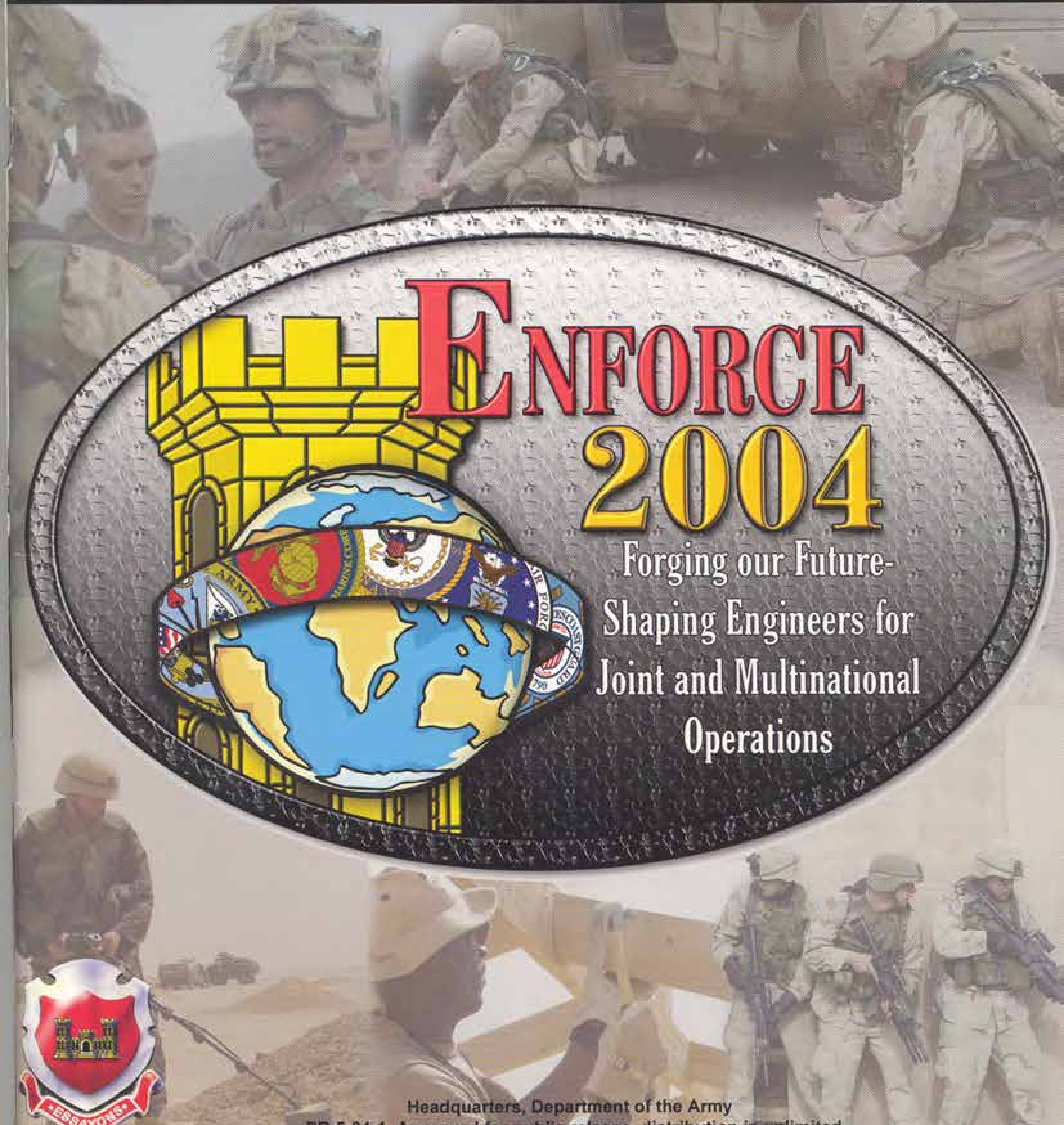
ENGINEER

The Professional Bulletin of Army Engineers

January-March 2004



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PB 5-04-1 Approved for public release, distribution is unlimited.

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Engineer (ISSN 0046-1989) is prepared quarterly by the U.S. Army Maneuver Support Center, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929. Periodicals postage is paid at Fort Leonard Wood, Missouri, and additional mailing offices.

POSTMASTER: Send address changes to U.S. Army Maneuver Support Center, ATTN: ATZT-DT-DS-B *(Engineer)*, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929.

CORRESPONDENCE, letters to the editor, manuscripts, photographs, official unit requests to receive copies, and unit address changes should be sent to *Engineer* at the preceding address. Telephone: (573) 563-4104, DSN 676-4104. *Engineer's* e-mail address is *<pbd@wood.army.mil>*. Our Internet home page is located at *<http://www.wood.army.mil/engrmag/emag_hp.htm>*.

OFFICIAL DISTRIBUTION is targeted to all engineer and engineer-related units.

PERSONAL SUBSCRIPTIONS are available for $19.00 per year by contacting the Superintendent of Documents, P.O. Box 371954, Pittsburgh, Pennsylvania 15250-7954. Address changes for personal subscriptions should also be sent to the Superintendent of Documents.

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January-March 2004 | Headquarters, Department of the Army | Volume 34 PB 5-04-1

Front Cover:
ENFORCE 2004 *Forging Our Future - Shaping Engineers for Joint and Multinational Operations.* Logo by the Visual Information Center at Fort Leonard Wood, Missouri.

Back Cover:
Images of U.S. Army engineers in Operation Enduring Freedom and other missions.

FEATURES

DEPARTMENTS

Clear The Way

By Major General R.L. Van Antwerp
Commandant, U.S. Army Engineer School

Forging our Future - Shaping Engineers for Joint and Multinational Operations is not simply the theme for ENFORCE 2004 (26-30 April), it reflects the current operational environment and state of our Regimental transformation. In the last two years, we have gone from preparing for transformation to transforming. One of the featured articles in this issue of the bulletin, "The Future Engineer Force," outlines how we are shaping the Regiment at this moment—forging our future to meet the challenges of today and tomorrow. This transformation must be a rapid but purposeful change. As engineers, we provide a unique set of core competencies that critically enable the combatant commander and the joint team with the mobility required to provide a position of advantage at the tactical through strategic levels. We'll retain the best of our current capabilities and attributes and develop others that will increase relevance and readiness in joint and multinational coalitions. To continue to provide this support in the future, we will reexamine and challenge our most fundamental institutional assumptions, paradigms, and procedures.

In this issue, we have published our thought process to stimulate a "no-holds-barred" discussion here at ENFORCE—between leaders at all levels—and obtain feedback so we can make adjustments where necessary. I encourage those of you who cannot attend in person to send us your comments.

The first installment of the transformation framework is currently occurring in the 3d Infantry Division and the 101st Airborne Division. In accordance with the Chief of Staff of the Army's guidance, these two divisions are being reorganized into more modular, deployable, lethal, integrated, and joint interoperable units. The first installment of the Engineer Model clearly depicts a joint and expeditionary flavor and defines what engineers must bring to the fight and how. It is the starting point for partnering on organizational solutions, equipment, doctrine, standards, and training strategies. It also becomes the reference point for the hard discussion we must have on joint interdependencies—we must become more interdependent if we are to optimize our support to the joint force commander. That means taking a hard look at divesting ourselves of certain "traditional" Army engineer capabilities. Equipment and organizations must be common for all engineer forces as much as possible. Imagine the increased flexibility the joint force commander has if a bridge unit in the Marine Corps has the same modular design as that in the Army, and both branches undergo the same training regardless of component.

We are not only looking at transformation from the joint perspective but from the multinational perspective as well. We will enlist the members of the joint and multinational engineer communities attending ENFORCE this year to share their experiences and assist us in ensuring that engineers remain a relevant and ready force. Their perspective is invaluable as we refine the design of the Future Engineer Force.

I am looking forward to this year's ENFORCE being a celebration of engineers and the many achievements that have directly contributed to our nation's success in Iraq and Afghanistan. I feel an immense pride in our Regiment and our soldiers when I hear or read about the great works engineers are doing around the world. As many of you have experienced, these successes have not come without a price. We have lost comrades in arms, friends, and family in this Global War on Terrorism. I would like to close by paying respects to our most recent losses in the Engineer Regiment. Essayons!

Captain Matthew August	1st Engineer Battalion, Fort Riley, Kansas
Sergeant Dennis Corral	1st Engineer Battalion, Fort Riley, Kansas
Sergeant First Class James Hoffman	1st Engineer Battalion, Fort Riley, Kansas
Staff Sergeant Sean Landrus	1st Engineer Battalion, Fort Riley, Kansas
Sergeant Travis Moothart	1st Engineer Battalion, Fort Riley, Kansas
Captain Eric Paliwoda	4th Engineer Battalion, Fort Carson, Colorado
Sergeant Benjamin Gilman	41st Engineer Battalion, Fort Drum, New York
Specialist David Goldberg	52d Engineer Battalion Fort Carson, Colorado
Specialist Joshua Neusche	203d Engineer Battalion, Joplin, Missouri
Private First Class Kristian Parker	205th Engineer Battalion, Slidell, Louisiana
Private First Class Duane Longstreth	307th Engineer Battalion, Fort Bragg, North Carolina
Sergeant First Class Robert Rooney	379th Engineer Company, Nashua, New Hampshire
Private First Class Jonathan Cheatham	489th Engineer Battalion, Camden, Arkansas
Specialist Gabriel Palacios	588th Engineer Battalion, Fort Hood, Texas
Sergeant First Class Dan Gabrielson	652d Engineer Battalion, Spooner, Wisconsin
Specialist Brandon Tobler	671st Engineer Brigade, Portland, Oregon
Staff Sergeant Kenneth Hendrickson	957th Engineer Company, Bismarck, North Dakota
Sergeant Keith Smette	957th Engineer Company, Bismarck, North Dakota

Lead The Way

By Command Sergeant Major Clinton J. Pearson
U.S. Army Engineer School

We are eagerly anticipating our 15th ENFORCE Conference, and we sincerely hope that you are looking forward to spending a week with us here at Fort Leonard Wood. Just remember to bring your colors—we want to display them proudly at the Regimental dinner.

As Major General Van Antwerp stated, this year's theme is *Forging Our Future - Shaping Engineers for Joint and Multinational Operations*. This ENFORCE will be unlike any other, particularly because we are a nation at war. We will start the week with a day and a half of Council of Command Sergeants Major sessions. Some of the other highlights include a briefing on Career Management Fields from the Human Resources Command (HRC) (formerly PERSCOM); an update from the Directorate of Combat Developments on the Future Engineer Force; an Initial Entry Training/Initial Acceptance Test update by the 1st Engineer Brigade; Operation Iraqi Freedom/ Operation Enduring Freedom Lessons Learned; Sapper Leader Course update; and a Noncommissioned Officer Education System (NCOES) update.

I'm also proud to announce the 1st Annual Joint Senior Noncommissioned Officer Symposium on *Engineers in Contingency Operations* from April 20-22 at Tyndall Air Force Base, Florida. This conference will include mostly senior noncommissioned officers from all of our sister services. If you are invited, I highly encourage you to attend.

Over the past quarter, we have been constantly assessing the Regiment's T3s *(Transform the Regiment, Train Soldiers and Leaders*, and *Take Care of the Regiment)* to meet our National Security challenges now and in the future. This concept *must* be embraced, and I can see it is taking shape. It's great to see everyone not only supporting this philosophy but also putting it into action. During Operation Enduring Freedom and Operation Iraqi Freedom, nine of the Army's ten active divisions will have been deployed to that region of the world. Currently, the largest rotation of Army forces in history is taking place. I've witnessed the deployment and redeployment of thousands of engineer soldiers throughout our Regiment—both Active Component and Reserve Component—and am pleased by their significant contributions and service to our nation in our joint effort to stamp out terrorism.

We must learn from those who have been deployed. The Engineer School recently surveyed Operation Enduring Freedom and Operation Iraqi Freedom veterans attending the Captain's Career Course (CCC), Advanced Noncommissioned Officers Course (ANCOC) and Basic Noncommissioned Officers Course (BNCOC). By using their experience, we can develop education systems that are flexible enough to support today's wartime environment as well as future operating environments. Our education systems must train leaders to be capable of operating as part of a joint team. In the survey, participants reviewed the training objectives of the courses to make our curriculum more relevant to current operations. To date, 41 ANCOC, 50 BNCOC, and 27 CCC students have participated in this survey. Initial findings were submitted to the Combined Arms Command Quality Assurance Office on 1 March 2004 and a final report is due 31 May 2004.

Another organization in the forefront of training is the Countermine/Counter Booby Trap Center (CMCBTC). From 1-18 March, the CMCBTC conducted specialized training for members of the 379th Engineer Battalion, which will deploy in support of Operation Iraqi Freedom. The battalion will assume the duties of the CJTF-7 Mine and Explosive Ordnance Information Coordination Center (MEOICC).

In September 2003, the first squad of four mine detection dog handlers in the Engineer Regiment deployed to Baghram Air Base in Afghanistan. They were certified and began supporting the mine-clearing company for Combined Joint Task Force-180. The mine detection dogs were a vital asset to the company because they facilitated the safe and timely expansion of the base camp. Their outstanding accomplishments in theater have proven to the Army the need for an organic mine detection dog capability. The squad has returned, but the noncommissioned officer in charge remains in Afghanistan, conducting relief in place with our second squad of mine detection dogs.

I'd like to pay tribute to Command Sergeant Major Edward H. Lugo (Retired), who passed away on 15 March 2004 at Walter Reed Army Medical Center in Washington, D.C. A veteran of more than 30 years of service, he served as the sixth Command Sergeant Major of the U.S. Army Corps of Engineers from July 1997 until his retirement in March 2001. Command Sergeant Major Lugo entered the Army in June 1970. He was the senior enlisted engineer soldier in the Army at the time of his retirement and had 12 years as a command sergeant major. Command Sergeant Major Lugo was—and always will be—a part of our engineer and Army family.

On Being an Engineer: Reflections From the Chief of Engineers

By Lieutenant General Robert B. Flowers

I was asked to write an article, a "heart-to-heart chat over a cup of coffee" to discuss what I consider important to pass on to Army engineers before I retire this summer. It's my pleasure to do so.

In a few months, I'll hand over Douglas MacArthur's castles to the 51st Chief of Engineers and say farewell to the Army. After he retired, General MacArthur wanted an engineer to wear his castles, and as a result, every Chief of Engineers has had that unique privilege. For me it was not only an honor, it was a continual reminder that Army engineers are part of a long and proud history of service.

When I was commissioned from the Virginia Military Institute almost 35 years ago, my intent was to complete my initial service commitment and then become a civilian. But after about six months, I knew soldiering was what I wanted to do, and I never looked back.

Much has changed since I began serving in the conscript Army. Today's all-volunteer force has improved training and education, and constantly evolving technology has allowed the Regiment to render more efficient and effective service. Our progress in building field force engineering capability is a prime example.

What hasn't changed is that engineers take on the tough tasks and always answer the nation's call. From my view, I see your great work every day, and it never fails to put a lump in my throat. I'm enormously proud of the entire Regiment—active duty, National Guard, Reserve, and civilians. The Regiment's soldiers and civilians are serving around the world, often in dangerous conditions. What is being accomplished in Iraq and Afghanistan is remarkable; there is no doubt that engineers are making a tremendous difference.

I will retire knowing the nation is in good hands. But before I go, I want to leave you with some parting thoughts.

Selfless Service

I'm often asked about what it takes to be a great engineer. The key is to be totally selfless and to be willing to do whatever it takes to make the team successful. As a platoon leader, I witnessed that type of selfless behavior. In 1970, when our platoon was bridging a frozen river—the Danube—in Germany, the bridge pontoon exploded. Many were injured, including the platoon sergeant, Sergeant First Class Jose Camacho. Although he was seriously injured, he refused to be taken away until all the other injured soldiers were taken care of and until after he had issued instructions to squad leaders to complete the day's missions. His behavior that day demonstrated his totally selfless nature.

Right now, hundreds of U.S. Army Corps of Engineers civilians are working in Iraq, and they volunteered knowing that conditions remain dangerous. In October, Sacramento District employee Ghassem Khosrownia was injured during an attack on his convoy near Baghdad. He was undaunted, however. He said he wanted to return to Iraq and finish his important work. That type of selfless service is common in our civilian employees.

Our combat engineers are a testament to selfless service. Just one example is Bravo Company, 11th Battalion, 3d Infantry Division. The unit has suffered many losses, including Sergeant First Class Paul Smith, who valiantly fought off an assault at the Baghdad airport. He went through 400 rounds

Emergency operations personnel—accompanied by representatives from the Federal Bureau of Investigation and the Bureau of Alcohol, Tobacco, and Firearms—survey the damage at the World Trade Center.

of ammunition before he was killed. His determination, bravery, and selfless service saved many lives that day.

