drill, and how does the staff execute it? With fundamentals learned through specificity and repetition at a home station BCTC, the team will make the split-second decision, complete the play, and win.

Mr. Hutchison is the Chief of Collective Training at the Battle Command Training Center, Fort Bragg, North Carolina. He is an Operation Iraqi Freedom veteran and served eleven years in the United States Army. He holds a bachelor's in management from Park University.

More information about the XVIII Airborne Corps BCTC training program may be found at Army Knowledge Online (AKO), <*http://bit.ly/BCTC-on-AKO*>, and by visiting the BCTC on Facebook and Twitter.

("Counter-IED," continued from page 16)

Contributions of the Engineer Regiment

Much has been written about the transition of the people of Anbar Province from active support for the insurgency in late 2004 and 2005, to neutrality, to eventual support for the coalition. The insurgency was more focused on reinforcing anarchy and disrupting security and stability than it was concerned with the welfare of the people; certainly this contributed to its demise in the province. There were many factors contributing to the success of U.S. forces in this part of Iraq. One key was the investment of 4,000 combat troops during the surge, since it provided commanders with options and flexibility and demonstrated commitment to the citizens. Much of the credit goes to the sheiks, imams, and local mayors, who led the Sunni Awakening movement at great risk to themselves. In addition, it took the exhaustive efforts of the II MEF and its ground combat element, the 2d MarDiv, to endure what amounted to an economy-of-force strategy in the province during the violent years of 2005–2006.

On 1 September 2008, the commander of U.S. forces in Anbar Province formally handed control to the people, an event that symbolized the greatest defeat of Al Qaeda since the Taliban had been initially dislodged in Afghanistan. The Engineer Regiment's leaders, noncommissioned officers, and Soldiers played a critical role in the tactical fight that set the conditions for slow but steady progress, resulting in a secure and stable environment in the province. The Regiment used initiative, flexibility, and ingenuity to provide the commanders with freedom of maneuver in their AOs in an environment of persistent unrest. It should come as no surprise that the C-IED fight in Anbar Province was executed with all three components of the Engineer Regiment: the 224th is an Army National Guard battalion, the 54th is an Active Army battalion, and the 321st is a United States Army Reserve battalion. It's an honor to serve.

Lieutenant Colonel Jacobus was a United States Army War College Senior Service Fellow at the Fletcher School of Law and Diplomacy at Tufts University when this article was written. He is currently the officer in charge of the Iowa National Guard Installation Component. He has served as Commander, Iowa Army National Guard Recruiting and Retention Battalion, and Commander, 224th Engineer Battalion, Iowa Army National Guard, including a deployment to support Operation Iraqi Freedom, where the 224th served as the divisional engineer battalion for the First, then the Second, Marine Division. He holds a bachelor's from the University of Iowa and a master's in public administration from Drake University.

Battle Command Staff Training for Engineer Commands

By Lieutenant Colonel Ted S. Weaver and Major Patrick J. Farrell

Deploying Reserve Component (RC) headquarters receive postmobilization battle command staff training (BCST), executed by the 75th Battle Command Training Division (75th BCTD) and hosted by a training support brigade (TSB). The exercise director, the TSB commander, is the validating authority. For most deploying RC engineer commands, the 3d Battle Command Training Brigade (3d BCTB) provides this training, and the 181st TSB at Fort McCoy, Wisconsin, is the validating authority.

The 3d BCTB trains other types of units as well as engineer battalion and brigade headquarters. On one mission, they may train a mayoral cell, followed by an infantry brigade combat team, then followed by an engineer brigade. It takes a wide skill set to train this variety of units. The brigade has no explicit concentration of military occupational specialties (MOSs), since several or all are needed for most units trained. Battle command tasks are universal to any battalion or brigade, but when training engineers, 3d BCTB is always looking for more MOS 21 series Soldiers. With that in mind, high-quality, mission-focused training is always afforded every unit that the brigade is tasked with preparing for deployment.

All postmobilization battle command training is a team effort. The most important member of that team is the engineer headquarters—the deploying expeditionary force (DEF) unit. The early participation of the engineer unit's commander and staff is essential to shape an effective, well-aimed exercise. Besides the 3d BCTB, essential members of the team include the TSB, the unit in-theater that is being replaced, and potentially additional members of the engineer community.

Battle Command

"Battle command is the art and science of understanding, visualizing, describing, directing, leading, and assessing forces to impose the commander's will on a hostile, thinking, and adaptive enemy. Battle command applies leadership to translate decisions into actions—by synchronizing forces and warfighting functions in time, space, and purpose—to accomplish missions. Battle command is guided by professional judgment gained from experience, knowledge, education, intelligence, and intuition. It is driven by commanders."[1]

"The operations process consists of the major command and control activities performed during operations: planning, preparing, executing, and continuously assessing the operation. The commander drives the operations process. Battle command is at the center of the Operations Process."[2]

Commanders and staffs use the military decision-making process (MDMP) and troop-leading procedures to integrate activities during planning. They also use other processes and activities to synchronize operations and achieve mission success.

Key to Mission Success

The commander of the 181st TSB served as the exercise director of multiple engineer brigade missions executed by the 75th. His training goal when executing BCST is to ensure that members of the DEF unit have a solid understanding of their mission and how they nest into their higher headquarters. He believes that it is a continuation of preparation for the transfer of authority (TOA), and he wants them to walk into the relief in place (RIP) knowing their knowledge gaps and what questions need answers. He also wants them to come to grips now with the specific issues they will face in-theater.

BCST often presents the first time that the full staff of officers and noncommissioned officers (NCOs) are able to work together doing their daily, tactical jobs in an integrated fashion with all of the staff sections. Many RC engineer units—and route clearance units in particular—arrive at the mobilization site with limited training experience in their new form as a modular force. For example, although the unit may have previous combat experience as a construction force, it may be mobilized for a route clearance mission with subordinate units that are not part of their home-station chain of command.

One example of the benefits derived by client units was given by the executive officer of the 724th Engineer Battalion, Wisconsin Army National Guard. He observed that the command post exercise (CPX) was critical to the growth of his staff. Prior to the experience, they were planning for deployment—but during the CPX, they transitioned to their tactical mission, which made the training highly beneficial.



A construction management and survey team works with an Iraqi role player through a translator to clarify requirements for a police station design.

The 3d BCTB timeline from receipt of mission to execution of the first event is typically 150 days. After the 3d BCTB conducts its own MDMP, the project officer contacts the TSB. Collaborative planning ensues between 3d BCTB, the TSB, and the DEF unit. Three essential elements that the team must agree to at the outset are the "Road to War" timeline, the exercise line of effort (LOE) framework, and a 3d BCTB seat on the leader's recon.

The timeline puts the key scenario development players in sync. One of the early events is the mission event list (MEL) development conference, at which the DEF unit provides input for the BCST scenario. Questions that are asked are—

- What are the unit's LOEs?
- What are the unit's battle drills?
- What are the commander's training objectives (CTOs)?
- What are some specific issues/events that they want injected into the scenarios?

Answers to these questions become the mission's LOE framework, which guides the writing of the MEL—the series of messages, role playing, and taskers that are delivered to the engineer headquarters during the exercise. The commander of the 181st sees this LOE framework as the centerpiece of any exercise: a "vital diagram" that defines how the unit fits into the higher headquarters plan. Since some LOEs are not easy to understand—for example, supporting governance—this creates dialogue with the unit in-theater.

Forming a Positive Relationship

The DEF units are pulled in many directions when preparing for deployment. From a distance, the postmobilization mission rehearsal exercise (MRX) is just one more of those tasks—and the DEF unit often misses the MEL development conference mentioned above. The 3d BCTB project officer and TSB will make a preliminary assessment of the DEF unit's mission, based on research, and develop a suggested LOE framework and CTOs for discussion.

The commander of the 724th Engineer Battalion said that the support received before a 75th Division exercise demonstrated a commitment to professionalism: The 75th's project officer wanted to work the CTOs into the exercise, which suggested a major recurring theme for a successful exercise—positive relationships. He was also the project officer for eight engineer battalions at Fort McCoy in 2009 and 2010. He keeps in contact with every unit once it deploys and ensures that each one is assisting the unit it will conduct RIP/TOA with at deployment's end. Additionally, he looks a year out, building relationships with units projected to mobilize for deployment.

During the 150 days prior to the engineer brigade mission, the 3d BCTB project officer (a lieutenant colonel) is in weekly contact with the DEF unit. His point of contact is usually the brigade's chief of staff or executive officer. For battalion missions, the timeline is shorter, and the point of contact is normally the engineer battalion commander or executive officer. The discussions often focus on—

- Updating training objectives to reflect changes in mission.
- Assessing the state of staff training, level of Army Battle Command System training (ABCS), and general expectation management.

The leader's recon to visit the unit in-theater is a key event in the preparation for the MRX. It is imperative for the 3d BCTB to have an officer on this event, which allows the 3d BCTB trainers the time needed to fully understand the mission and challenges that the DEF unit will face. This is the mission realism keystone for the model of training that 3d BCTB develops. It enables a meaningful scenario and realistic role playing of higher, adjacent, lower, supporting, and support (HALSS) units. Perhaps even more important than raw data collection during the leader's recon is that relationships are created with both the DEF unit and the unit in-theater.

The need for relationship-building here is impossible to overemphasize—the unit in-theater is the most credible source of relevant data for the realistic theater model of training. A steady stream of this data is needed during scenario development. A surge of this information provides additional realism during the exercise—often with only hours to acquire it. Without established relationships, the accessible raw data is often without context—and requests for information (RFI) will go unanswered or may be delayed beyond the latest time of value to the detriment of the training. The degree of mission success goes back to the human factor—solid, personal relationships.

This slow turnaround on exercise RFIs is consistently the greatest source of frustration for the DEF unit. Some types of required information are—

- Battle update briefs.
- Intelligence summaries (INTSUMS).
- Current operations orders (OPORDs).
- Fragmentary orders (FRAGOs).
- Operational graphics.
- Mission tracking tools.
- Unit status reports.
- Daily situation reports (SITREPS).

For an engineer brigade, the typical sequence of post-mobilization BCST events is three days of MDMP training, followed by two 3-day CPXs and an 8-day MRX. The battalion sequence is similar; however, a training support battalion will execute a mission rehearsal exercise (MRE). Battalions normally deploy with their subordinate companies, and the MRE incorporates the companies' boots-on-the-ground training mission into the BCST exercise.

MDMP Training—Not a Slide Show

When the war began, 3d BCTB taught MDMP to deploying units in a traditional classroom with 100 PowerPoint slides and a practical exercise based on a National Training Center scenario. This was an adequate model at the time. DEF units arrived at the mobilization station with poor MDMP skills, and this crawl method filled the training gap. For several years now, most units arrive at the mobilization site having basic MDMP skills. They only need a controlled environment, and 3d BCTB's MDMP course coaches them to keep on track through their preparation for deployment.

One method used to train MDMP ensures that the DEF unit does a classified MDMP event on their theater higher unit's OPORD and strengthens the staff's natural roles. The DEF unit produces a *straw man* order of their own. As the DEF unit transitions through the seven steps of MDMP, either the 3d BCTB MDMP facilitator or the DEF unit's chief of staff will give a short PowerPoint-based instruction for that step as a refresher. Since the chief of staff/executive officer is responsible for conducting staff training[3] and is their natural leader, it makes the most sense for the engineer staff to see him driving the process. The facilitator provides the tools: the PowerPoint instructions to introduce each new step in the MDMP process, a suggested timeline, doctrinal references, and hints as necessary.

The *straw man* order is based on both facts and assumptions and will need amendments when the unit gets into theater, but it is supposed to be the 75 percent solution. It also forces the engineer staff sections to develop their running estimates, lengthen the list of RFIs, and understand the fundamental baseline of their mission. In the process, the unit's ability to conduct MDMP is considerably sharpened, while the natural roles within the staff are strengthened.

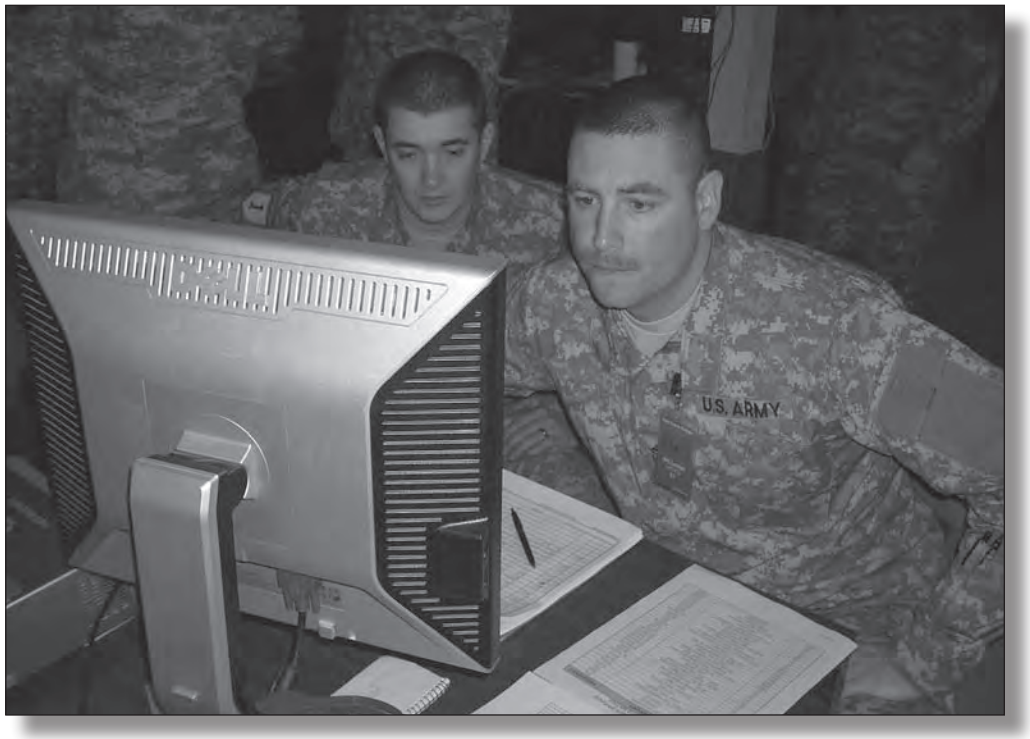
The chief of staff for the 16th Engineer Brigade was pleased with this method of MDMP training, the success of which he attributed to having the 3d BCTB MDMP team and the senior mentor with them every step of the way.

Mission-Focused Staff Integration

The basic pattern for the CPX and MRX is the same. Messages come into the command post in a variety of ways—e-mail, instant messaging over the classified "closed-loop" network, Secure Voice Over Internet Protocol (SVoIP) telephone, live role players, or frequency-modulated (FM) radio. Yet another method is over the Command Post of the Future (CPOF). Battalions use Blue Force Tracker during their CPX and MRE. As the battle staff is working these issues, reacting to battle drills, exercising their standing operating procedures, and receiving and submitting reports, the higher headquarters sends down major taskers relating to missions that the unit is expected to execute when deployed. These taskers may require additional analysis through MDMP. Units brief their products to role-played VIPs—often division and corps staff. Simultaneously, there are competing mobilization requirements. These may include new equipment fielding, crew-served weapons makeup, central issuing facility issue, medical issues, equipment moving to theater, departure of advance party Soldiers, and genuine

Uniform Code of Military Justice (UCMJ) actions. Although units often say these distracters are artificial, these same sorts of issues compete for attention in-theater.

