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On behalf of the United States Army Engineer School, I would like to welcome the entire engineer community, to include spouses, to the annual Engineer Regimental Conference—ENFORCE 2008. This year’s conference activities will be held in two locations: St. Louis, from 4–6 May, and Fort Leonard Wood, from 7–10 May.

Beginning with the Army Engineer Association (AEA) icebreaker on Sunday evening, you can expect the following days to be filled with extraordinary events and social activities. We have scheduled several engaging speakers, to include the Chief of Engineers with his State of the Regiment address. In addition, there will be United States Army Corps of Engineers (USACE) break-out sessions, Engineer School work groups, contractor-industry events, vendor displays, along with several ceremonial activities, including the AEA President’s Dinner, the Regimental Ball, the Regimental Review, the Commandant’s luncheon, and the “Remembering Our Heroes” Memorial Service. You are invited to end the conference week on Saturday with a few rounds of golf at the Fort Leonard Wood Piney Valley Golf Course. Activities are also planned for spouses in both St. Louis and Fort Leonard Wood throughout the week.

One of the highlights of the Regimental Ball will be the Chief of Engineers presentation of the Itschner, Outstanding Engineer Platoon Leader (Grizzly), Van Autreve, and Best Sapper Competition Awards, as well as the Sturgis and de Fleury Medals. Congratulations to all the recipients! Once again, you have demonstrated the outstanding accomplishments of the Regiment.

The ENFORCE 2008 theme is “Building Great Engineers,” which stems from our ongoing Engineer Leader Technical Competency (ELTC) Study. The analytical framework for the ELTC Study is from the book Good to Great by Jim Collins. The Study is part of a larger strategic issue of how best to manage our precious human talent in the Information Age, during an era of persistent global conflict. We MUST figure out how to properly access, develop/train/educate, employ, and retain our great engineers for full-spectrum operations, which requires a blending of both great tactical and technical expertise and capabilities in our Regiment.

We are teaming with people and organizations from across the Army, joint forces, allies, academia, industry, and professional organizations to plan how we can get the right people on the right seat on the right bus. To this end, much of our ENFORCE time at Fort Leonard Wood will be spent in six work groups that are assigned the task of paving the way ahead for the Regiment. The work groups are—

- Future Engineer Missions, Roles, Methods of Delivery
- Accessions
- Training and Education (post-accession)
- Employment
- Retention
- Strategic Communications

The deliverable on Friday, 9 May, will be a back-brief from each work group—with a written action plan—to the Chief of Engineers and the Regiment. These action plans will address “cradle to grave” personnel management and will be the foundation of our Regimental Campaign Plan, which will set our course for the future.

In addition to the hard intellectual work, we will have a great time of fellowship and enjoyment, learning and professional development, as we celebrate the achievements, traditions, and history of our great Regiment.

I am looking forward to ENFORCE 2008! It is a great event for the entire Regiment—Civilians, Soldiers, and Families; Active, Guard, Reserve; USACE; Directorates of Public Works (DPWs); Retirees; Academia, and Contractors. We will also embrace our Joint, Interagency, Intergovernmental, and Allied teammates, from whom we have much to learn and whose good ideas we will shamelessly steal (while willingly sharing our own). Together, we will make this an ENFORCE to remember!
To all the engineers who don’t run the world but who make it run, I’d like to once again extend my heartfelt appreciation for all you do to help make our Regiment great. Here at the Engineer School, we have won, then lost—and in some cases won back—key battles in regard to our Regiment’s organizations, equipment, personnel, and doctrine. Although some of the faces have changed, and will continue to change, the mission here at Fort Leonard Wood will always be to ensure that our Regiment is relevant and integral to the Army’s transformation.

I have visited most of our engineer Soldiers throughout the world, and I’m always impressed with their enthusiasm and professionalism when they perform their duties. Our engineer Soldiers are the busiest in our Army and are the busiest they have ever been over the last 20 years.

Soon Fort Leonard Wood will host two important yearly events for our Regiment—ENFORCE and the Best Sapper Competition:

ENFORCE 2008. This year’s ENFORCE, with the theme of “Building Great Engineers,” will have more than one regimental concept, as we bridge the gaps between our Corps and Regiment. We will leverage all of the experience from our Corps’s senior leadership, as well as our civilians. ENFORCE 2008 will begin in St. Louis, from 4 - 6 May, and the conclusion will be at Fort Leonard Wood, from 7-10 May. I look forward to seeing many of you at this year’s events, and I hope that you are planning to spend the week renewing friendships and resolving issues as we focus on our full-spectrum engineering capability in support of our Army.

ENFORCE 2008 will be filled with extraordinary events and social activities in both St. Louis and Fort Leonard Wood, to include vendor displays, the Regimental Review, a barbeque, an Army Engineer Association luncheon, the Engineer Run, the Regimental Ball, the Engineer Memorial Dedication Service, and the Best Sapper Competition. The conference will culminate with the annual Regimental Dinner, where we will recognize our 2008 Itschner, Sturgis, and Grizzly Award winners, along with our Honorary Colonel of the Regiment, Honorary Command Sergeant Major, and Honorary Warrant Officer. To sum it up, ENFORCE 2008 will undoubtedly instill in each of us an immense sense of pride in our Regiment.

Best Sapper Competition. The 3d Annual Best Sapper Competition, held at Fort Leonard Wood from 6 - 8 May, will coincide with ENFORCE for the second time. Last year’s competition was won by the 66th Engineer Battalion from Hawaii, which took first place for the last two years. The ultimate measure of a person is not where he stands in the moments of comfort and convenience, but where he stands at times of challenge and controversy. I challenge all high-speed, qualified sapper Soldiers to dethrone the Tropic Lightning and claim the top honors as the best sapper team.

The competition, which includes events involving demolitions, mountaineering, U.S. and threat weapons, land navigation, and more, tests the knowledge, physical prowess, and mental fortitude of engineer Soldiers across the Regiment. Conducted in two-man buddy teams, the competition is open to all personnel serving in a 21-series MOS, or anyone who has completed the Sapper Leader Course. This is the defining competition for the Engineer Regiment and its Soldiers. So select and train your best teams for this extraordinary competition! I encourage all commanders and sergeants major to plan ahead and come to Fort Leonard Wood to show your support to our Sappers.

In closing, I am extremely proud of our Regiment’s Soldiers for their contributions and positive impact over the past year. I am especially proud of the sappers who are deployed around the world in harm’s way. To those who have made the ultimate sacrifice in the cause of freedom, justice, and the American way of life, neither you nor your Families will be forgotten. God Bless America!
The Chief of Engineers has received several indicators recently that engineer leader technical competency has declined. Some of these indicators are—

- Criticism of the United States Army Corps of Engineers (USACE) in the aftermath of Hurricane Katrina.
- Comments from senior military leaders concerning engineer support to the War on Terrorism.
- Known decreases in military engineering developmental assignments in USACE and in installation directorates of public works (DPWs).
- A decades-long shift away from the more balanced and full-spectrum approach that characterized our Regiment for most of its history, toward a predominantly sapper (mobility and countermobility) mentality in the Engineer Regiment.

All of these factors indicate that this decline may cross multiple levels of both civilian and military leadership.

Make no mistake—combat engineering, tactical warfighting expertise, and our Sapper-Warrior spirit are still paramount, and the hallmark of our Regiment. But today’s operational environment of persistent conflict requires a more balanced engineer capability that can more effectively deliver combat, general, and geospatial engineer effects in order to expertly support full-spectrum operations.

Another factor spotlighting the need for—and perhaps magnifying the decline of—competency is Department of Defense Directive 3000.05, Military Support for Stability, Security, Transition, and Reconstruction (SSTR) Operations, which places stability operations as a major priority on par with combat operations. Recently released Army Field Manual 3-0, Operations, echoes this theme and further emphasizes the Joint Publication 3-0, Joint Operations, definition of stability operations to include “infrastructure reconstruction.” For the Engineer Regiment, this has placed increased emphasis on construction engineering skills and interagency operations.

Engineer Technical Competency

What is engineer technical competency? The phrase “engineer technical” refers to those skills unique to Army officers (commissioned, warrant, and noncommissioned [NCO]), enlisted Soldiers, and civilians that differentiate engineer abilities from those found in most other Army branches, military occupational specialties, and civilian career programs. “Competency” is the occupation-based knowledge, skills, and abilities required for successful and acceptable job performance. Though initially associated with construction and general engineering tasks under current stability operations, engineer technical competency also encompasses a myriad of broader Army engineer capabilities such as geospatial, firefighter, underwater diving, and utilities competencies.

USACE began its investigation into issues, problems, and factors related to technical competencies and mission execution in 2005. Among the findings of a 2006 Logistics Management Institute study were:

- There is no corporate agreement and understanding of the USACE competencies needed to successfully deliver a wide range of engineer products and services.

Great vision without great people is irrelevant.

— Good to Great, Jim Collins
There are multiple nonintegrated, competency-related initiatives underway within USACE.

There is no corporate champion for competency development.

There is no integrated sense of urgency regarding competency.

The USACE culture does not readily accept the integration and changing nature of delivering its services.

Subsequent actions established a USACE National Technical Competency Strategy and a team to develop integrated, sustainable ways to effectively and efficiently implement that strategy. Concepts from Jim Collins’s book *Good to Great* are being used to further study and mitigation.

In light of the perceived decline and increased capability requirements, the Chief of Engineers, Lieutenant General Robert Van Antwerp, enlisted the Commandant of the United States Army Engineer School to lead further investigation and resolution of the decline. Using the model and lessons learned by USACE, the Commandant has championed and widened the efforts across the Engineer Regiment.

**The Flywheel Effect**

It takes great effort to get a flywheel to move from a standstill and inch forward. With continued pushing, the flywheel eventually will begin to move faster until it rotates. As it makes more turns—moving faster and faster—the momentum of the heavy wheel comes into play, and its own weight helps keep it going. Now there is no need to push harder and the flywheel accelerates, building momentum and increasing speed.¹

The Commandant of the Engineer School has partnered within and outside the Department of Defense to investigate and implement solutions to reverse the decline of engineer leader technical competency. Army participants include—but are not limited to—the Engineer School, USACE, United States Military Academy at West Point, various organizations within Accessions Command, Human Resources Command, Office of the Chief of Engineers–Pentagon, Office of

⁰

Students from the Engineer Basic Officer Leader Course take bridge measurements as part of their route reconnaissance training.
Sustainable Strategy

The intent is to develop and implement an integrated, sustainable National Engineer Leader Technical Competency Strategy that accesses, develops, employs, and retains world-class engineer leaders who are technically and tactically capable and competent to deliver full-spectrum engineering in the 21st century. To date, there has been incremental but tangible progress that fits into an overall working concept.

Six work groups have been organized to investigate deficiencies and recommend and implement initiatives:

- Future Engineer Missions, Roles, Methods of Delivery
- Accessions
- Training and Education (post-accession)
- Employment
- Retention
- Communications

Work group responsibilities include assessment of near- and long-term engineer leader capability and competency concerns; recommendation of “quick wins” to improve engineer technical competency; collaboration and sharing of information on future missions, roles, and methods of delivery; standardized definitions of competencies; definition of metrics to measure desired competencies; determination of how to anticipate and shape future work force trends; partnership and communication with other work groups concerning trends, objectives, needs, solutions, and progress.

Initial data collected on Active Army engineer officers (one of the smaller leader groups for which quantifiable data are available) corroborates the perceived decline. There has been a significant decline in the share of Engineer Branch officer accessions with a degree in engineering—from 54 percent in 1998 to 31 percent in 2007. The share of engineer officers with engineering degrees from top-tier schools has declined in recent years—from 30 percent in 1999 to 14 percent in 2007. Engineer technical developmental assignments for officers have declined—installation DPWs have lost military positions, and there are fewer military assignments to USACE. The share of engineer field grade officers with engineering credentials, such as a professional engineering license, has fallen by about a third—from 19 percent in 2002 to 12 percent in 2007. Allied nations and sister Services invest more time educating their officers in technical skills and developmental assignments that enhance technical skills. For example, the Canadian Army equivalent to the U.S. Army’s Engineer Basic Officer Leader Course is 24 weeks versus 13 weeks. U.S. Air Force and Navy engineers are held to more stringent standards that mandate engineer technical proficiency.

The current U.S. Army engineer force structure does not facilitate senior engineer mentoring of junior engineer officers and NCOs. For example, there is typically no resident engineer battalion commander/staff to mentor brigade combat team engineer company captains and lieutenants. Additionally, the

Soldiers of the 299th Engineer Company span the gap in the bridge over the Kazer River, created during the war by Iraqi forces.
contemporary operational environment has raised concerns over a decline in officer tactical competency in high-intensity conflict engineer operations. (Much unit-level and predeployment training focuses on fighting counterinsurgencies rather than more conventional enemy forces.) Some investigation has revealed that this challenge is not confined to engineers and is even more pronounced in armor and field artillery.

In addition to the research in defining the challenge, announcing initial Engineer Leader Technical Competency findings and actions has been part of early “flywheel” efforts. This includes visits by the Commandant to engineer students in the Intermediate Leaders Education Course at Fort Leavenworth, Kansas, and to cadets, faculty, and senior leaders at West Point, which have uncovered vigorous offers of assistance. The Commandant has also addressed the issue of engineer leader technical competence at venues such as the Society of American Military Engineers Joint Engineer NCO Symposium, Engineer Precommand Course, Engineer Captains Career Course, 1st Engineer Brigade, and Joint Engineer Operations Course.

The Engineer School has also initiated actions that include examining the curricula of the Basic Officer Leader Course and Captains Career Course, the addition of contracting officer representative instruction, and selection processes for instructors. In the Engineer Captains Career Course–Reserve Component, a pilot program restructuring and enhancing project management instruction can result in nationally recognized project management certification. The Engineer School partnership with the Missouri University of Science and Technology has also been enhanced by including Reserve Component students. The flywheel is beginning to turn.

Way Ahead

Engineer Leader Technical Competency is an issue that is broad and deep, since it addresses a capability of the military and the nation. Contributions from all levels of military and civilian engineer leaders are both welcome and needed. A series of briefings, in-progress video teleconferences, and presentations at applicable forums are planned. Obtaining and sharing additional information can be accomplished via Army Knowledge Online (AKO). E-mail Major Mark Conrad at mark.aaron.conrad@us.army.mil to be added to the access list. Then enter https://www.us.army.mil/suite/submitdraft.do?Se=0&Sp=504789 to find a specific working group’s point of contact to contribute to this effort. As with many efforts, this is not the primary mission of any individual, but contributions from across the Engineer Regiment in numerous areas of expertise can make a difference and move the flywheel.

Engineer Leader Technical Competency will be a major focus for discussion and breakout groups during the annual ENFORCE conference to be held in St. Louis and Fort Leonard Wood from 4–10 May 2008. The conference theme is “Building Great Engineers” for full-spectrum operations. The book Good to Great by Jim Collins will be the theoretical construct. We hope you will engage, write papers, and join us at ENFORCE!

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Brigadier General Martin is the Commandant of the United States Army Engineer School, Fort Leonard Wood, Missouri. He has served in a wide variety of command and staff assignments, including instructor duty at West Point and the Army War College and Commander of the 130th Engineer Brigade, during full-spectrum operations in Europe, Kuwait, and Iraq from 2002–2004. He is a graduate of the United States Military Academy, Command and General Staff College, and the Naval and Army War Colleges. He holds a master’s and a doctorate from the Massachusetts Institute of Technology.

Endnotes


2 Statistical data from OEMA.
Lead the way. The phrase is not new to Reserve Component (RC) engineer officers. As the Regiment continues to support the War on Terrorism, RC officers are expected to be leaders in their communities or industries one day and on the cutting edge of maneuver support and protection operations the next. Army National Guard and United States Army Reserve engineers are now involved in a nation-building and reconstruction effort unlike any since the reconstruction of Europe and Japan following World War II. Technical skills—especially in construction project management (PM) and contract administration—are sorely needed. Since its inception, the United States Army Engineer School has provided an overview of construction methods, and currently does so in its Basic Officer Leader Course, the Engineer Captains Career Course (ECCC), and the Engineer Captains Career Course–Reserve Component (ECCC-RC). Officers in the field have asked for more such training and ECCC-RC is moving to deliver.

Since 13 December 1636, when the oldest Army engineer unit (now designated the 101st Engineer Battalion, Massachusetts Army National Guard) was organized by the Massachusetts Bay Colony, the Engineer Regiment has supported our country with full-spectrum engineer operations. The ability of engineer officers to provide the technical expertise to fulfill the needs of the nation has sometimes been questioned. This has been mainly a process of self-reflection to assess the engineers’ abilities and ensure that they can meet operational needs. The Regiment has again reached a point of questioning its ability to meet the technical competencies needed to fulfill today’s operational requirements.

ECCC–RC Improves Technical Competency

By Lieutenant Colonel Steven K. Knutzen and Major James L. Bunch

ECCC–RC Changes

Two of the engineer technical competency areas being questioned today are—

- PM skills.
- Contracting officer representative (COR) or fiscal responsibility training.

As a result, starting 1 October 2009, the following seven changes to the ECCC-RC will be instituted:

Change 1

Add a COR course to Phase II. A 40-hour block of instruction via distributed learning (dL) will cover the complete COR course, and completion will be required before attending Phase III. All students will receive Army COR certification from this block of instruction. The course will be taught once each quarter via the Engineer School Blackboard system and will have live feedback from the instructor. This instruction is being added without the allocation of any additional resources. We have already received requests from RC officers who are not currently enrolled in ECCC-RC to receive this training, and the staff is working to obtain the resources necessary to implement this training for all RC engineer officers. A pilot course will be conducted during the fourth quarter of fiscal year (FY) 2008, and earlier ECCC-RC graduates will be given the opportunity to participate.

Change 2

Enhance the infrastructure reconnaissance (IR) training during Phase III. A critical task to providing engineer support
during stability operations is conducting a thorough IR. Currently, warrant officers receive training on a tool called “It Knows Everything,” or IKE, which facilitates rapid integration of IR data, coupled with a reachback capability and reporting and analysis functions. Starting in the first quarter of FY 2009, a full day of IR instruction using IKE will be provided using local community infrastructure. Tasks to be trained are as follows:

- Introduction to IR (2.5 hours)
- It Knows Everything (2 hours)
- Hands-On IR Practical Exercise (5.5 hours)

**Change 3**

*Add 1-hour blocks of instruction on the history of combat engineering and civil works engineering. This will serve as an introduction to the branch to facilitate inclusion of officers seeking branch transfer to the Engineer Regiment. These lessons have already been piloted and will be taught during Phase III, effective immediately.*

**Change 4**

*Add an introduction to engineer personnel and equipment to Phase III. A 4-hour overview of engineer equipment and personnel will familiarize officers with the equipment that will be discussed and integrated into tactical plans for the remainder of Phase III. Equipment demonstrations and subject matter expert interaction will be used when possible. This instruction is intended to serve as refresher training to students returning to the Engineer School and as a first-time overview for branch-transfer officers. Full implementation of this training will begin in FY 2009.*

**Change 5**

*Restructure and enhance PM instruction. This will align with the Project Management Body of Knowledge (PMBOK) developed by the Project Management Institute (PMI). A 35-hour dL module will be added to Phase IV, along with an optional 35-hour advanced PM module. The training will allow officers to sit for the PMI Certified Associate in Project Management/Project Manager Professional exams to earn certification, depending on PM experience. A pilot course will run during the fourth quarter of FY 2008, and recent ECCC-RC graduates will be notified and invited to participate. Full implementation will begin in FY 2009. New PM topics include the following:*

- Introduction to PM (2.5 hours)
- Project Life Cycles and Stakeholders (2 hours)
- Introduction to Project Process Groups and Initiating a Project (1.5 hours)
- Project Planning (2.5 hours)
- Executing, Monitoring, Controlling, and Closing a Project (1.5 hours)
- Initiating a Project and Preparing the Project Plan (2.5 hours)
- Planning Project Scope (1.5 hours)
- Project Scheduling (3.0 hours)
- Estimating Activity Costs (1.5 hours)
- Planning for Quality (2.0 hours)
- Communications Planning and Information Distribution (2.5 hours)
- Planning and Identifying Project Risk (2.5 hours)
- PM Practical Exercise (10 hours)

**Change 6**

*Add 10 hours of “hands-on” PM training and a 12-hour construction capstone exercise to Phase V. PM training will provide reinforcement training to the Phase IV PM instruction through a 10-hour practical exercise using Microsoft® Project and the Theater Construction Management System (TCMS). This will lead into the 12-hour construction capstone exercise, a military decision-making process-driven engineer battalion planning exercise. Additional instruction will also be provided on force protection and environmental laws.*

**Change 7**

*Add counterinsurgency/urban operations instruction to Phase V. Training will include the following topics, which will be integrated with the capstone combined arms exercise scenario:*

- History of Counterinsurgency (1 hour)
- Urban Intelligence Preparation of the Battlefield (1.5 hours)
- Urban Operations Practical Exercise (3 hours)

**Summary**

Support of full-spectrum operations requires highly trained RC engineer officers, and ECCC-RC has been updated to meet the growing complexity of the problems faced by the Regiment. Though not the complete answer to the overwhelming requests for more technical training, the revisions to ECCC-RC represent a large step in the right direction. It is an exciting time to be an engineer officer, and RC engineers are leading the way!

For more information about the changes to ECCC-RC, e-mail Major Bunch at <james.bunch@us.army.mil>.

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It is an exciting time to be an engineer officer. Given the enormous surge in construction in Iraq and Afghanistan, technical skills for engineer officers have never been in greater demand. The United States Army Engineer School at Fort Leonard Wood, Missouri, offers an overview of construction methods in the Basic Officer Leader Course, the Engineer Captains Career Course (ECCC), and the Engineer Captains Career Course–Reserve Component (ECCC-RC). However, many of the technical skills needed to manage complex projects are gained only through civilian education. The Engineer School and the Missouri University of Science and Technology (Missouri S&T) at Rolla, Missouri, provide a way for engineer officers to hone their technical skills.