Often, selfless service is a family trait. Fellow engineers Command Sergeant Major Ioakimo Falaniko and his son, Private Jonathan Falaniko, deployed to Iraq with the 1st Armored Division. Less than one month after Private Falaniko arrived, he was killed in combat. Command Sergeant Major Falaniko said his son was proud to be a soldier and proud to serve his nation and that he understood the danger of answering the nation's call. After he buried his son at Arlington National Cemetery, Command Sergeant Major Falaniko said, "I will finish this fight," and returned to Iraq. That is true selfless service.

Those few examples demonstrate the type of engineer we have in today's Army. There are many other stories of bravery and selfless service—and that is why our Regiment is so strong.

Leadership

I've also been asked how to become a successful leader. One of the greatest lessons I've learned is that good leaders aren't born, they are developed—something the Army does very well. Soldiers today are in the nation's finest leadership development program. Wherever I've served—on the fields of Desert Storm; in Somalia; Kosovo or Bosnia; the training areas at Fort Leonard Wood, Missouri; Gulfport, Mississippi; Sheppard Air Force Base, Texas; or Washington, D.C.—I was surrounded by great leaders, skilled soldiers, and inspiring mentors.

Supervisors, commanders, and general officers taught me what right looked like, and I replicated the good things I saw. I always had support from my peers, I believe, because I did everything I could to support them. And I'm thankful for all the first sergeants and command sergeants major I encountered along the way. They were great teachers to junior soldiers and officers. They led by example and taught me a lot about leadership and about myself. Let me pass along some of what I've learned:

Emulate Great Leaders. Read about and watch other leaders to discover what you want and do not want to emulate. My role models and heroes have always been soldiers, especially my father. I learned a lot by seeing how he treated others. He put people at ease, interfaced with them, and demonstrated that he cared about them. I've tried to follow his principles, including never asking anything of others that I wouldn't do myself.

Lead Eyeball to Eyeball. Great leaders are inspirational, have empathy, and are great listeners. To have those qualities, however, you must interface with those you lead. Too many

Photo by Specialist Ryan Smith

Combat engineers from the 671st Engineer Company patrol the Tigris River in Baghdad.

Photo by the 130th Engineer Brigade

Army engineers installed two temporary bridges over the Khazir River on the highway between Mosul and Irbil. They were removed following repairs to the permanent bridge, which had been bombed during the fighting.

supervisors are captured by automation and think they can coach, teach, and mentor by computer. Some things have to be done eyeball to eyeball, and leading is one of those things. Find time to talk to people so you can find out what is happening. It becomes increasingly important as you rise in rank, because there is a reluctance to give the boss bad news. By interfacing with others, you know more about what is really going on. I made it a habit to run regularly with soldiers. At Fort Leonard Wood, I enjoyed running with different engineer classes each week to hear what was on soldiers' minds and to challenge them with questions. It was a good way to better know our great team.

Provide Regular Feedback. People must know where they stand and what they must do to improve. When I was a battalion commander at Fort Bragg, North Carolina, I visited an injured soldier in the hospital. When I asked if there was anything I could do, he said that he had been a private first class for a long time and didn't know why he couldn't get promoted. It turned out that he was working out of his military occupational specialty (MOS) because members of his platoon weren't comfortable around him on the demolitions range. His counseling statements didn't reflect that, however. Instead, the statements reflected only the positive: that he was in excellent physical condition and had tremendous spirit and a drive-on attitude. There was a real disparity between reality and what he was told. From then on, I required five things in counseling statements: strengths, improvement areas, suggestions on how to improve, training and education, and promotion potential. I also required monthly counseling for junior soldiers and quarterly counseling for more senior soldiers.

USACE

I'm enormously proud of the U.S. Army Corps of Engineers and the 35,000 employees who support the armed forces, provide disaster assistance, restore the environment, and help the nation's economy through civil works projects. I've been asked why the Corps still has a civil works mission. Although the mission is steeped in our history, the value of retaining it in the Corps was readily apparent during Operations Enduring Freedom and Iraqi Freedom. Employees who usually are assigned to civil works projects transitioned quickly to support warfighters' technical and engineering needs. And they have done a terrific job.

In 1947, General Eisenhower spoke before the Senate Armed Services Committee and said, "I am firmly convinced that but for the existence of the Corps of Engineers as a peacetime organization and its resources of men, methods, training, and supply and its close association with the military through the years, the history of World War II would have been written more in blood than in achievement." General Eisenhower's words remain true to this day. And now that the Corps is restructuring, its service to the nation and the armed forces will be even better.

The Future

Developing a joint and expeditionary mindset is essential for the 21st century Army to succeed. I'm convinced that if there is any group that can thrive in a joint environment, it's engineers.

Engineers have shown time and again their ability and agility to see a job through under any circumstance. Since George Washington first called on engineers to help fortify Bunker Hill, engineers have always found a way to adapt and to accomplish the mission at hand. One hundred years ago this year, President Theodore Roosevelt selected an Army engineer to oversee a project that had been a failure—building the Panama Canal. The result? The most remarkable engineering feat the world had ever seen was completed ahead of schedule. When President Kennedy set a goal to send a man to the moon and return him safely to earth, no one knew just how to accomplish such a goal. Yet the U.S. Army Corps of Engineers went to work and helped to build National Aeronautics and Space Administration facilities at Cape Canaveral, Florida.

As you continue the Army engineers' heritage of service and accomplishment, continue to be flexible. Also, let me add, if at times your work is not recognized, that is okay. You know what you have done, your fellow engineers know, and that is good enough. There is a bright future ahead for the joint engineer team. Engineers have never let the country down, and I know they never will.

Final Thoughts

I will leave Army service with no regrets and only positive recollections. If I made a positive difference to those I've led, I've done my job well. My hope is that when people speak of me, they have smiles on their faces and remember me as a good man. It's been the privilege of a lifetime to serve with you. May God bless you, your families, and this great nation. Essayons!

The Future Engineer Force

Projecting the Capabilities of the Regiment

By Lieutenant Colonel Bryan Watson, Lieutenant Colonel David Holbrook, Major Stephen Bales, Major Mollie Pearson, Major Brian Slack, and Mr. Mike Fowler

Our Army is at war. Since Operation Enduring Freedom and Operation Iraqi Freedom began, more than 444 soldiers have been killed in action and more than 2,252 severely wounded. The largest rotation of Army forces in history is taking place, and nine of its ten active divisions—all but the 2d Infantry Division, which is already committed to Korea—will have seen action in Afghanistan or Iraq. We have activated the largest number of U.S. Army Reserve (USAR) and Army National Guard (ARNG) soldiers since the Korean War.

Some may say this operational state, that of war, is the exception rather than the norm. As stated by some of our nation's most experienced leaders, peace will be the exception in the future. Americans face a "new reality"—one that is significantly different from that of the Cold War. A conflict of irreconcilable ideas exists. Adaptive adversaries seek our demise by any means. Our own forces can't focus solely on future overseas contingencies but also must defend bases and facilities at home and abroad. Above all, because at least some current adversaries consider "peaceful coexistence" with the United States unacceptable, we have a foreseeable future of extensive conflict in which real peace will be the anomaly.

Today's Army is not designed for such a strategy; consequently, swift change is essential to survival in our new reality. As the Chief of Staff of the Army, General Peter J. Schoomaker, pointedly states, "We're going to have to [change] some of the things that made us the best Army in the world. Our values are sacrosanct. But everything else is on the table."[1]

Accordingly, the Engineer Regiment must change—NOW. The fact that we provide a unique set of core competencies that critically enable the combatant commander and the joint team with the mobility they need to provide a position of advantage at the tactical through strategic levels will not change. However, we must reexamine and challenge our most fundamental institutional assumptions, paradigms, and procedures to better serve our nation. We must be a campaign-quality, modular force with a joint and expeditionary mindset in order to adapt to unforeseen circumstances that will occur in the future. We'll retain the best of our current capabilities and attributes and develop others that will increase relevance and readiness to respond in the current and projected new reality.

Joint and Expeditionary Transformation Framework

One of the most essential pieces of transformation is "viewing all change processes through the lens of a joint and expeditionary mindset."[2] The Army's transformation efforts irrefutably must support operations in a joint environment, with an underlying interdependence among all services down to the tactical level to maximize complementary effects. Additionally, the uncertainty as to where we deploy, the probability of a very austere operational environment, and the requirement to fight on arrival throughout the battlespace pose an entirely different requirement—the fundamental distinction of expeditionary operations. The Army's new framework of how we organize *echelons of command*, *maneuver units of action* (UAs) and *support units of action* (SUAs) clearly support such operations and provide the joint force commander the right capabilities at the right place and the right time.

The nature of modern operations requires that our echelons of command become more flexible than our current divisions and corps. Hence, the Army is changing its command structure from three echelons of command (divisions, corps, and armies) to two—*units of employment-tactical* (UEx) and *units of employment-operational* (UEy). Both echelons will be modular entities designed to employ a tailored mix of forces. The particular organization of Army forces will be based on the requirements of the joint force commander and the conditions in the theater. These commands will orchestrate tactical engagements into battles, major land operations, and even campaigns when designated as a joint task force.

Maneuver UAs made up of battalion-sized and company-sized subunits will be the principal means of conducting tactical engagements. The principal tactical unit of the modular Army—the combined arms maneuver brigade—will consist of three standard types. The first two types will replace task-organized formations inside today's divisions.

- Heavy (armored) UA
- Light (infantry) UA
- Medium Stryker brigade

These maneuver UAs will be approximately the size of today's task-organized brigades and will include battalion-sized combined arms maneuver, fires, intelligence and reconnaissance, and logistics subunits. In contrast to current divisional brigades, the modular force maneuver UAs will be fixed-base (table of organization and equipment [TOE]) units.

Along with the maneuver UAs that will operate under the command and control (C2) of a UEx will be five brigade-sized SUAs that will provide modular, scalable, and tailorable effects to the maneuver UAs or operate independently given missions from the UEx:

- Fires
- Reconnaissance, surveillance, and target acquisition (RSTA)
- Aviation
- Sustainment
- Maneuver enhancement (ME)

The ME brigade deserves critical attention because it is the conduit for engineer effects that support the UEx above those embedded in the maneuver brigades. The ME brigade is designed as a shell headquarters to organize and control forces within the area of operations assigned to the UEx but outside of the areas assigned to the maneuver UAs. This SUA has the secondary mission of controlling combat and combat support assets not committed to the fires, RSTA, aviation, and sustainment SUAs. Typically, the ME brigade will include a mix of engineer, chemical, civil affairs, and military police personnel. It also may control air and missile defense units when assigned to the UEx. Depending on the scope of the operation, more than one ME brigade may be assigned to the UEx. Figure 1 shows the Army's expeditionary modular force model.

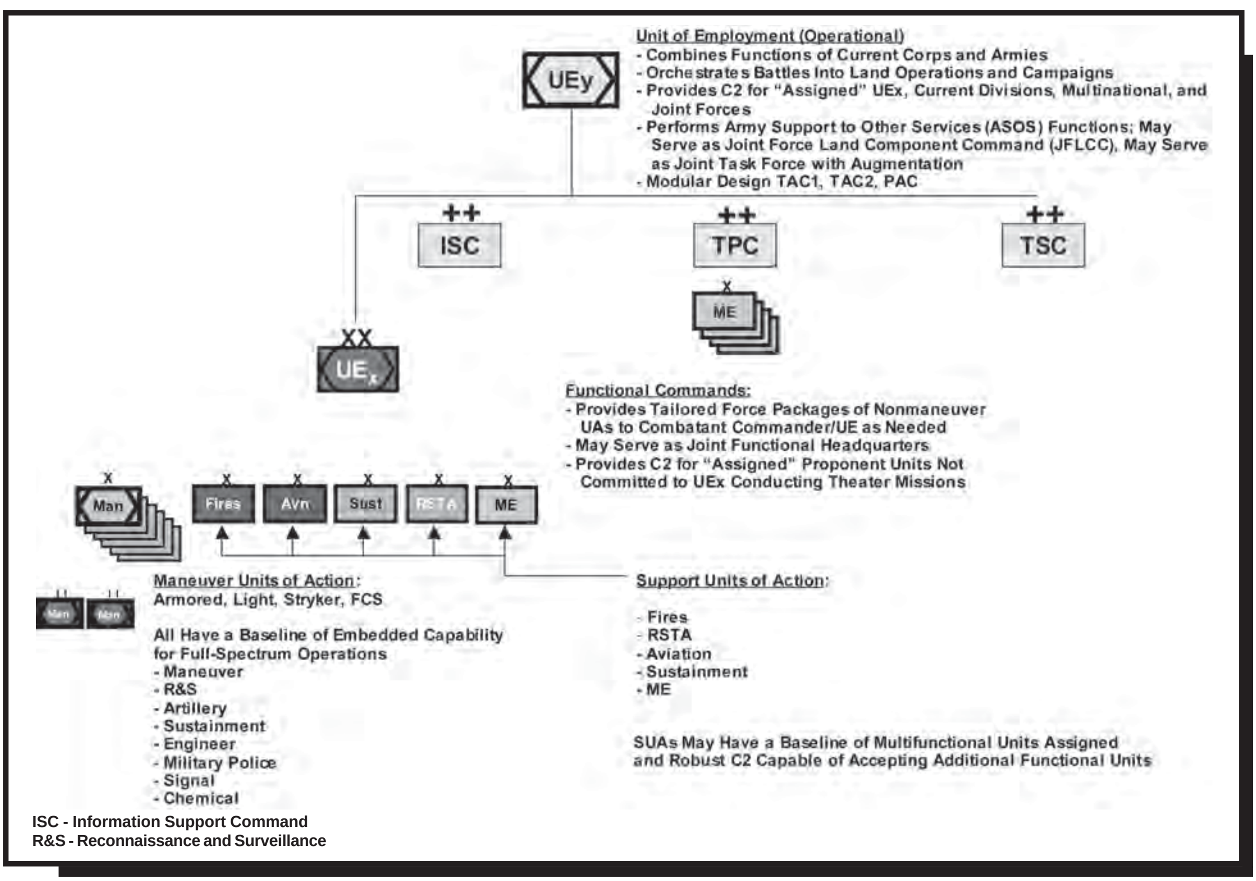

Figure 1. The Army's Expeditionary Modular Force Model

Transforming the Engineer Regiment

The framework of the future Army is the model for the Engineer Regiment's transformation efforts. The first installment of the Engineer Model clearly depicts a joint and expeditionary flavor and defines what engineers must bring to the fight and how. It is the starting point for partnering on organizational solutions, equipment, doctrine, standards, and training strategies. It also becomes the reference point for the discussion we must have on joint interdependencies—a practice we must embrace if we are to optimize our support to the joint force commander. This means taking a hard look at divesting ourselves of certain "traditional" Army engineer capabilities.

The Future Engineer Force facilitates the joint fight by supporting the five *joint functional concepts*:

- Battlespace awareness.
- Force application.
- Protection.
- Focused logistics.
- C2.

These concepts provide an overarching description of how the future joint force will operate across the *full spectrum of operations* (support, stability, defense, and offense). To enable the joint functional concepts, the joint engineer force must provide unique engineer capabilities to the joint force commander. These are referred to as *joint engineer capability elements.* Figure 2 shows the relationship of the joint engineer capability elements to the joint functional concepts via the universal joint task list (UJTL) tactical and operational tasks, depicting how engineers have adopted the joint concept.

Equipment and organizations must be common for all engineer forces as much as possible. This allows interoperability and cooperative engineer engagements. It also enables efficient equipment acquisition and fielding and a significant reduction in logistics footprints for the entire joint engineer force. Common equipment is more sustainable, easier to manage from a joint force perspective, and easier to train for the entire joint engineer force. For example, if a bridge unit in the Marine Corps has the same modular design as that in the Army, and undergoes the same training as its brethren in the National Guard, the joint force commander has increased flexibility tenfold.

To ensure a complementary and interoperable mix across all components and services, we must engage the Joint Capabilities Integration and Development System process through the Joint Operational Engineer Board. This will ensure that we utilize a top-down approach, achieving interoperability while influencing the overall organization of joint engineer forces.