The assistant chief of staff, signal (G-6) for the 416th Theater Engineer Command changed his mind on this when he served in Afghanistan as the chief of staff for the 420th Engineer Brigade. They experienced heightened activity and had 10 percent of Soldiers on leave and the headquarters split between two locations. The MRX helped them get ready.



Soldiers conduct a shift change brief during a command post exercise at Fort McCoy, Wisconsin.

The main differences between the CPX and MRX are the goals and intensity. The goals of the CPX are for the staff to identify their roles and responsibilities, set up a functioning command post, establish processes for information analysis and dissemination, establish their battle rhythm, validate battle drills, and gain situational awareness by posting relevant information to their common operational picture—for example, battle tracking. These are parallel with opportunities to continue their MDMP training and practice briefing skills.

By the start of the MRX, the basic skills learned in the CPX are in place, and they are polished for eight more days. In addition, the intensity of the exercise increases with more frequent and complex scenario "injects" from the HALSS role players. Key leader engagements and visits with real local national role players challenge and enhance the commander and staff's preparation for their mission downrange.

During the MRX, the TSB trains the brigade commander's personal security detachment (PSD). A series of field events are injected into the exercise. There are multiple opportunities for the brigade design engineer technical section (G-7) to conduct quality control/assurance, recons, surveys, and other engineering tasks outside the wire. These missions provide the opportunity to use the PSD for escort. PSD training includes reacting to numerous attacks and a debriefing with the intelligence staff officer (G-2) upon return. This information becomes part of the G-2's intelligence picture.

For the primary staff officers, the value of the training is obvious in the quality of the products, increased efficiencies developed, and improved briefing skills by the end of the MRX. However, throughout this entire process, whole lists of skills are also being sharpened by the enlisted Soldiers, battle staff NCOs, and junior officers, as they develop an effective command post.

Among the most important skills developed is their ability and confidence with Army Battle Command Systems and CPOF. The experience is stressful, but necessary, and Soldiers react positively.

Observer-Controller/Trainers

From the MDMP through the end of the MRX, 3d BCTB and First Army TSBs position observer-controller/trainers (OC/Ts) with each staff section. During the exercise, the OC/Ts do not evaluate as much as they provide feedback based on a combination of Army Doctrine and the Combined Arms Training Strategy (CATS). These three to five tasks (per staff section) are agreed on with the DEF unit in advance. The 3d BCTB believes that a positive relationship between the OC/T and the staff section enhances the training.

In addition, 3d BCTB also uses a tool developed by the former commander of the 4th Cavalry TSB, when he worked on training engineers along with the 3d BCTB early in this present conflict. He called his method of evaluation *staff assessment standards*. In essence, he condensed the doctrine in FM 3-0, FM 5-0, and FM 6-0 into five main areas—time management, staff estimates, common operational picture, information analysis and dissemination, and generating relevant options. If a staff can perform well in these five critical areas, they will work efficiently: "*Each of the five categories relies on staff integration for the section to be efficient. The staff must understand how their section*

affects other sections, and they must understand the purpose and audience of running estimates. The staff must be integrated and have a mutual view of the battlefield and the commander's desired end state to achieve the desired effect; without integration, the staff will lack clarity and unity of effort."[4]

There are multiple opportunities for self-discovery within the staff. Every evening the OC/Ts conduct an informal after action review (AAR) with their staff section, focusing on one or two areas to improve for the next day. The CPX ends with AARs conducted by the 3d BCTB mobile training team chief, and the MRX concludes with an AAR conducted by the TSB commander. The AARs focus on CTOs, what needs fixing, and who is going to fix it. The facilitators strive to maximize the DEF unit's participation and self-discovery.

Challenges

Battle command tasks are common to any field unit, and 3d BCTB can provide BCST under any circumstances. DEF units, however, want a high degree of realism. A challenge for 3d BCTB is having enough engineer officers (with specific theater experience) for all the requirements of an exercise. Three or four engineer OC/Ts are enough to cover down on the engineer brigade's design engineer technical section (G-7) and operations staff section (G-3). That is usually all that the 3d BCTB has available. Unfortunately, that often does not leave many engineer-trained role players who often have to answer technical RFIs for the HALSS cell.

Having a 3d BCTB Soldier on the leader's recon is essential in developing a realistic exercise baseline for the role players. Relationships made on the leader's recon result in prompt turnaround of RFIs. Subject matter experts sent back by the deployed engineer unit (while it is still in-theater) to facilitate the BCST have a huge impact on realism, including expediting accurate answers to RFIs. In reality, this provides a 30-day jump start to the RIP/TOA process.

The 3d BCTB project officer started contacting units (scheduled or expecting to be scheduled for the next rotation) and requested that they send Soldiers forward to observe their predecessors' BCST events. Not only did they learn about the CPX and MRX, but they became an asset for the OC/Ts and HALSS.

The project officer of the 176th Engineer Brigade mission received three members of an engineer battalion command group to role-play themselves in the HALSS during the exercise. It does not get any more real than that. There is a substantial payoff to any unit that participates. They are training themselves and mastering their higher headquarters' standing operating procedure at the same time. One further resource is sending the DEF unit's liaison officers to participate. These engineer officers can work in the HALSS, acting in their real liaison officer function as well as providing an engineer flavor to the role playing.

Conclusion

Creating a BCST event for a deploying engineer unit takes months of preparation and continuous coordination between different entities. The 3d BCTB, along with two TSBs, has trained nine engineer brigades and most of their subordinate battalions in the past five years. Together they have developed an effective model of BCST and have fostered relationships within the engineer community. The essential exercise ingredients boil down to theater realism with recent and relevant classified data and an engineer unit (using staff integration) working on the same issues they will encounter in-theater. Fostering positive relationships between the DEF unit, 3d BCTB, the TSB, the unit in-theater, and the engineer community at large is key to the success of the BCST and the unit's deployment.

Lieutenant Colonel Weaver is a field artillery officer who is currently mobilized and serving in the 3d BCTB, 75th BCTD, Fort Sheridan, Illinois. He was the project officer of both the 420th Engineer Brigade and the 41st Infantry Brigade Combat Team missions. He has executed key roles on ten other brigade and battalion MRXs and was the commander of Service Battery 1/121 Field Artillery, and the S-4, 7th Brigade, 84th Division. As a civilian, he teaches high school chemistry in Racine, Wisconsin. He holds a bachelor's in secondary education broad field science from the University of Wisconsin–Milwaukee and a master's in curriculum and instruction from National Louis University, Evanston, Illinois.

Major Farrell is an engineer officer serving as an OC/T with 2d Battle Command Training Group, 3d BCTB, 75th BCTD, in Fort Sheridan, Illinois. During that time, he has participated in multiple roles, including project officer, HALSS engineer subject matter expert, and OC/T for five engineer brigade BCSTs and five engineer battalion BCSTs as a mobilized Reserve Soldier. Previously, he was the S-3, company commander, a battle captain, and S-1 with the 244th Engineer Battalion in Denver, Colorado. He holds a bachelor's in civil and environmental engineering from Cornell University and owns Castle Engineering Solutions, LLC, a forensic structural engineering consulting firm. He is a licensed professional engineer in Wisconsin and Colorado.

Endnotes

[1]Field Manual (FM) 3-0, *Operations*, 27 February 2008, p. 5-2.

[2]FM 5-0, *The Operations Process*, 26 March 2010, p. vi.

[3]FM 6-0, *Mission Command: Command and Control of Army Forces*, 11 August 2003, Appendix D-9.

[4]Jeffrey R. Sanderson, "4th Cavalry Brigade Staff Assessment Standards," *Armor & Cavalry Journal*, May–June 2008, p.16.

SUPPORT THE CASTLE:

A Forward Support Company in Action

By Captain David L. Brewer



A truck driver from the FSC provides security while his platoon changes a tire on an M870 semitrailer.

In 2007, the United States Army Reserve completed its transformation to modularity. The impact on the Engineer Regiment was immediate. Companies, detachments, platoons, and even squads were now organized to serve as elements of a tailored force package, designed to complete a specific mission or task, rather than deploy with an organic engineer battalion. The direct impact on the engineer battalion headquarters was also instantaneous, eliminating the headquarters support company with its 200 or more Soldiers, and developing two separate support companies that together formed the battalion headquarters element. The battalion headquarters became a headquarters and headquarters company (HHC), designed to support the staff sections, and a forward support company (FSC), intended to conduct the sustainment functions needed to sustain an engineer battalion. In many battalion headquarters, the HHC quickly came into its own and began serving as the "staff company," but the best employment of the FSC proved more elusive, and it has often been underutilized. It is the intent of this article to provide information on how an FSC is designed to work for an engineer battalion and how it worked for the 844th Engineer Battalion during the unit's recent deployment to Baghdad, Iraq, supporting Operation Iraqi Freedom.

Unlike any other company in the Regiment, the FSC is purely logistical, manned entirely by Quartermaster, Transportation, and Ordnance Branch Soldiers. In a modular engineer battalion, the FSC is responsible for providing food service, haul and transportation, Class III supplies, water distribution, and maintenance and recovery support. It is worth mentioning that not all FSCs are the same, and an FSC supporting an aviation or armor battalion looks slightly different from the FSC supporting an engineer battalion. This is linked to the overall intent of modularity, which places the right mix of sustainment elements into a battalion headquarters and attempts to eliminate the misallocation of sustainment assets and personnel. Furthermore, due to the logistical nature of engineering tasks, an FSC has a unique relationship with the battalion supply officer (S-4), who is a chief customer of the unit. The S-4 often serves as the materiel manager for much of the



An FSC Soldier services an M916 light equipment transporter at Camp Striker, Iraq.

supplies transported by the FSC and relies heavily on the FSC for the requisition and use of Class IX repair parts.

Theater Factors and Flexibility

In a nonpermissive environment such as Iraq, the FSC supporting an engineer battalion must be extremely versatile to achieve its overall mission of providing logistical support to the battalion headquarters and the modular engineer elements attached to it. The force mix for a modular engineer battalion can vary drastically, depending on the battalion's mission in-theater. During the 844th's deployment to Iraq, the battalion consisted of one survey design detachment, two horizontal companies, one vertical company, one bridge company, and one United States Air Force field engineer team (FET). The force structure therefore dictated the requirements of the FSC. For instance, the haul and transportation requirements for moving two horizontal companies were more than the FSC was designed to support, so adjustments were made internally at the company to fulfill this requirement. In addition, the maintenance support requirements were affected by the force structure, resulting in the maintenance platoon being organized into field maintenance teams that were able to support organic movements, fulfill emergency work orders, and complete scheduled services simultaneously.

A major factor determining which sustainment functions an FSC provides in-theater and how those functions are carried out is the location of the battalion. Located at Camp Striker on the Victory Base Complex in Baghdad, the 844th benefited from the massive dining facility, large Class III supply point, and water treatment facility on the base. Access to these facilities impacted the FSC's mission and allowed the company to task-organize itself in a way different from the standard set by the unit's modified table of organization and equipment (MTOE). Due to a lack of a food service support requirement on Victory Base Complex, the company was able to cross-train the majority of the company's field feeding section into a convoy security element to support the transportation operations of the distribution platoon. The same was done for the organic petroleum specialists and water treatment specialists assigned to that platoon. This allowed the company to provide its own security for the haul section and manage its own organic convoys, thus meeting the haul support requirements for moving two horizontal companies throughout the theater of operation. On occasion, the company also pulled Soldiers from its headquarters and maintenance platoons to support time-sensitive transportation operations, making it possible for the unit to support multiple movements simultaneously. This flexible use of company assets enabled the FSC to complete a variety of missions in Iraq and support a 1,000-Soldier engineer task force.

In addition to the location of the battalion, the equipment allocated to the FSC in-theater determines what sort of mission sets can be completed. The FSC's theater-provided equipment in Baghdad was significantly different from the MTOE equipment used at home station. The primary example of this was the equipment designated for the company's haul section. According to the MTOE, the main mover for the haul section is the heavy expanded-mobility tactical truck (HEMTT) with a palletized loading system. In Iraq, however, the company was only provided

one HEMTT for palletized loading and another equipped with the older load handling system. The equipment used most by the haul section in Iraq was the M916 light equipment transporter with the M870 low-bed semitrailer. The M916 and M870 combination was an essential transportation asset and could be used to haul both Class III and Class IV supplies effectively. Nevertheless, the shift from MTOE to theater-provided equipment forced the FSC to retrain the haul section's Soldiers on the M916 and M870 rather than operate the equipment it was familiar with at home station. Luckily, FSC leaders were aware of the equipment shift before mobilization, so the unit's premobilization training focused on adapting to it. This allowed the company to become combat effective quickly once it arrived in-theater.

Perhaps the most important aspect determining the FSC's role in-theater is the battalion's mission. During its deployment, the 844th's primary mission was to support the responsible drawdown of forces as the corps construction engineer battalion. The mission required subordinate companies, platoons, and detachments to operate in all three U.S. divisional areas of responsibility in 14 of 18 Iraqi provinces. The battalion's subordinate engineer elements did everything from building staging yards for transporting supplies out of country to removing bridges that were no longer being used. Therefore, as the principal sustainment unit in the battalion, the FSC was required to provide simultaneous support to the multiple engineer elements operating in disparate locations throughout Iraq. Performing sustainment functions virtually everywhere at once forced the company to remain flexible. In addition to the mission requirement of operating in a massive operational environment, the battalion and the FSC had to deal with movement restrictions imposed by the government of Iraq. These restrictions varied throughout the country and sometimes required unit convoys to move in conjunction with Iraqi Security Forces. Under these conditions, sustainment requirements often changed, and change became a way of life. Therefore, the FSC established the principle of being "actively reactive," which meant that the company anticipated possible changes and did whatever was possible to plan for likely contingencies. By building flexible plans and remaining actively reactive, the company succeeded in providing adequate logistical support throughout the theater of operation. However, versatility is not the only prerequisite for being a successful sustainment element in-theater.

Additional Best Practices

Along with being flexible, it is extremely important for an FSC to establish strong lines of communication with the modular elements within the battalion. During the 844th's deployment, the FSC conducted 70 organic missions and supported more than 60 missions with its available haul and transportation assets. The company also conducted numerous missions within the Victory Base Complex, moving Class III, Class IV, and Class IX equipment for multiple units. To coordinate these missions, the FSC designed a haul request form for units requesting transportation support. Units were able to request available assets directly from the FSC, which then notified the battalion plans and operations (S-3) section of the planned configuration of the company's transportation assets for



An FSC security team positions its gun trucks during a halt on a main supply route.



The FSC distribution platoon loads construction materials for base support missions throughout Iraq.

the next seven to ten days. The S-3 approved the allocation of transportation assets or, on special occasions, reprioritized requests based on battalion requirements. The direct lines of communication between the FSC and the modular engineer companies resulted in increased throughput and better velocity management of battalion transportation assets. A similar system was established for requesting maintenance and welding work orders, using the Standard Army Maintenance System–Enhanced, and resulted in the delivery of efficient maintenance support within the battalion headquarters and to the subordinate elements.