Since 1984, the Engineer School has partnered with Missouri S&T (formerly known as the University of Missouri–Rolla) to give Active Army officers the opportunity to earn master’s degrees in engineering management or civil, environmental, or geological engineering while attending ECCC. Officers are granted eight hours of graduate credit for satisfactorily completing ECCC, which is applied—along with an additional four-credit course taken in the evenings—toward a graduate certificate in either military construction management or military geological engineering. Upon completion of the graduate certificate requirements and ECCC, these officers are allowed to remain at Fort Leonard Wood on permissive temporary duty for 16 weeks to complete the remaining 18 credits required to earn a master’s degree. Officers are assessed a special Fort Leonard Wood tuition rate and are not required to pay for the eight hours of shared credit.

Reserve Component Opportunity

Hundreds of Active Army engineer officers have taken advantage of this program since its inception. Now, recognizing the significant number of engineer officers who are in the Army Reserve or National Guard, the Engineer School announces the addition of Reserve Component (RC) officers to the educational partnership with Missouri S&T. The RC programs will be structured similar to the Active Army programs, with the Missouri S&T portion being offered via distributed learning (dL). RC officers will receive eight credits for satisfactorily completing ECCC-RC, which will be combined with a four-credit course offered by Missouri S&T via dL to earn a graduate certificate in either military construction management or military geological engineering. Officers who have an undergraduate degree in either engineering or natural science disciplines will be able to apply the certificate in military construction management toward Missouri S&T’s online master of science degree in civil engineering or engineering management and the certificate in military geological engineering toward the master of engineering in geotechnics.

Currently, all these programs are being offered online as part of Missouri S&T’s Distance and Continuing Education (DCE) program. For these traditional dL programs, officers will be assessed the special Fort Leonard Wood tuition rate.
for the four credits required to complete the certificate and will not be required to pay for the eight hours of shared credit. Tuition and fees for the remaining 18 credits will be assessed according to existing DCE policies.

Recognizing that a large number of engineer officers don’t have the prerequisites to get into these existing programs, the Missouri S&T Department of Geological Sciences and Engineering has custom-designed a master’s degree program in geological engineering for RC officers. In effect, this program will be similar to the traditional dL programs, with two significant differences. First, this program will be assessed the same tuition and fees as the resident Fort Leonard Wood program. It will be offered directly by the Department of Geological Sciences and Engineering via its Blackboard dL platform. Second, the remaining 18 credits will be provided during compressed semesters to allow completion of the entire program within one year. It is the hope of both Missouri S&T and the Engineer School that officers who have not yet earned the degree in engineering or engineering management necessary to work as a facilities/contract construction management engine will use this opportunity to earn the credential.

Although similar to the programs already mentioned, the custom-designed geological engineering program will be accomplished in three stages:

**Stage I**

Admission to the Stage I program (graduate certificate in military geological engineering) requires officers to submit an application and provide a copy of their ECCC-RC Phase IV (general engineering) completion certificate, in addition to an...
official transcript showing proof of having completed at least one semester of college algebra, college chemistry, and either a college biology or physics course. Officers who do not have the prerequisite college courses may be required to take a five-credit bridging course, also provided by the Department of Geological Sciences and Engineering at the same tuition rate, which is included to ensure that every officer will succeed in the program.

Once admitted to the certificate program, officers will be required to complete four credits of online course work, which will be offered during Missouri S&T’s normal spring, summer, and fall semesters. Upon completion of the introductory course, officers will be awarded a certificate in military geological engineering. Officers will be given credit for the following courses upon satisfying all Stage I requirements:

- Geomorphology and Terrain Analysis
- Geologic Field Methods
- Engineering Geology and Geotechnics
- Applied Geological Engineering

Officers who have already completed a legacy advanced course or career course will be allowed to participate in the program by enrolling and completing ECCC-RC Phase IV (general engineering) as part of their admission requirements.

Stage II

Officers must apply, but they will be granted acceptance into Stage II of the program without the usual Graduate Record Examination if they complete Stage I with a letter grade of “B” or better. Stage II will consist of completing 15 credits of coursework, of which two three-credit classes will be offered during each special 8-week semester. Stage II courses can be taken in any order, with Stage I completion being the only prerequisite. The following courses will be completed during Stage II:

- Remote Sensing Technology
- Advanced Concepts of Environmental Geological Engineering
- Geotechnical Construction Practice
- Subsurface Exploration
- Subsurface Hydrology

Stage III

Stage III of the program will serve as the capstone exercise and will consist of a three-credit, regular semester course entitled Capstone Project in Geological Engineering. Officers will only be admitted into Stage III during their final semester of study because successful completion depends on knowledge acquired in previous stages.

Cutting Edge Problem-Solving

As students in the program, officers will have the opportunity to learn about the application of earth science principles to the engineering solution of critical problems facing global society, such as environmental and hazardous waste issues, natural resource protection and energy sustainability, and the design of geotechnical infrastructure such as tunnels, excavations, dams, and waste disposal sites. Geological engineering is a very broad engineering discipline focusing on applications of geology and engineering fundamentals to solve problems. Geological engineers apply their unique set of skills to protect and preserve the environment in which we live, studying geological hazards such as landslides, rock falls, earthquakes, Karst features (which create sinkholes), and dam and levee failures such as those in New Orleans during Hurricane Katrina. Geological engineers are called upon to study and clean up contaminated sites, develop water supply wells, and map hazards using geographical information systems. Across a wide spectrum of global problems, geological engineers are on the cutting edge of engineering problem-solving. For more information on the geological engineering profession, visit the Missouri S&T Geological Engineering website at <http://web.mst.edu/~gee/>.
To get started in the program, an RC officer must enroll in and complete the requirements for Phase IV of ECCC-RC. Officers will be briefed about the program during their ECCC-RC resident Phase III and be placed on a list of potential candidates so they can start receiving information regarding the program. Upon completion of ECCC-RC Phase IV, officers can present their Phase IV completion certificate and apply for the graduate certificate program. Once they have completed the introductory course and ECCC-RC, they can apply for admission to the program. Officers will then complete Stage II and Stage III and earn their master’s in geological engineering. It is that easy!

Officers interested in the RC programs in the traditional disciplines of engineering management, civil engineering, or geotechnics should contact Lahne Black at <lahne@mst.edu> or at (800) 441-5218 or visit the Missouri S&T DCE website at <http://dce.mst.edu/index.html>. Officers interested in the custom-designed program in geological engineering should contact the Missouri S&T Department of Geological Sciences and Engineering RC Program coordinator at <flwgee@mst.edu> or visit the program website at <http://mst.edu/~flwgee>. For questions about ECCC-RC, contact Major Bunch at <james.bunch@us.army.mil>.

Future Opportunities

Engineering technical skills training has now been placed at the fingertips of the RC officer, and this is just the beginning. Missouri S&T has agreed to study the possibility of offering similar programs to engineer warrant officers and noncommissioned officers with undergraduate degrees, as well as Department of the Army civilian employees who work as part of the Regiment. These programs will be the subjects of future articles in Engineer.

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The French Engineer Corps, which has a total of about 20,000 active duty sappers,\(^1\) has three components: combat, security, and infrastructure. These three components are interdependent, and all training for them is done at the Engineer School in Angers, in western France. It is fairly common for an officer to begin his career in a combat unit, go to the Paris Fire Brigade for some time, and then come back to a combat regiment or move to the infrastructure component.

The combat component (the engineer branch) is under the command of the Army. It consists of twelve regiments—eight embedded in combat brigades, three in the engineer brigade, and one attached to the Air Force. Its mission is to provide direct and general support to the forces.

The security component is under the control of the Ministry of Interior, which is broadly equivalent to the Department of Homeland Security. The Paris Fire Brigade (consisting of 8,000 personnel) and the civilian security units (consisting of 2,000 personnel) belong to this ministry. The latter are responsible for disaster relief and support the local firemen. The Fire Brigade has full responsibility for the security of the people in Paris and intervenes in case of fire, accidents, or terrorist attacks.

The infrastructure component, which is equivalent to the United States Army Corps of Engineers, has more than 1,000 sappers and the same number of civilian employees. Called service du génie or service, it is responsible for the infrastructure, construction, and maintenance for the armed services.

The purpose of this article is to explain how the French education system works for engineer officers.\(^2\) But before talking about...
specialized training, it is necessary to describe the specifics of officers in the French Engineer Corps.

The Officer Corps

According to Napoleon Bonaparte, “There is a field marshal’s baton in every Soldier’s knapsack.” By this he meant that even a private can aspire to the highest rank. It is not so common now, because there are fewer wars, but some generals come from the enlisted ranks, and more than 50 percent of officers have come from the noncommissioned officer (NCO) corps. Most of them stay in the same domain. It is common to see 50-year-old captains who are former senior NCOs who were promoted late.

For an NCO, it is possible to be promoted to officer at different levels, usually after a selective exam. Junior NCOs spend two years in a different officer academy before going to branch school for basic training, but some other NCOs who are more senior can go directly to the branch school. Senior NCOs are chosen by the Army for promotion to lieutenant, and those officers always stay in their initial specialty.

Saint Cyr Military Academy recruits cadets (after they have taken an exam) directly from universities or preparatory classes. Before the exam, it is necessary to spend three years in college or two in preparatory classes. After high school, these preparatory classes prepare a student for the difficult exams, based on mathematics and physics, for entering civilian engineer schools that are called “great schools.” These schools, which are considered schools for the elite, are a unique French institution. Although most of them are civil engineer schools in all domains, there are also such schools for business or linguists, and they are completely separate from the universities. Although they are the preferred way to success, they are also the most difficult.

Saint Cyr is a great school, and 40 percent of the cadets who attend there receive a mathematics education. When they finish the 3-year curriculum, they receive a master’s degree in general engineering.

In some specialties (lawyers, linguists, architects), officers can be commissioned directly from civilian life if they have the required degree. Their military training is short, 2 to
4 months, before these specialists become officers in their domain. They are considered contract officers, rather than career officers like the others. A career officer “owns” his rank, which means he can stay in the Army until the retirement age limit of his rank, even if he is not promoted.

**Training for Young Officers**

All officers attend basic training at the Engineer School in Angers. The course there lasts 11 months—from September to the end of July. It is a mixture of theory and practical exercises in the field, with the objective of training lieutenants for their first job as platoon leader. The basis of training is combat engineer skills: mobility, countermobility, and survivability. After years of peacekeeping operations all over the world, the emphasis nowadays is much more on demining or force protection than on bridging or obstacles, as it was 20 years ago. The first phase, which lasts for 8 months, gives the students a detailed overview of engineer subjects.

Based on their evaluation, the young officers choose their first assignment at the beginning of the second phase, which lasts for 3 months. Several domains are offered: construction, security, bridging, and combat. Even in the combat domain, there is a place for specialization. The future platoon leader in the Airborne Engineer Regiment goes to jump school. The future diver goes to the Navy Diving Center in Toulon, in the south of France, before coming back to Angers for engineer-specific training. These 1-year courses are not only long but also very demanding. The same is true for students who enter the Paris Fire Brigade, where it takes almost a year to complete all the qualifications required.

This training gives the student a good knowledge of the basic engineering skills required to be a platoon leader. It provides the Engineer Corps with multipurpose officers who are flexible enough to evolve through different jobs, if necessary.

Three or four years later, the officers return to the Engineer School for the captain’s course, where the process is similar. During the first 4 months, students focus on the generalities of company command in the context of a combat unit. The 5th month is spent on specialization. Although some training is done on-site, other training is done in units, as it is for security. For specific training in the Fire Brigade, the officers go to Paris. Captains in the Chemical, Biological, Radiological, and Nuclear (CBRN) Regiment, which is now attached to the Engineer Brigade, take the common training in Angers, then move to Draguignan, in the south of France, where the CBRN training center is located to complete the training.

In the first part of his career, until he reaches the rank of major, an officer can follow other specialized courses, such as water treatment or prime power and electricity distribution courses, to fulfill a position. Usually, an officer coming from Saint Cyr does not take such courses because the hierarchy expects this officer to be a future commander, not a specialist. Most of the time, these positions are held by experienced officers who have been commissioned from the NCO ranks and are already specialized in these matters.

**Training After Company Command**

After company command, there are several ways for officers to continue their career in the Army, depending on the age and the academic level of each officer.

For staff positions, there is the Staff School in Compiègne, north of Paris, where most officers attend a 5-month course just after company command. Then, they prepare for the exam to enter the Staff College in Paris. This is the way to prepare for command positions, except for engineers. For an engineer officer with a scientific education, there is another exam—which is based on mathematics and called the brevet technique (BT) or technical brevet—that an officer must pass to enter one of the famous great schools in civil engineering.
For the Engineer Corps, this is the preferred way because it provides qualified officers not only for regimental commands but also for district commands in the service. This integration in a civilian school can last from 1 to 3 years, depending on the school and the curriculum chosen. Afterwards, this officer joins his colleagues in the Joint Staff College in Paris.

Only a minority of officers will follow this path, because most do not have a high enough academic level to pass the exams. But even if an officer fails this type of exam, his career is not finished. There are several other career possibilities, especially for engineers.

The service offers a lot of positions at different levels: surveyors, crew chiefs, project managers, and district and division commanders. It has no Soldiers, only NCOs and officers, and they all come from combat units. The service is also open to officers coming from other branches, with the only condition being that they pass the exam.

The certificate technique (CT) or technical certificate is for captains. This 1-year course, which is taught in Angers, provides infrastructure officers for the regiments. At a higher level is the diplôme technique (DT) or technical diploma, which is reserved for captains or majors with a good background in sciences (a university degree, for example). In 2 years, they can earn a master’s degree in vertical construction. If an officer already has a master’s degree, he can obtain this master’s in only 1 year. After these courses, officers join the service to work in staff positions or as project managers. The best officers can expect to command a district.

If an officer fails, he still can drop one level below his current level—for example, from BT to DT or from DT to CT. All of these courses are taught at the Engineer School in Angers. This system provides the service du génie with the highly professional workforce it needs. For officers who were rejected or not attracted to command positions in their branch, this system offers new opportunities to continue a career in a very different but essential domain. If for any reason the engineer officers decide to leave, they will have little problem finding a job in the construction industry with their technical training.

**Conclusion**

Since the end of World War II, the French Army has built a complex but complete system of professional training for officers. It is still evolving to adapt to changes in the Army and in society. The main disadvantage is the length of time that the average officer spends in schools. Although it is a heavy load, it is the only way (especially in the Engineer Corps) to have experienced and qualified officers who are flexible enough to adapt to any position. This lengthy training is possible because officers stay on duty longer—they can receive a minimum pension only after 25 years of duty. The unemployment rate is still high in France, and it is not easy for the average officer to leave the Army and find a job. Consequently, most of them choose to stay in the Army family. This system is a good investment for the Army. Although the courses take a lot of time, the officers remain in these specialized positions long enough to make the system viable and durable.

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**Endnotes**

1In France, reserve forces are small: one company for each regiment, for about 1,000 sappers total.

2The infrastructure component is called “service du génie” or “service”; génie is the French word for engineer.

3For more details, contact the author at Fort Leonard Wood: LTC Potin, (573) 563-4027 by telephone, or by e-mail at <philippe.potin@us.army.mil>.

4This is an approximate translation of the original: « tout soldat a dans sa giberne son bâton de Maréchal ».

5For a lieutenant colonel, it is age 57.

6About 70 lieutenants every year: 20 from Saint Cyr, 25 from the officer academy for NCOs, 10 from the NCO corps, 5 from diverse origins, and 10 international students.

7In 2007, improvised explosive device (IED) defeat was integrated in the program.

8The Staff College lasts 2 years: 6 months in the Army Superior Staff School, 6 months in overseas operation as a staff officer, and 1 year in the Joint Staff College in Paris.

9In 2007, there were 500 officers.

10There is 1 position for each regiment, or 100 total. He is responsible for maintaining the infrastructures in a regiment and conducting minor construction projects in liaison with the local engineer district.

11The last reform, which was in 2007, is too recent to observe the consequences on the Engineer Corps.

12I spent 8 years in courses, for 21 years on active duty.

13To receive the maximum pension an officer needs to serve more than 30 years, especially if he has no bonus from operations or specific assignments.
I have been asked to write this article to support the current review of technical competence in the United States Army Engineer Regiment. In the article, I will describe the United Kingdom’s (UK’s) approach to developing the leadership and technical skills of the Royal Engineer (RE) officers and noncommissioned officers (NCOs), and then explain how the UK’s military engineering capability is configured on operations. My purpose is not to suggest that the UK’s approach is necessarily an applicable model for the U. S. Army engineers to adopt—far from it, since our history, ethos, missions, and size differ so markedly. However, I hope that by offering an alternative perspective on developing and managing engineer capability, I am able to contribute to the current debate.

Overview of the Royal Engineers

Key Facts

To place the article into context, it is first worth highlighting a few facts about the Royal Engineers:

- **Size.** At just under 9,000 strong, the Corps constitutes approximately 9 percent of the Army. In recent operations, however, it has comprised 15–25 percent of any deployed force, and the motto “First In, Last Out” has never been more applicable.

- **Joint Approach.** The RE mission is to provide engineer support across defense. In any deployment, the joint task force commander has an RE advisor, as does each component commander. The level of engineer support allocated to each component is mission-dependent and is controlled at the operational level.

- **Military Engineering Focus.** In the late 1950s, UK peacetime civil works responsibilities were transferred from the Royal Engineers to a civilian agency. As a result, the Corps’s primary focus over the past 50 years has been the delivery of engineer support to military operations.

- **Full-Spectrum Engineer Capability.** All RE Soldiers are multiskilled—they are Soldiers, combat engineers, and artisan tradesmen. A UK engineer battalion therefore has the flexibility to switch from a combat engineer mission to a construction engineer mission without the requirement to reorganize or re-equip.

- **Specialist Capabilities.** The Corps has regiments that provide specialist engineer capabilities in air assault, commando, explosive ordnance disposal (EOD), search, geographic, and air support (fixed and rotary wing). Infrastructure engineering tasks at the more demanding end of the technical spectrum are undertaken by deployable works groups made up of Specialist Teams Royal Engineers (STREs).

The full-spectrum engineer capability that the Corps delivers is illustrated by the three triangles in Figure 1.

![Figure 1. Full-Spectrum Engineer Capability](image-url)
Royal Engineer Officer Training

Junior Officer Training

The RE officer intake traditionally consists of approximately 5 percent non-graduates, 35–40 percent engineer graduates, and 55–60 percent non-engineer graduates. All officers, regardless of their academic qualifications, undertake a year of officer training at the Royal Military Academy Sandhurst (RMAS), followed by the 27-week Royal Engineer Troop Commanders’ Course (RETCC) at the Royal School of Military Engineering (RSME). The RETCC is designed to equip junior officers with the skills required to command an RE troop, and the course consists of the following modules:

- 11 weeks of combat engineer training that covers the reconnaissance, planning, and management of combat engineer tasks.
- 7 weeks of construction training that covers basic engineering principles, project management, and aspects of health and safety. This phase is predominantly classroom-based but includes practical elements such as temporary camp reconnaissance and the use of earthmoving equipment.
- 1 week of communications training.
- 9 weeks of command and leadership training that builds on the education received at RMAS and concludes with a 2-week confirmatory field training exercise.

Officer Appointments

Career Stage 1 encompasses the first 10 years of an officer’s career—from initial appointment to promotion to major. On completion of 18 months of initial training, junior officers normally undertake an initial tour commanding a field troop and a subsequent tour commanding a troop or platoon in the training organization. The generic junior officer career structure also includes a provision for up to 6 months of officer development (leading an adventurous training expedition or humanitarian project, for example), although operational commitments mean that few young officers are currently able to exploit such opportunities. On completion of the second junior officer tour and promotion to captain, officers normally fill either an adjutant or squadron executive officer (XO) billet, and the officer’s final tour as a captain is normally as a Grade 3 staff officer in either an engineer or all-arms headquarters.

Command and Staff Training

Upon being selected for promotion to major and entering Career Stage 2, all officers attend the all-arms Intermediate Command and Staff Course (Land) at the UK Defence Academy. This training prepares officers for Grade 2 staff appointments and sub-unit command which, in the British Army, is a field rank appointment. Thereafter, a proportion of officers selected for promotion to lieutenant colonel (Career Stage 3) attend the Joint Advanced Command and Staff Course in preparation for Grade 1 staff appointments and battalion-level command.

Specialist Officer Training

The generic officer career development profile described above is applicable to all officers in the Corps, less those who undertake specialist training to provide the professionally qualified engineers that the Corps needs to sustain its infrastructure and geographic capabilities. The RETCC is designed to equip junior officers with the skills required to command an RE troop, and the course consists of the following modules:

- 7 months of postgraduate study at the RSME: revising principles; developing design, planning, and contractual skills; and gaining a broader knowledge of military infrastructure engineering.
- 9 months with a civilian contractor.
- 8 months with a civilian consultant.

Officers who have completed the PET course are then eligible to command an STRE (the technical sub-unit), although it is not unusual for the higher-caliber PET officers to command a mainstream sub-unit, either instead of or in addition to an STRE. Following sub-unit command, PET officers are eligible to be employed either in mainstream or technical staff appointments, but if they are promoted to lieutenant colonel on the technical roster, then they are limited to employment within the technical field for the remainder of their career. Specialist officers have the opportunity to command one of the four RE works groups, and the pinnacle of the CEng career pyramid is to command the infrastructure support engineer group—a colonel’s billet.

The generic officer career model up to sub-unit command, highlighting the developmental progression achieved at each stage, is shown in Figure 2, page 20.

Royal Engineer Soldier Training

Initial Soldier Training

Initial training for all RE Soldiers is broken into 3 phases:

- Phase 1: 10 weeks of basic Soldier training.
- Phase 2A: 10 weeks of combat engineer training.
- Phase 2B: 6–15 months of Class 2 artisan trade training, the length of the course being dependent on the Soldier’s trade.