A critical characteristic of future operations—one that came early in our recent operations—is the requirement for the force to be able to execute across the full spectrum of operations simultaneously. In the past, our force design and time-phased force and deployment data (TPFDD) was based on a linear

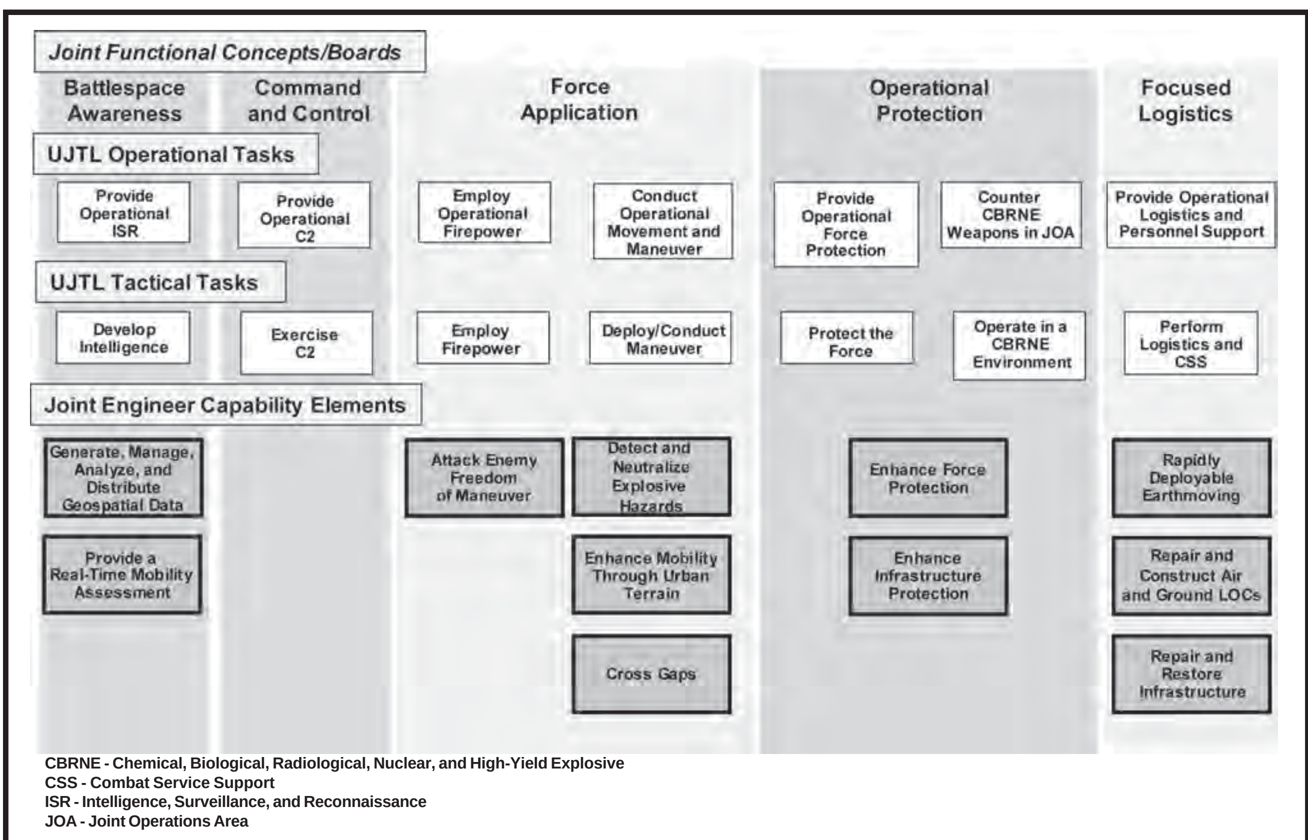

Figure 2. Joint Engineer Capability Elements

progression from defense, to offense, to stability—and rarely embraced support operations. Today, the model no longer fits.

Our formations must be capable of conducting rapid, decisive operations in part of the battlespace while executing defensive and stability operations in other areas. This "new" nature of operations is one of the primary drivers of a joint and expeditionary mindset. It demands a tailorable, scalable force and brings the joint commander a suite of capabilities that can be right-sized, mixed, and projected to meet the full range of operations.

Figure 3 depicts the range of capabilities that an expeditionary engineer force must be capable of bringing to the fight and how the premier capabilities change as the nature of the operations changes. Add the dimension of simultaneity—executing both offensive and stability operations in separate, noncontiguous areas—and one fully understands the challenge set, as well as some of the fundamental requirements from modularity that must be inherent in the Future Engineer Force design.

Engineer Organizational Concept

The Army's framework of maneuver UAs, SUAs, and functional commands organized under two echelons of command—UEx and UEy—drives the Future Engineer Force framework. We must layer engineer capabilities in the same manner.

- The first layer is an *embedded engineer capability* in the maneuver UAs, which is fixed. The embedded capability is either engineer forces or technology that is organic. The focus of these forces is the mobility of small-unit tactical formations. It is crucial that engineer C2 is an integral part of these elements.
- The second layer consists of an *engineer force pool* of baseline forces (building blocks), mission module forces (specialized blocks), and an expeditionary engineer brigade C2 headquarters designed to support all echelons. It is the expeditionary force pool that gives the joint force commander the ability to tailor the force and react. This gives the force a full-spectrum capability and campaign qualities.

Baseline and Mission Module Forces provide the modular effects building blocks. Baseline forces provide two early-entry basic engineer capabilities—combat and construction. These elements can augment the embedded capability of the maneuver battalions or brigades. They are capable of receiving modules from the mission module forces for specific short-duration missions. Mission module forces provide engineer effects modules required by baseline forces to respond to specific changing missions. They consist of fixed organizations with discrete sets of capabilities.

Expeditionary Engineer Brigade C2 Headquarters will manage the training, certification, employment, deployment,

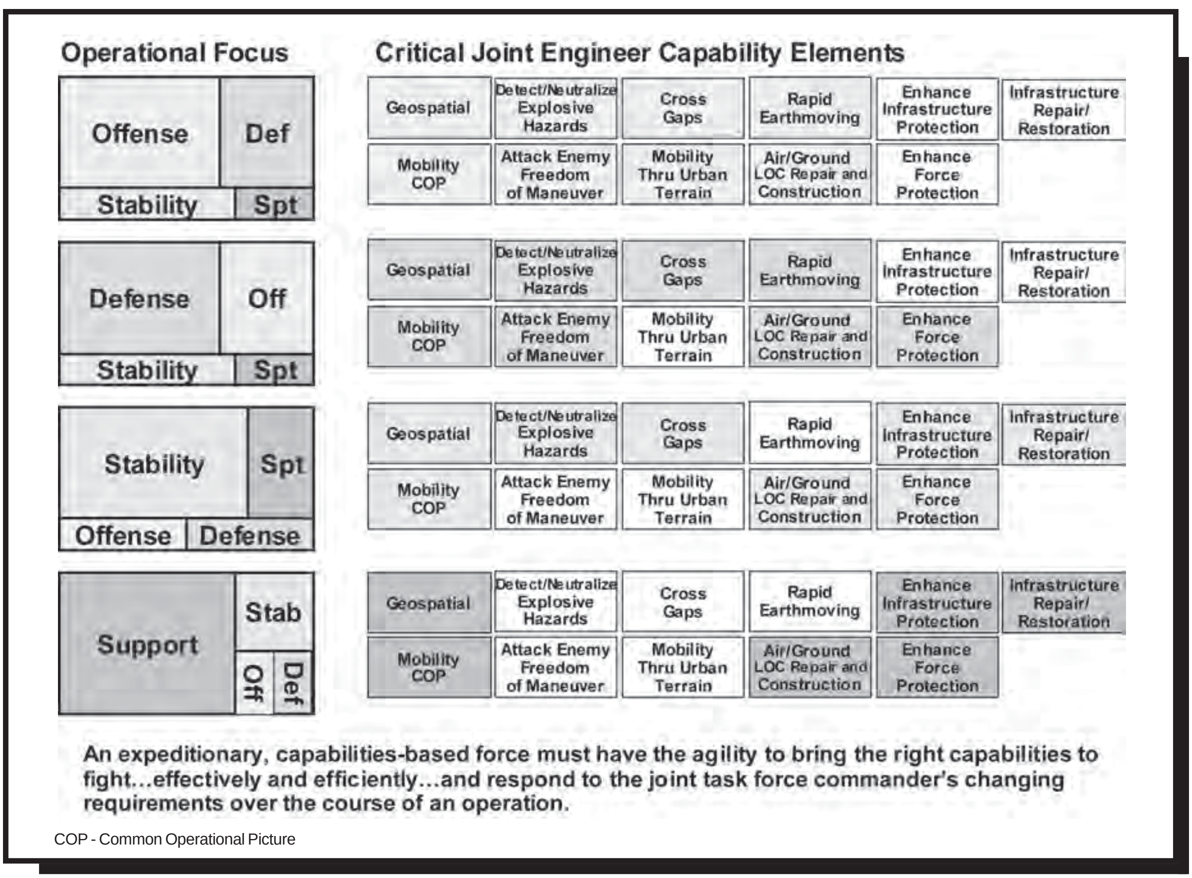

Figure 3. Critical Expeditionary Engineer Force Capabilities

and sustainment of engineer forces, both in garrison and operationally. It will provide operationally scalable C2 for the baseline and mission module forces. Engineer brigades become streamlined modular organizations able to command and control any combination of capabilities—Army, joint, or multinational. They will consist of network-enabled organizations that have separable, deployable command posts that are linked to home station operations centers (HSOCs) to minimize forward footprints that provide the rapid, early-entry, and sustainable C2 of engineer forces.

Engineer Employment Concept

An expeditionary mindset requires that we think of force employment differently than force structure. Although we will continue to have squads, platoons, companies, battalions, and brigades as a garrison structure that oversees training readiness, we won't employ wholesale garrison units—we will mission-tailor. The following paragraphs describe a framework of how we will employ forces (depending on the frequency required, integration required with other forces, where they will be positioned on the battlefield and when, and theater-specific conditions):

Engineer Effects Modules (EEMs) are the basic building blocks of engineer baseline forces and mission module forces. EEMs are narrowly focused, fixed organizations that train as a team to deliver discrete engineer effects. They do not have a C2 element. They are composed from engineer units, equipment contracts, and even full contracts. The commander will own the contract and execute it when required.

Engineer Mission Teams (EMTs) combine engineer effects to accomplish specific missions and fight engineer engagements. The C2 element is fixed and only capable of C2 for EEMs. EMTs are not designed to plan future operations. For example, there is a mission to clear and repair a route from Main Supply Route (MSR) A to MSR B to facilitate logistics. EEMs will consist of route clearance, rapid earthmoving, resurfacing, security, and initial line-of-communication (LOC) bridging elements. When combined, an EMT is formed.

Engineer Mission Forces (EMFs) are tailorable forces that orchestrate engineer missions, support maneuver operations, anticipate engineer requirements, synchronize engineer effects, and command and control engineer units at the tactical or operational level where necessary. They have the capability to integrate into Army or joint headquarters, and unlike EMTs, they are capable of simultaneous C2 and planning future operations. In the previous example, an EMF may be used to sustain the route clearance mission for an extended period of time, constituting a number of EMTs capable of planning future missions.

One of the fundamental shifts that an expeditionary mindset demands from leaders is the ability to separate garrison organization (optimized for training readiness) from employment organization. We do this today in the maneuver force. Garrison companies become companies and teams, and garrison battalions become task forces. We must have the same mindset in the Future Engineer Force using EEMs, EMTs, and EMFs. These organizations do not have a set size; their use is tied to the scope and duration of their mission and the command/support relationship they have with the supported force. More importantly, it breaks the mindset of sending an entire company or battalion if there is a requirement. We must be more precise than that. We must send only what is needed, when it is needed, for as long it is needed—and nothing more.

Early Deployment Detachments (EDDs) are perhaps the most important feature of the Future Engineer Force framework. This element serves as an engineer assessment team that advises the commander on what engineer assets are needed and where, when, and how (EEM/EMT/EMF) to optimize them to best support the fight. Unlike our non-TOE tactical reconnaissance capabilities in the past, this element focuses on a technical reconnaissance TOE capability within our formations. It provides the force commander with engineer eyes forward, as it did in the past, but helps the commander develop engineer solutions before commitment using a reachback capability. It also enables the commander with a forward contracting capability to reduce the amount of assets that must be moved to the fight.

Given an operational scenario, an EDD is deployed into a theatre of operations. It determines the mix of forces required to support the operation. Based on the technical reconnaissance and assessments, it determines that one brigade-sized EMF is required. That EMF consists of three EMTs with a mix of twelve EEMs and two full equipment contracts. As the operation progresses, additional technical reconnaissance and assessments are conducted and the composition/number of EMFs, EMTs, and EEMs is adjusted to meet the changing requirements.

Complementary and Expeditionary Employment Concept

An expeditionary force design framework demands a complementary expeditionary employment concept. This also must fit within the Army framework of how forces will be employed. It presumes that UE headquarters are standalone and do not require plugs from engineer subordinates. It also presumes that engineer forces will use the combination of theater protection commands (TPCs); and ME brigades as the primary conduit for projecting forces into theater and to the UEx. In some instances, missions may be so engineer-specific that the multifunctional capability of the ME brigade headquarters is not an optimal match. As a result, an engineer brigade may be assigned directly to a UEx.

The Future Engineer Force will be dynamically employed, enabled by its agile and modular design to meet the needs of the warfighter and the combatant commander. Combinations of expeditionary engineer C2, baseline forces, and mission modules will form EMTs and EMFs to support the two echelons of command—UEy and UEx (see Figure 4, page 12).

As depicted in Figure 5, page 12, engineers in the UEy will be allocated to the TPC based on mission requirements. EMTs