The most essential lesson learned by the FSC, 844th Engineer Battalion, from its time in-theater was the importance of fostering a positive vendor-customer relationship with subordinate units supported by the battalion. Tracking what each company was doing at any given time was an essential tactic for finding opportunities to support the battalion, while determining the best methods to do so. This also allowed the FSC to forecast future support requirements of the subordinate units. For example, if a company or platoon was moving from one location to another after completing a project, the opportunity existed to provide transportation assets to move the element and provide maintenance support while the element reset for a follow-on mission. Being proactive and finding these opportunities was only half the fight. The FSC also had to provide efficient and effective support on the modular company's terms and timeline. Most of the time this was as simple as staying in contact with the different companies throughout the stages of their projects and selling ideas where the FSC could help provide assistance, freeing up engineer assets to complete more projects. This often led to unique missions, such as providing meals at a jobsite, but it built a reputation for the FSC that would in turn create additional opportunities.

Summary

By remaining versatile, maintaining lines of communication, and providing great customer service, the FSC, 844th Engineer Battalion, built a solid reputation while in Iraq. The company became the premiere support element within the battalion and was called on to do everything from supporting the operational environment owner with welding wire mitigation kits for the mine-resistant, ambush-protected (MRAP) vehicles to running combat logistics patrols with Special Forces. The company even supported the battalion's Iraqi Army partnership efforts by providing food service and maintenance training to the Iraqi soldiers. During the unit's ten months in-theater, it hauled more than 500 loads, serviced more than 20 joint security stations and contingency operating bases throughout Iraq, and completed more than 400 maintenance work orders and 1,000 technical inspections during 10,000 man-hours—all while maintaining a rigorous service program that contributed to the battalion's 90 percent or better operational readiness rating. The example of this company was affected by the battalion's force structure, location in Iraq, mission, and the company's positive approach to providing sustainment support. No FSC will have a completely similar experience. However, the FSC did exactly what it was designed to do—support the engineer battalion and the modular companies by serving as a logistical lifeline, allowing engineers to do what they do best: build.

Captain Brewer is the commander of Forward Support Company, 844th Engineer Battalion, in Knoxville, Tennessee. He has served as the battalion's engineer plans officer and as commander of the 739th Engineer Company (Multirole Bridge) in Granite City, Illinois. He holds a bachelor's from the University of Missouri–St. Louis and is a graduate of the Engineer Officer Basic Course.



Photo by First Lieutenant George Holland

Quality Verification of Contractor Work in Iraq

By Captain Gregory D. Moon

As part of civil-military operations in Iraq, United States Army engineers perform quality verification (QV) of contractor work in areas that may not be fully secure or are exposed to insurgents. Rebuilding projects are targets because restoration of normal life works against the terrorists' goals. In the densely populated section of Baghdad known as Sadr City, terrorists in 2008 had been stopped from openly attacking or sabotaging civil works projects but still emplaced improvised explosive devices (IEDs), used snipers, and intimidated the civilian population.

QV is needed to assure the owners that a contract is being fulfilled and that they are getting what was paid for. It is the process the government uses to check on work being performed, determining that progress is satisfactory and will result in a completely functional product in the time allowed by the contract. Part of the mission of the 729th Facility Engineer Detachment (FED) during its deployment was to support Task Force Gold in Sadr City, assessing the progress of Iraqi contractors on jobs paid for by the Commander's Emergency Response Program (CERP) and the Iraqi CERP. The security situation was too unsettled to allow a daily presence. There were active threats from IEDs, indirect fire, and snipers. Movement in the area required a patrol in mine-resistant, ambush-protected (MRAP) vehicles to move as close as possible to each work site. Once on-site, teams acted as quickly as possible to assess progress and then move out. To reduce danger, regularly scheduled visits and prior notification of contractors were avoided.

The Iraq counterinsurgency strategy in use in 2008 was "Clear, Hold, and Build," and Task Force Gold was established to help in the "Build" part of the plan. Part of the work involved actual construction, while another part included mentoring the local government in the care of its public sector responsibilities. Task Force Gold operated on the terrain of 3d Brigade, 4th Infantry Division, part of the Multinational Division–Baghdad, with an engineer commander and a mixed civil affairs and engineer staff. Some of its operations were service projects involving cleanup and debris removal, but a growing number of projects involved construction—renovating schools, reconstructing public health clinics, building public spaces such as parks and sports fields, repairing infrastructure such as sewers and water pumping stations, and providing generators for local power needs.

QV operations were accomplished by sending out teams of two to four engineer Soldiers as part of a civil affairs patrol or on a QV-specific mission with a security team to secure a work site while it was evaluated. All movements in Sadr City involved several vehicles and a sizable



Photo by First Lieutenant George Holland

Soldiers enter the public clinic for inspection of local contractor work.

number of Soldiers. The objectives for a typical patrol consisted of checking six to eight projects that required a team to dismount and three or four projects that could be evaluated while mounted. Such missions took three to four hours from assembly to return to base. The return to base did not finish work for the day though. QV teams had to prepare reports for each project and a daily summary for 4th Infantry Division—and eventually Multinational Force—headquarters. These reports usually took five to six hours and another hour was spent in a daily briefing to the task force commander.

Project Selection

The civil affairs teams nominated projects, and a project engineer prepared project packages that were submitted to the brigade and division for staffing and funding. Once contractors were notified and work was started, the QV work began. Funded projects were listed in order of the start work and estimated completion dates. Mission-dependent considerations also helped prioritize the inspections.

Coordination between the QV team and security detachment was an important planning consideration. When QV teams from the 729th FED were conducting inspections for Task Force Gold, the security detachment was not stationed at the same location as the task force. That meant

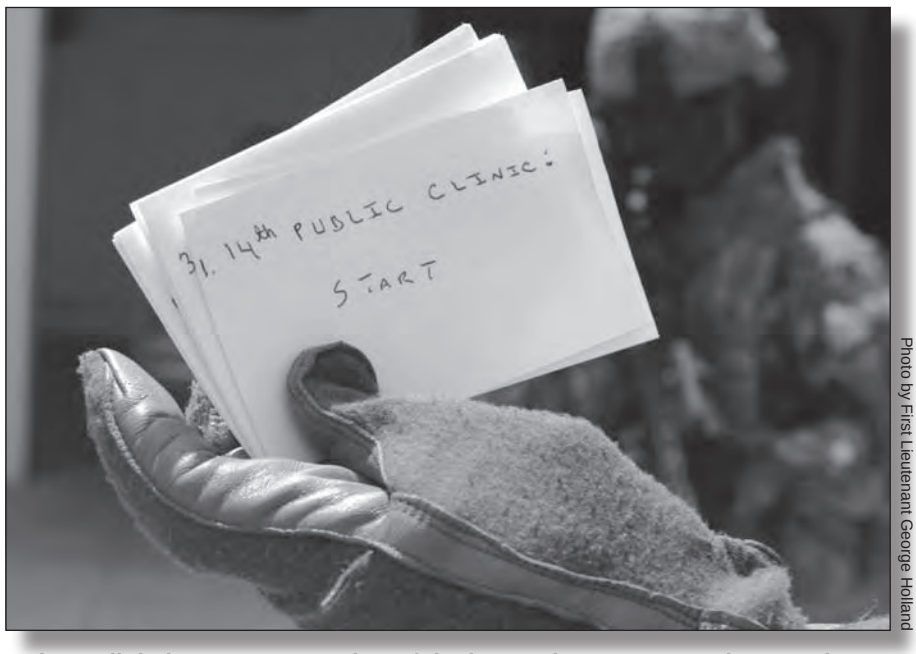


Photo by First Lieutenant George Holland

Using a digital camera, a member of the inspection team records a starting picture.

"[Quality verification] ... is the process the government uses to check on work being performed, determining that progress is satisfactory and will result in a completely functional product in the time allowed by the contract."

that coordination for the daily project list was performed in three steps. First, projects for the upcoming week were selected at the task force. Then that list went to the leader of the security detachment, who used available intelligence about the area to generate a schedule for each day that would avoid predictable patterns of travel. Finally, the schedule went to the QV team.

QV teams prepared for patrols by reviewing the package for each project to be visited that day. The aim was to know what work was required for each project, observe what was being accomplished, note key items from the scope of work, and verify the presence of high-value items such as generators, air conditioning units, and other large equipment. The security detachment confirmed current intelligence and changes in project priorities, then gave the QV team the sequence of sites to be visited. The entire patrol got the patrol order for the day and rehearsed dismount, assembly, movement to the work site, and actions at the site. Once this was accomplished, the patrol loaded up and moved out.

Inspection Process

The basic QV team was two Soldiers and an interpreter. One Soldier was designated the photographer, and the other accompanied the interpreter. The photographer took pictures that identified the site, showing its overall condition, illustrating problem areas and good work, and recording high-value items and high-value parts of the job. The team member with the interpreter started with a quick interview with the job superintendent or the most knowledgeable person on-site. Basic points confirmed that the team had the right place, the number of workers who were on-site, what the contractor was doing that day, whether high-value material was on hand, and if it had been installed. Next, the interviewer walked the site to observe overall progress and, if time and conditions allowed, make on-the-spot notes about the project. Then it was on to the next site on the day's list. The security team usually cleared each site. Since the U.S. government was paying for the work, the teams didn't kick down doors to enter locked rooms. If the contractor wasn't on-site and the team could not gain access to a room, it was noted. Occasionally, the teams suspected the presence of insurgents, in which case the site visit was halted.

The practical reason for using at least two Soldiers on the QV team was to speed up the process. Leaving the cameraman free to move around and take pictures made efficient use of limited time on-site. However, a camera leads to tunnel vision. The Soldier acting as the interviewer-recorder got a wider view of the site and generally was the leader of the assessment. Index cards with the name of the project were photographed at the beginning of a site visit, then used to record notes about the work.

After returning to the security station at the end of patrols, teams performed maintenance and worked on project reports. The 729th FED teams organized site visit pictures into computer files that kept each day's projects together. Project folders also kept together all reports on individual projects. Once photographs were downloaded, report documents could be prepared. Information management authorities should note that this information must be moved onto the local network, so blocking portable data storage devices from network access stops the reporting process.

Project Reports

The initial general project report template didn't fit the information gathered by the teams, so later reports were based on each project's line items of work. Using the line items from contract packages yielded a breakdown with a quantity or dollar amount attached to each item. This allowed QV teams to estimate the percentage of the work completed. Since information for the project reports is collected quickly, it is short on details. If there are specific items of command interest, QV teams should be notified before site visits.

Project reports contain several types of information:

- Confirmation that work is or is not being performed.
- Estimates of the amount of work accomplished to date.
- Estimates of the quality of work.
- Predictions of whether or not the contractor will complete the project within the contract time.

Each evening, individual project reports and an executive summary were sent to headquarters and an update was presented to the task force commander. QV teams also assisted project officers with pay requests from contractors and talked with contractors about quantity and quality of work at specific sites.

Equipment Needed

The QV teams need several pieces of equipment, including—

- **Digital camera.** A high-quality digital single-lens reflex camera with high-speed storage cards and a fast lens takes pictures quickly and with sufficient quality to be

used for other purposes, such as information operations. Point-and-shoot cameras process pictures more slowly, thus slowing down site visits.

- **Digital voice recorder.** This would allow immediate and accurate recording of comments and questions about the work at each site. However, notebooks and note cards are also useful for writing and memory aids and may even offer some advantages. For example, if the order of visits changes, note cards can be rearranged and kept in order.
- **Computer.** The QV team needs access to a computer hooked up to the local network to allow photos to be downloaded from portable storage. Because the reporting process takes a lot of time, a computer dedicated to that effort is necessary. Ideally, the work should be done on nonsecure computers, because the data has to be shared not only with U.S. forces but also with local contractors.

Planning Factors

Mission, enemy, troops available, terrain, and time available (METT-T) analysis works well to develop planning factors for QV.

- **Mission.** The description of the type of projects to be checked is important. Typical missions are relatively small in scope and total cost. Larger projects require a secure environment to be executed successfully. Depending on the phase of a project, even relatively modest ones can require a lot of time to check. For example, the final inspection of a school renovation requires more time and effort than the initial checks. Commanders should be aware of the types and number of projects being checked.
- **Enemy.** Local contractors won't work if there is an active threat facing them. Given that the risk to contractors is low enough for them to work, some threats may still exist. During the 729th's deployment, IEDs were a possible danger during movement to the work site, while at the site, and while moving away from the site. Indirect fire and snipers were also a consideration. Avoiding predictable patterns of movement and not scheduling meetings with the local contractors ahead of time reduced the danger from terrorists.
- **Troops available.** Experienced QV teams can do their jobs quicker, and their estimates will be quantitatively and qualitatively better. The security element



Photo by First Lieutenant George Holland

Soldiers move through the Al Yarmouk School.

must be large enough to clear and secure sites for the duration of visits. The security element averaged 20 Soldiers on 729th FED missions. An interpreter is necessary in most cases.

- **Terrain.** The farther projects are from the base of operations, and the farther they are from each other, the fewer that can be inspected in a given time. In a relatively compact area such as Sadr City, projects may be within an area of five or six square miles. In other cases, projects may be scattered all across a province.
- **Time available.** Project reports impact time-on-task on a daily basis. The more in-depth and detailed the reports required by headquarters, the more time they take to generate. If reports are modified to reflect specific project requirements, the reports become easier to complete. Commanders should tailor their specific information requirements so that the QV teams can get on-site, collect the information, and depart—minimizing the number of trips to the site.

Potential QV Team Members

Engineer NCOs in construction engineering supervisor military occupational specialties and company grade engineer officers have the background to get a good start as QV team members. Experience in supervising unit construction projects is a good place to sharpen the ability to assess work. Another way of gaining useful experience is to check contractor work. Officers and NCOs can gain this by helping the Directorate of Public Works at their home station to perform QV work. Another avenue for officers and NCOs to explore is to establish a relationship with the United States Army Corps of Engineers (USACE) to work on projects at or near their home stations. A good class to introduce the basics of QV is "Quality Verification for General Construction," available through the USACE Proponent-Sponsored Engineer Corps Training (PROSPECT) program.

These recommendations are necessary because of the lack of experience of many Soldiers in-theater. They were enthusiastic but had not been allowed to do much practical construction work. This was apparent in the way they handled their tools and equipment and in some of their judgments. This lack of experience also affected command decisions about which units to employ. United States Air Force and United States Navy construction units were preferred for performing construction jobs. They were more effective because they had practiced their specialties more than their Army counterparts. *Building Great Engineers* starts with Soldiers performing their specialties at home and taking that experience into theater.

Captain Moon was commissioned through the Reserve Officer Training Corps at Auburn University with a bachelor's in civil engineering. He served for ten years on active duty and for seven years in the United States Army Reserves. He enlisted as a staff sergeant construction engineering supervisor in 2002 and was mobilized to Iraq in 2008. He applied for and received reappointment as a captain in 2009 and continues as a member of the 729th FED. He works for the Federal Aviation Administration as a civil engineer.