Follow-On Training

Having completed initial training—sometimes lasting as long as 18 months—Soldiers normally serve 3–5 years in their first unit. During this tour, they normally complete a junior
NCO (JNCO) leadership cadre to determine their suitability for promotion; thereafter, they are required to complete both generic and occupational-specific command, leadership, and management courses at each stage of their career as a prerequisite for further promotion. All RE Soldiers must also gain a Class 1 artisan trade qualification and a Class 1 combat engineer qualification before being eligible for promotion to corporal. Class 1 trade courses last about 6 months, and Soldiers identified as having technical aptitude are then considered for clerk of works training.

**Clerk of Works Training**

The RSME has the capacity to train up to 24 JNCOs/senior NCOs (SNCOs) per year to become clerks of works construction, electrical, or mechanical. Clerks of works are responsible for planning and managing technical projects and for providing detailed technical advice in their specialist field. The Clerk of Works Course is just under 2 years in length and comprises 4 months of science and math, 18 months of engineering design, and a 6-week attachment to industry. All clerks of works are promoted to staff sergeant on completion of the course and have a clearly defined career path to warrant officer Class 1, with a very strong chance of commissioning thereafter.

**Engineer Support to Operations**

**Close and General Support Engineering**

Engineer support to a maneuver brigade is provided by a close support (CS) engineer regiment (a U.S. battalion equivalent). The regiment lives and trains with the brigade in peacetime and, in addition to commanding the unit, the commanding officer is also the brigade commander’s engineer advisor. As already highlighted, a CS engineer regiment is able to provide full-spectrum support to the brigade, from high-intensity combat engineer operations at one end to CS infrastructure engineering at the other. Engineer support at the divisional level is provided by a general support (GS) engineer regiment, and all the engineer assets with the division are commanded by a Commander Royal Engineers (CRE), a colonel who is the divisional commander’s engineer advisor. It is worth noting that the current configuration for engineer support (CS and GS/engineer regiment supporting a brigade) was introduced in the early 1990s when it became apparent that the existing structure, which entailed an engineer squadron (a U.S. company equivalent) supporting a brigade, was unable to deliver the level of engineer advice, or the concentration of engineer capability, required by all-arms units and formations.

(Continued on page 27)
The president's 2006 National Security Strategy (NSS) stressed a policy to seek and support democratic movements and institutions in every nation and culture. The NSS is founded on two pillars:

- To promote freedom, justice, and human dignity; work to end tyranny and encourage effective democracies; and extend prosperity through fair trade and wise development policies.
- To confront today’s challenges by leading a growing community of democracies.

An important element in fulfilling and shaping the pillars of the NSS in the international environment is the operational effectiveness of joint military engineers in conducting combat operations and humanitarian assistance. Trends from the conflicts in Iraq and Afghanistan and from the past decade show that the United States—together with its international partners—must have the capacity to manage two or three reconstruction and stabilization operations concurrently.2

Joint military engineers have a long history of heavy engagement in activities such as United States Southern Command’s Operation Fuertes Caminos, a wide range of assistance to Panama, and the responses to the 2004 Indian Ocean tsunami and 2005 Pakistan earthquake. Engineers provide civic assistance, support, stability and reconstruction operations, development projects for critical infrastructure, and the further development of the natural resources of other countries. Engineers from all the military Services provide unique capabilities in all these endeavors and are well-suited to organize and execute these missions to fulfill the NSS.

To accomplish this, joint military engineers must develop a supporting strategy to become increasingly flexible, thus providing the full spectrum of military engineering required by leaders from the president down to the joint task force commander. Joint military engineering is unique in that it can operate and support strategic, operational, and tactical objectives. Unlike any other group, joint military engineers typically support and enable both operational and sustainment functions, as well as all the instruments of national power. To be more effective, the number of military engineers should be increased, and a reorganization of engineer commands should be considered.

Successful strategic military joint engineering can be seen in Iraq today with the United States Army Corps of Engineers (USACE) Gulf Region Division (GRD). The mission of the GRD and its partners in the Naval Facilities Engineering Command (NAVFAC) and Air Force Civil Engineer Support Agency (AFCESA) is to provide high-quality, responsive, full-spectrum engineering services in Iraq in support of military and civil construction, logistical services, and aggressive assistance to the Iraqi government so it can assume full responsibility for national reconstruction.3

Joint Engineers as Shapers

Using the joint military engineer force to shape the international community can be extremely effective in fighting poverty, increasing economic growth, and promoting democracy by helping governments make better use of their own countries’ resources. Engineers shape the security environment by supporting the combatant commander’s vision. They engage other nations by working with allies, as well as potential coalition partners, by participating in international exercises and supporting stability operations in foreign countries. Engineers can often lead combatant commander engagement initiatives through ministry-level contact, military-to-military contact, instruction, and construction projects.4 For example, USACE was designated by the Department of Defense (DOD) to be the executive agent in extinguishing the oil fires in Iraq during the 2003 invasion. USACE was able to extinguish a number of oil fires during initial operations and has since awarded contracts to sustain Iraq’s oil infrastructure, which is the country’s main economic resource.5 The National Response Plan also identifies USACE as the primary agency for providing Emergency Support Function #3-2 (technical assistance, engineering, and construction management resources and support during response activities).6

By Major John P. Lloyd

Joint Engineering Strategy

Photos courtesy Society of American Military Engineers
Historic Joint Military Engineering

Joint military engineering has been involved in every major conflict from World War II to present-day operations in Iraq and Afghanistan. It also assisted with Hurricane Katrina recovery efforts and is involved in Homeland Security.

World War II

During the 6 June 1944 Normandy invasion, the United States Navy Seabees were among the first to go ashore as members of naval combat demolition units. Working with United States Army engineers, their primary task was to destroy the steel and concrete barriers that the Germans had built in the water and on the beaches to forestall Allied amphibious landings.

Vietnam

Based on a 1965 memo from Robert S. McNamara, Secretary of Defense, to Harold Brown, Secretary of the United States Air Force, a study was conducted that led to the development of the United States Air Force Prime Base Engineer Emergency Force (Prime BEEF) units. These units worked alongside United States Army and Navy engineers to build or improve airfields that supported strategic bombings in North Vietnam. Projects included improved beddown and maintenance facilities for crews and aircraft.

Haiti

In September 1994, the 20th Engineer Brigade from Fort Bragg, North Carolina, deployed to Haiti as Task Force Castle, a joint military engineer task force. The brigade conducted a number of decisive engineer operations that included the construction of base camps, restoration of electrical power directly benefiting the local populace, construction of a landfill on Soleil, refurbishment of an academy for the International Criminal Investigators Training Assistance, construction of a marketplace that supported hundreds of vendors, improvements to local schools, and removal of garbage as part of the national cleaning fervor in Haiti.

Bosnia

Military engineers played a major role in Bosnia with the initial bridge construction across the Sava River, which allowed 1st Armored Division forces to enter the country. The 1st Armored Division Engineer Brigade formed a joint military engineer task force that built more than 24 base camps to support the 28,000 North Atlantic Treaty Organization (NATO) peacekeeping forces monitoring the Dayton Accords. Engineers supported the NATO mission by improving roads and removing explosive hazards such as mines and unexploded ordnance.

Tactical and Technical Implementation

The national strategic engineering assets of USACE, NAVFAC, and the Air Force Center for Engineering and the Environment (AFCEE) will be vital in implementing the NSS. The increased capability of the Office of the Secretary of State/Office of the Coordinator for Reconstruction and Stabilization (S/CRS) will allow for an integrated civilian and military response that is agile, flexible, scalable, and able to build on lessons learned. According to Joint Publication 3-34, Joint Engineer Operations, USACE and NAVFAC are the principal engineer organizations to plan, design, construct, and acquire facilities and real estate for DOD. Joint military engineering will play a vital role in supporting the Department of Homeland Security and its three national priorities of preventing terrorist attacks within the United States, reducing America’s vulnerability to terrorism, and minimizing the damage and facilitating the recovery from attacks that might occur.

Joint military engineers support this strategy by working with organizations such as United States Northern Command’s Joint Task Force North to prevent transnational threats to the homeland. This includes using engineer units for construction along the Mexico-U.S. border to increase law enforcement’s ability to fight illegal drugs. It also assists law enforcement agencies with combating illegal immigration, as outlined in Chapter Eight of the 2006 NSS. Joint Task Force North’s engineering and surveillance projects have contributed to hardening the border, and halting “alien smuggling organizations” is among its stated goals. It provides a model for the kinds of projects the National Guard will be expected to undertake as the Bush administration implements its controversial plan to strengthen the southern frontier. One such project can be found in the hills east of San Diego, California, where active duty United States Marine Corps engineers teamed with a Maryland Army National Guard unit to build an access road.

The border security and illegal immigration issue remains a top strategic issue for the United States and Mexico. The National Guard is playing a huge role in border security. The United States depends on the National Guard—especially its engineer forces—as part of the Total Force concept. More than 60 percent of the military’s engineer force resides in the National Guard and Reserves, and they will continue to be a strategic asset in improving the nation’s borders. National Guard officials in San Diego say that much is being accomplished, and they point to engineers who are working on projects such as a secondary border fence. In the next year, they are scheduled to build drainage structures and a stretch of all-weather road in the western part of the San Diego border area; gates and fencing in the eastern portion; and fencing at Campo, about 60 miles east of San Diego.

Conclusion

Joint military engineers bring unique capabilities that support reconstruction efforts and nation-building along with all other elements of national power. Military engineers are experienced at interagency support and in leveraging nonmilitary and nongovernmental engineer assets to support mission accomplishment. While transformation
has reduced much of the military engineer forces, a strategy must be developed to ensure that military engineer capabilities are maintained and that joint force commanders understand the employment of those capabilities. Joint military engineers must develop a strategy that supports the way ahead as outlined by the administration’s strategy in Chapter 4 of the NSS. This strategy includes three levels of engagement:

- Conflict prevention and resolution.
- Conflict intervention.
- Post-conflict stabilization and reconstruction.

Chapter 9 focuses on the same strategy in the way ahead in improving the capability to plan and respond to post-conflict situations. The S/CRS is responsible for integrating U.S. government resources and assets, including military engineers. Military engineers must continue to work closely with the Department of State to achieve national objectives. The S/CRS identifies two goals for engineers:

- Be responsive to immediate needs, which is the assessment of existing facilities for post-conflict needs.
- Establish the foundation for development, which includes the construction of facilities to promote governance, commerce, and social well-being.

As the S/CRS continues to grow, its capability will bring added value in developing policy and strategy for reconstruction efforts. The S/CRS currently has one USACE liaison assigned to its staff and will need to expand the numbers of its military members to ensure that capabilities and resources are managed across the full spectrum of contingencies from civil war to natural disaster. An S/CRS representative would be a vital member in the joint military engineer headquarters as an interface with in-country teams who understand host nation reconstruction capabilities.

Just as DOD is increasing the number of Special Forces operators and units, it should study the joint military engineer force and increase the number of units and engineers in all the military services. Like the Special Forces, military engineers provide support across all six phases of an operation and provide tactical, operational, and strategic engineering to the president, combatant commanders, and joint task force commanders. The Quadrennial Defense Review and follow-on Strategic Planning Guidance emphasized the need to continue to build on DOD’s capability-based planning and management. The Joint Operational Engineer Board may need to develop a joint military engineer strategy as it builds the Capability Portfolio Management for Operational Engineering. To maximize effectiveness, DOD may need to develop an “Engineer Command” that is similar to the proposed “Medical Command” that would combine the medical capabilities of all the Services into one command. Doing so would ensure that military engineers would be able to significantly contribute to the achievement of national goals by overseeing and coordinating the effects of engineer forces from all Services.

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Endnotes

2 Department of State Office of Reconstruction and Stabilization website at <http://www.state.gov/s/crs/>.
4 FM 3-34, Engineer Operations, 2 January 2004, pp. 1-16.
14 FM 3-34, pg. 1-2.
16 Department of State Office of Reconstruction and Stabilization website at <http://www.state.gov/s/crs/>.
Current theater operations necessitate the integration of all Service engineers if full-spectrum joint engineer functions are to be attained. From combat to general engineering, our engineer Services are sharing the battlefield and expanding their capabilities to address a broad range of planning and execution efforts. Joint engineer planning can include simultaneous planning for an extreme range of engineer requirements, to include—

- Combat mission planning support.
- Improvised explosive device (IED) defeat.
- Base camp planning and development.
- Contingency contracting.
- Infrastructure assessment.
- Reachback capability utilization.
- Construction management.
- Contractor and industry relations.
- Reconstruction and stabilization engineer operations, including joint interagency, intergovernmental, and multinational (JIIM) support.
- Humanitarian operations support.

Joint engineer planning is the key to bridging the gap in full-spectrum engineer operations. Engineering capabilities from across the Services are uniting to bring high degrees of expertise to theater mission planning. Engineers are no longer able to maintain Service-centric focus areas. The entire theater is now the focus. Thus, it requires an expanded engineer knowledge and skill base, increased training, and the ability to execute large-scale theater operations. Current engineering missions indicate a demand of such magnitude that it will require all U.S. engineer forces to support the joint mission. The force multiplier in joint engineer theater operations is having technically and tactically competent engineers who comprehend the expertise and capabilities the joint engineer Services and their civilian counterparts bring to bear.

The Joint Engineering Way Ahead

By Ms. Rachel M. Walkenbach

Joint Training Initiatives

The “way ahead” for joint engineering identifies training and education gaps and promotes the integration of new programs throughout the Services. Engineers from all ranks and echelons of operations are identifying the joint requirements and training gaps throughout multiple theaters. The Joint Engineer Training and Education Working Group, composed of engineer training and education leaders from across the Services, is working to mitigate these gaps by discussing key joint engineer considerations and the mechanisms to program and integrate them into our training and education systems. These senior leaders then take these considerations and recommendations for joint application to the Joint Operational Engineering Board (JOEB) to support the effort to update existing—or implement future—joint engineer programs. The joint initiatives will help integrate theater lessons learned and practical applications into our Services’ training and education systems with a joint perspective and formalized education. This senior working group has generated five initiatives that address gaps within training and education and joint organizational leadership of engineers and point the way ahead in joint engineering:

- Joint Engineer Training
- Engineer Leader Competency
- Joint Engineer Training and Education Center of Excellence
- Construction Leader Exchange Program
- Military and Industry Strategic Alliance Program

Joint Engineer Training

In-theater, the joint task force (JTF) engineer cells are using the capabilities of our engineering assets from the joint perspective. JTF engineer senior leaders, planners, and mission executors are expected to understand the varied capabilities of joint engineer assets and the roles of civilians on the battlefield with them. Joint training encompasses aspects
Engineer Leader Competency

Engineers are required to perform simultaneous combat and general engineering mission planning while maintaining the joint perspective. For those who are both planning and executing the operational mission, the engineer knowledge requirements are expanding. To prepare our forces for full-spectrum engineer operations, engineers need more cross-Service engineer training and formalized civil engineer education and training to perform joint duties with technical competency. The forward movement for our engineers integrates civil engineer degree programs or professional technical certifications into the military curricula, thus establishing technically competent engineers. Achieving engineer leader competency requires establishing Service engineers with a civil engineer education and technical performance skills. They must possess the ability to—

- Comprehend the engineering capabilities of the joint Services.
- Participate in facilities engineering and infrastructure planning.
- Conduct base camp design and planning.
- Utilize construction management programs.
- Execute contingency contracting and procurement requirements.
- Establish diplomatic relations.
- Utilize large-scale construction planning knowledge for outside-the-wire missions.

These skills require the accuracy of formal training and expertise of joint experience in theater operations. The Service engineer institutions recognize this requirement and are answering the call to provide support to combatant commanders with trained professionals.

Joint Engineer Training and Education Center of Excellence

The Joint Engineer Training and Education Center of Excellence (JENTEC) concept is derived from the Joint Center of Excellence concept and would serve as the training and education center for joint engineer training programs. The intent is to implement a greater “joint context” into collective, individual, and staff functions to enable engineers to meet theater operational requirements. The purpose of the JENTEC is to provide joint engineer Service input and oversight to joint programs with participation and recommendations to the JOEB and coordinating working groups. The JENTEC would encompass three engineering directorates—the Joint Engineer Combat Directorate, the General Engineering Training Directorate, and a Joint Education Directorate—to manage the joint engineer courses. Senior engineer training and education leaders would oversee joint training and education. They would support the establishment of organizations, develop and maintain existing programs established to support multi-Service and joint training agreements, and establish and maintain joint accredited engineer military education.

JENTEC would offer full-spectrum joint training opportunities to train engineers and civilian counterparts in all aspects of joint engineering. Joint training should include—

- Combat leader and training courses.
- Accredited joint engineering dL and resident courses.
- Assignment-oriented training.
- Joint construction management programs.
- Joint base camp planning and development programs.
- Engineer support to JIIM operations.

The JENTEC would also support Interservice Training Review Organization (ITRO) growth and provide a joint staffing process for the joint and ITRO organizations.

Construction Leader Exchange Program

The Construction Leader Exchange Program is being designed for enlisted personnel, warrant officers, and officers to establish expert engineers. They will be capable of providing engineer support within combat situations and horizontal and

(Continued on page 46)
The joint engineer community continues to move forward in the process of educating and preparing its officers and noncommissioned officers for operations in the joint environment. The Joint Engineer Operations Course (JEOC), which was designed by engineers for engineers, will bring together engineers from all the Services. Not only will they use what they learn in the current operational environment, but they will also use it for future applications to meet the challenges faced by engineer forces of the 21st century.

The need for the JEOC is based on guidance from the National Military Strategy, Quadrennial Defense Review, February 2006, and the Chairman of the Joint Chiefs of Staff's CJCS Vision for Joint Officer Development, as well as from other sources. The joint engineer community has set its sights on developing engineers who are better prepared and who can quickly immerse themselves into the joint task force (JTF) and its ongoing campaign.

Course Description

The JEOC is a two-phase course designed for selected engineer officers (senior 0-3s and junior 0-4s), senior noncommissioned officers, warrant officers, and government civilians who may serve on a joint staff.

Distributed Learning Phase

The JEOC Distributed Learning (dL) Phase is open to all engineers for self-development in JTF engineer operations. It is a self-paced, self-development course consisting of current information in support of joint engineer operations. Joint engineers from across the Services and from combatant commands abroad have participated in the development of this course and its resources. An Army Knowledge Online (AKO) account is required for enrollment, but joint Service members will be sponsored for an AKO account in order to enroll in the course. The dL Phase is designed to be 40 to 48 hours and, although there is no obligation for completing the course after enrollment, a dL course certificate (good for one year after completion) is a prerequisite for attending the second phase, which is the Resident Phase. A student may elect to complete the JEOC dL Phase only, but the interaction and collaboration with students of other Services at the Resident Phase play a big factor in the success of JEOC.

The dL Phase consists of seven modules with associated lessons that introduce the student to—
- National Security Strategy Development.

Resident Phase

The JEOC Resident Phase primarily consists of facilitator-led small-group discussions and associated practical exercises (PEs). Integrated throughout the course agenda are seven JTF engineer seminar discussions via video teleconference (VTC), guest speaker or panel discussions, and social activities with guests from specialized engineering fields.

The seven seminars are aligned with PEs built around likely JTF scenarios. Students must demonstrate their knowledge and ability to apply joint Service engineer capabilities, common functions, and responsibilities of a JTF engineer staff officer or noncommissioned officer in a simulated JTF engineer staff environment to develop a joint engineer solution. The seminars and practical exercises are—
- Service Engineer Capabilities.
- Engineer Support Plan.
- JTF Assignments, Functions, and Roles.
- Horizontal Staff Integration.
- Engineer Functions.
- Facilities Engineering and General Engineering.
- Outside-the-Wire Considerations.
The Resident Phase guest speakers and topics are as follows:

- Combatant Command Engineer – Area of Responsibility (AOR) Briefing
- Theater JTF Engineer Perspectives and Lessons Learned
- Coalition Engineer Panel (A, B, C countries)
- JTF Engineer Observations and the Effects-Based Approach to Operations
- Senior Engineer (JS-J4) Theater and Joint Engineer Considerations
- Geospatial Engineering Capabilities Presentation
- Sourcing and the Request-for-Forces (RFF) Process
- Base Development and Planning
- Environmental Considerations for the JTF Engineer
- Senior Engineer Brief (Service Engineer Chief)
- Improvised Explosive Device (IED) Defeat Presentation
- Engineer Support to Joint Interagency, Intergovernmental, and Multinational (JIIM) Operations
- Office of Foreign Disaster Assistance – Engineer Roles in Disaster Operations
- Contractors on the Battlefield
- Defense Support to Civil Authorities (NORTHCOM)

Enrollment in the Resident Phase of JEOC is based on priority, considering the fact that only 45 students can be accommodated per course. Top priority goes to personnel assigned to a JTF, combatant command, or component command. Second priority goes to personnel with a high probability of being assigned to a joint billet. Third priority is for other personnel who would benefit from attending JEOC.

Summary

The course provides sufficient grounding for students to understand the responsibilities of a staff officer assigned to the joint engineer staff section of a JTF. The major focus of the course is to introduce students to joint doctrine, planning and operations (specifically engineer operations), and the types of engineer staff positions and associated products engineers are required to develop.

All engineers are encouraged to enroll in the Joint Engineer Operations Course. For questions pertaining to enrollment, contact Mr. Dwayne Boeres at the Directorate of Training and Leader Development, United States Army Engineer School, Fort Leonard Wood, Missouri 65583. He can also be reached at <dwayne.boeres@us.army.mil> or (573) 563-7065.

Ms. Walkenbach is a contractor with C2 Technologies, Inc., and works in the Directorate of Training and Leader Development, United States Army Engineer School, Fort Leonard Wood, Missouri.