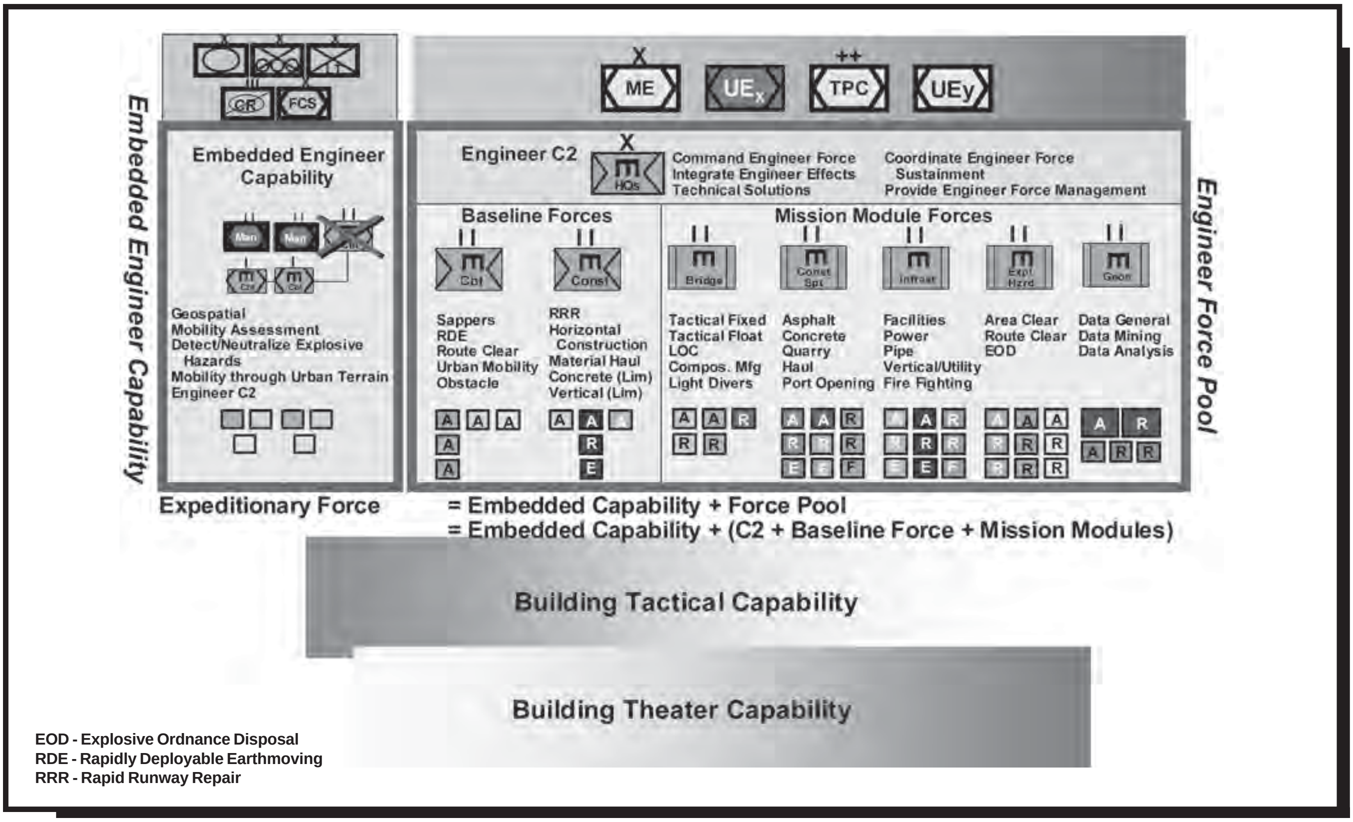

Figure 4. Future Engineer Force Framework

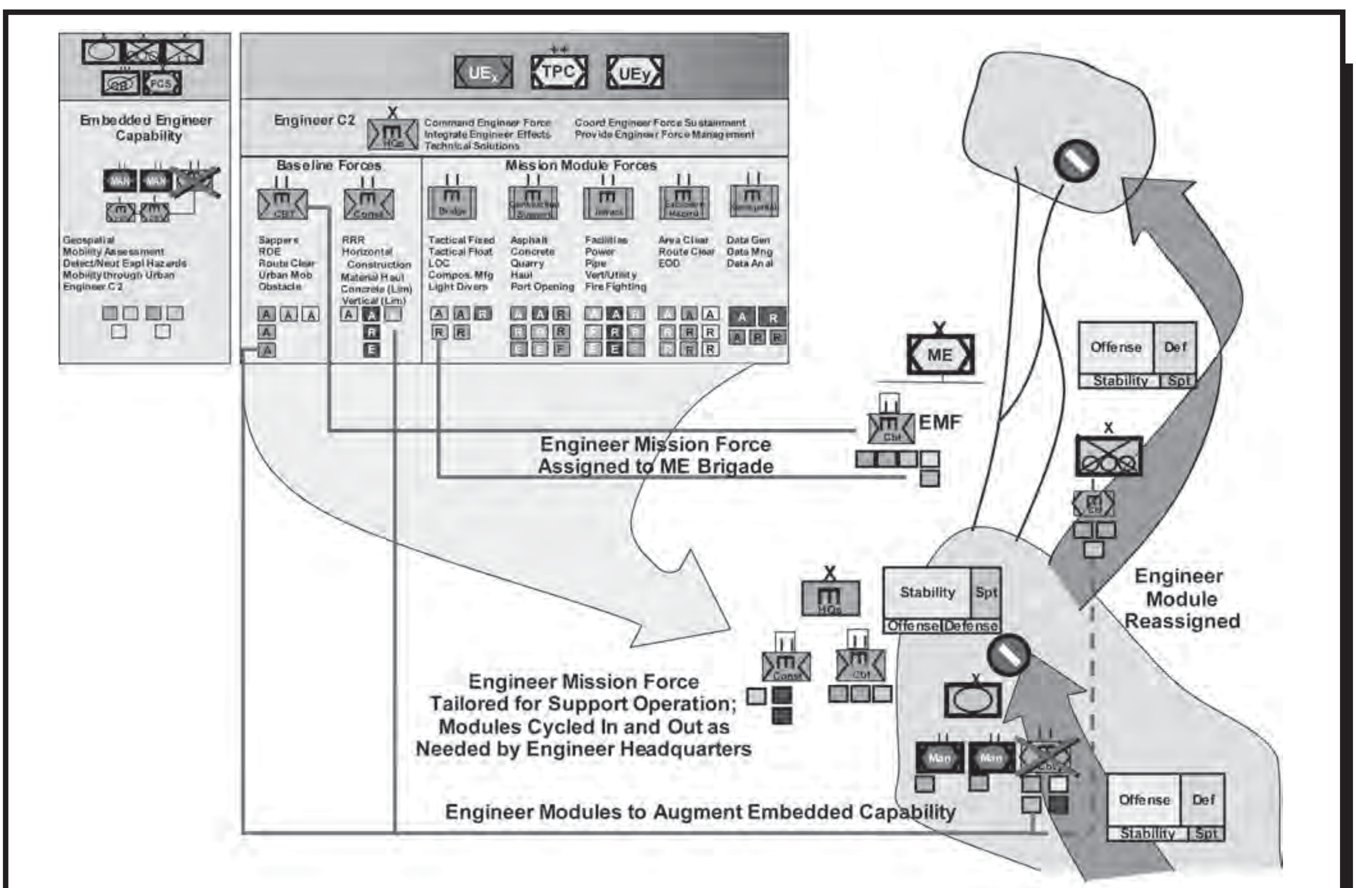

Figure 5. Force Design Theory Applied

and EMFs will be organized under the C2 of expeditionary engineer brigades that will serve as the force employment managers within theater. The number of engineer brigades and subordinate EMTs and EMFs will be tailored to the specific missions assigned by the UEy. EEMs, EMTs, and EMFs will be rapidly cycled in and out to meet the demands of full-spectrum operations. As required, the TPC may allocate an EMF to the theater support command (TSC) in a support role. This retains the ability to rapidly reallocate forces to meet the demands of the rapidly changing nature of full-spectrum operations.

To meet the needs of the UEx and its subordinate UAs, the TPC will form a tailored ME brigade. The expeditionary engineer brigades from the TPC will create EMFs, tailored to the specific needs of the UEx, and allocate them to the ME brigade. As required, EMTs or individual EEMs will be pushed from the ME brigade to other SUAs in the UEx or to augment the embedded forces in the maneuver UAs to conduct short-duration missions. As with the engineers assigned to the TPC, EEMs and EMTs will rotate in and out of the ME brigade based on changing mission requirements (see Figure 6).

Structuring the Total Force for the Expeditionary Model

The plan to convert the current structure to joint expeditionary units that are more deployable, employable, modular, and sustainable demands a comprehensive relook of the roles and structure of the Active Component and Reserve Component. As stated by General Schoomaker, "We need to examine what we have in there and what we need."[3] The Army is thus reviewing 100,000 positions to redress the balance—especially for the early days of a conflict.

> *"We are riddled with industrial-age policies that make no sense in a time of constant mobilizations…we want to have more modularized units…we intend to lower the force structure dramatically."*
>
> *Lieutenant General James R. Helmly*
> *Chief of the Army Reserves*
> *Reserve Officers Association meeting, 23 January 2004*

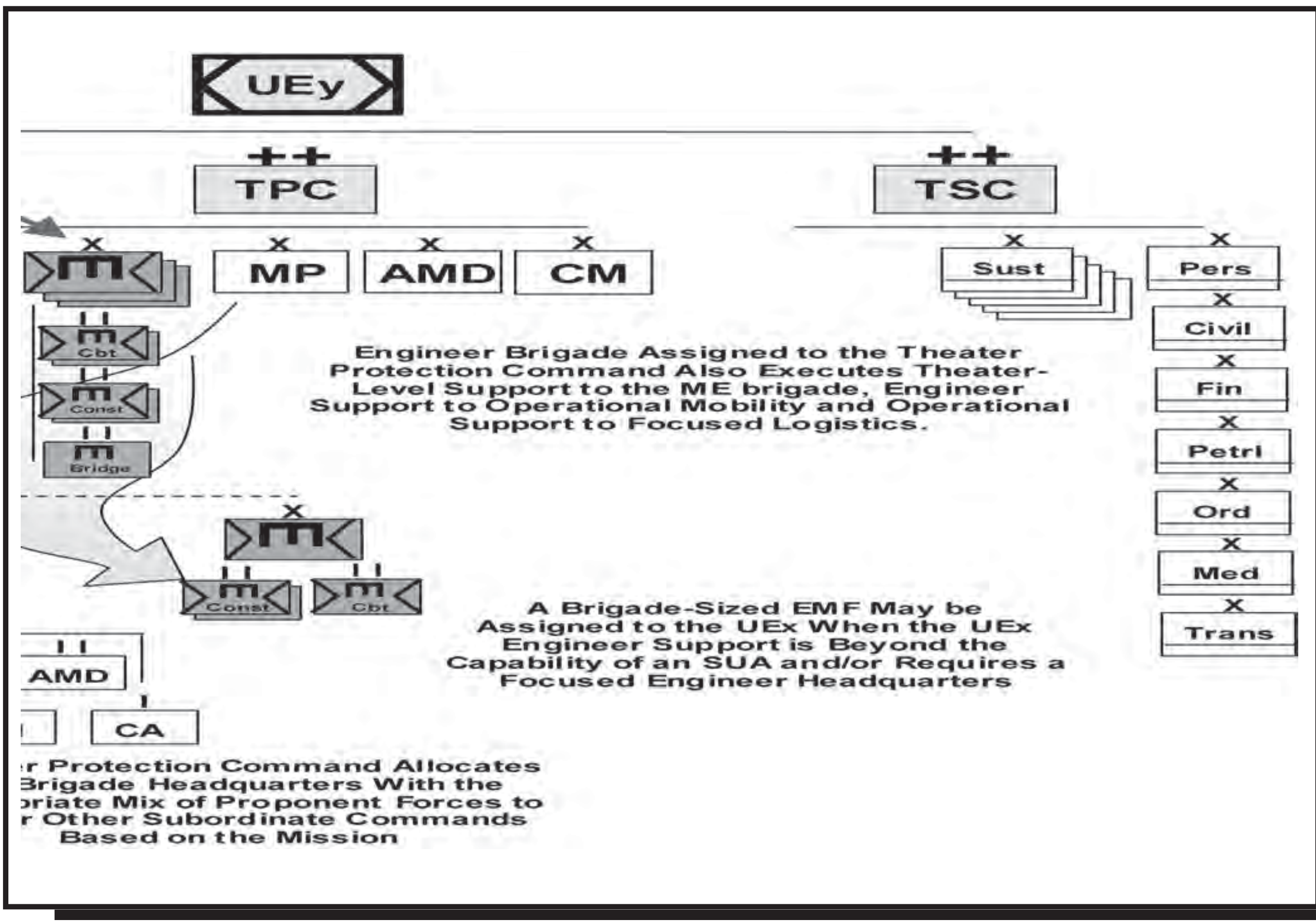

Figure 6. Projecting Engineer Capability to the Force

It is likely that changes required in our Reserve Component organizations will match or exceed those in the Active Component. Some of the engineer capabilities that reside predominately in the Reserve Component may need to be shifted to the Active Component and vice versa. The Army's Active Component will provide rapidly responsive, agile, and expeditionary forces that typically respond in the first thirty days of an operation. The Reserve Component will provide strategic depth to reinforce the warfight. They will also conduct stability operations and support operations (SOSO) and lead our efforts to protect the homeland.

The Active Component will provide the embedded early-entry capability in the maneuver UAs to meet the immediate needs of the warfighters. They will also initially provide the baseline/foundation capabilities (C2, combat engineers, and construction) that are required above the embedded capabilities in the maneuver UAs and those required by the combatant commander. The USAR will provide effects-based modules to augment the baseline forces to provide the breadth of required engineer capabilities. The ARNG will continue to lead homeland security efforts and augment when and if needed by the Active Component and USAR. Secondary to that effort, they will provide the strategic depth of foundation capabilities to support major combat and SOSO on a rotational basis. The USAR will sustain the provision of effects-based modules to the ARNG baseline forces to sustain the breadth of engineer capabilities.

Force Management Concept

The default condition of our operational environment has become one of continuous conflict. Major portions of our Army will repeatedly be deployed and employed. As a result, the senior leadership of the Army has recognized that we must alter our force management practices to reduce turbulence and account for the strain that more frequent deployments will have on force modernization efforts, soldiers, and families. They have designed three stabilization models that aim to achieve continuity in training, stability of leadership, unit cohesion, enhanced unit readiness and combat effectiveness, and greater deployment predictability for soldiers and their families.

One initiative requires that soldiers, both enlisted and officers, report to an installation and remain on that installation through their time as a squad leader or company command equivalent. They will attend the Basic Noncommissioned Officer Course or Captain's Career Course and return to their home station. This improves stability and predictability and is the stepping- stone to life cycle unit manning.

Another initiative allows leaders and soldiers to assemble, train, and employ together throughout the unit's operational cycle. This forms the basis for rotations of fully deployable units while increasing stability and cohesion. This also results in more depth of experience and increased family stability and predictability. Embedded engineer units will be managed in this manner in conjunction with the maneuver UA to which they are assigned. Baseline engineer units will also be managed using this approach. Individual engineer brigades and their assigned baseline engineer battalions enter the cycle simultaneously. Leaders and soldiers assemble and conduct training and certification. The brigade is not available during much of the train and release phases. Once certified, the brigade and its subordinate units are then allocated to the TPC for employment. As needed, the engineer brigade or its subordinate elements are deployed to support ongoing operations, peacetime military engagements, or deterrence on a rotational basis. Once the employment phase is completed, the brigade and its subordinate battalions enter the release/rebuild phase. During this phase, the preponderance of the unit is released and reassigned to other units. A core cadre of personnel remains to receive replacements and the brigade reenters the train phase to begin the cycle again.

The final initiative is the most effective method for sustaining units and mission module forces. The unit, once manned, enters a continuous sustain-employ-sustain cycle. Leader and soldier assignments are synchronized with sustainment phases. During sustainment phases, the unit experiences a 15 to 30 percent turnover of personnel. This model is used since most of these mission module forces are low-density, high-utility skill sets. This reduces the inflow and outflow of personnel units to very discrete time periods. Mission module force engineer brigades will offset the employ and sustain phases of assigned mission modules, and perhaps battalions, to ensure that they continuously maintain a full array of ready and deployable mission modules.

Each of the force management concepts ensures that the Future Engineer Force is capable of providing the full range of required engineer capabilities. The engineer brigade remains the cornerstone of force management.

The role of the Engineer Commands (ENCOMs) is significantly more multifunctional in the new force management concept. They will be responsible for training readiness of the engineer forces, will decide what force is "in the ready rack" and which unit will be deployed, and could work for the UEy commander as a joint deployable headquarters. All around, the new force management concept will allow for the utmost flexibility.

Achieving the Vision

Achieving the future vision discussed in this White Paper may seem like a time-consuming and lofty goal. But we owe it to past, present, and especially future engineers to design a way ahead that is achievable, realistic, and timely.

Our initial effort will be the establishment of an expeditionary force pool that is capable of supporting the entire joint force. With this effort, we will challenge the C2 structure as we know it today and convert groups and corps engineer brigades into expeditionary engineer brigades that will be capable of commanding and controlling the baseline engineer battalions, other service engineer forces, and even other proponent forces, if required.

The role of baseline engineer forces is to enhance the engineer capabilities of the maneuver UAs. This baseline force pool will consist of two early-entry basic engineer capabilities—combat and construction. The new design will impact the Active Component as well as the Reserve Component structure. As part of this initial effort, we must rethink how we train and equip these baseline battalions so they can respond quickly to specific changing missions. This change will involve training from initial entry to command preparation. These mission module forces will be fixed organizations with a discrete set of capabilities. To improve the way our forces are equipped, we will step up efforts to procure modern and common construction engineer equipment so that the Active and Reserve Components are identically equipped. Additionally, we are studying how to put more of the decisions on leased equipment at the commanders' level. Our leased equipment must be consistent with sister service lease agreements so we come closer to commonality of engineer capabilities.

A simultaneous but supporting effort in achieving our vision is to accelerate the enablers of the embedded engineer forces. We will improve, through training and procurement, how our forces detect and neutralize hazards. We will ensure that our engineer soldiers are placed on platforms that are as survivable and mobile as the maneuver UAs they support, by designing capabilities for the FCS that are consistent with our capabilities environment. This supporting effort will also include finding new ways to train and fight in urban terrain so that engineers are the first soldiers called when a unit approaches a built-up area. Our modular design will allow us to have a just-in-time assault bridging capability that allows the maneuver UA commander to maintain momentum in any environment.

These monumental changes in the Engineer Regiment call for new management techniques that allow an organized approach to providing engineer forces to the joint force commander. We will accomplish this through a force management system where ENCOMs are responsible for tracking the unit readiness and deployability of every engineer unit assigned to their regional alignment. We envision two and possibly three ENCOMs under the purview of the U.S. Army Corps of Engineers that provide forces through U.S. Army Forces Command to a joint force commander. This concept could include an ENCOM responsible for forces capable of responding to homeland security issues.

Last, but certainly not least, in this effort to transform our Regiment is the dialogue with our sister service engineer forces. The end state of all our efforts is the "Color Purple." Our senior leaders must begin discussions now with other service leaders on accomplishing commonality in equipment and training and interdependency in mission sets. The end state is an engineer force that is fully integrated, expeditionary, networked, decentralized, adaptable, decision superior, and effective.

> *"The joint force, because of its flexibility and responsiveness, will remain the key to operational success in the future. The integration of the core competencies provided by the individual services is essential to the joint team, and the employment of the capabilities of the Total Force (active, reserve, guard, and civilian members) increases the options for the commander and complicates the choices of our opponents."*
>
> *—Joint Vision 2020*

The Future Engineer Force . . . Relevant and Ready

This article was a joint effort of members of Engineer Concepts, Engineer Division, Directorate of Combat Developments, Maneuver Support Center, Fort Leonard Wood, Missouri:

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Major Slack is a concepts officer.

Mr. Mike Fowler is a program analyst

Endnotes

[1] The Way Ahead, 26 November 2003.

[2] "An Army at War - A Campaign Quality Army With a Joint and Expeditionary Mindset (Draft)", 17 February 2004.

[3] General Peter Schoomaker, 8 January 2004.

Reference

Unit of Employment (UE) Operations White Paper, Version 3.0, 5 March 2004.

Joint Engineer Training

"I'm not surprised to find out that your Navy has its own Army, but I am surprised to find out that your Navy's Army has its own Air Force."

—Israeli officer undergoing Joint Professional Military Education at Command and General Staff College

"Our Navy's Army has its own engineers too."

—Engineer officer's reply

Here's an interesting thought. In Europe, we send engineer captains to courses to introduce them to the engineer formations, capabilities, procedures, and doctrine of fellow NATO countries. Yet there is no such training for our engineers on the other services of our own country. The point is not that we should eliminate the training at the Euro-NATO Training Engineer Center. The point is that we do more training on NATO engineer procedures than we do on our sister services.

This article opens the issue of joint engineer training, with four authors—with very different backgrounds—providing thoughts on it. We have viewpoints on how we do business now, what we saw during Operation Iraqi Freedom, what implications we see from that, and what we see coming tomorrow that will define the joint engineer training environment.