("Lead the Way," continued from page 4)

Control. Traditionally, this addresses the importance of controlling the movement of the unit while you move from one place to another and the actions of the unit on the objective. In this case, I think a leader should consider the management of the construction phases of the COP. Each COP should provide the basics of protection, health, and safety for the engineer; it starts from the ground up. There are lots of project management tools to help the engineer, but it takes someone on the ground to organize the construction effort to meet the commander's objectives.

Common Sense. An overused term nowadays is *expectation management*, but it does have applications in this case. The engineer cannot pour all of the precious construction resources of the brigade into one platoon-size COP. The commander and his engineer must clearly define the basic standards for security, functionality, and life support. It's up to the engineer to take a commonsense approach and ensure that the life support standards of construction aren't compromised just because a subordinate commander truly wants a castle for his COP. Remind leaders of the old saying of "improving your fighting position" but within reason. Tell them to stay away from those pieces of construction that will get a Soldier seriously injured or killed, such as electrical work. Leave it for the experts, the engineer.

Combat, construction, and geospatial engineers are all involved in the process of building a COP. The Regiment expects you to be an expert in your field and recognize that it's essential for today's engineer to embrace the three disciplines of engineering to solve the commander's most difficult problems. It's not rocket science, but it is a matter of physics. Whether it's building something or blowing stuff up, it's the brave Soldiers who have embraced their profession who step forward to say, *"Let Us Try, Sir!"*

Or you can stand in line and watch the heads roll… .



Construction Unit Training Challenges:

A Proposal for Construction Engineer Qualification Tables

By Captain Jacob R. Kondo

The deployment rhythm for a typical engineer construction unit has had a negative effect on the quality and length of training in these units. The emphasis on quality commercial construction has declined in these units while the type of "hurry-up-and-build-it" projects typically found in combat zones has increased. The construction tasks in the Soldier Training Publications (STPs) are not being taught and evaluated to the standard of commercial construction, leaving Soldiers inexperienced except for the brief overview they receive in advanced individual training (AIT). Even AIT does not teach all of the tasks in the STPs. Some of these construction tasks require the Soldier to learn at the unit. Construction units in today's Army need a solid set of guidelines—similar to the standardized method used by most combat engineer units—to train and evaluate their subordinate units.

Proposed New Tables

The concept of combat engineer qualification tables can be used in conjunction with the construction tasks established in the individual military occupational specialty (MOS) STPs to form new construction engineer qualification tables. The construction tables would have a biannual schedule that provides construction MOS Soldiers a refresher on AIT-taught tasks and teaches actual unit-specified tasks that are in the STP. This schedule would also ensure that companies have a mandated time to train their Soldiers on construction STPs. This proposed schedule and the construction tables are a method the construction battalions can integrate into their training calendars, giving a solid set of guidelines to assess the companies.

Table I. Construction tasks can be divided into three different engineer tables and should be taught using the *crawl-walk-run* method. Table I, in the *crawl* phase, begins with individual companies teaching Soldiers straight from the field manuals (FMs) and STPs in a classroom-type environment, where most of the learning is done by reading the FMs and applying the lessons in a practical exercise. Outside agencies can help during this phase as well. The 92d Engineer Battalion invited representatives from several organizations to Fort Stewart, Georgia, to teach its Soldiers. These organizations included AutoCAD®, EMC Engineering Services Incorporated, the United States Army Corps of Engineers (USACE), the Directorate of Public Works (DPW), Hilti Corporation, and Stihl® Incorporated. All of them can have a part in the one-month block of instruction for Table I, but units must plan thoroughly to integrate these resources into training.

This means that the MOSs of greatest benefit to Soldiers need to be assigned to the class. For example, the 92d sent its company executive officers and drafters to the AutoCAD class, construction supervisors to the EMC and USACE internships, and skill level one and two Soldiers to the construction tools and equipment licensing classes presented by Hilti Corporation and Stihl Incorporated. All of this outside training should be within the one-month time frame and synchronized with each company's classroom training. Once the companies have completed their internal evaluation of Table I, they can request an evaluation from the battalion. The evaluation will consist of a written test based on the guidelines established in the STPs. Once all Soldiers pass the written test, the unit can proceed to the *walk* phase, or Table II.

Table II. Table II consists of small "battalion-owned" projects that the companies must complete and inspect before moving on to the next table. Battalion-owned means that the projects are constructed for the battalion and no other outside unit or agency. This approach ensures that the Soldiers remain in a focused learning environment. The companies begin with the design phase of the project when the company construction officer and the platoon leader develop a design and a bill of materials (BOM) based on the scope of work derived from the subject areas of the STP. For example, if a vertical company has reached the *walk* phase, then its individual project must include a scope of work that encompasses all subject areas for electricians, plumbers, carpenters, and masons. The project should be very basic and not become a permanent structure. Examples of projects allowed for this phase would be wood footing-supported maintenance sheds constructed by a vertical company and equipment operator training for a horizontal company.

Once the company has designs and an initial BOM, the project packet should be submitted to the battalion, which will evaluate and critique the packet and allow the company to move on to the construction portion of this phase. When the project packet is approved, the company will order, track, inventory, and store its BOM. When construction begins, the company will inspect and evaluate individual Soldiers through quality control (QC) personnel, using the same evaluation criteria as the STPs. The battalion will use the completed evaluation to track the project and coordinate with DPW to inspect it with QC personnel. The 92d Engineer Battalion has employed these QC steps successfully and found that DPW has been very willing to provide additional training to our Soldiers. As the QC personnel evaluate Soldiers and their individual tasks, the battalion will evaluate the company QC personnel and how they inspect the job sites. The battalion will also use the evaluation criteria found in the STPs for the construction engineering supervisor (MOS 21H) and construction equipment supervisor (MOS 21N). As quality assurance inspectors, the battalion also inspects the company projects. This allows the battalion to oversee evaluations by the QC personnel and also evaluate the overall company command and control of the project. After the construction portion of this phase is complete, the project will undergo prefinal and final inspections and typical close-out procedures by the companies while the battalion is evaluating.



Military surveyors receive a class on soil analysis during Table I training.



Soldiers from the 92d Engineer Battalion lay the first course of a concrete masonry unit wall.

Table III. Table III, the *run* phase, is the culminating training event in which companies will design and construct their own capstone project. The project will be larger than the Table II project and will have an outside agency as the customer. Since there is an actual customer, all initial designs and project packets will be synchronized with the battalion and the company. Once the project packet is complete, it will be sent to the customer for approval. Due to the typical six-month waiting time that DPW and the Directorate of Contracting require for all projects, the project packet must be submitted during the first phase. This will require the battalion-level construction officer to do all initial planning and coordination with the customer at the start. Once the company reaches the third table, then in-progress reviews between battalion and company will begin and the company will plan the actual project packet.

Timeline

The timeline for this type of training is spread throughout the year. The training will be biannual, with the first qualification tables starting in Month One and ending in Month Six. Table I will take place at the beginning of the course and will typically take a month to complete. This leaves five months to complete the small and capstone projects during Tables II and III. Performance of Table II will determine if Table III can actually be accomplished. If the company's Soldiers are ahead of schedule during Table II and appear to be retaining their STP skills, then the battalion may allow the company to continue on to Table III once Table II is complete. On the other hand, if the Soldiers are falling behind and not retaining their STP skills, Table III can be cancelled and Table II extended to the end of the six-month period. Once that period is up, the



A Soldier uses a D7 bulldozer to push-load a scraper.



Carpenters train on their skill level one tasks.

company can start over and begin the second iteration of Tables I through III. This will allow for all the Soldier and leader transitions during that six-month period.

Potential Challenges

The most significant uncertainty for this proposal is how well it will match up with units' training calendars. Each unit must compare and synchronize its long-range training calendar and balance out its construction tasks with common Soldier tasks. Another challenge may arise if the customer approval process for the capstone project starts in Month One, which will leave little flexibility in the timeline in case a company does not pass the battalion evaluations for each table. In that case, a company could delay its capstone project (Table III) and use that time slot to continue working on Table II. The only coordination needed for this postponement would be to inform the outside agency sponsoring the capstone project.

Another consideration is the budget, time schedule, and agenda of the DPW or other outside agency. DPW's budget and time schedule may conflict with the battalion's training calendar. Past projects have shown that the time between the planning and construction phases varies widely due to the unpredictable processes that all BOM and project approval requests must undergo. Since there is no definite timeline for these processes, it will be difficult for the battalion to define the training timeline for the projects and to synchronize DPW's calendar with its own. To prevent lost training time, all BOM and project approval requests will be approved three months before any construction begins (Table III). These approvals from DPW will be one of the decision points that will determine if the companies will reach Table III. This will eliminate any undefined variations in the timeline between the planning process and the construction phase. Having the project approved and the BOM awarded before the construction phase will allow the companies to create a more accurate critical path method and synchronize that timeline between DPW and the battalion.

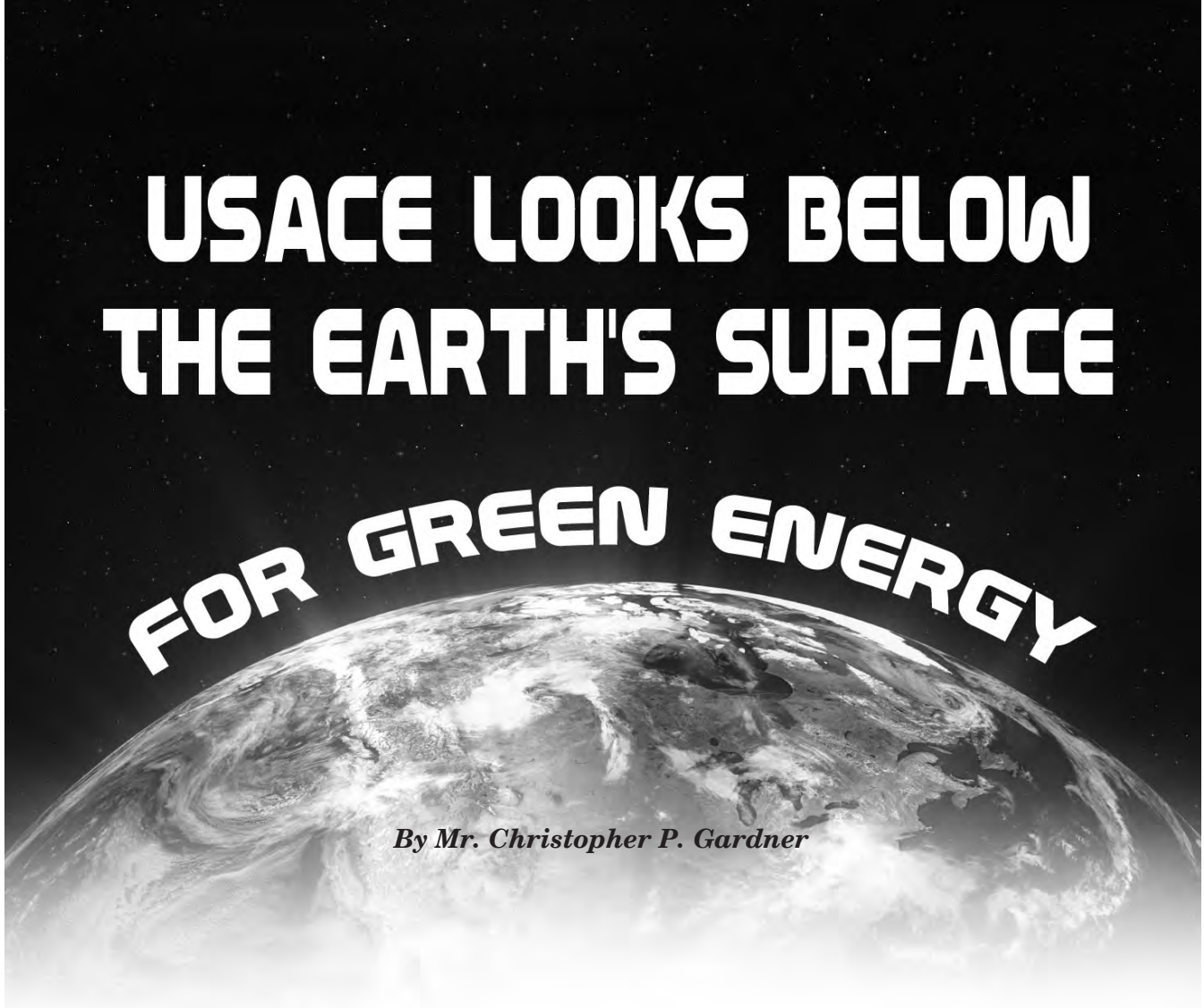
Conclusion

The little training time most construction units have between deployments is valuable and should be used to its fullest potential. Simply assigning construction projects to subordinate units does not teach Soldiers the fundamentals of construction. That is why there should be a redundant teaching system that starts with the fundamentals of construction. Soldiers start with the basics and learn straight from the STPs and FMs. Once Soldiers pass the first table, they will use what they have learned and apply it first to a small-scale project and eventually to their capstone project. This article proposes to overlap lessons that teach Soldiers their individual construction tasks because redundancy is the best way to reinforce training. The overlap also helps train new Soldiers and newly promoted noncommissioned officers (NCOs). Soldiers and NCOs who might have missed a previous table will be accounted for during the next six-month training cycle. This proposal is one way the Engineer Regiment can ensure that construction units are properly trained on basic skill sets and can execute projects in a variety of circumstances.

Captain Kondo is the 92d Engineer Battalion construction officer. He attended the United States Military Academy at West Point, New York, and holds a bachelor's in civil engineering.

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USACE LOOKS BELOW THE EARTH'S SURFACE FOR GREEN ENERGY



By Mr. Christopher P. Gardner

With construction booming around Fort Drum, New York, and the Army looking for more ways to "green" its construction practices and buildings, the Fort Drum Program Office of the United States Army Corps of Engineers (USACE) New York District decided to look into alternative sustainable energy sources for new construction. One of these alternatives was geothermal energy.

Renewable Energy Source

The Corps first started using geothermal systems at Fort Drum in 2004 for the construction of the Wheeler-Sack Army Airfield Complex. These systems provide a renewable source of energy for heating and cooling buildings. The temperature below the earth's surface remains nearly constant between 50 and 60 degrees Fahrenheit. Geothermal systems consist of a network of pipes filled with liquid buried in the ground; this acts as a heat exchanger to transfer energy to and from the building. Geothermal heat pump systems provide temperature control inside buildings without the burning of fossil fuels that occurs in traditional systems.

Use of these systems exceeds the standards for military energy requirements and reduces utility costs for Fort Drum, according to the New York District's program manager. In these facilities, the heating and cooling work similar to that in traditional systems. Occupants can adjust the temperature on a room-by-room basis, and the installation can adjust the temperature from a central location.

Beyond the Barracks Projects

During the initial design of the Wheeler-Sack Army Airfield Complex in 2002, engineers from the Fort Drum Program Office met with the local Indian River School District, which incorporated a geothermal system into one of its large building additions. The engineers toured the facility and talked to the users and the design firm to get a better idea of the system operation and performance capabilities.