“Royal Engineers,” continued from page 20

Infrastructure Support Engineering

Infrastructure engineering support to the joint force is provided by the infrastructure support engineer group. The group comprises four works groups, each of which consists of five STREs of various disciplines (materials, works, water development, bulk petroleum, utilities, water infrastructure, power infrastructure, fuels infrastructure, rail infrastructure, and port infrastructure). Although predominantly made up of active duty personnel, there is also a reserve component that provides specialist expertise in civilian infrastructure and utilities. The role of the works groups on operations is to conduct professional and technical assessment, design, planning, and supervision of infrastructure engineering tasks, including the use of contractors and locally employed civilians when required. This use of small, stand-alone deployable teams—combining professional engineers, technician engineers, technicians, design trades and, in certain teams, specialist trades—has proved to be highly successful in recent operations.

Summary

Given the constraints of space, it has only been possible to give a broad overview of the capabilities of the Royal Engineers in this article, and there are some elements of the Corps’s capabilities that I have not addressed at all. However, I hope that I have been able to provide an insight into the way in which the British Army develops and manages its military engineer capability and that this insight is informative in the context of the current debate. By way of conclusion, it is worth noting that the UK’s recent review of future army structures has resulted in a significant increase in the size of the Royal Engineers and, furthermore, that this increase has largely been achieved at the expense of the combat arms. This clearly illustrates the value that UK Defense places on its engineer capability, and it will ensure that the Corps can continue to uphold its motto of Ubique (everywhere).

Colonel Phillips is the British Liaison Officer at the United States Army Maneuver Support Center, an appointment which he took up in October 2007. Prior to this, he was the officer career manager for the Royal Engineers, and previous appointments include Commanding Officer at the Royal School of Military Engineering and Commanding Officer of the Army Technical Foundation College. He also commanded the UK’s Joint EOD Force on the entry operation into Kosovo.

Endnotes

1In the British Army, an engineer battalion is designated as a “regiment.”
2A UK engineer company is designated as a “squadron.”
3The geographic capability will not be discussed in this article.
4The construction field also includes the discipline of military plant foreman.
The 1/101 Brigade Combat Team (BCT) Operations Center receives an urgent call from a mounted combat patrol, Rough Rider element, in the city of Kirkuk, Iraq, requesting immediate explosive ordnance disposal (EOD) team response. The Operations Center relays to the EOD team that during the course of a coalition presence patrol in downtown Kirkuk, a convoy of five up-armored HMMWVs was struck by an improvised explosive device (IED); the lead vehicle took the force of the blast, resulting in minor injuries to the occupants and minimal vehicle damage. The Operations Center immediately dispatches its on-call quick-reaction force to escort the EOD team to the incident scene. Once at the scene, the on-site convoy commander provides the EOD team chief with a detailed description of the events that led to the attack and a sketch of the scene. The EOD team chief ensures that 360-degree site security is in place and that all coalition and local national personnel in the area are safely evacuated. The EOD team uses robotic equipment to quickly do a remote survey of the vehicle damage, explosion site, and surrounding area. They find an animal carcass with electrical wires coming out of it, obviously emplaced by insurgents as a secondary IED meant to kill or injure the first-responders. Using a robot, the EOD team destroys the secondary IED by placing an explosive charge on the carcass. The site is cleared and the EOD team is escorted back to the forward operating base (FOB)—another mission success.

EOD robots have proved to be invaluable on the battlefield.
This realistic scenario is just one of many that Air Force EOD teams encounter during a Global Antiterrorism and Operational Readiness (GATOR) Course. The two-week course, held at the Ordnance Munitions and Electronic Maintenance School, Redstone Arsenal, Alabama, is required predeployment training for EOD forces. The course provides training on IED threats and unique EOD procedures and equipment encountered in Iraq and Afghanistan.

GATOR is owned and operated by the United States Army, which established the course in 2003 to enhance the training its EOD forces received before deploying for Operation Iraqi Freedom or Operation Enduring Freedom. The Army conducts more than 30 GATOR classes per year, training well over 500 EOD technicians from all Services, as well as EOD teams from other countries. The permanent GATOR staff consists of four Active Army EOD instructors and a team of contract support personnel who build IED training aids and maintain specialized robotics and equipment. Each Service provides additional subject matter experts to assist the GATOR staff while their Service teams attend the course.

GATOR’s joint Service training venue allows Air Force EOD teams to train as they will fight on the joint Service battlefield. Week one consists of classroom training on current enemy tactics, techniques, and procedures (TTP); IED trends; advanced IED electronics; electronic countermeasures; Iraq/Afghanistan ordnance identification; crime scene investigation/forensic analysis; and robotic equipment operations. During week two, students respond to more than 30 practical scenarios based on current EOD incidents and evolving insurgent TTP.

The GATOR course is just a part of the required training EOD forces must have before heading to the Iraq and Afghanistan areas of operations. They must also complete Air Force predeployment training at home station and a 15-day basic Combat Skills Training Course at one of the Army’s stateside power projection platforms. This is all in addition to their normal schedule at home station. EOD forces spend more than 30 percent of their time in training—to maintain their minimum career field qualifications, to hone their wartime skills, and to stay proficient on specialized EOD tools and TTP.

It’s a lot of training, but the execution of EOD operations on the Iraqi and Afghani battlefields requires unwavering skill to ensure the safety and survival of coalition forces and local nationals. The GATOR Course provides exceptional hands-on classroom training and challenging practical scenarios built from actual EOD operations occurring in-theater within the past few months.


Note: A version of this article was published in the Air Force Civil Engineer magazine, Volume 15, No. 2, pages 12-13.
Engineer Operational Manuals Update

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

This article provides an update on the status of the Engineer Regiment’s keystone manual—Field Manual (FM) 3-34, Engineer Operations—and the ongoing development of its two subordinate and companion manuals, FM 3-34.22, Engineer Operations – Brigade Combat Team and Below, and FM 3-34.23, Engineer Operations – Echelons Above the Brigade Combat Team. These are significant revisions of the doctrine for engineer operations supporting all echelons from company teams and task forces to theater armies.

Status of FM 3-34 and the Way Ahead

The final draft (FD) of FM 3-34 was staffed “worldwide,” and 340 comments were received. The writing team is adjudicating all comments and preparing the “approved” FD for editing. Once editing is completed, the manual will begin its final staffing through the United States Army Engineer School commandant, the United States Army Maneuver Support Center commander, and then to the Combined Arms Doctrine Directorate of the Combined Arms Center at Fort Leavenworth, Kansas, before it is published and posted on Army Knowledge Online (AKO). The publication of this latest version of FM 3-34 is projected for early fall of 2008. The completed version of FM 3-34 will be the 21st edition of our engineer keystone operational manual, with the first one being printed before 1897. (See Engineer, January-March 2007, page 4.)

Development of FM 3-34.22 and FM 3-34.23

FM 3-34.22 reflects the considerable changes that have occurred over the 14-plus years since all of these manuals were released. While many of the tactical tasks associated with combat and general engineering support have remained essentially constant, the operational environment has dramatically shifted. New focused threats such as improvised explosive devices (IEDs) are but one example of those changes. Another major change involves the Army’s reorganization and restructuring to the modular force and the effects that this has had on doctrine and the conduct of operations.

FM 3-34.23 is a new manual that will supersede the following manuals and will combine doctrine previously published in them:

- FM 5-71-100, Division Engineer Combat Operations, dated 22 April 1993
- FM 5-100-15, Corps Engineer Operations, dated 6 June 1995

Just as Army transformation has flattened higher-echelon structure into modular, scalable capabilities, this manual flattens the associated engineer doctrine for these echelons for greater effectiveness and efficiency.

The intent of these two new FMs, with consolidated and revised material from the superseded manuals, is to establish doctrinal guidance for the employment of engineers and the conduct of engineer operations supporting full-spectrum operations. These manuals will support the doctrine articulated in the newest version of FM 3-0, Operations, dated 28 February 2008. Each of these manuals will link directly to the revised FM 3-34, as well as each other, and also complement joint engineer doctrine found in Joint Publication (JP) 3-34, Joint Engineer Operations, dated 12 February 2007. These engineer manuals will serve as references for commanders and staff, leaders, training developers, and doctrine developers throughout the Army and the joint, interagency, intergovernmental, and multinational (JIIM) community.

The development of these manuals is being led by the engineer doctrine team, which includes writers who are former engineer officers, available subject matter experts from the Army Engineer School and around the Regiment, as well as the community of combined arms doctrine developers to review and comment as drafts are staffed.
Senior engineer leader input from across the Regiment is critical to the development of each of these manuals. Also critical is the use of a targeted working group of senior engineer leaders for focused guidance and reviews as the manuals are developed. Most of the development of each manual is being done virtually, primarily through e-mail correspondence and AKO. Targeted discussion of the latest drafts of both manuals occurred prior to ENFORCE 2008 (5-9 May) through a virtual Council of Colonels conducted via video teleconference (VTC).

**Need for FM 3-34.22 and FM 3-34.23**

There are many reasons driving the requirements for these manuals. Some of the reasons to consolidate and update them are that the Army, and we as engineers in particular, have had significant recent operational experiences through our participation in ongoing operations in Afghanistan and Iraq, as well as other worldwide operations (such as in the Philippines and Hurricane Katrina relief). In addition to FM 3-34, the following key joint and Army manuals have been recently revised or are under revision:

- JP 3-34, Joint Engineer Operations, dated 12 February 2007
- JP 5-0, Joint Operation Planning, dated 26 December 2006
- FM 3-0, Operations, dated 28 February 2008
- FM 3-90, Tactics, dated 4 July 2001
- FM 5-0, Army Planning and Orders Production, dated 20 January 2005
The collective body of evolving policy and doctrine, coupled with joint and Army transformation impacts on the Engineer Regiment, led to development of and conversion to the modular engineer force structure. To remain relevant and current, it is imperative that engineer doctrine remains synchronized with the prevailing body of thought for the Army. Doctrine is increasing focus and emphasis on stability operations, coupled with the recognition that the Army conducts simultaneous full-spectrum operations. Revised doctrine recognizes the impacts of conducting multiple operations simultaneously and with distinctly different objectives for forces in the field, the revised force structure and how it is employed, and the modified way that the Army conducts its operations.

Another significant doctrinal change is the deletion of the Battlefield Operating System (BOS) construct and the development and adoption of Army warfighting functions. Adoption of the warfighting functions and revisions to the elements of combat power make it necessary to revise our thoughts on engineer operations and integrate them through warfighting functions. In addition to functional brigades, transformation to the modular force has led to the creation of three types of maneuver BCTs and five multifunctional support brigades designed to provide support to the division level. (They are the Maneuver Enhancement Brigade [MEB], Battlefield Surveillance, Combat Aviation, Sustainment, and Fires Brigades.) The MEB conducts maneuver support operations which enhance protection and mobility through variable mixes of forces—such as engineer, military police; chemical, biological, radiological, and nuclear (CBRN); and explosive ordnance disposal (EOD)—conducting combined arms operations. When engineer units are assigned or attached to an MEB, many of their traditional combat and general engineer missions will be executed in the context of maneuver support operations for the supported force.

All of these changes are driving significant content adjustment in these manuals, to include a crosswalk of linkages from the three engineer functions of combat, general, and geospatial engineering to the six warfighting functions. The Army warfighting functions, which were first introduced in FMI 5-0.1, replace the BOS construct in the new FM 3-0, link to the joint functions, and will be reflected in the revised version of FM 3-34. The new FM 3-34 will highlight and describe the criticality of engineer staff integration at all echelons and the importance of functional, as well as multifunctional, command and control for engineer elements. The manual recognizes the transformation to a modular BCT-focused Army and describes engineer capabilities within that context. In conjunction with these changes, the manual also updates integration into the Army and joint planning processes, to include considerations in the rapid decision-making and synchronization process.

FM 3-34.22 and FM 3-34.23, which are intended to be companion manuals to FM 3-34, will complement and integrate other recent and ongoing doctrinal updates within the engineer doctrine proponenty as well. These manuals include the following:

- FM 3-34.210, Explosive Hazards Operations, dated 27 March 2004
- FM 3-100.4, Environmental Considerations in Military Operations (will be republished as FM 3-34.500/MCRP 4-11B)
- FM 5-103, Survivability Operations (will be republished as FM 3-34.300/MCWP 3-17.6)
- FM 5-104, General Engineering Operations (will be republished as FM 3-34.400/MCWP 3-17.8)
- FM 5-170, Engineer Reconnaissance (will be republished as FM 3-34.170/MCWP 3-17.4) and the related infrastructure reconnaissance
- FM 90-13, River Crossing Operations (will be republished as FM 3-90.12/MCRP 3-17.1, Combined Arms Gap Crossing Operations)

These updates to doctrine should be available on AKO within the year.

**Framing of the Manuals**

The development of FM 3-34.22 leverages foundational changes made during the development of FM 3-34.221. This new FM further aligns doctrine for engineer operations at the BCT and below echelons with evolved doctrine for all three types of BCTs and specifically FM 3-90.6, The Brigade Combat Team, 4 August 2006; FM 3-90.61, The Brigade Special Troops Battalion, 22 December 2006; and the recently released FM 3-90.5, Combined Arms Battalion Operations.

To avoid doctrinal redundancy in the manual, it references FM 3-90.6 for the general discussion on BCT operations, while focusing on engineer aspects at that level. It also references FM 3-34 for discussion of an engineer view of the operational environment and modular engineer capabilities and references FM 3-34.170 for detailed discussion on engineer reconnaissance capabilities. FM 3-34.22 will be framed in eight chapters:

- Chapter 1: Engineers in Support of the Brigade Combat Team – describes the role of engineers and engineer support to the BCT, as well as specific engineer organization within the BCT.
- Chapter 2: Integrating Engineer Operations – describes processes to integrate engineer operations within the BCT.
Chapter 3: Engineer Support to Intelligence, Surveillance, and Reconnaissance – describes engineer reconnaissance in support of BCT ISR operations.

Chapter 4: Engineer Support to Security Operations – describes engineer support of BCT security operations.

Chapter 5: Engineer Support to Lethal and Nonlethal Fires – describes the integration of engineer support to targeting and civil affairs operations.

Chapter 6: Engineer Support to Combat Operations – describes integration of engineer support in BCT offensive and defensive operations.

Chapter 7: Stability and Civil Support Operations – describes integration of engineer support in BCT stability or civil support operations.

Chapter 8: Sustainment Support for Engineer Operations – discusses the considerations for sustainment of engineer units and operations supporting the BCT.

In addition to the chapters, a number of appendixes will be included in the manual to provide additional detailed discussion for a variety of selected topics.

The development of FM 3-34.23 currently precedes the development of other new higher-echelon manuals that are likely to be designated as FM 3-91, FM 3-92, and FM 3-93 for division, corps, and theater army echelons. The new FM 3-34.23 flattens the body of doctrine for engineer operations at echelons above the BCT from three separate manuals into a single manual. To avoid doctrinal redundancy in the manual, it references FM 3-34 for discussion of an engineer view of the operational environment (OE) and details on modular engineer capabilities. The manual will be framed in seven chapters:

- Chapter 1: Engineer View of the Operational Environment – describes the role of engineers and engineer support at higher echelons.
- Chapter 2: Modular Force Organization – describes the engineer organizations and the higher echelon headquarters they will support.
- Chapter 3: Foundations of Engineer Operations – discusses integration of engineer operations at higher echelons.
- Chapter 4: Theater Army Echelon Engineer Operations – describes engineer support for theater army echelon operations.
- Chapter 5: Corps Echelon Engineer Operations – describes engineer support for corps echelon operations.
- Chapter 6: Division Echelon Engineer Operations – describes engineer support for division echelon operations.
- Chapter 7: Sustainment Support for the Engineer Unit – discusses considerations for sustainment of engineer units and operations at echelons above the BCT.

In addition to these chapters, a number of appendixes will be included in the manual to provide additional detailed discussion for a variety of selected topics.

Current Development Status

The writing team is currently preparing a final draft of FM 3-34.22 and the initial draft of FM 3-34.23. Both drafts were completed in time for a presentation and discussion prior to ENFORCE 2008. Based on the guidance from the review of these documents and this virtual meeting/Council of Colonels, revised and updated drafts will be completed later in the year and staffed for Armywide review and comment. After the comments from these staffings are received and adjudicated, final electronic file drafts will be prepared, edited, and staffed to enable these manuals to be published (in print and on AKO). Other focused working group actions and staffing dates will be developed as necessary to support the production of the manuals for the Regiment. The publication of these manuals and placement on AKO is projected for late 2008 for FM 3-34.22 and late 2009 for FM 3-34.23. Your participation in the reviews and development of these manuals is necessary to make them relevant and useful to all leaders in the Engineer Regiment and the Army.

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

Lieutenant Colonel Lefler is the Chief of the Engineer Doctrine Branch, United States Army Maneuver Support Center Directorate of Training, Fort Leonard Wood, Missouri. He is a registered professional engineer in Nebraska and a Project Management Professional.

2008 Engineer Unit Directory

The 2008 United States Army Engineer Unit Directory is available online in Adobe PDF format at <http://www.wood.army.mil/engrmag/Engr%20Unit%20Dir/2007Directoryonline.pdf>. Take a moment and see if your unit’s listing is correct. Changes to the Unit Directory can be made by calling (573) 563-7644 or e-mailing <leon.engineer@conus.army.mil>.
As the engineer keystone manual, this field manual (FM) encompasses all engineer doctrine; integrates the three engineer functions of combat, general, and geospatial engineering; and addresses engineer operations across the entire spectrum of operations and at all echelons. While embracing the concept of modularity, this manual is being updated to fully integrate the modular engineer force (MEF). The new versions of Joint Publication (JP) 3-34, Joint Engineer Operations; JP 3-0, Joint Operations; FM 3-0, Full Spectrum Operations; and other manuals drove the requirement for this manual to be updated. All other Army engineer doctrinal manuals are based on the principles and tenets found in this manual.

**Revision Highlights:** MEF, warfighting functions, explosive ordnance clearance agent (EOCA), and the maneuver enhancement brigade (MEB).

**Status:** Under revision in FY 08. The revision is linked to the FM 3-0 revision and its finalization; the final draft staffing is complete, the comments have been received, and adjudication of the comments is ongoing.

**Description (and Current Status)**

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<tr>
<td>FM 3-34</td>
<td>Engineer Operations</td>
<td>10 Mar 03</td>
<td>As the engineer keystone manual, this field manual (FM) encompasses all engineer doctrine; integrates the three engineer functions of combat, general, and geospatial engineering; and addresses engineer operations across the entire spectrum of operations and at all echelons. While embracing the concept of modularity, this manual is being updated to fully integrate the modular engineer force (MEF). The new versions of Joint Publication (JP) 3-34, Joint Engineer Operations; JP 3-0, Joint Operations; FM 3-0, Full Spectrum Operations; and other manuals drove the requirement for this manual to be updated. All other Army engineer doctrinal manuals are based on the principles and tenets found in this manual. <strong>Revision Highlights:</strong> MEF, warfighting functions, explosive ordnance clearance agent (EOCA), and the maneuver enhancement brigade (MEB). <strong>Status:</strong> Under revision in FY 08. The revision is linked to the FM 3-0 revision and its finalization; the final draft staffing is complete, the comments have been received, and adjudication of the comments is ongoing.</td>
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<td>FM 3-34.22 (FM 3-34.221) (FM 5-71-2) (FM 5-71-3) (FM 5-7-30)</td>
<td>Engineer Operations – Brigade Combat Team and Below</td>
<td>Pending (Jan 05) (Jun 96) (Oct 95) (Dec 94)</td>
<td>This new manual will encompass engineer operations in support of all three types of brigade combat teams (BCTs) (heavy, infantry, and Stryker—the armored cavalry regiment) and their primary subordinate units. It combines the current manuals that guide engineer operations in BCTs, and will integrate the significant changes caused by transformation. Changes in the structure of the force have caused adjustments to the command and control (C2) structure and tailoring of engineer forces to support the BCTs. Engineer augmentation of each of the BCTs now occurs on a regular basis. Recent lessons learned in security and reconstruction operations; infrastructure reconnaissance; clearing operations; and engineer support to intelligence, surveillance, and reconnaissance (ISR) operations will also be incorporated. This manual will support the BCT doctrine found in FM 3-90.8 and include key engineer employment principles and C2 procedures found in FM 3-90.81. <strong>Revision Highlights:</strong> MEF and warfighting functions. <strong>Status:</strong> Preparing the final draft.</td>
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**Combat Engineering**

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<td>FM 3-90.11 (FM 3-34.2)</td>
<td>Combined Arms Mobility Operations</td>
<td>Aug 00</td>
<td>This is a full revision, to include renaming and renumbering of FM 3-34.2, Combined Arms Breaching Operations. Changes in the structure of the force have not changed the principles of breaching, but they have required adjustment of the tactics, techniques, and procedures (TTP) associated with breaching and clearance operations. Recent lessons learned in clearance operations are being incorporated into this revision, as well as selected information on improvised explosive device (IED) defeat and gap crossing operations. The numbering for this manual reflects its critical relationship to the keystone manual FM 3-90, Tactics and Combined Arms Operations.</td>
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**Combat Engineering (continued)**