Joint Training Today

By Colonel Thomas E. O'Donovan

Today the primary vehicle for joint engineer training is found in two places. For leaders, we have embedded joint training in the programs of each service (Figure 1). That training is limited to general understanding of other service organizations and capabilities.

For example, Army lieutenants get two to three hours of joint training in the basic course, including an overview of concepts such as joint doctrine and organizations, and a brief introduction to joint fires. Captains in the career course get five to seven hours about the organizations, functions, and capabilities of Air Force, Navy, and Marine Corps engineer assets. Noncommissioned officer training has a similar structure and content. Additionally, we train about eight Marine Corps officers annually in the Engineer Captain's Career Course and have a Marine Corps officer on the faculty at the U.S. Army Engineer School. But until an officer reaches field grade rank and begins Joint Professional Military Education (JPME), there is no other joint engineer training, and JPME includes very little engineer training.

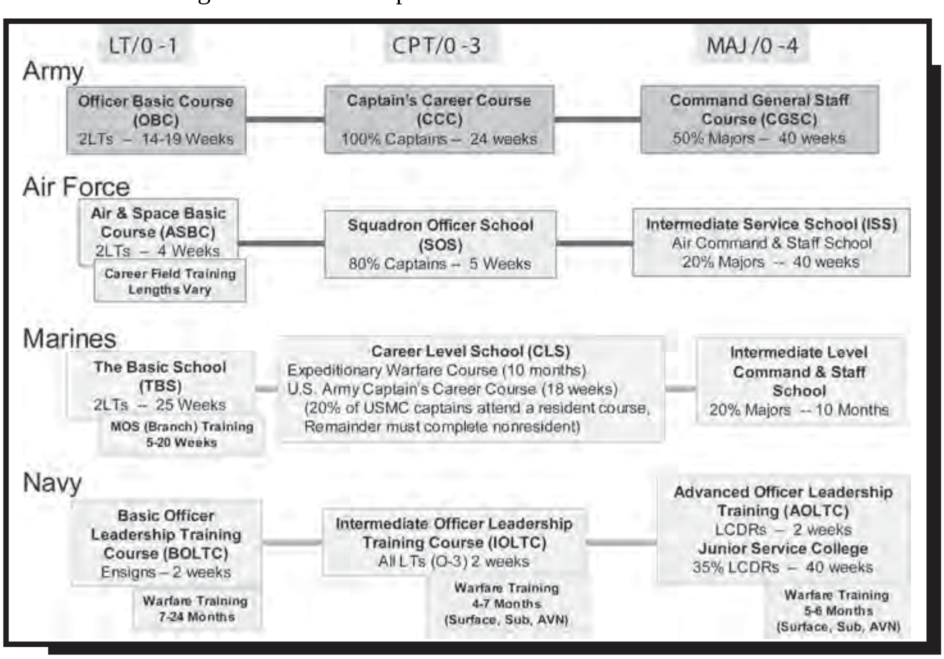

Figure 1. Officer Education Timelines for the Services

For enlisted training, we have the Interservice Training Review Organization (ITRO) system and all three forms (consolidated, unique, and colocated) train enlisted engineers. For example, Army firefighters train at an Air Force school. This program was a long time in development, has been in action since 1996, and is described in more detail in *Engineer*, February 2000, page 11.

The bottom line is that we conduct some leader joint training and common enlisted training. But does it achieve the "jointness" required for tomorrow? If not, what are the key pieces today's joint training is missing? We'll look at what joint engineering meant in Operation Iraqi Freedom and what it will mean in the future and then come back to that question.

Joint Engineer Training Aspects of Operation Iraqi Freedom

By Colonel Charles Smithers

The joint fight is with us to stay and there's no looking back. For years we've schooled on it during training events and contingencies, but it matured during major combat operations of Operation Iraqi Freedom. It's no longer good enough to stay in your "service" lane—it's time to be better and develop applicable skills to employ everything—and everyone—that comes to the fight. Joint engineer vision is driven by concepts being implemented now. In Operation Iraqi Freedom, today and in its earlier combat phases, joint engineer skills are a key part of the success.

As we look across the services at doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF), what do we "jointly" grab that will be the catalyst for joint engineer efforts? As we saw in Operation Iraqi Freedom, most of the components of DOTMLPF are different. But leader development is the common component—engineer leaders who will lead the way as we learn and put our new joint engineer skill into practice.

A model for developing this skill comes from Department of the Army Form 67-9, *The Officer Evaluation Report*. The "Skills (Competence)" section for assessing leaders rates technical, tactical, conceptual, and interpersonal attributes. Consider the tenets of breaching operations—suppress, obscure, secure, reduce, and assault (SOSRA)—and analyze them according to those attributes. Our formations, and we as leaders, are technically trained in each step. We apply that training to the tactical situation using mission, enemy, terrain, troops, time available, and civilian consideration (METT-TC). We conceptualize with judgment and critical thinking, while exercising interpersonal skills to communicate, teach, motivate, and lead.

Nothing is different in joint operations as it relates to skill and skill development. Operation Iraqi Freedom lessons learned by our engineer battle staff relating to this skill can easily be broken down using the model above. For example, at the beginning of ground operations, Coalition Forces Land Component Command (CFLCC) had three Marine Corps multirole bridge companies (MRBCs), one British M3 bridge company, and four Army MRBCs to assure mobility of ground forces as we attacked north to Baghdad. We allocated these critical bridging assets against the respective V Corps and 1st Marine Expeditionary Force (1MEF) missions. This bridging allocation plan received the highest level of attention, because without success in tactical bridging operations, the entire ground campaign could have been at risk. We found tremendous similarities between Marine and Army equipment, organization, operations, and training. Call that joint interoperability.

As integral members of the joint team, we had five Marine Corps officers on our battle staff, along with a Navy Seabee and an Air Force engineer. Before the start of the ground campaign, as we taught each other (interpersonal) about the capabilities and limitations of our materiel (technical) and the intricacies of our doctrine (tactical), we spent countless hours synchronizing (conceptual) our bridge plan to make sure it was right. It had to support the CFLCC plan and get the force quickly to the Iraqi Center of Gravity—Baghdad.

It came as a surprise to all the Army planners involved when we discovered toward the end of months of planning that though the three Marine MRBCs were ready for the fight, they were loaded on ships, but had only one set of bridge trucks, not three complete MRBCs as we knew them. What did that do to our plan? Where would we get CH-47 Chinook helicopters to sling bridge bays instead of ammunition forward in the zone? Where would the forward bridge park go, and who would secure it while the bridge crew built the bridges? What truck assets would be available when we needed to move the bridge bays?

Did we fail? Certainly not. But in a more time-compressed planning situation, or if the enemy had been successful in destroying fixed bridges, we would have had significant challenges to overcome. We didn't show the same inherent skill with this situation as we did with the SOSRA example. Maybe it was a harder problem, but the lesson learned was that we had to apply the same skill set—but with a joint engineering flavor.

Army engineers provided extensive support to the Marine Corps in Operation Iraqi Freedom, including the attachment of multirole bridge companies.

We also learned about command and control arrangements and how the different services really interpret and implement them. Changing task organizations between Army and Marine formations during the fight was tough. We discovered what it means to move an Army MRBC with 54 bridge trucks and other assorted vehicles from V Corps across the CFLCC zone to the 1MEF, rather than on paper or in a computer. And finally, we learned that with the speed of the battle and its ever-changing, ever-increasing requirements, we needed inherent joint skill to pull this and many other joint engineer challenges together.

So what are our key conclusions? Service engineers in a joint context must obviously be proficient in the skills of their service, but must also be joint skill-capable. The model above for establishing joint skill works, but we must get better at it because learning it in-theater is not a good approach. We may not have as much time to get it right when we do this again.

We can get there. In fact, recognizing that fact and talking about it begins the journey. The application of our model, using our four words above—interpersonal, technical, tactical, and conceptual—is critical. We must know ourselves and be able to employ our assets in any environment—our service engineer skill. But we must also know what's available and how it is employed in the other services. That's the power that makes us better than our opponent—our joint engineer skill.

Joint Doctrine Developments

By Lieutenant Colonel Reinhard W. Koenig

Can joint doctrine fix joint training and operational issues like those described above? Aren't we first supposed to look at the "D" in DOTMLPF for solutions? The answer is a qualified "yes" to both questions. As we look more to joint solutions in operations and training, the qualified "yes" should become much less qualified. Joint transformation implies a shift in the way we conduct unified action and in the way we train. It therefore requires changes in doctrine that will drive further changes in training, leader development, and even materiel development. Joint engineer doctrine clearly will need to transform as the force undergoes fundamental changes as part of that transformation.

Joint Publication (JP) 3-34, *Joint Doctrine for Engineer Operations*, is the overarching publication for planning and synchronizing the engineer effort in unified action. JP 3-34 is now being revised and will be combined with JP 4-04, *Civil Engineering Support to Joint Operations*, with an estimated publication date in 2006. JP 3-34 establishes the engineer battlespace functions of combat, topographic, and general engineering and directs the engineer effort to use these functions to help the joint force achieve assigned objectives and end states. The combat engineer function is further defined as mobility, countermobility, and survivability. JP 3-34 also guides planning, establishment of engineer staff organizations, and conduct of engineer operations. This manual extensively addresses the capabilities of each service's engineer organizations and how to integrate them into the operational plan of the joint force commander. Intimate understanding of this doctrine is required for a joint engineer officer to be successful, yet we do little or no training on these concepts.

JP 3-34 reflects and suffers from the way services now train and equip their engineer forces. Current engineer formations are structured to support the specific needs of their particular service, not the joint force, in an operational environment. This limits the ability of the joint force commander to focus engineer efforts at the time and place of his choosing. Joint engineer doctrine also recognizes the service Title 10 requirements that must be satisfied outside the joint environment. Ultimately, JP 3-34 is an effort to deconflict service requirements and at the same time gain synergy from various service capabilities. JP 3-34 is a manual that all services can live with, but it does not place the requirements of the joint force commander at the forefront, so it is going to change.

Unlike the past, when requirements were service-generated, the Joint Capabilities Integration and Development System (JCIDS) is now top-driven by the needs of the joint force and will drive doctrinal and other changes. The outlines of those changes are seen in current efforts to establish the needs of the joint force (Figure 2, page 19).

Engineer force developers from all services analyzed the established Joint Functional Concepts at the top and cross-walked them with the operational and tactical tasks in the Universal Joint Task List to establish the Joint Engineer Capability Elements (JECE). These codify the discrete warfighting effects that engineers from all services should provide to the joint force commander at all levels and throughout the spectrum of operations. Engineer DOTMLPF solutions need to focus on requirements established through analysis of these requirements. It is reasonable to assume that in the future, resourcing that does not address these needs is unlikely to be fulfilled.

The effect of the JCIDS process on future joint engineering doctrine, although unclear now, will be profound. Unlike current joint engineer doctrine, which gives the concepts of employing service assets in the joint fight, future engineer doctrine will assume much greater interdependence among the services. We will likely maintain an overarching set of joint engineer doctrinal principles, but doctrine will direct how each service will specifically support the joint force commander through application of the JECEs. For example, cross-service modularity of engineer capabilities will further increase the joint force commander's ability to employ engineer assets as needed, and doctrine will reflect this increased capability. Ultimately, these changes will give the joint force commander more options to employ joint engineer forces, because he will be focused on the desired effect and apply an engineer module to achieve that effect. The service providing the module should be transparent to the warfighter. This has tremendous implications for joint engineer training.

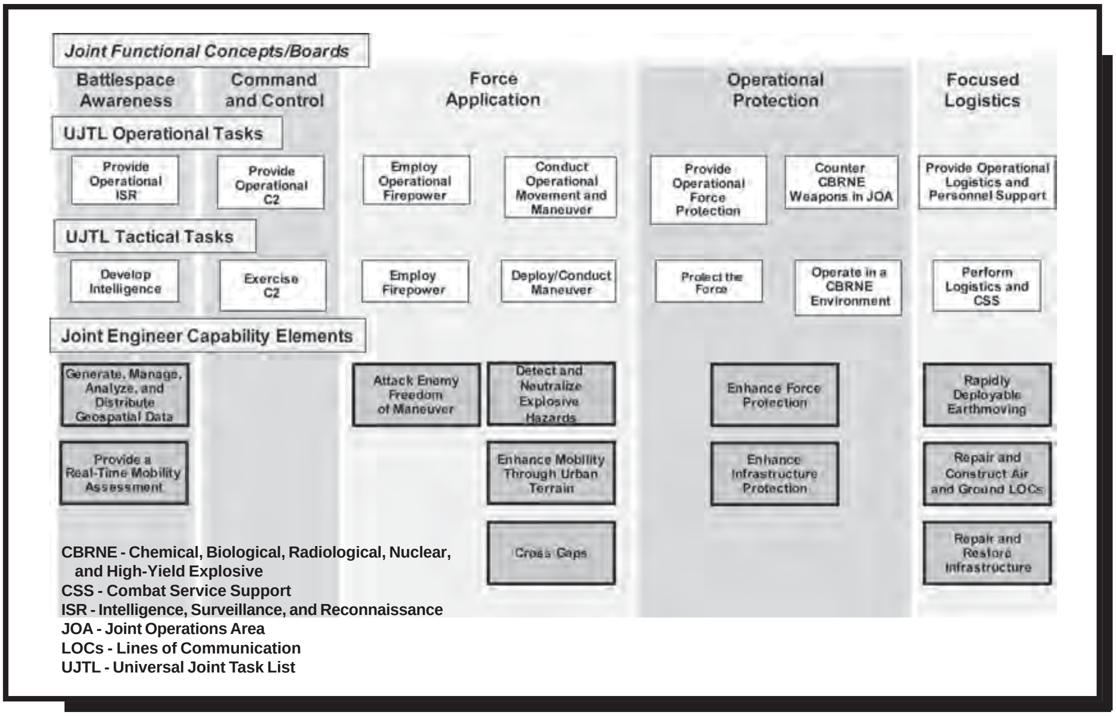

Figure 2. Top Down Crosswalk—Joint Functional Concepts to Engineer Capability Elements

Joint Officer Education of the Future

By Commander Steven C. Fischer

Engineer capabilities are in high demand, engaged in operations in Afghanistan and Iraq while supporting combatant commander theater engagement plans, routine training, and garrison support missions. To meet these challenges, the services have developed force rotation plans in which engineers perform missions traditionally executed by engineers from sister services. This is not only a challenge for the unit on the ground, it has also proven to be a challenge to engineer planning officers assigned to joint task force and combatant commander staffs. Most personnel newly assigned to joint engineer positions have little knowledge of engineer capabilities beyond their own service, limiting their effectiveness until they acquire experience on the job. Operation Iraqi Freedom showed this problem, but it isn't new.

Except for intermediate service schools, junior field grade engineer officers have few formal education opportunities to prepare them for joint engineer operations. Also, JPME has little or no engineer content. By default, most officers assigned to joint task force and combatant commander engineer staffs initially rely on their own experience and self-education. This clearly presents a steep learning curve before officers can contribute effectively by providing options and recommendations and implementing them in a joint engineer environment. An after-action review from Operation Iraqi Freedom noted, "Early planning efforts within the C-7 (staff engineer section) were hampered by a lack of knowledge of capabilities, requirements, and limitations of other service and coalition engineer forces, particularly among junior members of the staff. Action officers are often junior field grade or company grade officers who do not have sufficient joint engineer education or experience to be effective at the beginning of their assignment." To provide the combatant commander with options to meet their requirements, it is critical for engineers in a joint environment to fully understand the capabilities of each component engineer force.

The Joint Staff, J-4 (Logistics Directorate) sponsored an engineer capabilities study that examined this and other issues in detail. Involving the participation of the engineer community throughout the services and combatant commanders, the study concluded that the lack of formal education in joint engineer operations limits the ability of engineer officers to integrate their services' capabilities into missions involving joint engineer planning and operations. The study recommends that engineer officers be introduced to joint engineer operations earlier in their careers to prepare them for service with a combatant commander, joint task force, or other joint staff.

As recommended in the study, a general officer/flag officer forum—the Joint Operational Engineering Board (JOEB)—was established. The JOEB, which first met in January 2004, is the premier advisory group and proponent for operational engineering issues. Composed of senior logisticians and engineers from the Joint Staff, services, and combatant commanders, the JOEB is chartered to serve as a "board of directors" overseeing efforts to enhance joint engineer processes and capabilities to meet combatant commander requirements. One of the JOEB's first actions was to create a Training and Doctrine Working Group to address joint engineer training. This group is now organizing, prioritizing issues, and developing action plans.