After learning more about the concept, visiting other facilities that used geothermal approaches, and getting a better understanding of the specifics of geothermal design, the program office was ready to incorporate it into the designs and contract language of the barracks portion of the Wheeler-Sack Army Airfield Complex being solicited. The barracks were two of 17 buildings in a $100 million complex that was completed in 2006. The project manager at the Fort Drum Program Office reports that they were pleased with the end result of the project, and a bit surprised at how well the geothermal systems worked in the minus-20-degree



Photo by Dan Desmet, New York District public affairs

Crews work on trenches for geothermal wells, part of the heating and cooling system at the Fort Drum, New York, child development center.

temperatures. A survey of the residents in the Wheeler-Sack barracks yielded positive responses from all.

Based on the success with geothermal systems in barracks projects from 2004 through 2008, the Fort Drum Program Office is now providing geothermal energy as a primary option for heating and cooling needs in all new construction, where feasible. (Geothermal doesn't lend itself to large open-area buildings—such as hangars and vehicle maintenance facilities—where instead the Corps uses a green feature called "solar walls.") Projects that support geothermal heating and cooling range from barracks facilities to administrative buildings. Although there were concerns during the design phase in 2003 that geothermal methods would not work for Fort Drum applications due to the harsh winters, the Wheeler-Sack barracks project is proof that the systems do work there.

A child development center that is now under construction incorporates a geothermal heating and cooling system. The facility is designed to be Fort Drum's first Leadership in Energy and Environmental Design (LEED) Gold building. (The LEED rating system—with its four point-system levels of Certified, Silver, Gold, and Platinum—has created a framework encompassing building



Photo by Dan Desmet, New York District public affairs

Pipes are installed as part of geothermal wells during construction of the Fort Drum child development center.

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Warrior in Transition Complex: Growing in Phases

By Mr. Christopher P. Gardner

The United States Army Corps of Engineers (USACE) New York District recently completed construction of barracks and adjoining administrative facilities for the 385th Infantry Battalion at Fort Drum, but the job was different from other barracks projects that are springing up as the installation continues to grow. The 385th is one of the Army's Warrior in Transition (WIT) units—a relatively new concept for the Army. The units are made up of wounded Soldiers and are geared toward helping them make the transition back to traditional Army units or into civilian lives.

The 144-Soldier barracks is only one part of the new $35.7 million WIT Complex, a phased project that is capable of expanding to seven facilities. The complex also includes a new company operations facility, where medical and personal services are available and where WIT commanders can manage their Soldiers' intricate and often long transition processes in one place. Connected to the Soldiers' housing, the facility serves as a kind of nerve center for their healing. After the contract for the WIT complex was awarded in July 2008, Phase I of the project was completed 18 months later, in mid-February 2010, and the Soldiers moved into the barracks on 10 April 2010.

The 385th's Alpha Company has approximately 125 Soldiers, and their company commander notes that having everyone connected under one roof is a significant improvement. Many of the Soldiers, whether having suffered physical or psychological wounds—or both—have a litany of doctor and physical therapy appointments, counseling sessions, and other meetings required to prepare them



Photo by Dan Desmet, New York District public affairs

for the next steps in their lives. Many of these resources used to be spread all over the installation or even farther away. Now, case managers, nurses, social workers, counselors, and Army leadership are within walking distance of the housing—and Fort Drum's Guthrie Ambulatory Health Care Facility is across the street from the complex. A Purple Heart recipient who was injured in an improvised explosive device (IED) blast in Afghanistan, and who recently moved into the WIT barracks, stated that the improved access obviates the need to drive Soldiers who can't get around to their appointments. Additionally, having the Army leadership nearby is "a lot easier."

Just as the facility offers Soldiers many services to help them with their healing and transition back toward more traditional units—since the ultimate goal is to return Soldiers to duty—there are also resources for transitioning back into the civilian world. These resources can include helping Soldiers with career services, exploring educational opportunities, and determining what kinds of support Soldiers will need after they leave the Army. At the adjoining administrative building in the complex, education counselors guide those looking for colleges—such as one Soldier in the 385th who was injured while training for deployment and now wants to become a police officer.

The WIT barracks building appears similar to others from the outside, but on the inside the rooms are designed to be more comfortable for the transitioning Soldiers as they heal. The living quarters and kitchenette areas are larger and offer the Soldiers more privacy than in traditional barracks facilities. The size is comparable to a small apartment, with a personal side and doors to each room. The rooms offer more than comfort though, as they are not quite uniform throughout the barracks, and certain rooms are Americans with Disabilities Act (ADA)-compatible: They have unique features like adjustable-height stoves and countertops and/or specialized bathroom facilities that can be especially helpful for Soldiers with physical injuries. Here, a Soldier can be assigned the best room for his or her unique situation.



Photo by Dan Desmet, New York District public affairs

A sheltered walkway connects the Warrior in Transition barracks to important services, such as counseling and command leadership.

The three-story barracks is also equipped with elevators—including special oversize ones—and "areas of rescue," which are designated spots near exits where people with disabilities can remain temporarily in safety during emergency situations while awaiting further instruction. Neither the larger elevators nor the areas of rescue are standard for an Army barracks.



The Warrior in Transition Complex at Fort Drum, New York, located next to the Guthrie Ambulatory Health Care Facility, is composed of special barracks facilities for wounded warriors and adjoins the Company Operations Facility.



Photo by Dan Desmet, New York District public affairs

This geothermal system is inside the barracks in the new Warrior in Transition Complex at Fort Drum, New York.

The WIT Complex at Fort Drum was one of the first of its kind in the Army to open up to Soldiers; presently, the only other completed facility like it is at Fort Riley, Kansas. There are WIT units elsewhere throughout the Army, and other installations are already regarding the Fort Drum facility as an example. The USACE Center of Standardization is proud of how well the facilities turned out and recently brought two WIT unit company commanders from Fort Belvoir, Virginia, to visit the Fort Drum complex—with personnel from the USACE Baltimore District and an architect from the next WIT facility at Fort Belvoir—to learn what went into its planning, design, and construction.

The WIT Complex Phase I project is completely finished, but the complex is slated to continue growing immediately as part of WIT Phase II, which consists of a battalion headquarters facility, a Soldier and family care facility, and 48 additional rooms for Soldiers. During the next few years, there are also plans for additional housing, administrative facilities, a clinic, and a potential dining facility. The way the WIT Complex is designed to grow in phases—with structural additions having minimal effects on current occupants and the site—will benefit Soldiers, minimize impact to the environment, and provide savings to the government.

Mr. Gardner is a public affairs specialist with the United States Army Corps of Engineers. He currently serves with the New York District, based in New York City. He holds a bachelor's in mass communication from the University of South Florida in Tampa.

"Green Energy," continued from page 39)

performance and sustainability goals.) The $6 million child development center is essentially the Army's equivalent of a daycare center. The facility will be approximately 17,000 square feet, and contractors have drilled 16 wells to handle the facility's heating and cooling needs. The wells are approximately 425 feet deep and took about a week to drill. The depths of the geothermal wells will vary throughout the installation, depending on the geology and thermal conductivity of the area.

Using geothermal energy lowers energy costs by reducing the amount of fossil fuels burned—which can be considerable during Fort Drum's extreme winters, where temperatures can reach well below zero and have been known to reach the negative thirties. The geothermal system performs very well, even in the cold, but the project manager stressed that in the most extreme temperatures, the system sometimes needs a boost from traditional heating sources.

Despite geothermal energy's cost during the construction phase of approximately 30 percent more than traditional heating and cooling systems, the New York District's program manager pointed out that "payback"—the time it takes for a facility to recoup that initial cost with money saved in utilities—is generally three to seven years. The payback time depends on the building size and the fluctuating cost of fossil fuels—the latter having shortened the estimated payback time in recent years. The program office is looking into monitoring systems to determine the specific return on investment of geothermal energy at Fort Drum.

Energy Progress at Fort Drum

Geothermal energy has been used, where feasible, during the construction of facilities since 2004. As of today, geothermal systems have been incorporated into 19 buildings currently completed, under construction, or under design at Fort Drum. This includes the aforementioned child development center, 11 barracks buildings, a brigade and a battalion headquarters building, and the addition to the Guthrie Ambulatory Health Care Clinic. Geothermal energy was also used in the recently completed Warrior in Transition Complex constructed for injured Soldiers (see article on page 40) and will be included in the next two facilities to be added to this complex.

Mr. Gardner is a public affairs specialist with the United States Army Corps of Engineers. He currently serves with the New York District, based in New York City. He holds a bachelor's in mass communication from the University of South Florida in Tampa.

Captain George G. Meade and the United States Lake Survey

By Mr. Gustav J. Person

The five Great Lakes—Superior, Michigan, Huron, Erie, and Ontario—comprise one of our greatest natural wonders. Their six quadrillion gallons of water are spread over 94,500 square miles, and their connecting waterways form the world's largest inland water transportation system. From the westernmost port at Duluth, Minnesota, a ship can travel 1,160 miles to the St. Lawrence River and 2,340 miles to the Atlantic Ocean.[1]

Founded in 1841, the United States Lake Survey was undertaken as a hydrographic study to chart the inland seas and make them conducive to trade and development. One of the foremost commanders of this survey was Captain George Gordon Meade, an officer of the Corps of Topographical Engineers. Meade is usually widely recognized for his later role as the victor of the Battle of Gettysburg in 1863 and as commanding general of the Army of the Potomac during the Civil War. This article will examine Meade's early role in the survey, both in advancing scientific research and developing the national economy and defining civil/military relationships at the beginning of the Civil War.

George G. Meade

George G. Meade was born in Cadiz, Spain, on 31 December 1815. His father, a wealthy American merchant, was financially ruined by his adherence to the cause of Spain during the Napoleonic Wars. After obtaining an appointment to the United States Military Academy at West Point from a Pennsylvania member of Congress, he graduated in 1835, ranking 19th in a class of 56 members. Meade's original branch was artillery, in which he served in Florida during the Seminole Wars. Resigning in 1836 along with many other young officers, he pursued a short career in civil engineering but reentered the Army in 1842 as a second lieutenant in the Corps of Topographical Engineers. During the Mexican War (1846–48), he served at the battles of Palo Alto, Resaca de la Palma, and Monterey and was awarded the brevet of first lieutenant. Thereafter, he was mostly engaged in lighthouse construction in Florida, New Jersey, and Delaware, in the Fourth and Seventh Districts respectively.[2]



Photo courtesy of Office of History, United States Army Corps of Engineers

Less than a decade after his work on the United States Lake Survey, Captain George G. Meade was Major General Meade, hero of Gettysburg.

In April 1856, at age 41, Lieutenant Meade received a transfer from coastal duty and was sent to Detroit to assist in the ongoing survey of the Great Lakes. In May 1857, he was promoted to captain and placed in command of the



Map courtesy of Master Sergeant Paul Jenkins, United States Army, Retired

Map of the Great Lakes

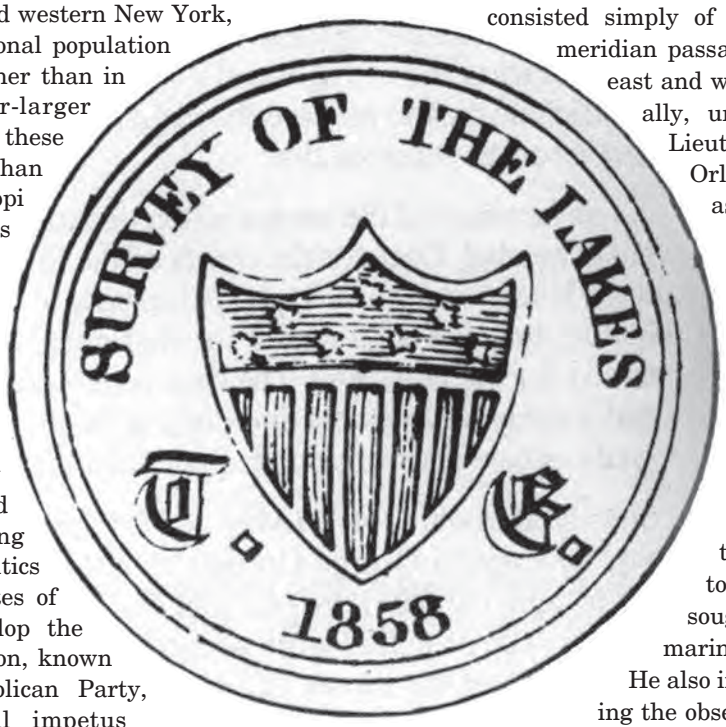
survey, replacing Lieutenant Colonel James Kearney, who was reassigned due to ill health. Meade's official title was *Superintendent* (or *Superintending*) *Engineer, Survey of the Northern & Northwestern Lakes*. The process entailed mapping the lake shores and navigation hazards; charting the lake bottoms to locate hidden dangers; and mapping projected ship channels. The duty included improvements of existing harbors, as well as searching for potential sites that could be converted into harbors in time of war. Sites for lighthouses, beacons, and buoys also had to be located. The work was daunting. Some 6,000 miles of shoreline were to be surveyed. The Army surveyors had to determine latitude and longitude; measure the discharge of rivers into the lakes; and survey tributary rivers, narrows, and shoals.[3]

Great Lakes Economy

With characteristically broad vision, Colonel John J. Abert (1786–1863), the first Chief of Topographical Engineers, described the survey in the most far-reaching terms. "These lakes," he wrote, "constitute a great northern seaboard." At almost every turn, he urged Congress to provide more money, buttressing his arguments for increased support by reminding the legislators of the thriving lake trade and backing his claims with the commercial statistics that he required of his engineers in the field.[4]

In the 1820s and 1830s, the economy of the Great Lakes region made tremendous gains, leading to the need for a comprehensive survey. Congressman Joshua Giddings of Ohio had witnessed the beginnings of trade on the lakes during this period. During the 1840s, he called on fellow lawmakers to recognize the greatly expanded trade and provide for harbor improvement. He noted that trade on these waterways amounted to more than $65 million in 1841 and more than $100 million in 1844. Chicago's Democratic congressman, John Wentworth, remarked in 1846 that "the commerce on the lakes the past season has been $125,000,000, employing 6,000 active seamen. The large amount of lake commerce (import/export) will be best appreciated when it is known that the whole export commerce of the United States is but $114,000.000." The Erie Canal, completed in 1825, already served as the linchpin for the new system of trade, tying the Great Lakes into New York City and the Northeast. Lake representatives demanded that the government create "harbors of refuge" for vessels caught in the violent storms that often swept across the inland seas.