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<td>FM 3-90.11</td>
<td>Combined Arms Mobility</td>
<td>Aug 00</td>
<td><strong>Revision Highlights:</strong> MEF, five areas of mobility (breaching, clearing, gap crossing, combat roads and trails, forward aviation combat engineering [FACE]), IEDs, urban breaching, and warfighting functions. <strong>Status:</strong> In final draft (on hold to address transition to warfighting functions and awaiting release of the revisions of FM 3-0 and FM 3-90). It likely will require some rework and possibly restaffing.</td>
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<td>FM 3-90.12</td>
<td>Combined Arms Gap Crossing</td>
<td>Jan 98</td>
<td>This is a full revision, to include renaming and renumbering of FM 90-13/MCRP 3-17.1, River Crossing Operations. This manual is and will continue to be a dual-designated manual with the Marine Corps. While changes in the structure of the force have not changed the basic principles of river crossing operations, they have required that the TTP associated with river crossing be adjusted. The revised manual incorporates considerations for all gap crossing operations. FM 3-90.11 will be the base manual for discussions on mobility operations, and FM 3-90.12 will be written as a companion manual, taking advantage of the discussion of mobility operations in FM 3-90.11. The numbering for this manual reflects its critical relationship to the keystone manual FM 3-90. <strong>Revision Highlights:</strong> MEF, engineer reconnaissance, gap crossing definitions, and warfighting functions. <strong>Status:</strong> The U.S. Army Engineer School Commandant has approved the manual; awaiting Marine Corps approval. The estimated posting to Army Knowledge Online (AKO) is Spring 2008.</td>
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<tr>
<td>FM 3-90.13</td>
<td>Combined Arms Obstacle</td>
<td>Sep 94;</td>
<td><strong>Revision Highlights:</strong> MEF, warfighting functions, and intelligent munitions. <strong>Status:</strong> Preparing program directive and initial draft.</td>
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<tr>
<td>FM 3-90.13</td>
<td>Obstacle Integration</td>
<td>Mar 85</td>
<td>This manual provides doctrinal guidance for engineer reconnaissance across the full spectrum of operations. It encompasses engineer reconnaissance in support of tactical operations, as well as engineer technical reconnaissance support, and introduces infrastructure reconnaissance. This manual supersedes FM 5-170. Changes in the structure of the force have not changed the basic principles of engineer employment, but they will adjust the C2 structure and tailoring of engineer forces to support the BCT. Recent lessons learned include the need to define, develop, and provide a proponent manual for infrastructure reconnaissance and its memory aid sewage, water,</td>
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<tr>
<td>FM 3-34.170</td>
<td>Engineer Reconnaissance</td>
<td>May 98</td>
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### Combat Engineering (continued)

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<tr>
<td>FM 3-34.170</td>
<td>Engineer Reconnaissance, cont.</td>
<td>May 98</td>
<td>electricity, academics, trash, medical, safety, and other considerations (SWEAT-MSO). <strong>Revision Highlights:</strong> The introduction of infrastructure reconnaissance (assessment and survey), environmental reconnaissance (assessment and survey), engineer reconnaissance teams, field force engineering (FFE), and other reachback mechanisms. The manual highlights the creation of the first dedicated engineer reconnaissance element in the engineer company of the heavy brigade combat team (HBCT). <strong>Status:</strong> U.S. Army Engineer School Commandant and the Marine Corps approved; accepted and approved by the Combined Arms Doctrine Directorate (CADD); and forwarded to the Army Publishing Directorate (APD) for publishing and posting to AKO.</td>
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<tr>
<td>FM 3-34.300</td>
<td>Survivability</td>
<td>Jun 85</td>
<td>This is a full revision, to include renumbering, of FM 5-103, <em>Survivability Operations</em>, which was last published in 1985. The emergence of protection doctrine, coupled with changes to FM 3-0 and FM 3-34, mandated a full revision. It will also relate survivability to the other capability elements of the protection warfighting function, as described and defined in FM 3-0 and FM 3-10. This manual focuses on providing survivability information needed by commanders and their staff at the tactical level, but has applicability for a much larger audience as well. The manual relates the engineer-focused aspects of survivability to the broader use of the terms of survivability and protection. This manual addresses the aspects associated with the six areas of survivability, with a focus on hardening. The manual will expand the discussion of survivability across all echelons. <strong>Revision Highlights:</strong> Protection, hardening, antiterrorism considerations, and warfighting functions. <strong>Status:</strong> Preparing final draft for update. It is on hold for release of FM 3-10.</td>
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<tr>
<td>FM 3-34.281</td>
<td>Military Diving</td>
<td>Jan 99</td>
<td>The original manual (FM 20-21) was a complete adoption of the Navy diving manual and a complete reproduction of Change 4 to Navy diving manual SS521-AG-PRO-010, dated Jan 99. This manual, which will be renumbered as FM 3-34.281 during revision, will support one of the modular units of the MEF. Within the Army, this document is used by special operations forces, as well as engineer divers. <strong>Revision Highlights:</strong> To make the manual more useful and comprehensive for Army use, the entire Navy diving manual will not be adopted; instead, the targeted sections applying to Army diving use will be adopted with other Army-specific considerations being added to the manual, creating an Army-focused diving manual. <strong>Status:</strong> A sequential effort will begin in detail after the Navy update to the Navy diving operational manual; developing the program directive.</td>
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**ENGINEER DOCTRINE UPDATE**

**U.S. Army Maneuver Support Center**  
Training and Doctrine Development Department  
Doctrine Division, Engineer Branch

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| FM 3-34.400 (FM 5-104) | General Engineering | Nov 86 | This is the primary manual relating the engineer function that bears its name. It provides the linkage between the engineering doctrine contained in FM 3-0, FM 3-34, and JP 3-34. As the implementing manual for general engineering, this manual describes the operational environment (OE) and how to apply and integrate general engineering principals in support of full spectrum operations. This manual is designed primarily to assist Army engineers at all echelons in planning and coordinating general engineering operations at the strategic, operational, and tactical levels. It is the primary doctrinal manual to define the engineer function of general engineering. It links to the FM 3-10 definitions of base camp and the various types of base camps. General engineering tasks are a part of most military operations. The degree of Army engineer involvement in accomplishing these tasks will vary based on the mission, situation, availability of engineer resources and the commander’s intent. Planners must recognize that joint and Army transformation has rapidly changed the way we resource and conduct operations, and the application of general engineering is no exception. We have always tailored engineer elements and capabilities to support the force. The provisions of the MEF have provided additional modularity into Army engineer organizations to facilitate the commitment of only the required engineer assets into the theater of operations (TO). Enhancing the capabilities of those assets are reachback capabilities that minimize the footprint of engineers while optimizing the performance of those deployed elements. Planners must apply these improvements and ensure that the general engineering effort is seamlessly woven into the commander’s plan in a proactive fashion and accomplishes the commander’s intent. This manual is the primary reference for all the other general engineering-related engineer reference manuals.  

**Revision Highlights:** Infrastructure reconnaissance, field force engineering (FFE) (reachback), homeland support, MEF, and warfighting functions.  

**Status:** Editing of the final electronic file, quality control, staffing for U.S. Army Engineer School Commandant approval, with an estimated posting to AKO as Spring 2008.  

| FM 3-34.410 Volumes I & II (FM 5-430-00-1 & 5-430-00-2) | Design of Theater of Operations Roads, Airfields and Helipads | Aug 94; Sep 94 | This is a full revision and consolidation of FM 5-430-00-1 and FM 5-430-00-2 into one manual that is separated into two volumes. 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 designation of AFJPAM 32-8013, Volumes I and II. The Navy plans to participate in this revision and to adopt this manual as well, making it multi-Service. The intent is to update the current FMs with new techniques and procedures for planning and designing roads, airfields, and heliports in support of TO. The revision will integrate recent doctrinal updates. FM 3-34.410 is intended for use as a reference text and training guide for engineer personnel responsible for planning, designing, and constructing roads, airfields, and heliports in the TO. The two current FMs are essentially one manual divided into two separate volumes. Volume I is a stand-alone volume for the design of TO roads. This volume also serves as a detailed description of information common to both roads and airfields. Volume II serves as the basis for airfield and heliport design. It covers the complete
## Engineer Doctrine Update

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| FM 3-34.410        | Design of Theater of Operations Roads, Airfields and Helipads, cont. | Aug 94; Sep 94 | process of airfield and heliport construction. It is not a stand-alone volume. Volume 1 contains much of the information required to design the substructure of an airfield or a heliport.  
**Revision Highlights:** This is a collaborative effort with the Engineer Research and Development Center (ERDC) and the U.S. Army Corps of Engineers (USACE) Transportation Center of Excellence (Omaha), Air Force, Air Force Civil Engineering Support Agency (AFCESA), and the Navy. It includes the newest technologies, current practices, and revision of formulas.  
**Status:** Initiating the program directive and developing the initial draft. |
| FM 3-34.428        | Theater of Operations Electrical Systems | Jun 97 | This manual is intended to be used as a reference text and training guide for engineer personnel who are responsible for planning and executing (TO) construction. The five major parts of this manual provide practical information for military personnel in the design, layout, installation, and maintenance of exterior and interior electrical wiring, and power-generation and distribution systems. The manual will be renumbered as FM 3-34.428 during this revision. While not currently designed to support a specific module of the MEF, this manual does support the general engineering function and typical vertical construction efforts.  
**Revision Highlights:** This manual needs to be revised to make it more comprehensive and includes more details on tactical power generation below prime power, power distribution, the newest technologies, and current practices in the deployed environments.  
**Status:** Developing the program directive. |
| FM 3-34.451        | Materials Testing | Dec 92 | This manual is intended to provide technical information necessary for military personnel to obtain samples and perform engineering tests and calculations on soils, bituminous paving mixtures, and concrete. These tests and calculations are required to achieve proper design with these materials and adequate control over their use in military construction. The manual covers soils, aggregates, bituminous cements, bituminous paving mixtures, portland-cement concrete, and stabilized soil—including stabilizing agents such as bitumens, cements, lime, fly ash, and chemical modifiers. The current manual (FM 5-472) gives detailed instructions for taking adequate representative test samples tests and for recording, calculating, and evaluating test results. The test procedures and terminology used in this manual 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. This manual is currently a multi-Service publication with the Navy and the Air Force (NAVFAC MO 330/AFJMAN 32-1221(I)). The manual will be renumbered as FM 3-34.451 during its revision.  
**Revision Highlights:** It a collaborative effort with ERDC and USACE Transportation Center of Excellence (Omaha), the Air Force, AFCESA, and the Navy. Newest technologies, current practices, and revision of formulas.  
**Status:** Initiating the program directive and developing the initial draft. |
**ENGINEER DOCTRINE UPDATE**

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<td><strong>General Engineering (continued)</strong></td>
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| FM 3-34.465        | Quarry Operations                  | Mar 05; Dec 03  | This manual emphasizes the aspects of pit and quarry layout, design, and operation. It outlines the methods and procedures used in the exploration for and operation of pits and quarries. It provides information on the 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. The revised manual will contain the revision and consolidation of the material in this manual, and the material contained in FM 3-34.468, Seabee Quarry Blasting Operations and Safety Manual.  
**Revision Highlights:** It is a collaborative effort with the Navy, with an Army lead and possible Air Force participation as well. The intent is to combine the two existing manuals into one manual containing the newest technologies, current practices, and revision of formulas, with an overall update of the materials contained within.  
**Status:** Staffing the program directive and initiating development of the initial draft. |
| FM 3-34.469        | Multi-Service Well Drilling Operations | Mar 94         | This manual is a guide for engineer personnel responsible 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 manual, currently a multi-Service publication with both the Navy and the Air Force (NAVFAP P-1065/AFMAN 32-1072), will support one of the modules of the MEF.  
**Revision Highlights:** This is a collaborative effort with the Navy, with Navy lead and Air Force participation. The intent is to update the material with the newest technologies, current practices, and revised formulas, making the main body of the document multi-Service in nature with specific appendixes to address Service differences in capabilities and equipment.  
**Status:** The initial draft is out for staffing and comment. |
| FM 3-34.485        | Firefighting Operations            | Feb 99          | The purpose of FM 5-415 is to give a commander and members of firefighting teams direction on deploying and using engineer firefighting teams. Engineer firefighting teams provide fire prevention/protection, aircraft crash/rescue, natural cover, and hazardous material (HAZMAT) (incident) responses within a TO. Normally, there are not enough firefighting assets within the TO; therefore, commanders must prioritize assets and facilities that are mission-essential and deploy firefighting assets accordingly. The manual will support one of the modular units of the MEF. It will be renumbered as FM 3-34.485 during revision.  
**Revision Highlights:** This is a parallel effort with the revision of the firefighting Army regulation (AR) to bring both policy and doctrine current with required certifications, newest technologies, and current practices.  
**Status:** Initiating the program directive and developing the initial draft subsequent to the revision of the AR and the conduct of the convoy firefighting integrated capabilities development team (ICDT). |
# Engineer Doctrine Update

## U.S. Army Maneuver Support Center
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<td>FM 3-34.500 (FM 3-100.4)</td>
<td><strong>Environmental Considerations in Military Operations</strong></td>
<td>Jun 00</td>
<td>FM 3-100.4, <em>Environmental Considerations in Military Operations</em>, guides the Army and the Marine Corps in applying appropriate environmental protection procedures during all types of operations. It also provides basic techniques and procedures for units at the company, battalion, and brigade/regiment levels. This manual states the purposes of military environmental protection, a description of legal requirements, and a summary of current military programs. It also describes the growing strategic significance of environmental factors in the 21st century. As a unit procedures manual, it describes how to apply risk management methods to identify actions that may harm the environment and appropriate steps to prevent or mitigate damage. This manual is currently a dual-designated manual with the Marine Corps and is under revision by the Directorate of Environmental Integration. When this revision is complete, the manual will have an Army number of FM 3-34.500. <strong>Revision Highlights:</strong> The revision will contain information and lessons learned from current operations. It will continue to be a dual-designated manual with Marine Corps involvement. <strong>Status:</strong> Staffing for U.S. Army Engineer School Commandant and Marine Corps approval and posting to AKO.</td>
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NOTE: All current engineer publications can be accessed and downloaded in electronic format from the MSKN Engineer Doctrine website at [https://www.us.army.mil/suite/page/500629](https://www.us.army.mil/suite/page/500629) or the Reimer Digital Library at [http://www.adtdl.army.mil/](http://www.adtdl.army.mil/). The manuals discussed in this article are currently under development. Drafts may be obtained during the staffing process or by contacting the Engineer Doctrine Branch at [leon.mdottddengdoc@conus.army.mil](mailto:leon.mdottddengdoc@conus.army.mil). The development status of these manuals was current as of 1 February 2008.

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## Engineer Doctrine Contact Update

The Engineer Doctrine team would like to introduce to the Regiment its newest member, Mr. Jeff Beacham, who is taking over from Mr. Les Hell as the Engineer Senior Doctrine Analyst as Les moves up to assume the duties of the Deputy Doctrine Chief for the Maneuver Support Center (MANSCEM). Good luck and best wishes are extended to Les as he makes his transition to MANSCEM, and a warm welcome is extended to Jeff as he comes onboard. Jeff’s Army Knowledge Online (AKO) contact information is [jeffery.beacham@us.army.mil](mailto:jeffery.beacham@us.army.mil). If you haven’t already, you will soon begin to see the staffing of draft doctrine coming to you from Jeff.

A new Maneuver Support Knowledge Network (MSKN) website has been established for Engineer Doctrine. There you can download the current manuals in the Engineer Doctrinal Hierarchy, as well as drafts of the various manuals under revision, and can stay updated on the status of those revisions and view the final comment matrices on each draft.

The page may be reached through the MSKN homepage or via this link, which goes directly to the Engineer page vice the MSKN homepage after AKO login: [https://www.us.army.mil/suite/page/500629](https://www.us.army.mil/suite/page/500629).

The Engineer Doctrine element is the lead for the Regiment’s doctrine. The Engineer School’s Doctrine Division is consolidated at the MANSCEM level within the MANSCEM Directorate of Training (MDoT) Doctrine Division. The telephone numbers for Engineer Doctrine are—Doctrine Chief, (573) 563-8161; Senior Doctrine Analyst, (573) 563-0003 (DSN prefix, 676-).

The mailing address for written correspondence is: Commandant, United States Army Engineer School, ATTN: ATZT-TDD-E, 320 MANSCEM Loop, Suite 220, Fort Leonard Wood, Missouri 65473-8929.

For electronic correspondence, the generic NIPR e-mail address has changed to [leon.mdottddengdoc@conus.army.mil](mailto:leon.mdottddengdoc@conus.army.mil).
To view the most current manuals go to the MSKN Engineer Doctrine website at <https://www.us.army.mil/suite/page/5006297>. The manuals can also be viewed on the Reimer Digital Library at <http://www.train.army.mil>.

To find the RDL page go to the Training Homepage and click on the “LOGIN” button (upper right corner). Use your AKO login.

* Asterisk denotes manuals currently not in digital format in the Reimer Digital Library
Over the past five years, engineers operating the Table Rock Dam at Branson, Missouri, have seen an alarming amount of water from Table Rock Lake leaking through the face of the dam into an inspection gallery buried by nearly 180 feet of concrete. Because of this leak, an additional pump was installed to remove the water, which was rushing in at a rate of more than 400 gallons per minute. When the United States Army Corps of Engineers (USACE) Little Rock District decided it was time to do something about this leak before it got any worse, it enlisted the services of the United States Army Dive Company from Fort Eustis, Virginia.

Earlier this year, four members of the 86th Engineer Team (Dive), an individually deployable and self-sustainable detachment from the United States Army Dive Company, traveled to Branson with a remotely operated vehicle (ROV) to inspect the dam and locate the source of the leak. The ROV allowed the team to travel with minimal equipment and still safely inspect and survey the dam. The ROV is equipped with a camera that sends streaming video to the surface and is easily maneuverable in the water. After a successful reconnaissance, the team planned a full-scale repair operation for 16 to 22 September 2007.

On 16 September, the 86th linked up with the 50th Multirole Bridge
Company (MRBC) from Fort Leonard Wood, Missouri, which deployed to support the diving mission with a six-bay float bridge section to be used for a working and diving platform. With more than ten common bridge trucks (CBTs) and support vehicles in convoy, the 50th MRBC traveled more than 100 miles and deployed its bridge sections directly from the CBTs. The sections, which expanded as they hit the water, were promptly retrieved by one of the unit’s bridge erection boats and towed to be assembled with the other bridge sections. The entire operation took less than 90 minutes and resulted in a 25- by 120-foot floating platform that could easily support the weight of the divers’ equipment. The rapidly deployable float bridges are designed to support the weight of a 70-ton M1 Abrams main battle tank. The working space and maneuverability offered by the bridge sections were helpful to the mission.

The Soldiers of the 50th MRBC secured the floating platform to the side of the dam; the 86th divers set up their equipment and began repair operations on 17 September. After the ROV located a series of 2- to 6-inch holes in the face of the dam, divers went down more than 140 feet to repair them. Despite the relatively small size of the holes, the amount of suction they create at such depths calls for a great deal of respect and caution from the divers. Their hands, feet, or equipment could get stuck in the holes, slowing production or even causing serious injury or equipment malfunction.

The 86th divers worked continually for three days alongside the Soldiers of the 50th MRBC and the USACE engineers and operators to fix the dam. The divers used underwater hydraulic drilling equipment to install a 200-pound patch fabricated by USACE engineers, bolting it onto the face of the dam to cover the holes. The patch was equipped with fittings to pump in a two-part grout that would expand as it came into contact with the water and fill the voids in the concrete where the water was leaking through. After the diving evolutions were completed, dam operators reported that the flow of water into the inspection gallery of the dam had completely stopped.

The mission was a success that benefited all the parties involved. The mission was cost-efficient for USACE, and the Soldiers of the Army Dive Company and the 50th MRBC gained invaluable training experience. The Army Dive Company has an ongoing relationship with USACE districts across the country and has worked with the Little Rock District in the past. Dive missions such as the repairs performed on Table Rock Dam allow the company to execute real-world training stateside to prepare it for its wartime mission, while providing a professional service to USACE. The Army Dive Company continues to foster its relationship with USACE and looks forward to future training experiences with it.

First Lieutenant Destremps is a platoon leader with the 86th Engineer Team (Dive). Commissioned through the Army Reserve Officer Training Corps, he is a graduate of the Engineer Officer Basic Course and the Sapper Leader Course at Fort Leonard Wood, Missouri, and the Marine Engineer Dive Officer School at Panama City, Florida. He holds a bachelor’s in mechanical engineering from Villanova University.
From the Archives

The Engineer

By Sergeant First Class Samuel S. Ramseur, Jr.

I dig the holes and cut the grass
    I am an Engineer
I rake the leaves and set the chairs
    I am an Engineer
I survey the land and make the maps
    I am an Engineer
I make the roads and clear the track
    I am an Engineer
When you need emplacements, dams, and minefields, call me
    I am an Engineer
I lay the bridges that troops will cross
    I am an Engineer
I have endured through time and seasoned with age
    I am an Engineer
I have crossed the deep blue seas and reached into space
    I am an Engineer
In love and hate, in peace or war
    I am an Engineer
Male and female, private or general
    I am an Engineer
And when I’m dead, let it be said
    I AM AN ENGINEER

This poem by Sergeant First Class Ramseur was first published in the OCT-NOV-DEC 1977 issue of The Engineer (now known as Engineer, The Professional Bulletin of Army Engineers). Before retiring from the Army, his many assignments included Senior Equal Opportunity Advisor to the Commanding General, United States Army Engineer Center, Fort Belvoir, Virginia. He is now associated with Jones-Ramseur Management Resources and IMAGES Consortium, Alexandria, Virginia, as an Equal Employment Opportunity consultant.

Military Review

2008 Writing Competition

For the 2008 General William E. DePuy Special Topics Writing Competition, Military Review seeks original papers on “Actions Required to Attain Overall Objectives in the Aftermath of Combat Operations.” Submissions should be from 3,500 to 7,000 words and should be unclassified, carefully researched papers on any topic examining issues related to post-combat operations. Previously published papers, or papers pending consideration for publication elsewhere, are ineligible.

Winners, who will be announced in July 2008, will receive the following:

- 1st place: $1,000, featured publication in a future edition of Military Review, and a certificate.
- 2d place: $750, publication in Military Review, and a certificate.
- 3d place: $500, publication in Military Review, and a certificate.
- 4th place: $250, special consideration for publication in Military Review, and a certificate.

- Honorable mentions: $100, consideration for publication in Military Review, and a certificate.

Papers should be submitted with an enrollment form via e-mail, or in hard copy with a CD, not later than 2 June 2008. Send e-mail submissions to <milrevweb@conus.army.mil>. Mail hard copies with CDs to Military Review, 294 Grant Avenue, Fort Leavenworth, Kansas 66027-1254. For more details—to include a copy of the enrollment form, criteria for judging, and a list of potential topics—visit Military Review online at <http://usacac.army.mil/CAC/milreview/index.asp>.