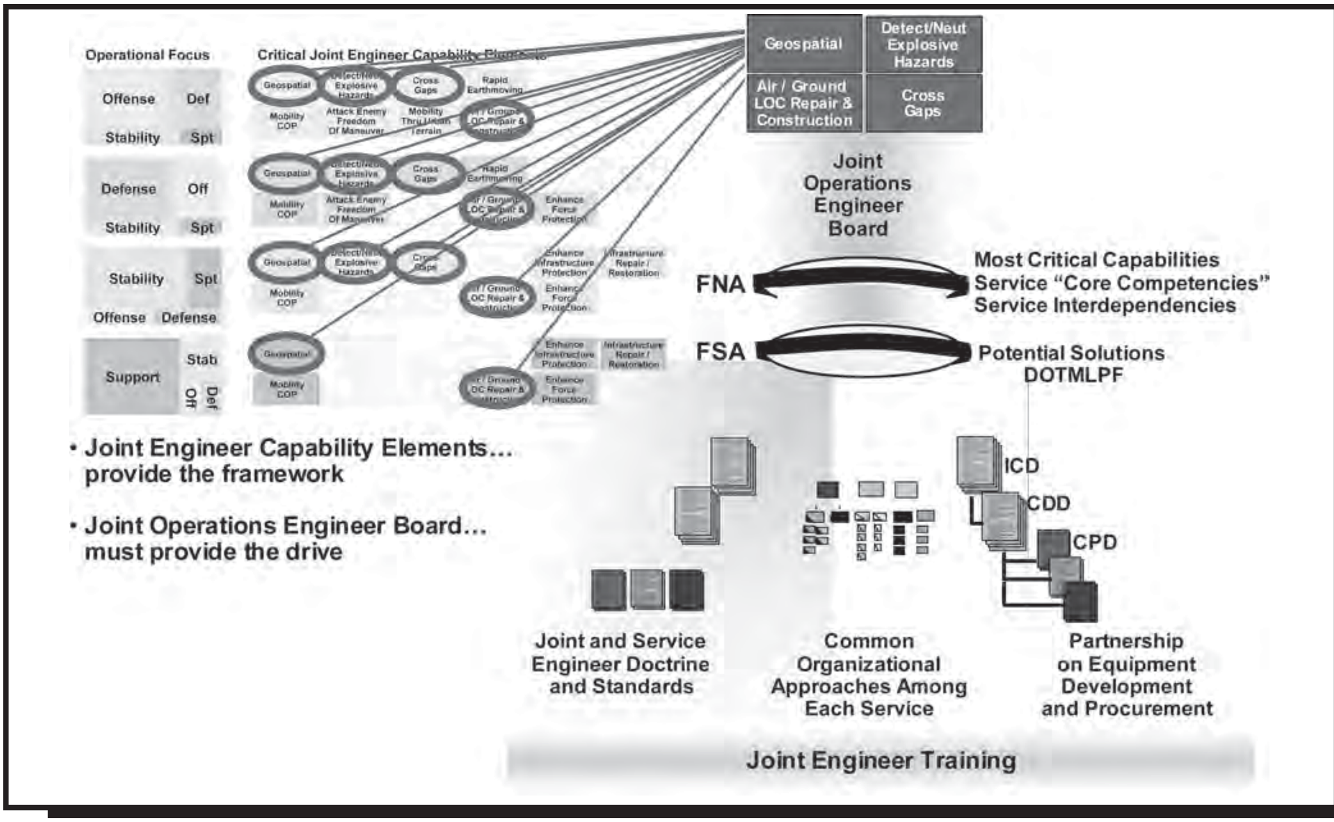

Figure 3. The Work to Be Done. . .to Fully Realize the Joint Engineer Vision

In the coming months, this working group will coordinate the details of putting together a joint engineer officers curriculum. Considerations include the following:

- At what level of professional development should joint concepts be introduced to the engineer officer corps?
- What skills do our combatant commanders expect in their engineer officers?
- Do we need a basic and/or an advanced training version?
- Will it be Web-based, taught in residence, or both?
- Where will it be taught, and by whom?

While these may be difficult questions, the joint engineer community should begin training officers to more effectively serve as joint engineers by fiscal year 2005.

Jointness used to mean "deconfliction"—ensuring sister forces weren't stepping on each other. Today jointness means services working together to ensure interoperability. At the staff level, that has been implemented through service officer representation. Tomorrow, jointness may mean interdependence, and that means leader responsibility for implementing joint engineering on the battlefield. In that evolving context, several things are clear:

- We must ensure that the hard-won lessons of today's operations are not lost.
- We must work to ensure that the leaders who will implement the joint engineer concepts of tomorrow are developed today.
- We must train our leaders and develop our doctrine to ensure that such joint approaches are implemented to accomplish the mission given to us by the National Command Authority.

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Colonel Smithers is the Assistant Chief of Staff, C7 (Engineer) and Deputy Chief of Staff for Third Army/U.S. Army Central Command/Coalition Forces Land Component Command. Previously he commanded the 14th Engineer Battalion (Corps)(Wheeled) at Fort Lewis, Washington.

Lieutenant Colonel Koenig is chief of the Doctrine Development Division, U.S. Army Engineer School, Fort Leonard Wood, Missouri. He previously served with the 326th Engineer Battalion, 101st Air Assault Division, Fort Campbell, Kentucky, and most recently in Korea.

Commander Fischer, Civil Engineer Corps, U.S. Navy, is a staff officer in the J4 Engineering Division of the Joint Staff. He previously served operational tours with the 3d Naval Construction Brigade, Naval Mobile Construction Battalions 62 and 74, and as a Logistics Civil Augmentation Program (LOGCAP) contract administrator in Somalia during Operation Restore Hope.

FORGING OUR FUTURE —

USING OPERATION IRAQI FREEDOM PHASE IV LESSONS LEARNED

By Lieutenant Colonel Reinhard W. Koenig

About a year ago, U.S. Army engineers crossed the line of departure for Operation Iraqi Freedom as members of a joint and multinational team. Immediately, and throughout the operation, they provided assured mobility for the force—breaching the berms at the Kuwaiti-Iraqi border, bridging gaps, reducing minefields, mitigating explosive hazards, providing an endless supply of geospatial products, constructing and repairing lines of communication, repairing airfields, and performing numerous other missions. Perhaps just as important, engineers executed their secondary mission of fighting as infantry, often as a primary mission.

To capture the myriad of lessons learned, the Engineer Regiment produced a draft after-action review (AAR) for Phases I through III and presented it at the Warfighter track of the Society of American Military Engineers Regional Conference in Savannah, Georgia, in November 2003. (See *Engineer*, October-December 2003, page 19.) Based on input from that conference and from across the Regiment, the U.S. Army Engineer School formed a doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) integration board to review each issue and formulate actions to resolve them. Solutions are being developed to address both short- and long-term challenges for the Regiment. While not all problems are easily solvable, it is important to note that approximately 50 percent of the issues from a similar effort in Operation Desert Storm were resolved before Operation Iraqi Freedom.

The transition from Phase III (decisive) to Phase IV (stability) operations is sometimes unintentionally portrayed in doctrine and training scenarios as smooth and easy. Experience in Operation Iraqi Freedom shows this is far from the truth. Some units that violently executed offensive operations suddenly, and in some cases immediately, found themselves supporting humanitarian relief operations, then rapidly returning to the offensive. Even today, it can be argued that engineers are simultaneously executing Phase III and IV operations. Engineers may be tasked to conduct cordon-and-search missions under combat conditions one day and provide construction support for schools and hospitals the next day. The last two issues of this publication included important articles that gave insights to the missions, challenges, and solutions of Phase IV. But given the additional complexity and the great challenges sappers in theater have met, it is time to begin compiling the Regiment's AAR for Phase IV. This will allow us to initiate the DOTMLPF solutions process the same way we are doing for Phases I through III.

During ENFORCE 2004 (26-30 April) the Engineer School will host a breakout session to begin to compile and analyze Phase IV issues. Individuals are encouraged to attend this

(Phase IV - Stability Operations) Soldiers from V Corps's 18th Military Police Brigade and 94th Engineer Battalion join an Iraqi policeman and contractor to cut a ribbon, celebrating the renovation of the Al-Jazaaer Police Station in downtown Baghdad. The project was a collaborative effort between military police, engineers, and Iraqi police and contractors.

(Phase IV - Return to Combat Operations) Engineers assigned to Alpha Company, 1-32 Infantry, 10th Mountain Division, use a breaching device to gain entrance to the building during a daytime raid of a shop suspected of producing and selling anticoalition CDs and DVDs in the town of Al Fallujah.

session to shape the discussion. If you cannot attend ENFORCE, please submit input on the issue, discussion, and recommendation format to <*doctrine.engineer@wood.army.mil*> for inclusion in all discussions. At the breakout session, we will have Colonel James (Jim) Greene, the engineer representative from the recent Center for Army Lessons Learned Operation Iraqi Freedom Combined Arms Assessment Team. Colonel Greene spent most of February in the area of responsibility, collecting information that will help guide the discussion.

Specific topics are being solicited and developed for the breakout discussion. The following areas are important to address:

- What lessons on modularity, Active Component/Reserve Component rebalance, and the joint and expeditionary mindset did we learn during Phase IV that should shape the road ahead for the Future Engineer Force?
- What geospatial products were useful during Phase IV, and how can our capabilities for this battlespace function be improved?
- What training for soldiers and leaders at home station and in the training base should be sustained or improved?
- The Regiment employed the 1138th Engineer Battalion (Missouri Army National Guard) as the Mine and Explosive Ordnance Information Coordination Center (MEOICC). What are the "sustains and improves" of this structure?
- Field force engineering was a huge success. How should the Regiment shape this capability for the future?
- Nation building is a major aspect of current operations. What have we learned and what actions do we need to take in the future?
- Base camp development was a major challenge for the Regiment. What worked and what did not?
- Engineers encountered explosive hazards, to include improvised explosive devices, on a massive scale. They quickly adapted to this dangerous environment and the associated missions. What actions should we take based on this experience?
- As part of this effort, engineers participated in one of the largest transfers of authority in history. What lessons should we take from this experience?
- What engineer equipment was useful during Phase IV? What equipment did not meet expectations, and how can we improve it?
- What are the joint aspects of Phase IV operations that have proved to be effective, and which need to be improved?
- What unit reports, histories, stories, and articles have been prepared and need to be submitted for analysis; archiving; lessons learned; doctrine; and development of tactics, techniques, and procedures?

This is clearly not an all-inclusive list, and many of these have important subtopics. So we encourage everyone to submit topics before and during the breakout session. As part of that session, we want to come as close as possible to articulating workable DOTMLPF solutions to the Regiment's leadership for immediate implementation.

The importance of this effort is readily apparent, and it is too easy to say that some of our problems are simply unsolvable. With sourcing for Operation Iraqi Freedom Phase III and beyond already underway, we owe it to the Regiment's great soldiers and leaders who are about to go in harm's way to give them our best effort in determining and solving the challenges they will encounter.

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How Transformation and JCIDs Impact Construction Equipment Modernization

By Mr. John Hegle and Mrs. Cathy Pryor

Your unit has old, maintenance-intensive construction equipment in need of replacement. While you appreciate the newer systems you've received, such as the hydraulic excavator or vibratory roller, equipment such as loaders and water distributors is in such bad shape you wonder if anyone cares about the unit's ability to accomplish its missions. Some of the equipment just went through a service life extension program, but much of it isn't suitable or cost-effective to rebuild. You may be short of equipment because it was so worn that it was "coded out." It may be difficult to find repair parts for some of the other equipment, or else the parts are very expensive. The unit may even have had to rent or lease equipment, and spent so much it would have been better off buying the equipment—but was told it couldn't. Surely this isn't the way things are supposed to work. Is anyone at the U.S. Army Engineer School planning to help? What is going on?

Change is going on, and sometimes change is painful. Army transformation, the Joint Capabilities Integration and Development System (JCIDS), and the Total Army Analysis process are producing many changes, challenges, and opportunities for the Engineer Regiment. Trying to be responsive to the field in the near term while preparing for the future is a significant challenge. Current world events don't make things easier. Couple that with an acquisition process that has changed almost constantly over the last four years, becoming more complex and time-consuming in an environment where everything is a possible bill payer, and you have the perfect setting for frustration.

Although the construction equipment budget has been slashed, work continues to define and document the requirements that will enable programming of funds. To understand the situation, you must know the lay of the land. To help yourselves, you must help us sell the critical role that construction equipment is playing in Operation Iraqi Freedom and Operation Enduring Freedom and that it will play in the Future Force. If the Engineer Regiment can't make this case, our chances of getting funding are slender, and our relevance to future operations will decline.

Situational Awareness

To be successful in the future, we must understand the environment we are operating in. At one end of the spectrum, we have the true, on-the-ground field environment—the soldier who can't understand why the Army does not replace his 25-year-old 5-yard loader and who pressed new Taliban loaders into service in Afghanistan because they actually worked. The need for reliable, supportable construction equipment is well understood at this level since it affects day-to-day operations. On the other end of the spectrum—where funding decisions are made—construction equipment must compete against a wide array of systems in a time of very limited resources. This is an arena where budget decisions may be made in minutes, often without an understanding of their impact on programs or the soldier on the ground. Decisions may be biased against buying new equipment because of the belief that "we can rent or lease commercial equipment if we need it." It is this end of the spectrum where we need to inject reality and understanding. While the future is uncertain, there are many things we know will be required of engineers and their equipment in the Future Force. Engineers will still be called upon to maintain the mobility of the force. Forces will rapidly deploy to territories and occupy them, and sustainment operations will be required. Many missions performed today will still be required tomorrow.

Missions

From a mission perspective, the physics of earthmoving are not going to change, and the requirements to build and repair roads and airfields and perform other construction missions are not going away. We must reduce the footprint of the force, minimize sortie requirements, and yet still accomplish our missions. We must identify the right mix of organizations and equipment. How many units and systems need to be transportable by C-130 aircraft? How many can't be because productivity and timely mission accomplishment outweigh initial deployability? We must pursue more reliable, less logistically burdensome systems that are easier to train, operate, and maintain.

Requirements

Missions drive organizations, which drive system requirements. As we modernize, we must take a hard look at where we are going and ensure that equipment evolves with our missions. We do not want to buy new equipment just for the sake of replacing the old. The Future Force will be a joint force. Deployability, speed, and responsiveness are critical to Future Combat System units and their survivability, as these forces move between noncontiguous areas of operation. Ultra-reliability, two-level maintenance, embedded diagnostics, and other factors also must be considered. These design goals are driven by the Army's transformation objectives.

How does this affect construction equipment? Commercial equipment brings reliability and supportability, but it typically must be adapted to meet Army requirements, such as the addition of blackout lights, a NATO slave adapter, tie-downs, or the redesign or removal of the cab to fit under bridges. Some equipment must meet airdrop, helolift, C-130 airlift or self-deployability requirements. This can drive us to develop military-unique equipment, sometimes compromising the benefits of commercial equipment. We seek to minimize these impacts on the force.

The implementation of JCIDS is a new challenge for the acquisition community and for engineers in particular. Gone are the days when engineers, or even the Army, dictated their own requirements. Today, requirements are top-down driven and supported by a joint vision with a joint concept of operations. Requirements are developed and evaluated from a joint perspective. An Initial Capabilities Document (ICD) replaces the Mission Need Statement (MNS), and the Operational Requirements Document (ORD) is replaced by a Capabilities Development Document (CDD) and/or a Capabilities Production Document (CPD). The JCIDS is oriented toward identifying and filling capability gaps rather than modernizing existing systems, the primary concern with construction equipment today. The bottom line is that we must ensure that our requirements and capability gaps caused by unreliable construction equipment are expressed and validated by the Department of the Army and the Joint Focused Logistics Capability Review Board and are understood to be critical to the Future Force and joint forces commander.

Budget Challenges

We can't program money without an approved requirements document. We can't defend Program Objective Memorandum (POM) funding without a clear link to the needs of the Future Force. We must fight the perception that construction equipment is a low priority and that we can buy, lease, or rent equipment or get a contractor to do the mission at the last minute. While the argument that commercial equipment is readily available is attractive on the surface, the truth is that leasing, renting, and buying nonstandard commercial equipment is much more costly in the long run. Equipment bought by units on an as-needed basis—

- Does not meet all approved user requirements for each specific equipment end item.
- Does not comply with Army regulations for type classification and materiel release.
- Has not been tested or given a safety release.
- Is not logistically supportable by Army maintenance and supply and does not have sustainment training.
- Is not approved for transportability by military conveyance.
- Is not approved by the Surgeon General's Office for health and safety.
- Is the unit commander's responsibility, as far as accident, injury, or fatality to troops is concerned.

Additionally, it is illegal for units to procure centrally funded equipment with their operations and maintenance money. However, leasing and renting remain attractive options and support Future Engineer Force concepts. A construction equipment lease study has been initiated with the approval of the Army Business Initiative Council. The study seeks to determine how a rent/lease/buy/contract acquisition strategy for providing construction capabilities might be executed and will identify the legal, policy, budget, and requirements changes necessary for implementation. The study will include a trial phase with certain types of engineer units.

“We must be creative and open to new engineer organizations and equipment that are more multifunctional, deployable, and tailorable.”