The development of the lakes considerably reoriented the economy of the Midwest. Reflecting the influx of settlers from New England and western New York, more and more of the regional population lived around the lakes rather than in the Ohio Valley. An ever-larger portion of shipments from these states flowed east rather than south down the Mississippi River. Finally, the demands of Great Lakes congressmen for government improvement outlays led to a realignment of Northern voters. The new patterns of trade weakened old political alliances and formed a new, purely Northern party that joined together two overlapping groups: the strongest critics of slavery and the advocates of federal programs to develop the North. The new organization, known after 1854 as the Republican Party, would provide additional impetus toward the outbreak of the Civil War.[5]



Seal of the Survey of the Lakes, 1858

Meade's Accomplishments

Although Army engineers conducted surveys as early as 1833 and during the period 1836–37, the systematic surveying was not begun until 1841. In that year, Captain William G. Williams, then stationed at Buffalo in charge of harbor improvements on Lake Erie, received directions from Colonel Abert to start the survey of the Great Lakes. Into this ever-expanding and potentially explosive political situation, George Meade arrived with his family at the Detroit headquarters of the United States Lake Survey in 1856. He came well prepared for this role. He had the comprehensive mental grasp of the country that makes a born surveyor and which must have been apparent to everyone associated with him. His principal accomplishment was the survey of the whole of Lake Huron during the 1857–59 seasons and completion of the survey of Saginaw Bay. Lieutenant Colonel Cyrus Comstock, one of Meade's successors as commander of the survey and a future commandant of the United States Army Engineer School (1886–87), noted that "the nature of the field operations required a combination of triangulation and astronomical work for the determinations of the positions of points on the shores of Lake Huron, and [Meade] made some changes necessary in the method of executing the off-shore hydrography." He also noted that Meade determined the general configuration of the bottom of that lake by running a few lines completely across it.[6]

Undoubtedly, the most notable method Meade adopted for the survey was a modification of the procedure to determine longitudes by the use of the electric telegraph, known as the American method. This procedure, invented by Professor C.A. Young of Western Reserve College in Ohio, consisted simply of observing and timing the meridian passage of stars at two stations east and west of each other. Additionally, under Meade's supervision, Lieutenants C.N. Turnbull and Orlando Poe did considerable astronomical work, and Lieutenant William P. Smith performed a good deal of magnetic work. The procurement of state-of-the-art chronometers and other instruments aided these important endeavors.[7]

In 1859, Meade set up 19 weather stations on the five lakes. In addition to gauging the weather, he sought to predict it and warn mariners of impending storms. He also instituted a system for refining the observations made on the force and direction of the wind, after finding that the meteorological authorities had developed no uniform system.[8]

In 1860, the survey of the northeastern end of Lake Michigan was extended southward to include the Fox and Manitou Islands and Grand and Little Traverse Bays. This survey resulted in the publication of a much-needed chart of that dangerous part of Lake Michigan—the route traversed by vessels sailing between the Straits of Mackinac and Chicago. The Lake Survey completed a few local harbor surveys on Lake Superior by 1859 and began a general survey of the western end of that lake in 1861.[9]

From 1858 through 1861, the federal appropriations for the Lake Survey grew to $75,000 annually. The increase permitted expansion of the scope of the survey; introduction of more accurate methods to obtain longitude; and commencement of a series of magnetic and meteorological observations, as described above. In addition, these appropriations provided funds for the construction of an astronomical observatory at Detroit and, after 1858, for the first systematic recording of lake water levels.[10]

Meade would later write that he considered the early work on coastal lighthouses and the lakes survey as among the most important duties of his extensive career. However, he had watched with great anxiety the stresses that were beginning to tear the nation apart in the late 1850s. He scanned the political horizon for some glimmer of hope that the dreaded resort to hostilities might be averted. Therefore, in the presidential election of November 1860, he cast his vote for John Bell and Edward Everett of the new Constitutional Union Party, a compromise group that attempted to sway conservative voters who opposed both the Republicans



Photo courtesy of Office of History, United States Army Corps of Engineers

Colonel James D. Graham

and the Democrats. Abraham Lincoln, with only 40 percent of the popular vote, won enough electoral votes to win the presidency. The secession of the Deep South states followed soon thereafter.[11]

Civil War

In the strongest language, Meade denounced the Southern leaders who were goading their people into civil war. He knew of the immense superiority of the North over the South in human and materiel resources, and of the contempt of the South for the North. In Detroit, as elsewhere, there was intense political excitement, and one of its manifestations was distrust of many officers of the Army and Navy—a number of whom had resigned their commissions to side with the Confederacy. In the midst of the uproar, a proclamation in Detroit requested the presence of military officers at a mass meeting in order that they might take the oath of allegiance to the United States. Captain Meade was having none of this. His officers met at his home and, with one exception, declined to attend the mass meeting. As justification, they claimed that it was unbecoming of officers in government service to be present at such a meeting, especially for such a purpose; that it would set a dangerous precedent for officers to take an oath at the demand of a crowd; and that the organizers of the meeting were unjustified in making such a demand. They then drew up, signed, and forwarded a statement of their willingness to take the oath of allegiance whenever called upon by the War Department.

The action of these officers in declining to attend caused a great deal of violent language from the public at the mass meeting, which dispersed after the usual patriotic speeches and resolutions. Nothing of consequence came of the affair, although it generated some suspicion and ill will among some prominent people in that part of the country.

Soon after the firing on Fort Sumter on 12 April 1861, Captain Meade made urgent and repeated requests to the War Department for active duty. With no response, he went to Washington in late June. He protested against being retained in charge of the Lake Survey and applied for a commission in one of the new regiments being raised to put down the rebellion. Unfortunately, nothing came of it and he returned to Detroit empty-handed. Meanwhile, he had been placed in charge of the erection of new lighthouses on Lake Superior. All of the younger officers under his command had already been ordered to active duty and were engaged in raising and organizing new volunteer units.

In early August, he was ordered to turn over his duties to Colonel James D. Graham—at age 77, one of the oldest topographical officers—and to return to Washington to take charge of the recruitment of a company of topographical engineers, lately authorized by Congress. Meade was much dismayed by the situation in which engineer officers, agreeing or ordered to continue their own corps duties, were left behind in junior rank, while others were rapidly being advanced to field and general officer grades in the volunteer service. This dismay had led to his determination to resign his Regular Army commission in order to accept the colonelcy of one of the regiments of Michigan volunteers, a post which had been offered to him by Governor Austin Blair. However, much to his surprise and gratification, he was officially notified of his appointment, on 31 August 1861, as a brigadier general of volunteers with orders to report to Major General George B. McClellan, then commanding the Union forces around Washington, D.C. He hurriedly sent his family back to Philadelphia and hastened to the capital, where he was assigned as a brigade commander in the division of Pennsylvania troops commanded by Major General George A. McCall. As the world knows, his later record of service in the Civil War was decidedly distinguished.[12]

Epilogue

In Meade's absence, Colonel Graham, and later Lieutenant Colonel William F. Raynolds, supervised the Lake Survey. Both officers would continue and capitalize on Meade's excellent work. Due to active operations during the Civil War, the survey was the only active topographical field office still operating, although only the survey of

(Continued on page 49)

Investigations—Part I:
Why Official Inquiries Are Needed

By Captain Daniel D. Maurer

This is the first of a two-part discussion of why an official investigation is often helpful to the Soldier, the unit, and the United States Army, and how this useful tool can best be conducted.

This two-part article is designed for two audiences: the commander who is wary of intrusive or distracting investigations that lack a positive goal; and the leader who is likely to be tagged as a unit's next investigating officer and who may not have any relevant experience investigating. It will delve into why it is almost always in the best interests of the Soldier, the unit, and the Army to investigate when a commander asks, "How did this happen?" and the answer is, "We don't exactly know."

Part II, to be published in the January–April 2011 issue, will focus on the mechanics and tactics, techniques, and procedures for executing lawful, thorough, and productive investigations. Like an engineer route sanitization mission, these two parts will push away some of the debris of misconceptions and obstacles to good detective work, fill in the potholes of poor execution with sound procedures, and give commanders and investigating officers some advice for traveling the road to executing legally sufficient and helpful investigations.

Balancing Act

Commanders often struggle to balance their focus between accomplishing the mission and maintaining good order and discipline among their formations. Of course, as all experienced leaders can attest, the one often affects the other. This balancing act is even more accented during a deployment, where there is little distinction between Soldiers' living and working environments. Tensions and stress levels are high, and the availability of "down time" is sometimes scarce. In such conditions, spending time and energy to question and answer nagging problems may not sit at the top of the priority list.[1] But the absence of clear and fair processes to deal with the nagging disciplinary problems that frequently arise may only serve to exacerbate small issues, turning them into large crises. These crises are often attributable to an earlier failure to deal with the problem. Consequently, the command's attention is drawn away from operations, which may result in a degraded ability to accomplish the mission. In other situations, misconduct is less a concern than a systemic failure in leadership, training, maintenance, or elsewhere. In all of these cases, it is imperative that the method of uncovering facts and making recommendations—how problems are investigated—is rational, reasonable, and internally cogent. This ensures that—

- The Soldiers' rights are protected.
- The right evidence is collected for the right reasons and in the right way.
- The chain of command is put in the best possible position to make sound decisions.

But before we get to *how* we investigate, it is equally important to know *why* we investigate.

Why We Investigate

Under Rule 303 of the Manual for Courts-Martial United States,[2] commanders are authorized to commit time and effort to investigating misconduct. It is a basic application of command authority to ensure the good order and discipline of the unit. The gist of this authority is the ability of the immediate commander, who has direct contact with and knowledge about a particular Soldier, to ask relevant questions to jump-start a more formal investigation or help drive an efficient and effective decision. Asking questions might take the shape of an investigation under Army Regulation (AR) 15-6, *Procedures for Investigating Officers and Boards of Officers*[3]; a formal Criminal Investigation Division inquiry driven by law enforcement specialists; or an immediate administrative response by the commander.

Of course, not all fact-finding efforts are about criminal misconduct, but fact-finding inquiries are permitted or even encouraged, even if the event or incident in question is not likely to lead to a court-martial. Consider a scenario in which a commander reasonably predicts that a vehicle accident "outside the wire" between a mine-resistant, ambush-protected (MRAP) vehicle and a pickup truck driven by a local national civilian was caused by poor road conditions or driver fatigue. The commander may be inclined to order

a response plan that includes nothing more than retraining, better route reconnaissance, and confirmation of crew rest. However, during the course of the inquiry or investigation, the commander may learn that the Soldier's fatigue was caused by his reckless choice to remain awake playing video games in his containerized housing unit (CHU) until 0430 on the day of the patrol. Or that the unit's patrol leader knew of a dangerous, accident-prone intersection on the planned route, yet never warned his Soldiers or trained them on mitigating that risk. In this case, the commander may want to consider adverse actions. The opposite scenario is equally plausible. The Soldier's actions may be labeled as misconduct at first, until investigation reveals that environmental factors or leadership failures set conditions for the accident. Every investigation has a potential for legal consequences and is therefore triggered by the body of law that governs military justice.

Since this potential exists in all investigations, it makes sense to give quasi-law enforcement authority to commanders before they engage their quasi-prosecutorial powers. Because of the unique environment in which the United States Army works and lives, efficiency—balanced against fairness of process—is essential to the promotion of justice in the functioning of a disciplined, ordered unit. In other words, there are situations—sometimes as a unique attribute of military service such as minor disrespect or failure to obey a lawful order while living in the barracks—wherein the commander can gather facts, review and reflect on them, draw reasonable conclusions from them, and dispose of the incident with some administrative or punitive consequence.

Sending a Positive Message

Sometimes, in an information-operations or public relations sense, commanders may find great utility in starting an investigation. There is a "strategic messaging" value to be gained when Soldiers, their families, the public, or superior commander see that the unit recognizes that an issue exists and takes reasonable steps to understand why. By initiating an investigation, a commander can counter the fear that "airing dirty laundry" somehow opens the unit to outside criticism. Telling superiors that an issue exists and what actions are being taken to investigate it and proposing reasonable and deliberate courses of action demonstrate the commander's depth of situational awareness, thoroughness of fact-finding, and calm maturity as a leader.

Sometimes, though, commanders will not have a choice. Many commands impose mandatory investigations for certain events, such as an AR 15-6 investigation for the suspected suicide of a Soldier. Formal equal opportunity complaints automatically spark investigations.[4] In these cases, the value gained by conducting a dignified, independent, official review of the facts to satisfy the concerns of interests such as the media, families, and fellow Soldiers is thought to outweigh the potentially negative effect such an investigation might have on the operational capability of the command.

Keeping Commanders Grounded

"Commanding officers exercise broad disciplinary powers in furtherance of their command responsibilities. Discretion, fairness, and sound judgment are essential ingredients of military justice."[5] Slowing down, pausing to reflect, and initiating an investigation is a field-tested and field-proven method for ensuring that a commander's first, visceral response to a troubling event is not some irrational or irresponsible action that could potentially end the career of a Soldier, seriously hinder promotion opportunity, take away pay, or rob a Soldier of liberty through confinement in prison. An investigation is one of the checks and balances on the commander's inherent disciplinary authority and helps ensure that the application of power is "warranted, appropriate, and fair."[6]

Resourcing an investigation early to immediately address incidents, when evidence and memories are fresh, allows the commander to make better-informed and relevant decisions. In contrast, waiting to investigate may seriously narrow options later on. Consider a verbal dispute between Soldiers in their shared CHU, where one has an M4 rifle loaded with a magazine. The platoon sergeant, upon breaking up the argument, sees the weapon and concludes that the rifle's owner intended to threaten his roommate and so launches a chain of events that lead to an Article 15. The commander may find that if an inquiry had started as soon as credible information surfaced, it would have revealed that the argument between the roommates started when one entered the room, saw his despondent roommate with a full magazine in his rifle, staring at pictures of his wife, and smelled alcohol on his breath. A reasonable person could believe that this was not an aggressive—or homicidal—threat but the interruption of a potential suicide. Consequently, the command's legal and leadership challenges would be different. Waiting, or choosing not to investigate at all, was tantamount to deliberately avoiding better situational awareness, not to mention losing the chance to act in a way that was most appropriate.

Improving Institutional Memory

Investigations serve purposes and create value in similar ways that after action reviews do. Just as such reviews identify what *actually* happened compared to what *should have* happened and formulate recommendations for improvement, investigations can be thought of as organized lessons-learned libraries for the next command. An investigation gathers information about an event or incident; assembles those facts into a complete picture of what occurred; draws conclusions based on applicable standards, guides, or laws; then proposes recommendations from the lesson of that particular case. When faced with a pressing issue or systemic concern, future commanders can find substantial utility in going back into the records to discover how previous leaders identified and dealt with similar issues or concerns.

Though there are several types of cases that they should refer to professional investigators *(to be discussed in Part II)*, commanders should not be reluctant to exercise their authority to investigate. The military has given commanders the ability and authority to be their own "internal affairs bureau." The difficult choice to trigger an investigation might be eased if a commander's inquiry or AR 15-6 investigation is considered a fact-finding trip led by a neutral observer. Would the unit benefit from a dedicated examination of the problem and a neutral set of recommendations about it? Commanders will consider all the information available and conduct a cost-benefit analysis, but a realistic standard guide could be quite simple. If a superior commander is likely to take an interest in an issue, incident, or event and would probably ask for an analysis of cause and effect—then an official inquiry is probably needed.

However, not every issue, incident, or event needs an expansive AR 15-6 investigation. Part II will look into the mechanics of executing an investigation, from deciding how big the scope ought to be, to planning the investigative mission, to the critical thinking inherent to solid probing and fact-finding.