For other information concerning the competition, contact the managing editor of Military Review at (913) 684-9330 or DSN 552-9330 or via e-mail at <leav-milrevweb@conus.army.mil>.

The environment in which the United States Army provides support to civil authorities during disaster response is very complex. The dynamic interaction of local and national politics, crisis management, and general disorder requires understanding and preparation in order to effectively deal with disaster response. The Great Deluge: Hurricane Katrina, New Orleans, and the Mississippi Gulf Coast by Douglas Brinkley of Tulane University is one of the first accounts of Hurricane Katrina and her aftermath and effectively captures the feel of a disaster response, while highlighting the friction points.

Brinkley provides a compelling account of the events of 27 August to 3 September 2005, during Hurricane Katrina. He has unique perspective (and perhaps motivation) as an eyewitness to Katrina. His writing style is slightly sarcastic, but also engaging. His work is meticulously researched from contemporary sources, weaving together vignettes from New Orleans citizens, government leaders, and news accounts into a compelling look at the U.S. military in action that manages to also offer provocative thoughts on how the military instrument of power can most effectively be used in the future.

Robert Kaplan is known for providing well-written commentary on events of the day. His unique travelogue writing style captures the reader, while serving as a vehicle for offering observations on larger issues. In Hog Pilots, Blue Water Grunts, he effectively uses this device to deliver a compelling look at the U.S. military in action that manages to also offer provocative thoughts on how the military instrument of power can most effectively be used in the future.

Kaplan’s premise is simple—in warfare of the future, the smaller the military footprint and the earlier the military is engaged, the more effective that military activity will be. He argues that low-profile engagements and use of proxies are the best use of the military instrument of power. This premise is the underpinning of every vignette he develops in this book. He examines the importance of personal relationships, understanding cultures, and decentralized initiative in the execution of policy decisions. He also does a commendable job of describing the unique culture of the military organizations he travelled with and observed.

Kaplan takes readers on a whirlwind journey across the globe, introducing them to life on Navy destroyers and submarines, Marine platoons, Army Special Forces detachments, Air Force flying wings, and Defense Attaché Offices. He offers a smattering of history and geography to complement vignettes regarding the people who put boots on the ground. He clearly has a deep affinity with the Noncommissioned Officer Corps of all the Services.

The only criticism I can muster is that Kaplan is too invested in so-called elite formations. The only conventional Army unit he visits is the 172d Stryker Brigade, and he clearly considers it something apart from the rest of the conventional Army because of its unique capabilities. A thread of disdain for the larger institutional military runs through his work. Perhaps Kaplan is influenced by his close affinity with the unique units he travelled with. His specific and implied criticisms of the conventional Army ring hollow. He doesn’t invest the time with conventional units and conventional headquarters that he does with the unique and elite.

I highly recommend Hog Pilots, Blue Water Grunts. Kaplan is an engaging storyteller, offers interesting perspectives on political and international events, and makes interesting arguments concerning the use of military power. His observations about the future of military operations are worthy of reflective thought.

Reviewed by Lieutenant Colonel Stephen V. Tennant, United States Army (Retired), Assistant Professor, Command and General Staff College, Fort Leavenworth, Kansas.
a gripping narrative. He takes a critical look at what happened in New Orleans and, to a lesser extent, the rest of the Gulf Coast and largely achieves his goal of writing a “…fast out of the gates history…” that enables “…holding city, state, and federal government officials responsible for their actions…”

He is unflinching in his description of events, dispensing both high praise and harsh criticism to key participants. He gives high marks to the United States Coast Guard, the Louisiana Department of Wildlife and Fisheries, the state of Texas, the city of Houston, and individual citizens too numerous to mention here. His harshest criticism is aimed at city officials and institutions in New Orleans, in particular Mayor Ray Nagin, Police Chief Eddie Compass, and the New Orleans Police Department. He is also very critical of Homeland Security Secretary Michael Chertoff, whom he says should be accountable for much of the slow start to the federal response and, in particular, the ineptitude of the Federal Emergency Management Agency.

Brinkley is strangely reticent in his criticism of Governor Kathleen Blanco, assigning responsibility to the city and the federal government that perhaps should accrue to the Blanco administration. He is also quite critical of President Bush, with some justification. At times, he goes too far; for example, stating (sourced from one opinion article, after the fact) that the slow federal response was due in part to partisan political considerations. With all the administration mismanagement and slow decision making available to critique, this vignette seems unnecessary and inflammatory.

The good and bad of the Department of Defense response are highlighted throughout Brinkley’s work. His major criticism of the military isn’t the response, but rather the perceived slow start and heavy-handedness in dealing with local officials. Brinkley harshly criticizes the United States Army Corps of Engineers (USACE) for the failure of the levee systems and the loss of buffering wetlands in Louisiana. In doing so, he doesn’t adequately address the involvement (or lack thereof) of the congress, state government, and local authorities. Even so, his criticisms are valid and should be studied and considered in order to provide more effective military disaster response in the future.

I highly recommend this book to all engineer officers. Support to civil authority, in particular disaster response, is a full-spectrum operation that the United States Army has executed many times. USACE and engineer troop units are typically deeply involved in disaster responses. Understanding the environment and reflecting on mistakes made in crisis is critical. This book offers a perspective that professionals should study and understand in order to be effective.

Reviewed by Lieutenant Colonel Stephen V. Tennant, United States Army (Retired), Assistant Professor, Command and General Staff College, Fort Leavenworth, Kansas.
Just 15 miles south of Ketchikan, Alaska, in a remote region of the Inside Passage, lies a pristine island rain forest known as Annette Island. It was founded by Anglican missionary William Duncan and 800 Tsimshian Indians in 1887, and in 1891, by Congressional Act, it became the Annette Island Reservation. In 1916, all waters and inlets within 3,000 feet of the island’s shoreline were included. Today, Annette Island and its surrounding islands comprise the only Indian reservation in Alaska. Metlakatla, with 1,800 residents, is the only inhabited village on the 136-square-mile island.

During World War II, a large airfield was built on the island as part of a defense network for the Canadian and American forces. After the war, the airfield became a United States Coast Guard search-and-rescue base, as well as a weather station for the United States Weather Bureau. For a brief period, the Federal Aviation Administration based personnel on-site. Until recently, it was the largest airfield in Alaska and continued to serve the area commercially until the 1970s. With the completion of the new Ketchikan Airport on Gravina Island, and the transfer of the Coast Guard Station to Sitka in 1977, Annette Field officially closed.

The Project

Operation Alaskan Road is the fulfillment of a 50-year-old promise made to the Metlakatla Indian Community after World War II—by the Alaska Road Commission and the United States Army Corps of Engineers—to build a road connecting their ocean side city to Alaska’s Inside Passage. This would allow year-round ferry service to Ketchikan, Alaska’s fourth largest city. The economy of Metlakatla is poor because of limited mobility to jobs and trade centers in Ketchikan, and the unemployment rate hovers near 80 percent.

Designated as an Innovative Readiness Training Program, Operation Alaskan Road was under the overall responsibility of the Alaskan Command, with the Missouri Army National Guard filling key leadership positions and providing engineering expertise. The road—14.3 miles of paved two-lane road with no more than a 7-degree grade in the roadbed—was a challenge seldom seen by military engineers. Clearing the dense vegetation (muskeg, which was sometimes 25 feet deep), blasting and moving 1.5 million cubic yards of rock, and an average annual rainfall of 13 feet challenged the military engineers’ expertise. Because of the

By Ms. Vicki D. Hall
inclement weather, work on the project was limited to spring through late summer, so the project took 10 years to complete—from 1998 to 2007.

In preparation for the 1998 arrival of construction forces, Navy Seabees constructed Base Camp Wy Wuh in 1997. The joint task force consisted of Army National Guard, Navy Reserve, United States Marine Corps, and United States Air Force units—mostly on rotational 2-week training cycles. In all, approximately 12,000 personnel, from all branches of the military Services and civilian agencies, contributed their expertise and labor to make the dream become reality.

Safety

While building the road was an extraordinary humanitarian mission, an equally impressive achievement is the safety record—**not one case of a lost limb or loss of life during the 10-year project**. An initial accident probability analysis performed by the United States Army Maneuver Support Center (MANSCEN) Safety Office, Fort Leonard Wood, Missouri, in 1999 identified that statistically, 17 fatalities could be expected over the programmed 10-year project. Commanders developed an aggressive risk analysis of the hazards, which included personnel inexperience, adverse weather conditions, water operations, blasting and quarrying, heavy equipment operation in mountainous terrain, clearing of vegetation, quantity and condition of equipment, and supplies.

Change became the norm: weather conditions changed by the hour, personnel availability fluctuated from day to day, and there were equipment shortages and a lack of supplies,

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The Metlakatla Indian community celebrates completion of the road.

This bridge was constructed to accommodate a scenic stream and waterfall from the mountains above.
all creating an ever-changing set of challenges. If there ever was a testing ground for the risk management process, Operation Alaskan Road was it. Risk assessments were prepared, revised, and reviewed continuously. Assessments were briefed to everyone, every day, and followed explicitly. Oversight took on a new definition as every member of the team monitored all operations; everyone was a safety officer. And it worked, but it did not come easily.

Challenges

Because Annette Island has no infrastructure outside of Metlakatla’s city limits, personnel, equipment, and supplies had to be brought to the island by barge or boat. There were many challenges.

By Sea. Equipment and personnel were transported by military watercraft several times every day. Global Positioning Systems (GPS) were installed to provide safer and more efficient travel routes. Prior to departure of any watercraft, “man overboard” drills were conducted and briefings were presented to ensure that all passengers knew exactly what to do in the event of an emergency. Water temperatures were extreme, and a passenger who fell overboard would quickly become incapacitated from the cold.

By Land. Access to the coastal project sites by land was a rugged, one-lane pioneer logging road cut into the steep mountainside during 1960s logging activities. Because of changes in elevation, rain quickly became sleet and snow midway through the 45- to 60-minute drive. During the first year of construction, vehicles frequently met nose to nose on treacherous mountain passes. To alleviate the difficulty this was creating, a two-way traffic pattern was implemented to keep everything flowing in only one direction at a time. Speed limits were established and strictly enforced. Radio communications were improved, and military police were assigned to provide better tracking and movement of equipment and personnel.

Equipment Maintenance and Fueling Operations. Hemlock Bay consisted of a K-span building that housed the maintenance facility, plus there was a motor pool facility and a fueling point. A vehicle junkyard was the most frequent source of spare parts, because shipment of new parts took precious time. The Marines, who operated the bulk fuel point, received fuel deliveries by barge. Fuel trucks then delivered fuel to equipment on the project sites and were in constant movement.

Medical. Annual rainfall in southeast Alaska averages 13 feet. Personnel were highly susceptible to what became commonly referred to as “the Ketchikan crud,” an affliction characterized by upper respiratory and/or gastrointestinal upset. Medical officers were added to the duration staff, substantially improving the degree of first-line medical treatment. Medics staffed ambulances at the job sites to provide emergency care for workers. The United States Coast Guard, located in Ketchikan, treated illnesses or injuries that were more serious. Chaplains were always on the job site, providing not only spiritual inspiration but also hot soup and hot chocolate, which dramatically improved worker morale in the cold and rain.

Utilities. All electricity had to be generated on-site. Base Camp Wy Wuh consisted of Southeast Asia (SEA) huts that housed administrative offices, barracks, warehouses, tool rooms, a post exchange/base exchange (PX/BX), a dining facility, showers and latrines, and laundry facilities. A water treatment plant was constructed to produce clean drinking water, and a wastewater treatment plant was constructed as well. Military technicians monitored all operations and equipment to ensure the health and safety of personnel at the base camp.
Wildlife Considerations

Eagles are abundant on the island, and strict protection of their habitat by the Fish, Game, and Wildlife Service ensures their continued survival. Military operations were conducted while carefully observing the habitat of indigenous animals, plants, and wildlife. If an eagle were nesting, operations would be suspended pending the hatching of the chicks.

Environmental Considerations

An agreement was made with the Metlakatla Indian Community that the island would be as environmentally unspoiled upon departure as it was when the project started. The fuel point and maintenance facilities were in continuous operation, providing fuel to equipment by day and receiving barge shipments of replacement fuel by night. Even in the hurried pace of repairing equipment, any products spilled were immediately remedied. All vehicles were equipped with spill kits to use if they encountered a spill. Rank did not matter when a spill was discovered; it was reported and taken care of by personnel in the area.

Project Success

All hardships aside, Operation Alaskan Road provided participants an experience that one may encounter only once in a lifetime. It’s not often you go to work surrounded by scenic mountain vistas, eagles in their natural habitat, clear blue lakes, and a serene beauty that can only be Alaska. The overwhelming safety record is a direct reflection on strong command oversight and individual commitment to success. The success of this project is absolute proof that risk management, when conducted properly, can produce dramatic, positive results.

On 6 August 2007, the road was turned over to the Metlakatla Indian Community in a lavish day-long celebration filled with native dancing, music, and cuisine. Military Service members were finally able to meet and visit with the people for whom the road was built. Until now, only a few staff members had been able to visit the village by boat. The Federal Highway Administration will complete the remaining paving, striping, guardrails, and road signage.

On 15 September 2007, the Missouri Army National Guard lowered its flag; the military mission was complete. Approximately 12,000 military Service members constructed a lifeline to the mainland for the people of the Metlakatla Indian Community. Training in a real-world setting provided the participants an opportunity to experience conditions impossible to replicate in a training facility.

But that’s not where this story ends; to all those who participated, there is a sense of being a part of something you can’t quite name: the inner pride of knowing all the hard work will significantly enhance the quality of life for a small group of Alaskan natives for generations to come. When asked what they would do with the road, the tribal elders replied, “We don’t know yet, but our children will!”

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Endnote

1 Muskeg, or peat bog, is like a soggy blanket that covers more than 10 percent of southeast Alaska. Consisting of dead plants in various stages of decomposition, it provides a home for a variety of plants that thrive in the wet, acid soil. In the summer, the flowers on many of them provide a carpet of soft color that contrasts with the muted greens and browns typical of muskeg. The soil conditions prevent large trees from growing, although stunted shore pine, cottonwood, some species of willow, and black spruce can be found. Stepping on muskeg is like stepping on a sponge, and the holes that form in it can be quite deep and dangerous. Construction in muskeg-laden areas sometimes requires removing the soil and filling the area with gravel. If the muskeg is not completely cleared to bedrock, then its high water content will cause buckling and distortion from winter freezing, much like permafrost.

Note: For more information on Joint Task Force Operation Alaskan Road, go to <http://www.elmendorf.af.mil/alcom/alaskanroad/index.asp>.
By Lieutenant Colonel Joseph D. Tyron

By now many senior engineer leaders have completed one or more tours in Afghanistan or Iraq and have been responsible for construction on one level or another. As many of us return for a second or third tour, we often go back to see the legacy we left. Some of us marvel at our work, while others think, “If I could do it over again, I would do it differently.” We are now at a point where we need to challenge the presumption that our standards for theater of operation construction have been correct. Does it make sense in the Central Command (CENTCOM) area of responsibility to build structures out of wood? This article will give some reasons why we have pursued this current course and why we should change our policy and perhaps our doctrine as they relate to the counterinsurgency fight. It also leads us down the road of how we need to train our junior leaders to be successful in fighting our current and most probable future conflicts.

Most engineers have been involved in troop construction in Afghanistan and Iraq and have seen a lot of problems with continued construction of wooden buildings in the harsh desert environments. The larger problem is that the temporary nature of these structures may send the wrong message to our coalition partners, as well as our enemies, about our commitment to win. One could argue that an American force that builds structures like Southwest Asia (SWA) huts is not committed to fight a long counterinsurgency or commit to a national support effort.

Beyond the question of appearances, there are many other valid reasons to build structures that endure. We should change our materials from wood to local materials for several reasons: availability, suitability, and transportation of materials; pest problems; fire protection issues; and protection from indirect fire. Using local materials solves many of these issues and also addresses questions of life-cycle costs, quality-of-life issues, transportation limitations, economic stimulus through procurement of materials and labor, and the issue of eventual transition of facilities to the host nation.

**History**

How did six months become the expeditionary standard for construction? Over the past 30 years, very few conflicts or operations have lasted less than six months. In Vietnam, most U.S. forces operated out of forward bases that were built to expeditionary standards but which always had logistics and support bases that were designed for 5- to 10-year operations. Even shorter conflicts such as Desert Shield and Desert Storm lasted longer than six months. As we continue operations into the seventh year in Afghanistan and the fifth year in Iraq, it is time to challenge these standards and build the structures we need for the wars we actually fight.

When I attended the Engineer Officer Basic Course in 1991, we were on the cusp of the revolution of automation at the tactical construction level. The traditional method used the Army Facilities Component System (AFCS) charts to plan and design. The charts, with ¾-size drawings of SWA huts and other standard structures, were used to determine
bill of materials requirements, additional tools required, haul assets, and projections for man-hours. Most of us were told that we would soon be migrating to the Theater Construction Management System (TCMS), which would automate the process with embedded computer-aided design and scalable and site-adaptable drawings. It was a great improvement over AFCS, but it was decided that our focus as engineers would be on breaching and mechanizing our force. I remember a senior engineer leader asking me, “Do you want to be a plumber or a killer?” That philosophy worked during Operation Desert Storm, but has not been effective during Operation Iraqi Freedom and Operation Enduring Freedom. I’m sure today’s senior Army leaders would prefer that engineers be as good at plumbing as they are at killing.

During the late 1980s and early 1990s, the time we should have devoted to construction was diverted to training on combined arms breaching and other tactics used at the National Training Center at Fort Irwin, California. Sadly, much of the construction program of instruction in our professional military education courses was deleted. A six-month facility lifespan for an expeditionary theater construction standard persisted even though we moved toward many missions that would have inherent reconstruction tasks.

The Roman Empire was one of the greatest of all times. There can be arguments about territorial gains, military conquests, and advancements in science, law, culture, and architecture, but few historians would dispute the idea that the Romans mastered all things in their sphere of influence. Of particular note was the Roman commitment to building throughout their empire. Nearly everywhere they went, they left lasting structures. One important idea from Roman military operations is relevant to the theater of operations construction standards today: the building of high-quality, long-lasting infrastructure in contested territories. Roman legions built great structures, roads, aqueducts, and permanent structures using locally available labor and materials. These structures contributed to the material welfare of the province or territory but also left a more lasting influence on the local culture’s architecture and social organization.

We are certainly not the Romans, but we can take a lesson from the legions on building structures to last. What does a six-month life-cycle structure say about America and our commitment to the region? Clearly, whether it is popular or not, nation stability operations and reconstruction operations are going to be in our doctrine in order to terminate wars in a way that actually achieves our political objectives and allows us to engage and support emerging allies.

As obvious and logical as the historical reference may be, we still primarily use wooden structures for coalition facilities in Afghanistan and Iraq. Let us look at the reasons of concern over this standard of construction.

- Wood is not a building material found in large quantities in Afghanistan, Iraq, or the Horn of Africa. It doesn’t hold up well in harsh, dry climates where intense heat and low humidity distort wood and cause quality problems.
- Central Asia and Iraq are arid regions and lack water resources and infrastructure. With that in mind, we need to take fire protection more seriously. Fires in wood

Soldiers from the 20th Engineer Brigade prepare to deliver wood throughout the battlefield to support engineering projects.
structures and tents can be devastating, and the danger doesn’t have to come from a careless Soldier; it can be poor electrical work or indirect fire.

- Termites are an unseen threat. On average, we will have termite problems within six to twelve months of building a wood structure in these regions.

- A large amount of costly lift assets is required to move lumber to the region. Our supply lines in Afghanistan and Iraq are long and vulnerable. Class IV supplies are difficult to transport, compete with other high-priority supplies, and put Soldiers’ lives at risk by increasing their exposure to dangers on the roads of Afghanistan and Iraq.

- Indirect fires continue to be a problem, and rocket and mortar attacks are an everyday event in both theaters.

Based on these concerns, most people can understand why our system should change, but to what standard and when? There is a time and place to use wood, but it is more cost-effective to go directly from tents to concrete and block buildings. It will be helpful to qualify a couple of inverse rules that apply in Afghanistan and Iraq. First, local labor is cheap and materials are expensive. Of course this seems obvious, but in the United States it is completely the opposite. Second, construction materials may not always be readily available and lead times are longer than in the United States or Europe. Seen through this lens, it will be easier to understand the logic of some of the following arguments.

In our current active theaters, the predominant local construction material is not wood but block and stone. Block and concrete construction is ideal for the environment in the Middle East and Central Asia. It is the predominant medium for most commercial construction. There are not many wood structures in Afghanistan and Iraq because wood has primarily been for support components and fuels in these countries. All dimension lumber has to be imported, but block is made nearly everywhere in the Middle East and Central Asia. Cement and rock products are in abundance all over the region, and there is an experience base in working with these products. Although their techniques make less efficient use of labor than our own, this is not a serious problem since labor is the least expensive component of the construction process and a coalition goal is to maximize local labor.

Aside from the obvious cost of building and rebuilding with wood, the issue of operations and maintenance rears its head. Every time a wood structure has to be rebuilt, there is a need to rewire and replumb. This raises the costs exponentially, and the problem is worse when we consider we are working on the third iteration of facility rebuilding or replacement in many locations. In some instances, Afghan and Iraqi soldiers have better facilities than American Service members.

Protecting wooden and light metal facilities from indirect fire is costly, but that problem could be solved by constructing buildings with block and concrete deck roofs. This would lower the risk of fire hazard and conserve fire protection assets while protecting our forces against mortar, rocket, and artillery fire. The problem of construction technique could be overcome with training and supervision to get a good quality product. It would also cut down on transportation costs, because block can be produced on-site and in the local economy. Instead of having to buy the most expensive imported building materials available in the overseas market, U.S. forces could buy inexpensive, locally-produced building materials right outside the gate. U.S. forces are constantly looking for programs to stimulate economic development in nation-building operations. Unfortunately, sweeping streets and cleaning canals does not do enough to stimulate an economy. If we employed more local nationals and taught them to build to Western standards, the benefits would be immense. In addition to improving war-ravaged countries, it could create a workforce that could move throughout the region and help contribute money to the economies of their home countries. This can be seen in the large numbers of third-country nationals working in Korea, Turkey, Indonesia, China, Saudi Arabia, and Egypt.