Why conduct a study? What’s wrong with buying? In a resource-constrained environment, we must look at new ways to deliver engineer effects on the battlefield. The upside of leasing/renting is that it gets more reliable systems with embedded diagnostic technology into units. Leasing/renting has a place in the Army in certain situations, but it does come at a price. For example, the projected cost of renting a 5-cubic-yard loader or backhoe loader to support Operation Iraqi Freedom is an estimated $10,000 per month. Longer-term, “always available” equipment leasing is typically not cost-effective either, as the break-even point is about 4 years. Since the Army keeps construction equipment for 20-plus years, leasing over the entire period would cost five times the price of buying new equipment. Could “just-in-time delivery” leasing for training and deployments be made more affordable? The lease study will evaluate the feasibility of leasing, answer the tough questions, identify prohibitive policies and regulations, make recommendations on potential equipment-leasing candidates, and determine the impact and risks associated with dependence on leasing.

On the procurement front, recent severe cuts have left construction equipment modernization at its lowest funding levels in years. Approximately $150 million per year is required for life cycle replacement of equipment. Current funding levels are less than one-third of what is required. Until decision makers understand the true cost (such as poor operational readiness, last-minute training, potential safety issues, transportability issues, and contractor logistics support costs) of rent/lease/unit-buy alternatives, funding levels are likely to remain low.

The Road Ahead

Where is the engineer force going? A Future Force concept with modular, tailorable organizations is being developed. New analyses and operational requirements documents are being developed. A Future Force centered around the Future Combat System is being planned. Dramatic change is coming, but the engineer role is not clearly defined yet. Currently, there are no engineers in the unit of action (UA), although this may change. The unit of employment (UE) and the engineer forces and equipment within it are still being developed. One thing we know is that much of the same type of equipment being used today will be required tomorrow. The numbers and proper mix of equipment are the big unknowns at this point and make selling the relevancy of construction equipment to the Future Force much more difficult. In the near term, the 3d Infantry Division and 101st Airborne Division are reorganizing, putting more pressure on the Engineer Regiment to fight for and define the Future Engineer Force as soon as possible.

Conclusion

The Engineer Regiment must educate joint and Army leaders on our transformational vision. We must seek better, more innovative ways to get our missions done. As the Army evolves through changing priorities and processes, the impact on engineer functional areas must be assessed to ensure that we can make the case that we are critical to the fight. We must look across the doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) and find new solutions to old mission needs. We must be creative and open to new engineer organizations and equipment that are more multifunctional, deployable, and tailorable. This may require tradeoffs when the benefits of military-specific equipment outweigh the reliability and lower per-unit cost of commercial construction equipment. We must be realistic and not just focus on engineer missions; we must think and plan as joint engineers and focus on being successful. That means assessing risks, strategizing our POM build, seeking joint and other Army proponent support for our capabilities, getting more bang for our buck, and lowering acquisition and sustainment costs. We must think and leverage joint capabilities and embrace a joint expeditionary mindset. We must consider divesting certain missions if it makes sense to do so, while ensuring that our Regiment remains adaptable, flexible, and responsive. We must ensure that the value of construction capability is recognized, especially by the leaders who are making critical funding decisions.

We rely on input from the field to ensure that our requirements reflect reality. If you have ideas to help sell construction capability or the need to replace existing construction equipment—and promote its critical role in the Future Force—please call the Directorate of Combat Developments, Engineer Division, Mobility Team, DSN 676-7338 or 573-596-0131, ext. 37338.

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Mrs. Pryor is a combat developments materiel analyst, working for the Mobility Team in MANSCEN DCD, Engineer Division. She has worked on requirements development and fielding of construction equipment systems for 11 years.

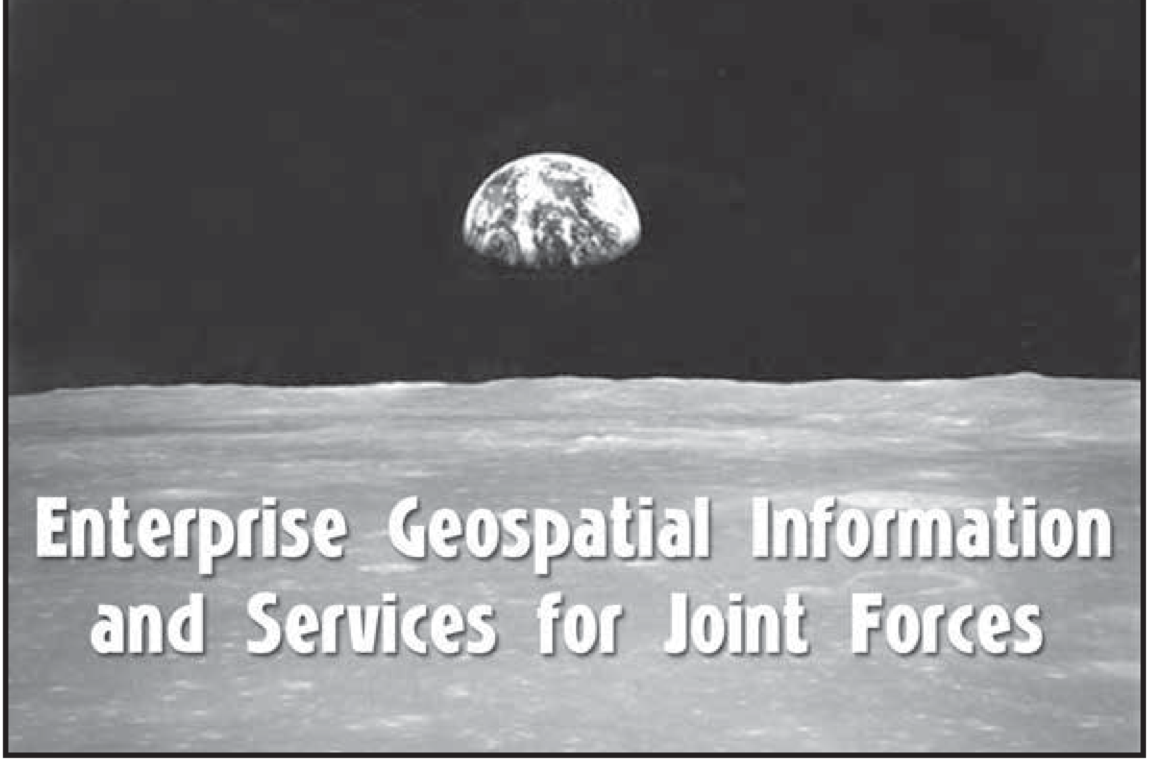


Photo courtesy U.S. Geological Survey

By Colonel David A. Kingston, Chief Warrant Officer 5 Ken Tatro, and Mr. Ken Bergman

Joint Vision 2020 describes how information will enable dominant battlespace awareness as part of information superiority. Geospatial information and services form the framework for understanding the physical environment and its impact on combat operations. This article shows how joint forces and their service components use geospatial information and services, how information is provided from the national level down to platform/user level, and how that information is dynamically updated and fused at all levels. The article also discusses doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) implications to ensure that the tenets of Joint Vision 2020 are met.

Using Geospatial Information

In the Joint Vision 2020 time frame, joint forces and their components will use geospatial information for three major purposes:

- Battle command.
- Training.
- En route mission planning and rehearsal.

Also, combatant commands (primarily Joint Forces Command) use geospatial information for experimentation and combat development.

The joint command and control (JC2) capability will enable joint force commanders to exercise battle command more effectively. The JC2 Operational Requirements Document (ORD) clearly articulates the need for timely and accurate digital geospatial products. Department of Defense (DOD) battle command capabilities require geospatial data to support all aspects of command and control (C2) and intelligence, surveillance, and reconnaissance (ISR)—from planning and tasking ISR assets, deliberate C2 planning and dynamic planning/replanning on the move, execution (such as targeting and navigation), and after-action reporting. Also, the distributed common ground station requires geospatial information for analysis and fusion of the weather and the enemy portion of the common operational picture (COP).

The DOD Training Transformation Strategy revolutionizes the way joint and service component forces train. Systems will have an embedded training capability to allow users to train while en route, in-theater, and at home stations. Geospatial information is a requirement for this embedded training. Unforeseen contingencies can require rapidly generated geospatial data before deployment. Also, the Joint National Training Capability that links the major training centers and systems of each service, under development by Joint Forces Command, will not work without the required common geospatial data.

En route mission planning and rehearsal systems are simulations that warfighters will use to rehearse missions before execution. These systems require robust, accurate, and timely geospatial information.

While joint force headquarters and their components need timely and accurate geospatial data, the types of data required will vary. At the joint force headquarters level, an operational level of geospatial data is required. However, the commander and his staff must be able to "drill down" to use high-resolution geospatial information over areas of key interest and importance.

For the naval warfare component (Navy and Marine Corps), the primary focus of geospatial information is on littoral areas, bathymetry (water depths), and navigation charts. The air component is interested in aeronautical charts and vertical obstructions. The land component (Army and Marine Corps) have the most challenging demands for geospatial information. Because the terrain has such a major impact on land combat operations, ground warfighters need much more detailed geospatial information. As potential adversaries increasingly use complex terrain and urban areas, there will be a commensurate increase in the need for detailed geospatial information. Special Operations Forces—because of their ability to operate on land, sea, and air—require the same type of data but with ultrahigh resolution and extremely timely delivery. Also, joint and service components require geospatial data for targeting. As weapons systems become more accurate, the required accuracy of geospatial data for targeting also increases.

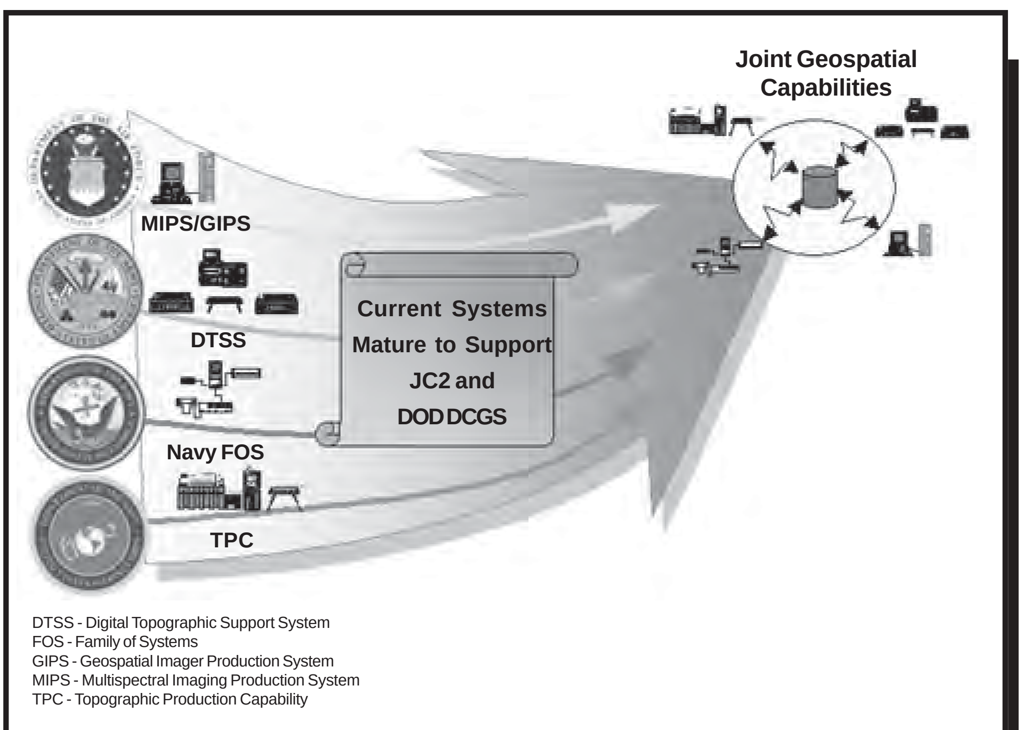
Evolving joint operations rely on service interdependence more than ever, so the lines separating the types of data each service requires are becoming blurred. The bottom line is that battlespace awareness and our ability to conduct joint operations as envisioned in Joint Vision 2020 simply cannot be accomplished without robust, accurate, and timely digital geospatial information.

Providing Geospatial Information to the User

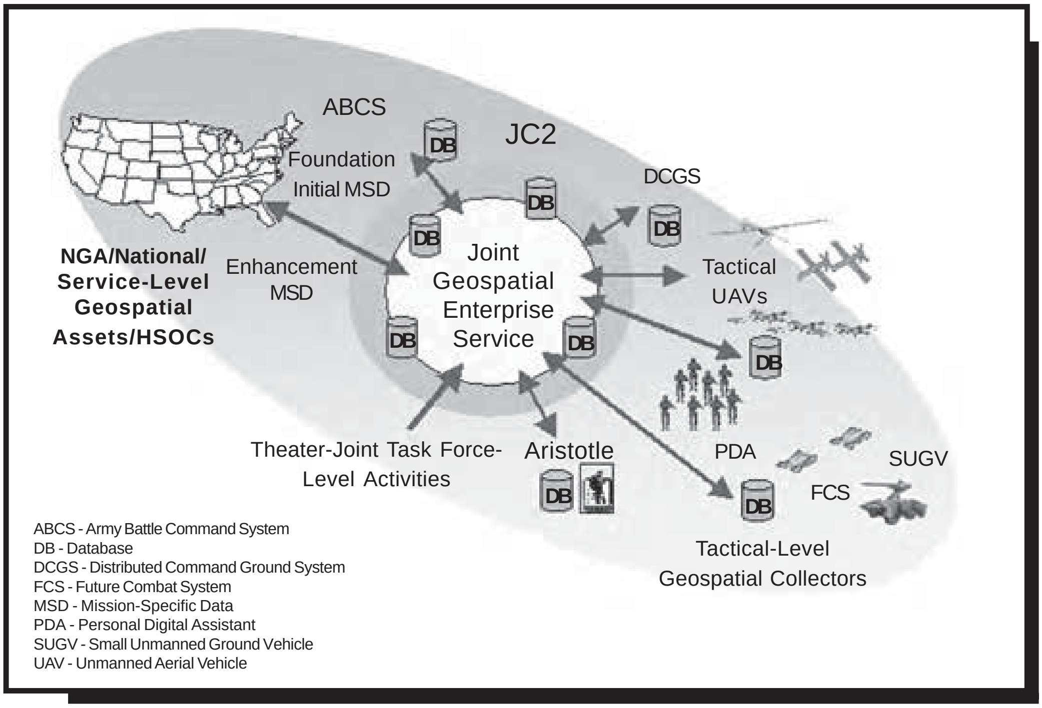
The imagery and geospatial Capstone Requirements Document (CRD) and the National System for Geospatial Intelligence ORD describe the concept and process for tasking, collecting, processing, managing, disseminating, and exploiting geospatial information to form the foundation for the COP. In the Joint Vision 2020 time period, the process will begin with a near-global foundation data set produced by the National Geospatial-Intelligence Agency (NGA). For mission planning and visualization, mission-specific data sets will be developed to provide the required level of geospatial information to the combatant commander. Additionally, NGA and the services agreed on a line of demarcation that calls for NGA to provide systems (hardware, software, and exploitation tools) and information down to combatant command level (on a case-by-case basis to the joint task force level). Beyond this line, services will provide their own systems to support their own organizations.

These service systems must comply with the requirements established in the imagery and geospatial support CRD. Thus, at component commander level and below, each service must be able to generate and manage its own geospatial information. For example, the Army must be able to rapidly generate and fuse data from multiple sensors on unmanned aerial vehicles, land vehicles, and individual soldiers.

Services will need to build some terrain data, using an enterprise (distributed) geospatial support capability over multiple sites. This will be achieved using geospatial sensor systems in the field, regional home station operations centers (HSOCs), and service-specific knowledge centers that can augment and build on the NGA foundation data to meet tactical-level needs. Geospatial data files can often be extremely large, and the processes to generate, disseminate, and update this geospatial data depend on a robust management and dissemination/communications architecture. It is envisioned that hard media such as digital video discs (DVDs) and compact discs-read only memory (CD-ROMs) will be used with high-bandwidth communications (where available) to provide the initial load of geospatial data, with radio/satellite communications to transmit updated data to platform and soldier levels.



Joint geospatial capabilities reside on the current service-based systems, and those systems mature to support joint and service-level command and control systems in a network-centric environment.



The Joint Forces Command is sponsoring a Joint Geospatial Enterprise Service to establish the standards and formats necessary for services to interoperate. This capability will evolve from current systems (DTSS, MIPS/GIPS, and TPC).

Manipulating and Fusing Geospatial Information

As missions unfold and more data becomes available, and as geospatial information changes (bridges are destroyed, buildings become rubble), databases must be automatically updated. Updates can come from all sources—from national assets to individual soldiers on the ground. Thus, each service must conduct some level of geospatial data enhancement. Data updates from services will be shared horizontally and vertically up echelons through component headquarters, to combatant commander headquarters, and up to NGA. Only updates to data sets will be distributed, to prevent resending extremely large data files. Management of these data files will be a complex operation. Failure to properly manage, conflate, and distribute data files would result in multiple differing COPs, within and between service components and joint headquarters, with potentially disastrous results.