Captain Maurer serves as the command judge advocate for the 36th Engineer Brigade (Joint Task Force Rugged). Previous assignments include trial counsel for the brigade at Fort Hood, Texas; assistant task force engineer; sapper platoon leader attached to a 4th Infantry Division mechanized infantry task force during Operation Iraqi Freedom; and battalion support platoon leader and supply officer in a mechanized engineer battalion at Fort Carson, Colorado. He holds a bachelor's from James Madison University, where he was Distinguished Military Graduate from the United States Army Reserve Officer Training Corps program, and a law degree from The Ohio State University.

Endnotes

[1]Investigations are not limited to cases of property accountability or possible misconduct. Any systemic problem that could be found on a commander's desk can call for a rational, ordered inquiry with a purpose and scope, gathered for independent scrutiny.

[2]*Manual for Courts-Martial United States*, Rule 303, p. II-19, 2008. "Upon receipt of information that a member of the command is accused or suspected of committing an offense or offenses triable by court-martial, the immediate commander shall make or cause to be made a preliminary inquiry into the charges or suspected offenses."

[3]AR 15-6, *Procedures for Investigating Officers and Boards of Officers*, 2 October 2006.

[4]AR 600-20, *Army Command Policy*, Chapter 6 and Appendix D, 18 March 2008.

[5]Ibid., para. 4-7a.

[6]*Manual for Courts-Martial United States*, Rule 306 (b) Discussion.

"Past in Review," continued from page 46)

Huron was finally completed. The Lake Survey would continue until 3 October 1970, when it was redesignated the Lake Survey Center and officially transferred to the National Oceanic and Atmospheric Administration. It became part of the National Oceanic Survey, the former Coast and Geodetic Survey. The Lake Survey Center was finally phased out in March 1976.[13]

Mr. Person is the installation historian at Fort Belvoir, Virginia. He retired from the New York State Division of Parole after 30 years of service and is a retired lieutenant colonel from the New York Army National Guard. He holds a master's in history from Queens College, City University of New York.

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[8]Schubert et al., pp. 44-45; Isaac R. Pennypacker, *General Meade*, D. Appleton and Company, New York, New York, 1901, p. 20.

[9]Woodford, pp. 37-38.

[10]Ibid., p. 38.

[11]Sauers, p. 12.

[12]Meade, pp. 213-16.

[13]Schubert et al., p. 45; Woodford, pp. 186-89.



ERDC Serves as Summer Home for Cadets

By Ms. Megan Holland

Ten cadets from the United States Military Academy at West Point, New York, found a temporary home in the United States Army Engineer Research and Development Center (ERDC) this summer while on Advanced Individual Academic Development Program assignments. Designed to give students hands-on experience, the assignments include weeks of research, with the cadets expected to create a final product, briefing, or report for West Point. In some cases, a cadet continues to work on the project as an individual study elective course during the following academic year, an option that many of ERDC's cadets chose.

The voluntary program offers many options, such as touring France to sharpen language skills and absorb the culture. ERDC has participated in the program intermittently since 1978, and this year's crop of 10 cadets was the largest yet hosted by the research organization.



Photo by Oscar Reihsmann ACE-IT

A cadet helps an ERDC researcher prepare for an experimental explosion while working with ERDC's Geotechnical and Structures Laboratory.



Photo by David Roberts, ERDC PAO

A cadet works in ERDC's Environmental Laboratory in Vicksburg, Mississippi.

Three of the cadets worked with ERDC's Geotechnical and Structures Laboratory, four with the Environmental Laboratory, and one with the Coastal and Hydraulics Laboratory, all in Vicksburg, Mississippi; two more were assigned to ERDC's Construction Engineering Research Laboratory (CERL) in Champaign, Illinois.

ERDC engineers and scientists mentor the cadets on a variety of diverse projects. One of this year's projects focused on mitigation of improvised explosive device (IED) attacks against Soldiers. The project involved making roads safer by reducing the forces that act on a vehicle during an IED attack, in addition to lowering the insurgents' ability to emplace the explosive devices in the first place. The cadets working on this project tested small-scale models in the Geotechnical and Structures Laboratory centrifuge lab and worked in ERDC's United States Army Corps of Engineers Reachback Operations Center, evaluating the best measures to lessen these risks in-theater and testing software. They also spent time at ERDC's explosives range, testing ERDC-created mitigation measures on quarter- and half-scale models. Their goal was to determine if the measures could make IED blasts survivable by Soldiers.

Another cadet deployed to assist the Environmental Laboratory in response to efforts by the Department of the Interior (DOI) after the Deepwater Horizon oil spill in the Gulf of Mexico. He helped the Environmental Laboratory and the United States Fish and Wildlife Service organize a natural resource damage assessment database to document injury to DOI public trust natural resources. He also helped in beach bird surveys by searching beach segments to collect data on bird populations in areas affected by the spill.

At CERL, a cadet majoring in civil engineering spent the summer researching renewable and alternative energy technologies in Afghanistan, concentrating on the potential to reduce the need for diesel fuel and reduce annual costs by installing a variety of energy-saving measures. He also studied the conversion of waste to energy through gasification, assessing the potential use of a gasifier to reduce the volume of waste while producing enough energy to automate the waste system and/or offset diesel fuel consumption for generators.

Much of the program's success is credited to the ERDC scientists and engineers who act as mentors for the cadets in their assignments. ERDC benefits from the efforts of the talented cadets, and the future leaders in turn learn about the center's important solutions to Army problems.

Ms. Holland is a contract writer for ERDC. She holds a bachelor's in English and writing from Mississippi College. Before working at ERDC, she was a newspaper reporter in Vicksburg, Mississippi.

Mobilizing the National Guard in a Modular Environment

By Major Kevin L. Becar

The modular deployment of United States Army units from different components presents many issues. This article discusses some of the lessons learned by leaders of the 779th Engineer Battalion (Construction), Florida Army National Guard, and its subordinate companies as they deployed to support Operation Iraqi Freedom.

Useful Preparations

React to changes in First United States Army's Commander's Training Tool (CTT) requirements during predeployment training. Any Reserve Component unit that has mobilized recently is intimately familiar with the CTT. With its massive tracking spreadsheet of training requirements to be completed before a unit arrives at its mobilization center, it can be a daunting list of documentation. One of the more significant challenges units face is the continual updating of CTT versions. If a unit begins training with the version in effect at the start of premobilization, it can be disheartening to learn that completed events are now invalid or incomplete because a newer version has taken effect.

Leaders may find it helpful to pursue a "grandfather clause" to remain under the standards of the version they started with, but at a minimum they must stay alert to version changes and the effects they may have on completed training. It would be ideal to immediately migrate to the latest training recommendations coming from in-theater, but once the time-sensitive nature, the complexity, and the



Soldiers of the 115th Engineer Company fabricate an interior truss.

"The more flexible a unit's organization and leadership teams are, the easier it will be for them to react to the many unknown situations encountered in-theater."

sheer size of the premobilization process are factored in, that migration would become very difficult to manage.

Mesh administrative functions with a new higher headquarters. Unity of command is one principle of war that many people believe is violated in today's modular environment. While the principle certainly exists within the deployed battalion, the United States Army National Guard companies from different states that comprise the battalion still have a secondary command relationship with their joint force headquarters and organic battalions back home. This can pose problems at the brigade level, where Active Army companies have different reporting requirements and procedures. The Active Army companies may authorize battlefield promotions that are not available to the National Guard units. Although the brigade may hold Noncommissioned Officer (NCO) Evaluation Report authority over the Active Army companies, the National Guard units may be allowed to report evaluations through their own state systems.

All of this introduces challenges to take into consideration for modular mobilization of units. It is critical for leaders to contact their higher headquarters as soon as possible to find out what requirements will be so that they can come prepared. For example, some of the 779th Engineer Battalion companies closed out Officer Evaluation Reports (OERs) the day before going on active duty. This allowed them to capture performance for the full mobilization on a single evaluation. Companies that did not follow this policy had to close out annual OERs intermittently throughout the deployment, often having to obtain signatures from the rear, which delayed their completion. If the theater headquarters can provide its rating chain requirements, these may be established before a unit's deployment.

The completeness of personnel records for all Soldiers before deployment is also important. Missing information will affect in-theater boards, awards, and many other administrative items. This information must also be updated throughout the deployment in order to be prepared for proper completion of demobilization records that can capture all the updates and additions that Soldiers earned during their combat tour.

Become acquainted with units assigned for deployment. Learning the capabilities, strengths, and weaknesses of attached companies and how they can be mobilized to support the commander's vision is a tough chore. The 779th hosted a conference for its subordinate companies that allowed key leaders from three states to meet each other, laying the groundwork for future operational relationships. The battalion found it most effective to stay on the same calendar for all major milestones. One company even realigned its annual training date and location to conduct the event with the battalion headquarters. After meeting with First Army to conduct a joint assessment, companies from the three different states discussed issues and challenges in order to agree on a strategy for the remainder of premobilization training.



A clevis and chain turn a bucket loader into a device to maneuver Jersey barriers.



This is one of the many ways to use a chain to lift a Jersey barrier, as demonstrated by the 1313th Engineer Company in Mosul, Iraq.

It is also important to begin setting up secure Internet accounts for key leaders before postmobilization training. This allows immediate contact with leaders in-theater to refine the unit's mission rehearsal exercise (MRX) scenario, based on the most relevant information. As units march toward completion of CTT requirements before postmobilization training, they should be planning to arrive at the same mobilization center on or about the same date to conduct the important MRX together. In addition, the mobilization center training schedule can be synchronized for the entire battalion. Agreement on the dates and order of training events, passes, and departure ceremonies is the key to maintaining this synchronization.

Collect situational awareness on the new area of operations before arrival. If a battalion-level predeployment site survey cannot be arranged, a visit to the mobilization center by a key leader from a unit in the future area of operations would be helpful. This representative can share intelligence updates and operational details about the area and answer most questions. This information was invaluable to the 779th and helped refine MRX details and packing lists and satisfy Soldier expectations. Early receipt of the tactical standing operating procedures and policy letters was a great benefit as well.

Learn engineer-specific tactics, techniques, and procedures (TTP) from new units. Despite the challenges, the positive effects of modularity include the opportunity to learn new, more effective TTP from units just attached for deployment. One of the most significant lessons the 779th learned from its attached vertical construction company was the use of prefabrication. Soldiers from the 115th Engineer Company (Vertical), West Virginia Army National Guard, introduced prefabrication during the MRX when they were tasked to construct Southwest Asia huts. Instead of arriving on-site, clearing it, and establishing security for the duration of construction, they remained on the forward operating base (FOB) in relative comfort and safety to prefabricate the shelters. They spent minimal time on travel and work time on-site to quickly erect the prefabricated huts. The concept was perfected during postmobilization training and was highly effective in Iraq. The 115th commander said that minimizing engineer on-site time eases the logistical strain on the supported unit and that prefabrication cuts that time by 30 to 40 percent.

Another great TTP came from the 1313th Engineer Company (Horizontal), Indiana Army National Guard. The company implemented nontraditional methods to maximize the use of heavy engineer equipment to accomplish the mission. The 1313th Soldiers fabricated a replacement bucket loader tooth to maneuver Jersey barriers more quickly. In addition to using excavators, the engineers used front end loaders to fill HESCO Bastion Concertainer® units, which reached heights of 11 to 12 feet. In the absence of a crane, excavators were used to move and set T-Walls® without applying too much stress to the arm. All of these methods were tested and practiced with the necessary risk assessments for maximum potential on-site.

Prepare for cross-functionality and reorganization as the mission dictates. A battalion may not operate with its own organic capabilities for all of its rotation. Engineer battalions may act as "construction effects" or "combat effects" units or a combination of both. In order to provide full spectrum engineer operations in every operational environment, engineer brigade commanders

may slice up battalions to share capabilities with each other. The staff of a construction effects battalion may not need to master company-level operations for route clearance, for example, but the staff should become familiar enough with assured mobility missions, procedures, and equipment to exercise command and control over any combat effects units that may be attached to their battalion. The 779th Engineer Battalion added command and control of route clearance missions to its MRX to validate staff proficiency. That effort paid off when the battalion was assigned an Active Army sapper company during its rotation. An experienced sapper NCO acted as liaison in the battalion tactical operations center to foster a close relationship and avoid miscommunications.

In addition to cross-functionality, units will likely need to reorganize their modified table of organization and equipment (MTOE) to meet new and unexpected demands. For example, most units will need to carve out a protective security detail to take the command team outside the wire on battlefield circulations. There will also be FOB details such as gate guard duty to provide. It is strongly advised that units capitalize on overstrength authorizations to help meet these requirements. The 779th was authorized to deploy with 10 percent excess strength, and the additional personnel proved valuable. Staying flexible to these ever-changing demands will allow units to quickly and effectively reorganize their structure to accomplish the mission.

Conclusion

The more flexible a unit's organization and leadership teams are, the easier it will be for them to react to the many unknown situations encountered in-theater. That's not to lessen the importance of a deploying unit arriving with the most relevant information available, especially from its new higher headquarters. Deploying leaders must learn as much as possible about the missions and organizations above, below, and beside them so that they can react most effectively to changes in plans. The Army has always been known for flexibility and adaptability to enemy TTP; deploying leaders can look forward to adding to that legacy during their rotations.

Major Becar is executive officer of the 779th Engineer Battalion. Previous assignments include operations and training officer, 779th Engineer Battalion; executive officer, 153d Finance Battalion; operations and training officer, 220th Finance Group; supply officer, 116th Engineer Battalion (Combat); and commander, Bravo Company, 116th Engineer Battalion. He holds a bachelor's in accounting from The College of Idaho and is a graduate of the United States Army Command and General Staff College, Fort Leavenworth, Kansas. A certified public accountant, he has been a member of the United States Army National Guard for 24 years.

THE ENGINEER WRITER'S GUIDE

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted Soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

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

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

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

Articles submitted to *Engineer* must be accompanied by a written release by the author's unit or activity security manager prior to publication. All information contained in the article must be unclassified, nonsensitive, and releasable to the public. *Engineer* is distributed to military units worldwide and is also available for sale by the Government Printing Office. As such, it is readily accessible to nongovernment or foreign individuals and organizations.

We cannot guarantee that we will publish all submitted articles. They are accepted for publication only after thorough review. If we plan to use your article in an upcoming issue, we will notify you. Therefore it is important to keep us informed of changes in your e-mail address and telephone number. All articles accepted for publication are subject to grammatical and structural changes as well as editing for style.

Send submissions by e-mail to <*leon.engineer@conus.army.mil*> or on a CD in Microsoft Word, along with a double-spaced copy of the manuscript, to: Managing Editor, Engineer Professional Bulletin, 464 MANSCEN Loop, Suite 2661, Fort Leonard Wood, Missouri 65473-8926.

Note: Please indicate if your manuscript is being considered for publication elsewhere. Due to the limited space per issue, we usually do not print articles that have been accepted for publication by other Army professional bulletins.



Photo by SSG Billie Jo Lorius, North Dakota ARNG Public Affairs

North Dakota National Guard Trains on New Bridge Equipment

By Staff Sergeant Billie Jo Lorius and Mr. William Prokopyk

The North Dakota Army National Guard's 957th Engineer Company (Multirole Bridge) was the first Army unit to train on a new bridge anchorage system in a fully operational scenario. The training took place on the Missouri River, south of Bismarck, during the unit's two-week annual training in June. The Missouri River was selected as an ideal location to test this system because of its width and fast-moving current.