In a previous assignment with the United States Army Corps of Engineers (USACE) in Afghanistan, we built many of our projects for the Afghan National Army (ANA) with local materials such as stone and with cement block made on-site. The projects employed more than 5,000 Afghans across the country and gave the ANA lasting facilities.

The last and most important outcome of using local materials might be transition, because that is our ultimate goal in Afghanistan and Iraq. Our ticket out of these theaters of operation is a long-term security apparatus. Changing our theater-of-operation construction standards would provide a short-term sustainment facility for coalition forces and would represent capital in the eventual transition of U.S. forces. A sustainable city with electricity, water, and waste water management would be a much more attractive bargaining chip than a base of aging and dilapidated SWA huts.

The Way Ahead

What is the way ahead for military engineers? First, we need to review and revise construction standards in the CENTCOM Sand Book and the TCMS. Our standards need to be flexible enough to consider all factors. Cost, life cycle, transportation assets, fire protection, force protection, external commitment to our coalition partners, and host nation economic stimulus need to be addressed. Senior leaders should study current theater of operations construction standards in order to rectify the problems addressed in this article.

Second, we need to change our wartime construction paradigm. We should plan to go for the long term—3 to 5 years, including post-conflict operations and stabilization operations—and should adopt a two-prong construction strategy:

(Continued on page 57)
THE ENGINEER STAFF PENTATHLETE:

Staff Leadership and Dimensions for Success in a Transforming World

By Lieutenant Colonel Adam S. Roth

As I returned from the United States Army Engineer School’s Precommand Course, I reflected on the term that kept coming up during the course — pentathlete. (See editor’s note at end of article.) I remember the best-known of all modern pentathletes, General George Smith Patton, Jr.—who competed at the 1912 Summer Olympics in Stockholm, Sweden—but I tried to bring the term into a more contemporary setting.

At the time I attended the Precommand Course, I served as the Deputy G3 of the 412th Engineer Command (ENCOM), an Army Reserve unit headquartered in Vicksburg, Mississippi. The G3 section had the following sections (each headed by a lieutenant colonel, a major, or a senior civilian):

- Operations
- Training
- Mobilization and Readiness
- Force Management
- Emergency Operations Center
- Budget and Funds Management

In the past 24 months, the 412th experienced one of its most intense time periods—a veritable “perfect storm” of major operations, including the Army Reserve command and control (ARC2) transformation with an end state of three subordinate brigades, located in an area that spans the tip of Maine to the tip of Florida and all the way westward to the Mississippi River. The perfect storm also included engineer transformation to modularity, which transformed more than 80 percent of those subordinate units into separate “AA” entities as low as the company and detachment levels. The last “front” of the perfect storm was support to the War on Terrorism, in which the 412th ENCOM mobilized not only multiple rotations of staff to support the United States Army Corps of Engineers (USACE) Gulf Region Division, but it also included a major mobilization of a subordinate battalion that was fast-tracked through transformation while at the mobilization station.

Army Reserve Pentathlete Triad

I tried to take this environment, especially for an Army Reserve unit, and put it into the context of the pentathlete skills required to succeed. After great reflection, I realized that the Citizen-Soldiers in the Army Reserve are pentathletes in their own right (aside from the pentathlete skills required for success on an echelon-above which I will discuss later in the article). The vehicle I will use for visualizing the reserve pentathlete skills is a triangle with two added dimensions (a triad), which is shown in Figure 1.

Competencies

The triad represents balance in a pentathlete’s life. Everything we do in life has balance, even more so as a Citizen-Soldier. Through the Army Force Generation (ARFORGEN) Model, the Citizen-Soldier has the added responsibility to become a Citizen-Warrior and then a Warrior-Citizen through the mobilization and deployment process.

Army Reserve pentathletes must possess the following five competencies, and they also need to maintain them in balance:

![Figure 1. Army Reserve Pentathlete Triad](image-url)
- **Work.** Civilian employment responsibilities (enable us to maintain a standard of living).
- **Family.** Family responsibilities (why we are here).
- **Army Reserve.** Army Reserve responsibilities (why we serve).
- **Fitness** (using a healthy lifestyle to maintain our bodies). This is in itself a challenge because most civilian employers do not put “PT” on the work schedules.
- **Beliefs** (how we hold all of the other dimensions together). When speaking of beliefs, we are also talking our value system, and the Army Values are at the forefront. I am also speaking of the values inculcated in each pentathlete through a family support network. Lastly, our beliefs—be they spiritual, metaphysical, or otherwise—are a strong driving force in keeping the entire pentathlete triad in balance.

Using the basic pentathlete triad, I then thought of the basic competencies that successful staff officers and leaders I observed throughout my career required in order to be successful, and how those competencies were applied in the “perfect storm” environment at the 412th ENCOM. The majority of the G3 staff had deployed at least once, either prior to or during my tenure as the Deputy G3, creating a core of staff officers and noncommissioned officers who became a division G3 staff overnight, despite being manned at a level between a battalion or brigade S3 staff.

**Bosses**

Bosses were even more crucial in this analysis. Running concurrent operations on three separate continents, while also maintaining enduring (and growing) command and control missions, did not leave much room for intense supervision. The one key, more than any other, for the G3, as well as for the chiefs of subordinate sections, was the establishment of a right and left limit. The challenge in establishing that right and left limit, as done primarily in initial face-to-face counseling, is also ensuring that sometimes connectivity between sections within the G3, as well as between staff sections, may portend “going out of their lane.” The key point, especially for younger field grade officers on their first echelon-above-brigade staff assignment, is to know the difference between coordinating activities and directing activities. Explaining this difference is the key to managing expectations and will ensure success as the new staff officer embarks on the route of developing advocates and enabling connectivity.

**Engineer Staff Pentathletes**

Looking at the breadth of knowledge required for a staff officer on an echelon-above-brigade staff, especially in the G3, it was pretty easy to say that what we need are officers who have had company command, are Command and General Staff Officer Course/Intermediate-Level Education (CGSOC/ILE) Program graduates, and possess the very nebulous term “operators.” I have broken down the competencies (either brought to the table or developed during their tenure) that have been critical in their personal success, as well as the joint success of the G3 section as a whole (see Figure 2).

Breaking down the triad into individual parts, there are many facets to the success at the echelon-above-brigade staff level. Whereas each member of the staff may not have had all competencies fully matured, this model has served as a goal to strive for during the duration of assignment within the G3.

**Warfighting Skills**

Each team member was part of the 412th ENCOM, which serves as an operational command under the ARC2 construct. This meant that we were not a continental United States (CONUS)-based table of distribution and allowances (TDA) organization, but rather had responsibilities supporting major contingency operations in both the European Command (EUCOM) and Pacific Command (PACOM) areas of responsibility.

**Warfighting Mission.** A major segment of the 412th ENCOM mission was to support United States Forces Korea in the defense of the Korean peninsula. Members of the G3 staff routinely deployed to the Republic of Korea to support either of two exercises: Ulchi Focus Lens or Reception, Staging, Onward Movement & Integration (RSOI). This ensured that all team members initiated their fluency with the language of war at the operational level, not only from an engineer perspective but also on how the engineer is capable of setting conditions for success for operational logistics through assured mobility as well as operational protection.

**Development and Maintenance of Battle Rhythm.** The development and maintenance of a battle rhythm in itself formed the “heartbeat” of the ENCOM. Situational awareness and synchronizations of battle rhythms at higher levels, as well as subordinate units and internal to the command, were an ongoing process to ensure that the 1/3 - 2/3 rule was enforced and that there was a timely response to all coordinating agencies.
Troop to Task. Assisted by the ARFORGEN Model, understanding of unit capabilities in a modular world (clearance, vertical, horizontal, equipment support company, etc.) and then applying those capabilities along lines of time, as well as combat power, enabled greater battlefield visualization for the G3 as to how far the force can go without reinforcement.

Technical and Analytical Competence

This forms the basis of how engineers (irrespective of baccalaureate degree discipline) think, using logic, and are able to take the abstract, make it concrete, and turn it into reality.

Rise Over Run. Whereas the 412th is an ENCOM, it cannot always depend on a degreed engineer with a professional engineering license to develop a design directive in either a training or deployed environment. Engineer staff pentathletes have to be able to satisfy the requirement using available means (including Theater Construction Management System [TCMS] software and the Engineering Infrastructure and Intelligence Reachback Center [EI2RC] through USACE) to provide subordinate units the rough order of magnitude required from both a scope-of-work and a bill-of-materials perspective in order to accomplish what is basically required, rather than prescribe the exact 11 over 14 rise-over-run solution.

Force Structure. Engineer transformation to modularity became a major driving factor in all operations. Engineer staff pentathletes needed to not only understand the new structures and standard requirement codes (SRCs), but they also needed to understand the basis of activation, conversion, and inactivation, as well as how a new unit is manned, trained, equipped, stationed, and resourced. It is much more than just being able to read a modified table of organization and equipment (MTOE).

Doctrine Development. The 412th ENCOM, in conjunction with USACE and the Engineer School, has been collaborating on the revision of many doctrinal publications, to include the new FM 3-34, Engineer Operations. Engineer staff pentathletes should bring with them a breadth of experience that will not only affect the operations of today but also have the foresight to reflect on past experience to shape the battlespace of tomorrow.

Technology Savvy. Engineer staff pentathletes must be able to master the many complexities of the standard Army computer software suite (PowerPoint® Rangers included). But they also must be able to harness the technology in order to share vast amounts of information. They can do this by performing the role of “webmaster” for a knowledge center on Army Knowledge Online (AKO) or by developing a SharePoint® site that allows access to the Army Reserve network for many of the troop program unit members of the Army Reserve who do not have dedicated access. Engineer staff pentathletes should also know the basics of some of the teleconferencing suites available, to include the USACE TeleEngineering Tool Kit. To stay connected is to stay relevant.

Time and Resource Management

Much of what is performed at the ENCOM level is management of resources. Engineer staff pentathletes have to know the basics of managing those resources (as well as being able to ask for more, or worse, to say no).

Training Readiness Oversight. For engineer staff pentathletes to know, based on the ARFORGEN Model, what level of resourcing a particular unit receives is one part of the puzzle. At the major subordinate command (MACOM) level, ensuring that units have the basics of transportation, ammunition, lodging, and observer-controllers involves setting conditions for the management of those programs. Having an understanding of contracting, as well as dealing with commodity managers, helps ensure that these resources are forecasted and eventually executed.

Meetings. Having more and more constituencies to become involved with—in order to attain staff synchronization, meetings (including face-to-face, teleconferences, video teleconferences, and full-blown conferences)—became a way of life for the G3 section. Aside from the mandatory agenda and objectives that guided almost every engagement, the most important was a Monday morning meeting referred to as Festivus (as in Festivus for the Restivus). The purpose of this meeting was to provide a sounding board for development and refinement of commander’s guidance. The key to the event was that everyone had an input, and the absolute best development and mentoring came from those sessions and created a better product and process with buy-in from all.

Funds Management. Engineer staff pentathletes frequently become the program managers for major exercises or conferences. Therefore, all officers need to attain a basic level of financial management skills. Knowledge in the development of field budget estimates, unresourced requirements, and of course monitoring of funds execution became daily staples for the engineer staff pentathlete. Only later in the game were we able to rely on dedicated finance personnel to assist in these processes, thus already preparing those engineer staff pentathletes for the lean staff of the contingency operations (CONOPs) environment.

Competitive Sales and Interpersonal Skills

The single greatest task for any engineer staff pentathlete was the ability to sell oneself and one’s own ideas. As engineers, we become complacent in knowing that the answer is 11 over 14, as stated earlier. We lost the bubble on how to sell that though, especially to diverse groups that may not know (or appreciate) what rise over run is. Pentathletes found themselves engaging in intense networking at every opportunity, not only to be known but also to get on the radar screen of those who were decision makers. With this also came relationship management and knowing how well that
alliance would blossom. The most important part of “selling” we learned during this period was how to communicate to senior-level commanders, in terms of risk, if “A” did not happen, what would be the second- and third-order effects of that action.

Leadership and Work Ethic

The key element to staff synchronization was the leadership required to make it happen. It transcended “walking the walk” but also meant going outside of the G3 “lane” to understand the battle rhythms of other sections (and subordinate units) so as not to be too intrusive and break the golden 1/3 - 2/3 rule. Additionally, engineer staff pentathletes had to know the guidance, intent, and battle rhythm of the command group to ensure that subordinate execution met the commander’s expectations. Engineer staff pentathletes also needed to be able to provide counseling to other team members (in writing), reward those who excelled and, most importantly, look out for their development.

Summary

To be sure, this was the most rewarding assignment of my career—in a career that continues to amaze me that each new challenge tops the previous one. The complexities that we as engineers find ourselves in, either while deployed or preparing for the next deployment, require a great deal of depth, transcending original models of technical and tactical competence. The staff officer of today has to speak a great deal of depth, transcending original models of technical and tactical competence. The staff officer of today has to speak

Editior’s Note: Per the Chief of Staff of the Army, the term “pentathlete” and “multiskilled” are no longer the preferred way to describe the broad capabilities the Army needs. The preferred way to describe the type of leaders the Army needs is “leaders skilled in their core warfighting and leader competencies who also have a variety of broadening experiences.” However, this does not detract from the essence of Lieutenant Colonel Roth’s article, because he clearly articulates the need for engineers to be skilled in engineer competencies, while highlighting the importance of having a broad experience base.

(“Theater Construction, “ continued from page 53)

- Develop and use expeditionary construction standards in the beginning of an operation, including deployable base camp packages that are already available.

- Plan, develop, and build—in concert with the tactical situation—durable facilities that can be supported with limited assets. Don’t build temporary structures that become permanent.

We should modify the CENTCOM Sand Book standards and go to permanent construction sooner, when it is clear that the national commitment will be long-term. Experience demonstrates that this level of commitment is required to achieve war termination or accomplish political objectives.

Finally, we need to update our collective skill sets in our schools to include instruction on building in block and other concrete vertical products. Our technical prowess should meet our tactical prowess on the combined arms team. That means increasing the investment in our training base and working with the latest industry techniques to keep our personnel in step with the construction industry. This change needs to happen in all engineer advanced individual training and officer and noncommissioned officer education courses. Also, at the higher staff levels, we need to send junior officers to assignments with USACE, public works, and prime construction contractors so they can gather best practices and disseminate the knowledge to the Regiment. Some officers in the Engineer Regiment must become warranted contracting officers to give ourselves a self-help capability to advise maneuver commanders on contract expectations and to more aggressively pursue contracting actions. This seems like a tall order, but it is already happening in the combat zones of Afghanistan and Iraq in a variety of assignments. We simply need to document our combat successes and failures and go with what works.

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Contributors

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Training a unit can be difficult even in a peaceful stateside setting. As the governments of Afghanistan and Iraq are stood up, however, our Soldiers are being tasked to train foreign soldiers in war zones. This presents special problems that need ingenious solutions. Issues such as culture and language are quickly apparent and must be dealt with. Other issues, such as leadership and equipment shortages, are not so easily managed. To combat these problems in Afghanistan, the United States Army has been sending Army National Guard Soldiers to act as “embedded team trainers” (ETT) for the Afghan National Army (ANA). While these two-Soldier teams are primarily trainers, they also serve as advisors and liaisons for combat operations. These teams are supposed to be the link between coalition troops and the ANA, enabling the Afghans to take more responsibility for their own defense.

Issues

During the past year, two engineers from the Missouri Army National Guard (MOARNG) were engaged in training the engineers of the ANA’s 1st Brigade, 205th Corps. Located in the volatile southern region of Kandahar, the Afghan soldiers had been used as either infantry troops or laborers for coalition projects, despite their engineer training. The job of the MOARNG engineers was to reverse this trend.

Combat itself was the major training hindrance. The spring offensive of the Taliban began in March 2006. To counter this, coalition forces began their own series of offensives. The conventional wisdom was to put an “Afghan face” on the operations but, unfortunately, the Afghan infantry units were farmed out to United States Army Special Forces units. Therefore, the bulk of the offensive infantry missions fell to the ANA’s combat support soldiers—the headquarters, engineer, and artillery units. The official manpower and equipment of the ANA units would have made them well-suited to support both combat and construction operations. However, just as in any organization (much less a developing army like the ANA), the reality does not necessarily equate to the ideal on paper.

Leadership was another problem. Afghans still have a “warlord” mentality, which means that subordinate leaders were hesitant to do anything that the company commander did not expressly order. This and other issues affected the
leadership of the junior officers. Part of the complication was due to the Afghan culture. Another part was the fact that different segments of the ANA were taught according to different philosophies. The French were in charge of teaching the officers, while the British and Americans were responsible for training the enlisted soldiers. This caused a difference in approach to leadership within the ANA.

**Solutions**

The first major issue to solve was the misuse of the engineers. Engineers are unique in that they can have an impact on both combat and reconstruction efforts. The more the local leaders and villages could see their government working for the good of Afghanistan, the more local support there would be for the government. With the engineers leading reconstruction efforts, the government could be seen as a beneficial force rather than just another warlord. Unfortunately, the ANA and coalition leaders were focused on the kinetic effort and ignored the nonkinetic fight. Due to ongoing operations, the ETTs performed their ANA training while in a combat environment.

After four months of combat operations and with little or no training possible, word was received that the 1st Reconstruction Task Force (Australian) was asking for Afghan support in the province of Uruzgan. The ETTs pushed hard to deploy with the ANA soldiers for two major reasons. First, that would pull the engineers out of the reach of the local corps commander, who repeatedly committed them to infantry combat operations. Second, in exchange for supporting the reconstruction efforts, the Afghan engineers would receive training assistance and support from the Australians, which would establish a good symbiotic relationship.

The Australians put forth a training program and used their resources to teach the ANA soldiers skills such as carpentry and masonry, as well as selected combat skills. These skills were put to the test since the Afghans would go with the task force and assist in construction or help provide security. The results were so positive that remote village elders approached the ANA soldiers, promising security for coalition forces if the ANA would assist their villages. The International Security Assistance Force (ISAF) Southern Regional Command in Afghanistan cited the effort as a model of coalition and Afghan troops working together. A steady supply of positive reports for both the American and Afghan leadership maintained the mission and maintained distance from the Afghan command.

The first missions included security and checkpoints, as the two militaries learned each other’s strengths. As confidence in the ANA soldiers’ abilities grew, the missions branched out to minor carpentry tasks under Australian supervision. Eventually, the ANA soldiers were given missions under their own supervision as part of the reconstruction projects. At all times, the Australians kept the American advisors as part of the planning process, fostering a true coalition effort.

Partly due to the culture, partly due to their training, progress among the officer leadership abilities was limited. On the other hand, the noncommissioned officers (NCOs) developed quite well and earned the respect of their men by their actions and abilities. The follow-on American advisors were briefed and expected to focus on the officer training portion.

Because of the poor supply system, replacements for broken equipment were difficult to get through the ANA system. The Australians were excellent about helping out and
bought tools for the trainees. While using this “backdoor” technique, the ETTs continually pressed the ANA officers and NCOs to push paperwork through the Afghan system to expose where the problem lay.

**Results**

Overall, the solutions to the problems enabled successful training and missions. The year highlighted the ANA engineers’ construction—as well as combat—abilities and their success at reaching out to the local communities. The cooperation of the Reconstruction Task Force and the ANA was beneficial to both sides and showed the advantages of true partnership. More successes of this nature in both Iraq and Afghanistan will allow national forces in both places to take more control of their own defenses and require fewer rotations for American and coalition troops.

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I recently completed a deployment to Iraq as the Division G7 and the Division Engineer for the 25th Infantry Division, which served as the Multinational Division–North (MND–N) headquarters at Contingency Operating Base (COB) Speicher and covered an area equivalent to the size of Pennsylvania. The division converted to the modular structure and deployed after a mission rehearsal exercise and, during the tour, it commanded and controlled four to six modular brigade combat teams (BCTs). From my perspective, I think the modular engineer force structure is about right. I offer the following observations based on my 15 months in Iraq.

**Staff Organization**

The engineer expertise on the division staff in the modular structure resides in the two tactical command posts (TACs), the division operations center, and the Division Engineer cell. By the modified table of organization and equipment (MTOE), engineers support other sections within the headquarters and are not a staff section such as the G1 or G4. We did not operate this way. The Division Engineer section became the G7 Reconstruction, not the Information Operations (IO) section. The IO section was part of G3. The MTOE engineers assigned throughout the division headquarters worked within the G7. The exception was the engineer planner, who remained a member of the G5.

The G7 included the engineers, the traditional G9 section, and several civil affairs personnel. The figure on page 62 depicts the areas of G7 responsibility. The G7 section coordinated reconstruction efforts at the division level, as well as the traditional engineer and civil-military operations functions. Placing all of the engineer personnel within the G7 allowed the engineer section to battle-track, coordinate engineer support, provide resources to the BCTs, and execute nonstandard missions, as assigned. The G7 provided personnel to the division operations center and executed the traditional roles of maintaining situational awareness of the current fight, providing engineer input for the staff battle drills, and briefing the commander. The G7 also coordinated with the assigned engineer brigade headquarters and corps for additional engineer capability, as required for the mission or as requested by the BCTs.

Resourcing in Iraq is requirements-based. Many of the resources required by engineers were construction materials, particularly barriers. These were justified through the Division Acquisition Review Board (DARB) or the Joint Acquisition Review Board (JARB), depending on the monetary thresholds. The engineers provide input for the division-level approval, or process the requests going to corps for their action. In addition to the material requests, an engineer reviewed all construction requests and conducted a work classification to ensure compliance with statutory construction limits. Within Iraq, the Logistics Civil Augmentation Program (LOGCAP) is a source of base camp support. As part of our division-level review process, the Division Engineer validates all LOGCAP requests over $100,000.