The training began with a weeklong 40-hour stretch of classroom instruction on the improved ribbon bridge (IRB), followed by a practical exercise with the equipment and bridge. The 210-meter bridge span was left in place overnight and observed on Friday before the Soldiers and trainers disassembled it. Not only was the 957th training on new equipment, but they were also uniquely part of an important operational assessment of a new anchorage system that has never been used to bridge waters with currents as fast as the Missouri River over a span of 200 meters. Observing the assessment was the North Dakota adjutant general, who said that the Soldiers' feedback will enable program managers to incorporate final adjustments to the anchorage system before final production and distribution to military bridging units.



Photo by LTC Rick J. Smith, North Dakota ARNG Public Affairs

This close-up shows the main component of the new "thrust and shore guy" cable system used to anchor the IRB installed on the Missouri River.

After the bridge span was emplaced, several tests were performed. First, the forward lateral movement of the bridge was tested by driving a 35-ton common bridge transporter truck across it, loaded with an MKII Bridge Erection Boat (BEB). Crossing at top speed, the truck then performed an emergency "braking stop." During a total of ten crossings, minimal forward movement of the system was observed.



Photo by William Prokopyk, North Dakota Army National Guard Public Affairs

Soldiers of the North Dakota Army National Guard's 957th Engineer Company (Multirole Bridge) secure the improvised ribbon bridge on the Missouri River.

Side deflection of the bridge was also tested. After ten MKII BEBs were attached on the downstream side of the bridge, they applied full reverse-throttle thrust to induce a tremendous side load pull. Little side deflection, shore guy cable movement, or loosing was observed, and only minimal adjustments to the cabling were required. Preliminary observations of these evaluations indicated that this new anchorage system successfully accomplished its designed mission. The 957th and the state of North Dakota—strategically selected for this assessment—played a critical role in determining the system's mission effectiveness and safety.

Following removal of all the equipment, the 957th and the various agencies responsible for evaluating this bridging system conducted a detailed after action review. Suggestions for adjustments and improvements to the hardware—as well as the operational employment and disassembly tactics, techniques, and procedures—were discussed and will be considered for inclusion before final production and delivery to the force. Once deemed ready, the new anchorage system is targeted for immediate movement and delivery to Afghanistan to address urgent warfighter operational needs for improved anchorage capability.

The new "thrust and shore guy" cable system is designed for use with the IRB. It is targeted to fully replace the older "overhead tower system," the 1950s vintage anchorage technologies currently used when employing the older bridge system now in use by the military. The system was designed for the IRB but is desired and targeted for multiple dry- and wet-gap systems. This new anchorage system will be more permanent and is easier and faster to install—which is paramount for Soldiers employing it in warfighter operations. The system was designed by General Dynamics European Land Systems–Germany. Overseeing the event and providing data collection efforts and additional safety oversight were members from various government offices and agencies. Supporting agencies include Product Manager Bridging; Tank-Automotive and Armaments Command (TACOM); TACOM Research, Development and Engineer Center (TARDEC); the Maneuver Support Center of Excellence, and the National Guard Bureau.

Staff Sergeant Lorius is the deputy public information officer for the North Dakota National Guard. She has a bachelor's in English and writing from Dickinson State University and a master's in management from the University of Mary.

Mr. Prokopyk is the strategic communication specialist for the North Dakota National Guard and is retired after nearly 27 years as a United States Army Corps of Engineers officer. He has a bachelor's in civil engineering technology from Youngstown State University and a master's in operational sciences from the Air Force Institute of Technology.

ENGINEER DOCTRINE UPDATE

U.S. Army Maneuver Support Center of Excellence
Capabilities Development and Integration Directorate
Concepts, Organizations, and Doctrine Development Division
Doctrine Branch, Engineer Division

Publication Number	Title	Date	Description (and Current Status)
Recently Published			
ATTP 3-34.80 (FM 3-34.600) (FM 3-34.230)	*Geospatial Engineering*	29 Jul 10	This full revision of FM 3-34.230, *Geospatial Operations*, incorporates changes as a result of FM 3-34, *Engineer Operations*, and FM 3-0, *Operations*. Geospatial engineering consists of engineer capabilities and activities that contribute to a clear understanding of the physical environment by providing geospatial information and service to commanders and staffs. **Status:** Published. Obtain from the Army Publishing Directorate or the Reimer Digital Library.
ATTP 3-34.23 (FM 3-34.23) (FM 5-116) (FM 5-100-15) (FM 5-71-100)	*Engineer Operations –Echelons Above Brigade Combat Team*	8 Jul 10 (Feb 99) (Jun 95) (Apr 93)	This is a new manual that encompasses engineer operations in support of all engineer operations above the brigade combat teams (BCTs) (division, corps, and theater). It consolidates and has revised three engineer FMs that provided doctrinal guidance for the entire spectrum of engineer operations supporting echelons above the BCT level. **Status:** Published. Obtain from the Army Publishing Directorate or the Reimer Digital Library.
Currently Under Revision			
FM 3-34	*Engineer Operations*	Pending (Apr 09)	This is the engineer keystone manual. It encompasses all engineer doctrine; integrates the three engineer disciplines of combat, general, and geospatial engineering; and addresses engineer operations across the entire spectrum of operations. **Status:** Revising manual to incorporate the engineer lines of support framework. Estimated publishing date is 2QFY11.
Combat Engineering			
FM 3-90.4 (*FM 3-34.2) (*FM 3-90.12)	*Combined Arms Mobility Operations*	Pending (Aug 00)	This is a full revision, to include the renaming and renumbering of FM 3-34.2, *Combined Arms Breaching Operations,* and FM 3-90.12, *Combined Arms Gap Crossing*. Changes in the force structure have required adjustment of the tactics, techniques, and procedures (TTP) associated with breaching and clearance operations. The Marine Corps is dual-designated on this manual, which will replace their Marine Corps Warfighting Publication (MCWP) 3-19.3, *Marine Air-Ground Task Force (MAGTF) Breaching Operations*. **Status:** To be published 2QFY11.
General Engineering			
TM 3-34.48 1/2 (*FM 5-430-00-1 & 5-430-00-2)	*Design of Theater of Operations Roads, Airfields and Helipads*	Pending Aug 94 Sep 94	This manual will serve as a reference for engineer planners in support of joint and theater operations in the design of roads, airfields, and helipads. This manual is currently dual-designated with the Air Force. The Air Force (as well as the Navy and Marine Corps) plans to adopt the new manual also. **Status:** Estimated publishing date is 3QFY11.
TM 3-34.41	*Construction Planning and Estimating*	New	This new manual is being produced by the Navy, in coordination with the Army and Air Force. The manual will provide the TTP and planning factors for conducting construction planning at the crew leader level. The manual will also provide useful expeditionary construction planning factors for use by planners at all levels. **Status:** Estimated publishing date is 3QFY11.

ENGINEER DOCTRINE UPDATE

U.S. Army Maneuver Support Center of Excellence
Capabilities Development and Integration Directorate
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Doctrine Branch, Engineer Division

Publication Number	Title	Date	Description (and Current Status)
General Engineering (continued)			
TM 3-34.43 (*FM 3-34.451) (*FM 5-472)	*Materials Testing*	Pending Dec 92	This manual will provide technical information for obtaining samples and performing engineering tests and calculations on soils, bituminous paving mixtures, and concrete. For use in military construction. The test procedures and terminology will conform to the latest methods and specifications of the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), and the Portland Cement Association (PCA), with alternate field testing methods and sampling techniques when complete lab facilities are unavailable or impractical to use. The Marine Corps and Air Force plan to adopt this manual as well. **Status:** Estimated publishing date is 2QFY11.
TM 3-34.65 1/2 (*FM 3-34.465)	*Quarry Operations*	Pending Mar 05	This manual outlines the methods and procedures used in the exploration for and operation of pits and quarries. It provides information on equipment required for operating pits and quarries and for supplying crushed mineral products, but does not cover the operation of the stated types of equipment. This is a collaborative effort with the Navy and Air Force and includes the newest technologies and current practices. There will be a focused staffing only for this manual. **Status:** Preparing Volume II. Initial Draft staffing of both volumes 2QFY11.
TM 3-34.49 (*FM 5-484)	*Multi-Service Well Drilling Operations*	Pending Mar 94	This manual is a guide for planning, designing, and drilling wells. It focuses on techniques and procedures for installing wells and includes expedient methods for digging shallow water wells, such as hand-dug wells. This collaborative effort with the Navy, Air Force, and Marine Corps includes the newest technologies, current practices, and revised formulas. **Status**: Estimated publishing date is 2QFY11.
TM 3-34.56	*Waste Management*	New	This manual addresses issues not currently integrated into FM 3-34.5, *Environmental Considerations*. The manual will address the role of waste management in support of deployed forces, as well as the integration of waste management throughout the operations process, including its critical linkage to the composite risk management process. **Status:** Estimated publishing date is 2QFY11.

Notes: Current engineer publications can be accessed and downloaded in electronic format from the Reimer Digital Library at <*http://www.adtdl.army.mil*> or the MSKN Web site at <*https://www.us.army.mil/suite/page/500629*>. The manuals discussed in this article are currently under development and/or recently published. Drafts may be obtained during the staffing process or by contacting the Engineer Doctrine Branch at commercial 573-563-0003, DSN 676-0003, or <*douglas.merrill@us.army.mil*> or by contacting commercial 573-563-2717, DSN 676-2717, or <*brian.davis6@us.army.mil*>. The development status of these manuals was current as of 29 Oct 2010.

***Publications shown inside parentheses with an asterisk beside the number indicate the current published number, but that number will be superseded by the new number at the beginning of the listing. Multiple manuals in parentheses will indicate consolidation into one manual.**

Due to the doctrine reengineering effort, some field manuals are being realigned as general subject technical manuals (TMs). These manuals will be numbered as TMs. Field manuals (FMs) dealing with Army tactics, techniques, and procedures (ATTP) will be renumbered as ATTPs.

U. S. Army Engineer School History Office. This Office maintains a multimedia collection of historical materials on the Engineer School and the Engineer Regiment. The collection—which consists of more than 17,000 manuals, 21,000 photos, 800 videos and tapes, and three million pages of documents on engineer history—includes information on units, equipment, organization, and operations that can support mission requirements and analysis efforts. The Office is seeking to expand its holdings on engineer units and requests that a copy of photographs, videos, or documents that are generated by units be sent to: History Office, U.S. Army Engineer School, 320 MANSCEN Loop, Suite 043, Fort Leonard Wood, Missouri 65473, or to <*leon.usaeshistory@conus.army.mil*>. The History Office also maintains a milBook page at <*https://www.kc.army.mil/book/groups/engineer-historian*> and a web page at <*http://www.wood.army.mil/wood_cms/usaes/2332.shtml*>.

Any questions should be directed to Dr. Larry Roberts at 573-563-6109 or Dr. David Ulbrich at 573-563-6365.



Photo by Specialist Jessica D. Zullig

Engineers Train in Real "Fire Power"

By Specialist Jessica D. Zullig



Photo by Specialist Jessica D. Zullig

A 573d Clearance Company Soldier sprays foliage with flames during a test of the GTS.

Flaming brush and debris were whipped by the afternoon breeze at a range near Contingency Operating Base Speicher, Iraq, during a Ground Torch System (GTS) exercise for Soldiers from 4th Platoon, 573d Clearance Company, 1st Engineer Battalion, 130th Engineer Brigade, White Sands Missile Range, New Mexico. The GTS will be added to the engineers' arsenal to combat improvised explosive devices (IEDs) by clearing foliage that can conceal the explosives along patrol routes. The system expels a burning gel-like fuel that covers the targeted area and eliminates the concealment.

Roadside foliage makes it difficult for patrolling Soldiers to spot hidden IEDs. Units equipped with GTS will be able to eliminate that foliage and make it more difficult "for the enemy to get out there and hurt our people," said the GTS instructor. Soldiers received in-depth training about safety precautions, standard operating procedures, fuel mixture, and factors such as atmospheric conditions that can affect the system's capabilities. After that training, the Soldiers performed a live-fire exercise to learn what the GTS can do. The system is another tool the company can use to better accomplish the mission by helping Soldiers see threats on the side of the road.

The brigade's mission is to clear roads, and the company is the spearhead of that. They have to go out and make sure the road is cleared of all IEDs during the daytime or nighttime. The GTS allows them to complete their mission, and when the company's mission is completed, it means the brigade's mission is completed.

Specialist Zullig is a journalist serving with the 135th Mobile Public Affairs Detachment under the 3d Infantry Division in Iraq.

Castle Ball: 412th Theater Engineer Command Warfighter Seminar

By Major Jesse H. Stalder

With a comedic style reminiscent of a Bob Hope USO tour, the 52d Army Chief of Engineers, Lieutenant General Robert L. Van Antwerp, delivered the keynote address during the annual Castle Ball at the Vicksburg, Mississippi, Convention Center on 5 June 2010. The ball, which consisted of Vicksburg engineer community members and 412th Theater Engineer Command Soldiers, was the culmination of the 412th's Warfighter Seminar that started on 2 June.

Van Antwerp used his keen sense of humor to highlight some of the significant events currently on the way in the United States Army Corps of Engineers (USACE). For example, he talked about the Asian carp, a type of fish that engineers in Illinois are trying to keep from getting into the Great Lakes. "I am waiting for some chef to figure out how to cook this thing just right," Van Antwerp said. "It eats everything and starves the rest of the fish out."

He also talked about the 8, 213 individuals that USACE hired from the private sector at the end of 2009. "There was an incredible amount of talent out there, and we got a ton of it," Van Antwerp said. "We are going to hire 8,000 people this year, and we are on track to actually exceed that … we have never hired on this scale in my lifetime."

He then talked of modifications currently being made to the Panama Canal that will change economies in the world. A new lock system scheduled for completion in 2014 will have a major impact on the 928 deepwater ports in the United States, according to Van Antwerp. "That lock is 1,600 feet long and it is going to be about 120 feet wide," he said. "The current Panamax ship carries 4,600 containers . . . . The Panamax ship of tomorrow going through the new lock system will carry 12,500 containers; it is that much bigger." In the future, ship designers will only design vessels that will fit the new Panama Canal lock system. The new Panamax ships must have a hull that is deeper by 5 feet, and all ports will be 53 feet deep, according to Van Antwerp, so that most U.S. ports will need to increase their present depths of 52 feet by 1 foot.

As he often does at the start of a presentation, Van Antwerp assigned an audience member to be his timekeeper and coached her on how she should tell him that his time was up. When the time had elapsed, she stood up and said, "Chief, thank you for your general remarks; you are generally out of time."

Major Stalder is the deputy public affairs officer for the 412th Theater Engineer Command at Vicksburg, Mississippi, where he has been assigned for two years. He holds a bachelor's in education from Washington State University and a master's in educational leadership from City University, Bellevue, Washington.



Photo by Specialist Lisa Soule, Mobile Public Affairs Detachment

Lieutenant General Robert L. Van Antwerp interacts with audience members during his keynote address at the Castle Ball at the Vicksburg Convention Center in Vicksburg, Mississippi.









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