The G7 in MND–N was responsible for oil and electrical infrastructure. This nonstandard mission entailed tracking the progress of improving crude oil exports, distribution of the refined product, and production and distribution of electricity. The MND–N area included one of the largest refineries and power plants in Iraq, as well as the Kirkuk oil fields. The G7 staff section provided our general officers and higher headquarters with accurate and timely oil and power information. This information assisted leaders at all levels in their engagements with Iraqi officials, resulting in improved production, security, and reliability over the course of our deployment.

The G7 also supervised the Commander’s Emergency Response Program (CERP), another nonstandard mission. This involved tracking all BCT projects, facilitating the approval of projects over $100,000, funding all projects in conjunction with the G8 CERP manager, and maintaining the Iraq Reconstruction Management System (IRMS) database. This was no small task, because the division executed more than 3,000 projects in one fiscal year. Civil affairs personnel augmented the engineers in order to accomplish these nonstandard missions.

The Division Engineer section accomplished all of these tasks, because all the engineer personnel on the division staff worked for the Division Engineer in G7. If personnel work according to their MTOE assignments, the engineer contribution to the division commander and staff is limited to battle tracking and coordination for engineer support. The consolidation of engineer personnel enabled the sourcing and execution of the nonstandard task.
Multiple vs. Consolidated Command Posts

The modular MTOE for the division does provide adequate engineer staffing, but the organization supports three separate command posts, which are critical for a mobile fight. In Iraq, we did not need the capability to conduct mobile operations, so we formed one staff from the three command posts and formed new cells as required by the mission in Iraq. Over the course of 15 months, two cells did form that operated separately from the division headquarters. Although referred to as TACs, these cells supported leader engagements rather than coordination of tactical operations. Additionally, the division formed the Iraqi Security Force (ISF) cell, the improvised explosive device (IED) defeat cell, the Project Coordination Center (executed CERP), and the reconciliation cell. With the consolidation of all engineer personnel in one staff section, we supported all of these cells with appropriate coordination, as well as controlling the Project Coordination Center. The G3 controlled the other cells.

Manning

My assessment is that the MTOE for personnel provides adequate expertise and leadership to execute engineer planning, integration, and support at the division and brigade levels. Discussions are already underway to modify the organization at division and BCT levels. Unfortunately, none of the BCTs nor the division staff was manned according to their MTOEs. Non-career course graduates often filled the captain positions and career course graduate captains filled the major positions. Only one Stryker BCT had the required major, one of one. Engineer officers were in great demand as liaison officers (LNOs) and military transition team (MiTT) members and for fulfilling branch qualifications in branch-immaterial positions (brigade special troops battalion [BSTB] or special troops battalion [STB] executive officer [XO]/operations officer [S3]). The same situation occurred with captains, although not to the extent of the majors. Many of the problems we experienced with communication and coordination would be alleviated by having more senior personnel on the staff. It is critical that the brigade and division staff positions are filled at the appropriate grade, not just with an engineer. I recommend consolidation of the division engineer personnel into one section, the G7, but retain the current MTOE authorizations. At the BCT level, I am hesitant to suggest a different force structure for the officers, but I would add a construction-type noncommissioned officer (NCO).

Battalion Headquarters in a BCT

Most engineer and maneuver commands commented on how they needed more engineers and how they missed having the attached engineer battalion in the BCT. With a properly manned brigade staff, the engineer battalion headquarters is not required to support the modular BCT. An engineer battalion headquarters is appropriate because engineer elements assigned to the BCT increase based on the assigned mission set. What is not required for the one or two organic engineer companies is an engineer headquarters element. A BSTB headquarters provides the required command and control. The knowledge and experience of an engineer battalion commander within a BCT is invaluable and is a tremendous advantage. But that capability is not worth the detachment or company that comes with the commander. A better solution is to place a high-quality, potential battalion commander on the BCT staff as one of the assigned majors. At BCT level, there are either one or two engineer majors, depending on whether it is a Stryker, infantry, or heavy BCT. I suggest providing two engineer majors on the MTOE, regardless of the type of BCT.

Engineer Capability in a BCT

Another common complaint with the new modular structure is the lack of engineer capability. In Iraq, I believe our problems are not a result of modularity.
Engineers are in high demand in counterinsurgency operations. Because a BCT requires additional engineers to support missions, the BCT must wait, share, or simply do without the requested engineer capability. Providing additional organic capability to the BCT is not a viable solution. We must remain flexible and agile to match the engineer capability to the BCT requirements at the correct time. As BCT missions require additional forces, the BCT receives engineer forces with the appropriate command or control relationship. The only capability I would suggest is additional horizontal capability within the engineer company.

Engineer Brigade Headquarters

The one required force structure change is the engineer brigade headquarters at division level, and there are many ways to provide this command and control headquarters. I suggest an arrangement similar to that of the sustainment brigades. Each division has a habitual relationship with an engineer brigade. The current four engineer brigades on active duty are not enough. Every division in Iraq, except the surge infantry division, has had at least one engineer brigade or group assigned to it to support operations. That fact should validate the requirement. Similar to the sustainment brigades, these engineer brigades do not require organic units. The division’s mission dictates the allocation of additional engineers. With the already lean organic engineer capability of the BCT, divisions will require additional engineer units for nearly every assigned mission. These modular brigades accept the additional engineer capability required to support operations. The modular engineer brigade is not integral to the division headquarters and will remain able to command and control engineer operations across the division area of operation. Typically, divisional engineer brigades provided their assigned engineer battalions to the BCTs and usually requested engineer groups as additional engineer battalions supported the division. Previously, we had an engineer command and control headquarters at division level, but we requested one more headquarters. What we really need is more company- and battalion-level capability; one engineer brigade headquarters per division is adequate.

Summary

I believe the modular concept and capability within the division and BCT is about right if properly manned. It is critical to have 100 percent manning on division and BCT staffs with the appropriate grade personnel. At division level, consolidate the engineers by MTOE into one section, nominally the G7. Provide some additional horizontal capability within the organic BCT engineer company. I would not attempt to provide the organic engineer battalion headquarters to a BCT. I would increase the number of engineer brigades in the structure to match the number of divisions and would continue with efforts to increase the engineer force structure. My experience in Iraq reinforces that we do not have enough engineers in the force structure; Engineer Soldiers deploying every other year deserve the additional force structure. The modular construct is valid and does not require major reworking or debate within the Regiment. We should first focus on bringing back engineer capability at the company and battalion levels.

Colonel Eckstein is the Chief of Staff, 25th Infantry Division, Schofield Barracks, Hawaii. He recently served in Iraq as part of Operation Iraqi Freedom. Previous assignments include Division Engineer and G7 for the 25th Infantry Division; Commander, 84th Engineer Battalion; and S3, 36th Engineer Group. He is a registered professional engineer in Virginia and Florida and holds a master’s in civil engineering from the University of Washington.
On 15 August 1946, the 697th Petroleum Distribution Company was reactivated and the unit then bounced around the Philippine-Ryukyus Command in the western Pacific until 26 May 1949, when it was again deactivated. No records of its activities for that time have been found.

During the Korean War, the 83d, 388th, and 700th Engineer Pipeline Companies lent their efforts to the fight. Their assignments were familiar—to build and maintain pipelines, tank farms, and distribution facilities.

On 15 November 1954, the 697th again was stood up, designated the 697th Engineer Company (Pipeline), assigned to the 5th Army, and stationed at Fort Leonard Wood, Missouri, where it spent about three years. On 14 February 1957, it moved to Fort Polk, Louisiana, where it participated in Operation Sledgehammer from 24 April to 24 May 1957. That exercise was probably the most important assignment United States Army pipeline companies had during the 1950s and early 1960s. Attached to the 1st Armored Division, the 697th again met the challenge of delivering fuel to combat forces in the field, but this time with a new system for pipeline fuel delivery. The fast deployment of pipeline, quick fuel storage devices, and concealment were emphasized. This would be the most important operation involving the 697th until the unit deployed to Thailand in 1965. The 697th received a meritorious unit commendation for its efforts during Operation Sledgehammer.

With the new system, the pipeline was no longer a rigid steel pipe but a flexible hose similar to a fire hose. Hundreds of feet of hose were folded up tightly in large crates and loaded onto a truck. In a deployment process called “flaking,” the loose end of the hose was fastened temporarily to the ground so when the truck pulled away, the hose rapidly unwound from the crate. When one crate of hose was strung out, a coupling crew connected the end to the hose in the next full crate and the truck would drive off again, dispensing the hose out the back as it went. The hose was meant as a temporary pipeline to deliver fuel to the front lines more quickly than, but just as dependably as, the steel pipelines. When not in use, the hose could be repacked and moved to another location. Terrain was easier to navigate with the new system. At streams, the hose was simply strung along the sides of a bridge. Sometimes a log set across the stream was enough to support the hose. In open territory, the hose was laid along the road grade.

The accompanying pump stations, tank farms and manifolds, and fuel-dispensing racks were also much simpler with this system. The pump stations along the line used marine-style engines and pumps, which were smaller and simpler to operate but spaced closer together. The flexible hose was laid out and hooked up to one side of the pump. The next section of line was hooked up to the other side of the pump, and then the truck would drive away, flaking as fast as practicable.

The tank farms were a series of 10,000-gallon blister bags that lay flat on the ground when empty but inflated when filled with liquids. The blister bags shortened the time needed to install a storage unit. First, the ground was leveled and all sharp objects removed, usually by men with rakes. Then the blister bags were pulled from their crates and laid out flat on the ground and connected to the manifold, which controlled the flow of fluids to and from the blister bags.

The system using inflatable blister bags was developed in the 1950s and was still in use during the 2003 invasion of Iraq.
The dispensing racks were simplified also. During Operation Sledgehammer, the 697th completed a filling station for tanker trucks, which in turn was used to fill canisters at points set up along the line. Vehicle fill points could also be set up there, or at any other point, by tapping into the pipeline. Since the 697th was working with the 1st Armored Division, a tank refueling station was also constructed. Another segment of the operation involved building a tank farm with a 10,000-barrel steel storage tank and two smaller tanks, including the conventional pump station and manifolds. Three other tank farms using blister bags and flexible pipeline were also built. To add to this mix, it was decided to try camouflaging the different systems and the company vehicles and men.

This system was also deployed for the current war in Iraq. It was critical that the main pipeline be built into Iraq as quickly as possible, so a flexible hose was used to deliver fuel to a tank farm a few miles from the main line. Although this system was more labor intensive and was unable to deliver the same volume of fuel as a regular coupled pipeline, it kept the tank farm adequately supplied until a regular coupled pipeline could be installed.

After the mid-1950s, there were only three pipeline companies in the Regular Army:

- The 697th Engineer Company (Pipeline) was based at Fort Leonard Wood from December 1954 to February 1957; Fort Polk from February 1957 to April 1959; Fort Hood, Texas, from April 1959 to January 1962; and Fort Wolters, Texas, from January 1962 until it deployed to Thailand in July 1965. It was deactivated in Thailand in August 1969.

- The 515th Engineer Company (Pipeline) was at Fort Belvoir, Virginia, before being attached to the 5th Engineer Battalion at Fort Leonard Wood. It went on to participate in the first Gulf War and then became a Missouri National Guard pipeline unit until it was deactivated in 1995. It has recently been reactivated but as an engineer construction company.

- The 543d Engineer Company (Pipeline) was stationed in France and was deactivated there in 1970.

Since the early 1990s, the Regular Army has not had a pipeline company.

The 515th developed a reputation for its ability to complete projects in an exemplary manner while at Fort Leonard Wood. The 543d operated, maintained, and oversaw petroleum distribution in five distribution districts in France and parts of Germany. The 697th worked in a “behind the lines” environment in Thailand for four years during the Vietnam War and completed innumerable projects on both company- and platoon-level missions in Thailand, Vietnam, and Korea. This part of the article will again focus on the 697th.

During the 1950s and 1960s, career pipeline noncommissioned officers (NCOs) rotated among the three companies and soon became a “pipeline family.” This made for...
a close-knit operation and support system. According to the career NCOs, true pipeline Soldiers need to have served in all three companies. The Soldiers were so close that officers were considered of no consequence unless they were affiliated with pipeline engineering in some form. The first assignment for the 697th Engineer Company (Pipeline) when it arrived in Thailand in 1965 was to build a base camp for itself and the 9th Logistics Command, which was head of all engineering activities in Thailand. The base camp, built at the outskirts of the inland city of Korat, was named Camp USARTHAI—short for “United States Army Thailand.” To the chagrin of most of the men there, later camps were given more impressive names, such as Camp Lightning or Camp Essayons.

The first task for the 697th was to build shelters (known as hooches) for Camp USARTHAI and other camps being set up at the time. The 2d Platoon was sent to the Sattihip Cantonment Area to build storage tanks and ship-unloading facilities at the new deepwater port there. The company also evaluated the roads leading to the major camps and air bases in the area and found that they were in dire need of improvement. For the first few months in 1965, the 697th built bases, scouted roads, constructed a helicopter pad and then turned it into a tennis and basketball court, and completed other small construction jobs. In the spring of 1966, the engineers were called on to start a major project: build six 10,000-barrel storage tanks at the Royal Thai Air Force Base (Camp Friendship) at Korat.

It was a job for the entire company and the first of a series of assignments to challenge the company’s mettle. The tank farm was already large by the usual standards, but the air base was expanding rapidly to keep pace with the war in Vietnam. The 561st Engineer Battalion cleared the jungle and set the level grade. Concrete was used for the tank foundations and as one foundation was set and ready, another was being built. The tanks were put up one after another as the foundations were finished. As many as three tanks were in various stages of construction at one time. In three months, despite technical problems with the materials, the tanks were completed and water-tested on schedule.

Building the six tanks was the last company-sized project the 697th performed until July 1969, when all the platoons came together at the Sattihip Cantonment Area to work on a new installation—Camp Samae San. The platoons completed many widely scattered projects; the main assignments included the following:

- In mid-1966, 2d Platoon went to Vietnam to build a 52.6-mile pipeline from Anke to Quin Yon.
- In October 1966, 1st and 3d Platoons built a tank farm at the Royal Thai Air Force Base at Nakon Phanom, Thailand.
- In January 1967, 2d Platoon returned from Vietnam and many of its men rotated home, to be replaced with new personnel. Along with 1st Platoon, they built the most elaborate movie theater in Thailand. Although a 697th electrician pointed out a wiring problem during construction, no action was taken. The theater almost burned down the same night it was dedicated.
- In March 1967, 1st Platoon returned from Nakon Phanom and joined 2d Platoon at Camp USARTHAI to build the movie theater. Road construction and repair to the adjoining air base were also on the hot list. Remaining at the Nakon Phanom Royal Thai Air Force Base, 3d Platoon performed an impressive list of tasks, including construction of three 10,000-barrel storage tanks at the farm, two 10,000-barrel storage tanks at the water purification plant, a pump station at the reservoir, and several miles of 8-inch pipeline to the base water purification plant to the south, a 4-inch water pipeline to
the tank farm from the water plant, and the start of the tank farm manifold system.

In September 1967, the platoons changed places and 2d Platoon went to Nakon Phanom Royal Thai Air Force Base to build two more 10,000-barrel fuel storage tanks in the tank farm and complete the tank farm manifold. Meanwhile, 3d Platoon went back to Camp USARTHAI for much-needed equipment repair and to continue area construction projects, and 1st Platoon convoyed to the Sattihip Cantonment Area to build two 10,000-barrel storage tanks for the water system and begin installing water lines to the new camp. This was the start of a two-year project building Camp Samae San, which ended up with the entire company present and working on it in July 1969.

For the four years that the 697th was in Thailand, the motor pool personnel had worked hard under less-than-perfect conditions. The mechanics did an outstanding job of supporting the line platoons, and never was there a breakdown or need for emergency road service on any of the company’s vehicles.

In March 1968, the 697th was alerted that it would be assigned to a project in Korea. All the company’s experienced Soldiers with more than 90 days to rotation were put into 3d Platoon to bring it up to full strength, except for a small contingent of experienced Soldiers left behind in 1st Platoon. This platoon would be based in Camp USARTHAI to perform tank farm maintenance throughout Thailand for the following year.

After losing most of its experienced Soldiers to 3d Platoon, 2d Platoon was sent to the Sattihip Cantonment Area in March 1968 to install more water lines.

Building the Sattihip Cantonment Area was probably the 697th’s largest and most time-consuming project. Delta Company, 538th Engineer Battalion, arrived at the site in May 1967 and built hooches and a water pipeline from nearby Utapoe Air Base. The 697th sent 1st Platoon there in September 1967 to build two 10,000-barrel storage tanks for the water system. The tanks were high on the side of a very large hill and would supply adequate pressure to the camp below, acting as a water tower. For two years the 697th worked, often in deplorable conditions, to complete the camp water and sewer systems.

While 2d and 3d Platoons worked at Camp Samae San, 1st Platoon had been doing repair work at the major air base tank farms and petroleum, oil, and lubrication (POL) facilities around Thailand for almost a year. From February to July 1969, 1st Platoon sealed and tested four 10,000-barrel tanks and refurbished the manifold system in the tank farm at Udorn Royal Thai Air Force Base. The platoon installed 1,200 feet of welded steel pipe and another 2,500 feet of coupled pipe. For their hard work and ability to do the job without shutting down the base tank farm, the platoon was awarded a unit commendation by United States Air Force officials, who do not lightly give out awards to Army units. At the end of this assignment, 1st Platoon also went to the Sattihip Cantonment Area.

In August 1969, the 697th Engineer Company (Pipeline) was deactivated. The following quote is from an e-mail by Captain Joe Wagda, the last company commander:

*By the way, at the time, we were told that the 697th was the first unit in the Vietnam theater to be deactivated, so we were to be the model for other units that followed. It was amazing to go through the deactivation process while concurrently working our projects right until the deactivation date when we transferred responsibilities over to the 538th. Quite a performance!*

Quite a performance indeed!

But this is not the end of the pipeline story. The wars in Iraq and Afghanistan marked another time and another need for fuel to be delivered to the front lines. Some of the needs of World War II are the same in the new conflicts. The Abrams M1 tank is considered to be one of the world’s best, but it guzzles fuel. According to an article in the July-September 2003 issue of *Engineer*, “The pipeline was essential, as one of the Combined Forces Land Component Command’s prestart

![At crossing sites, the pipeline is buried deep enough that the weight of passing vehicles won’t affect it.](image)
conditions for the war with Iraq was the completion of the [inland petroleum distribution system] to Breach Point West on the Kuwait-Iraq border.¹ Fuel delivery was now seen as a prerequisite rather than a secondary consideration of war. What was learned in previous wars was now applied once again. Long expansions of the pipeline, the location of pump stations, staggered workloads, and the relocation of the pipeline unit’s headquarters at intervals along the route were still the same. Packaging, advances in delivering materials, and the use of skid loaders and other labor-saving machines increased productivity tremendously.

The most important mechanical improvements in the pipeline system were the use of aluminum to make the pipeline tubes lighter and easier to handle and the redesign of the Victaulic coupler. The coupler is now hinged and pressed over the pipe tube with a special tool and then “pinned” into place rather than bolted. This improvement saves time during both installation and repair.

The use of several companies to construct and test the lines was incorporated to a higher degree than before. Regular combat engineer companies built the pipeline while Reserve pipeline companies did the follow-up line testing, repair, and pump station construction. Several hundred miles of pipeline were constructed and delivered enormous amounts of fuel to frontline vehicles. The 62d Engineer Battalion (Combat)(Heavy), 226th Engineer Company (Combat)(Heavy), and the 808th Engineer Company (Pipeline) (a United States Army Reserve unit) helped complete this project. Before the Abrams M1 tanks even rolled, the pipeline was planned, laid out, and operating right up to the border of Iraq. This may very well be the face of pipeline construction in the future, with Active Army engineer units doing the bulk of the work and specialized Army Reserve and National Guard pipeline units lending their expertise where needed.

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.

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 available for sale by the Government Printing Office. As such, it is readily accessible to non-government 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 3 1/2-inch disk or CD in Microsoft Word, along with a double-spaced copy of the manuscript, to: Managing Editor, Engineer Professional Bulletin, 464 MANSCE, 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.

The Army has established a Capability Integration Team (CIT) to specifically assist active and reserve deploying units with improvised explosive device defeat (IEDD) training and materiel capabilities integration. The CIT was established as a result of gaps identified in the Army IEDD training strategy published in March 2007. The CIT serves all units as a point of contact for IEDD questions and issues. In June 2007, the Army Assistant Chief of Staff, Operations and Plans, approved and funded six CIT locations: Fort Lewis, Washington; Fort Bliss, Texas; Fort Hood, Texas; Camp Shelby, Mississippi; Fort Bragg, North Carolina; and Fort Leonard Wood, Missouri. Teams at each location are capable of traveling to other nearby Army unit locations or other Service bases to assist units with their IEDD requirements. Priorities of work are driven by the Army Force Generation (ARFORGEN) process and the deployment and training priorities established by the U.S. Central Command and the U.S. Army Forces Command. For further information regarding the CIT, contact <leon.edid@conus.army.mil>.

By Mr. John Moore

The U.S. Army Training and Doctrine Command Improvised Explosive Device Defeat (IEDD) Integrated Capabilities Development Team (ICDT) has established an IEDD training website as a result of an initiative contained in the Fiscal Year 2007 IEDD Training Strategy. The site was established in close coordination with personnel responsible for operating the Center for Army Lessons Learned, the Battle Command Knowledge System, and the U.S. Joint Forces Command Knowledge and Information Fusion Exchange (KnIFE) sites. The IEDD training website encompasses the self-development, operational, and institutional training domains. Additionally, it provides training support products to remote locations to assist individuals with their current jobs and prepare them for future assignments with increased responsibility. The site further serves as a portal for access to other Army IEDD training resources that have been developed by various Army proponents. The uniform resource locator (URL) for the IEDD training website is <https://www.us.army.mil/suite/page/477426>. An Army Knowledge Online (AKO) account is required to access the site.

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