DOTMLPF Implications

The entire DOTMLPF process must be reviewed to correct the system's deficiencies. The most glaring deficiencies appear to be in the areas of doctrine, organizational designs, and materiel solutions. Joint Publication 2-03, *Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations*—the overarching publication that covers geospatial capabilities—does not adequately address how component and joint headquarters work together to generate and manage geospatial data. Current organizational designs do not reflect how NGA support teams augment joint task force and service headquarters. Finally, there is no joint geospatial system that provides the necessary capabilities for the joint force headquarters to generate, conflate, and manage geospatial data.

Joint and component commanders require robust, accurate, and timely geospatial information for combat operations. The demand for more exact, accurate, and timely delivery of geospatial information will increase greatly as joint forces and components field increasingly capable battle command training and en route mission planning and rehearsal systems. Our current processes and systems have severe deficiencies that must be corrected if Joint Vision 2020 is to be realized.

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Mr. Bergman is the technical representative from ERDC-TEC to the TPIO-TD. He holds a bachelor's in science from the U.S. Naval Academy and a master's in science from George Mason University.

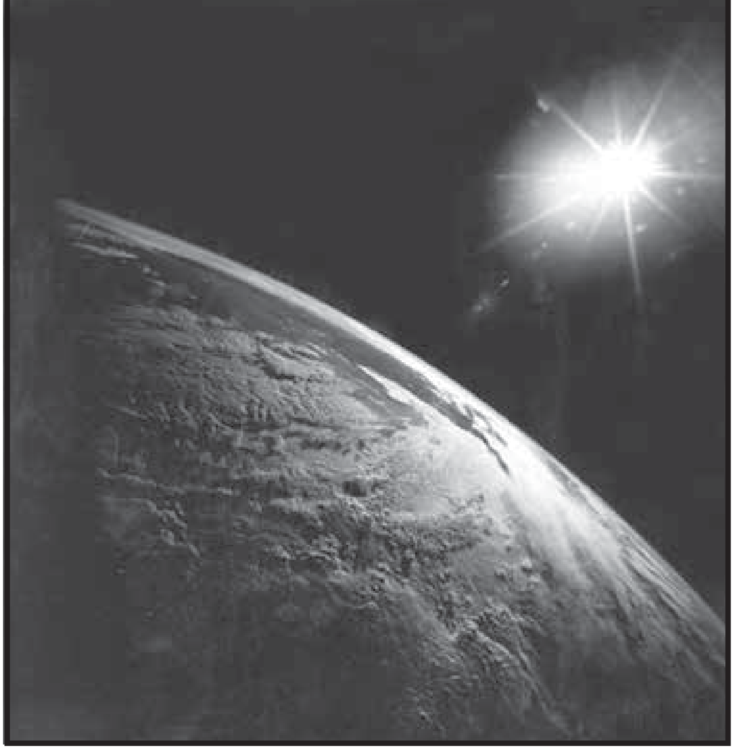


Photo courtesy U.S. Geological Survey

Joint/Army Geospatial Data Enhancement

By Mr. Ken Bergman

This article presents an overview of the essential types of terrain data, their uses and methods of collection, and the use of joint capabilities to overcome terrain data shortfalls. Examples of Army geospatial data enhancement are provided to show how service-level terrain data production can contribute to the warfighter.

The Army requires digital terrain (geospatial) data to function effectively on the battlefield. Today's forces use geospatial data in computer systems to provide an understanding of the terrain in the field. The geospatial data we have does not provide a perfect picture of the terrain, but it should give us a representation that is useful at the appropriate level of detail. Lower-resolution terrain data enables leaders at the theater level to plan operations, while higher-resolution products facilitate tactical-level operations. It is impossible to have digital terrain data that matches the terrain exactly, due to cost and technical limitations. Because our forces deploy worldwide on short notice, there will never be enough terrain data to meet all our needs. It is therefore important that we define our terrain data requirements carefully and focus limited geospatial production assets on the areas that are of most importance to us.

Command and Control Systems and Terrain Data

First, we need to address terrain data applications to establish the relevance of this product to the warfighter. The Army Battle Command System (ABCS) was developed as a cutting-edge suite of tools to deliver command and control (C2) functions across the various battlefield functional areas (BFAs). Significant resources were invested in the ABCS, with the result that the 4th Infantry Division and a few other units were given a high level of capability, while most units did not receive the ABCS. When the U.S. Army's V Corps deployed to Iraq last year, it did not have the ABCS, so it used a joint system called Command and Control Personal Computer (C2PC), which has less capability than the ABCS but is more affordable. As a result of lessons learned from Operation Iraqi Freedom, a "good enough" initiative was started to define C2 systems that all Army units could field right now, within limited budgets. In addition to C2PC, V Corps also used a system called FalconView™, which provides two-dimensional (2-D) and three-dimensional (3-D) terrain visualization capabilities. Also, Force XXI Battle Command Brigade and Below (FBCB2), which provided an unprecedented blue force tracking capabiltiy, used an optimized terrain data load. All C2 systems require some level of digital terrain data to achieve terrain understanding. In addition to C2 systems, the Future Force is scheduled to use terrain data in modeling and simulation formats to conduct training before forces deploy to combat.

In Iraq and Afghanistan, Army and Marine Corps terrain teams supported their respective components at the operational and tactical levels. The National Geospatial-Intelligence Agency (NGA) provided terrain data and theater-level geospatial analysts who supported Army terrain teams at the operational level. Army and Marine Corps terrain teams supported their respective components at the operational and tactical levels. Coalition forces made important terrain data contributions, especially in the early fighting in Afghanistan. But where does terrain data come from, and how can we ensure its availability?

Terrain Data Types

Some essential types of terrain data that the Army requires are maps, imagery, elevation data, and feature data. The NGA is the primary source for these products.

Maps. Maps are still a geospatial mainstay for the soldier. It is important to have both hard-copy and digital versions. The digital versions in the field need to be the same as the hard-copy maps.

Imagery. Georeferenced imagery provides a digital "photo" of the terrain with embedded geocoordinates (latitude/longitude or the Military Grid Reference System). The NGA is rapidly building an archive of unclassified georeferenced imagery which can help achieve terrain understanding.

Elevation Data. This data provides a digital representation of the earth's surface. At lower resolutions, this product provides a basic understanding of the lay of the land. At higher resolutions, elevation data provides a detailed representation of roads, alleys, and multilevel buildings in urban environments. Higher-resolution elevation data can give soldiers an important advantage in both urban and complex terrain. Elevation data is a key element for terrain reasoning, because it can be used to derive slope and other aspects of the "skin of the earth" that impact maneuverability.

Feature Data. Terrain features (such as roads, bridges, rivers, utilities, and buildings) are represented by digital feature data. Attribution ("right-click" data) is an important aspect of feature data, since it defines an object to some level of detail (such as bridge specifications, number of lanes in a road, stream velocity, and bank height). Figure 1 shows an example of feature data. The right-click information for one of the hard-surface roads is shown here in the feature table. Feature data with sufficient levels of detail can be used in automated systems to predict mobility, countermobility, and other terrain analysis parameters.

Terrain Data Generation and Use

Figure 2 shows a top-level overview of terrain data generation, transformation, dissemination, and use. Source data is collected using satellites or in-theater assets. This data is processed to generate interim products, which are transformed into finished products for use by field units. In some cases, source data and interim products can be used effectively by warfighters, before transformation into finished products.

Terrain Reasoning

Current battle command systems can display a static snapshot of a particular aspect of terrain (such as mobility analysis or helicopter landing zones). Terrain reasoning, on the other hand, gives the maneuver commander the power to do "what if" terrain analysis based on changes in the terrain using the C2 system in real time. For example, if a soldier encounters a minefield or a destroyed bridge, he can enter an icon to indicate that the road is blocked and then conduct a new route analysis based on criteria such as the fastest route, shortest route, and covered and concealed routes. This technology is being developed by the U.S. Army Engineer Research and Development Center–Topographic Engineering Center (ERDC-TEC). Terrain reasoning has not yet been fully embedded in C2 systems, but TEC is working with the Communications and Electronics Research, Development, and Engineering Center (CERDEC) to achieve this. Terrain reasoning requires the use of elevation data and feature data with sufficient right-click content to enable automated analysis. Without good data, the results of both static analysis tools and terrain reasoning applications will not adequately support tactical-level warfighters.

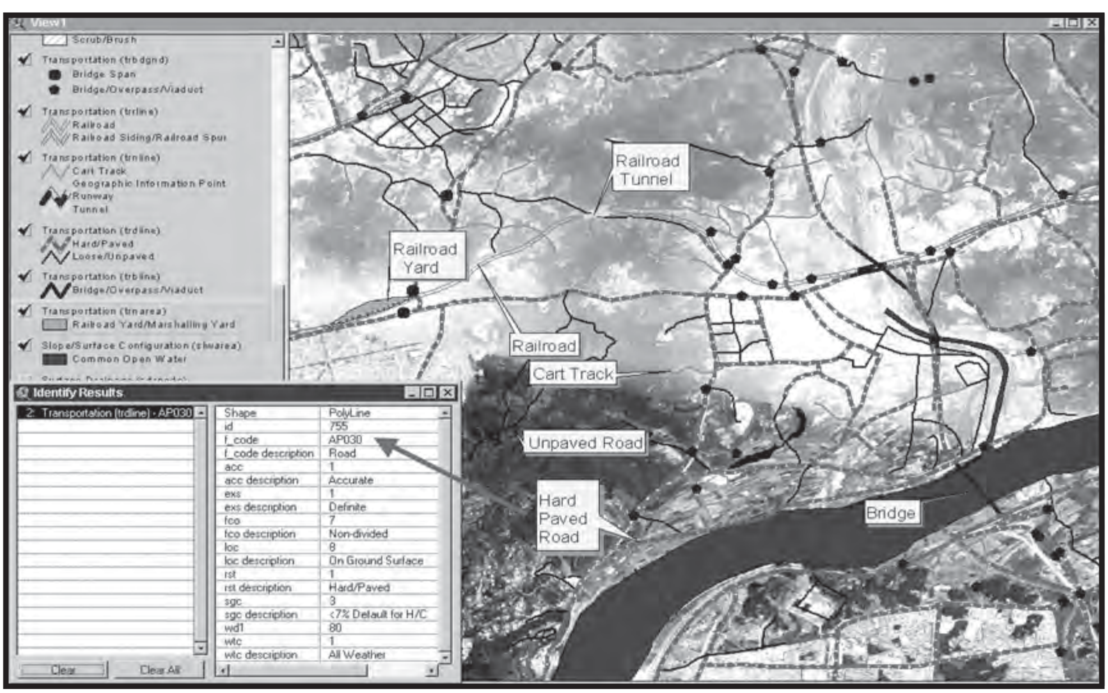


Figure 1. Feature Data - Transportation Layer

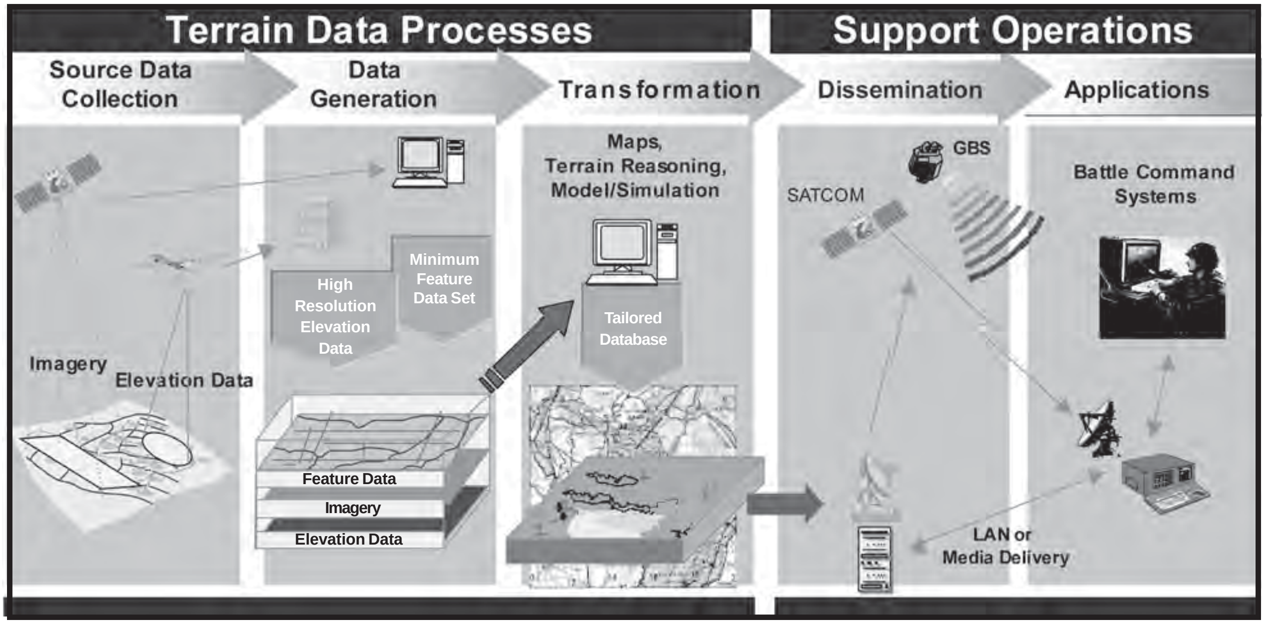


Figure 2. Geospatial End-to-End Process

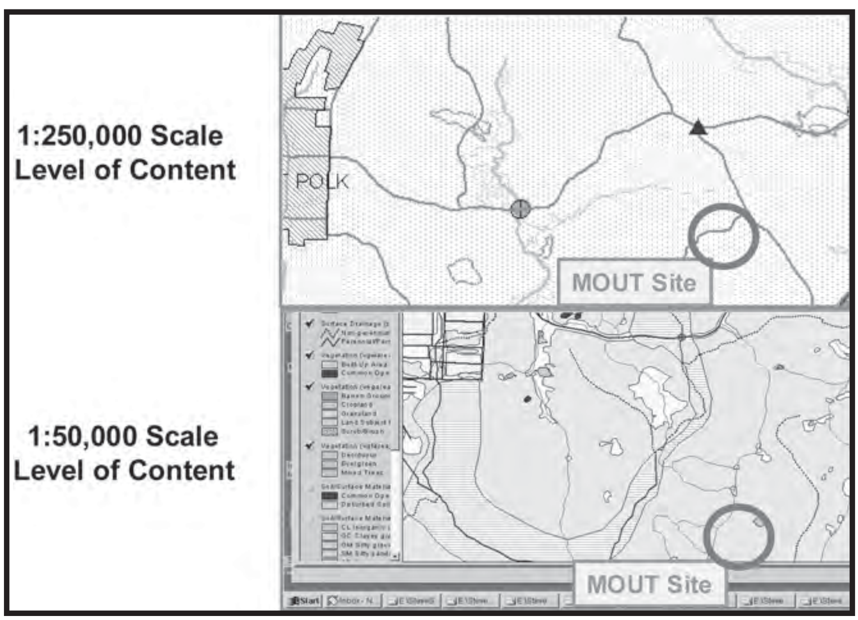


Figure 3. Varying Levels of Content in Feature Data

Terrain Data Shortfalls

There is a huge shortfall in terrain data worldwide. There are not enough current, detailed maps to support rapid response to contingencies in many regions. The digital geospatial picture we provide to soldiers plays a key part in all four steps of the Army's credo of "see first, understand first, act first, and finish decisively." We must do better. We must provide a better geospatial representation of the battlespace to give our soldiers the home field advantage before and during crisis response.

Figure 3 provides an example of the terrain data shortfall. The feature data displayed here shows North Fort Polk, Louisiana. The upper depiction shows feature data at a 1:250,000 scale, while the lower depiction shows a tactical level of detail (1:50,000 scale). The 1:250,000 version missed many features that impact maneuver, such as dirt roads, open spaces, an airport, the detailed road network in the city, more detailed stream network, and the military operations in urban terrain (MOUT) site. Clearly, a battalion commander planning maneuvers in this region would need the 1:50,000 level of detail. In terms of terrain reasoning, a computer algorithm would provide much different results based on the level of detail provided at the 1:250,000 scale versus the 1:50,000 scale. Much of the world has 1:250,000 scale feature data available, but there are relatively few places where feature data is available at the 1:50,000 or 1:100,000 scale. In addition, the right-click data for these features is frequently inadequate.

Overcoming the Shortfall

The Army and NGA are working with the joint community to overcome the terrain data shortfall. The NGA has the mission and resources to build most of our geospatial products. There has been a marked increase in the generation of source products, including imagery, elevation data, and feature data. Although NGA has built more source products, there is a growing shortfall of finished geospatial products such as maps and terrain reasoning data. There are three steps to overcoming this shortfall.

NGA Oversight. The process of prioritization for NGA production has resulted in an increased availability of source products, but not enough finished products. Users must shift NGA's focus toward the generation of more finished products.

Increased NGA Funding. There is a shortfall in NGA resources for geospatial data production. Once the priorities for producing finished products are addressed, the NGA should get more resources for increased production of finished products.

Service-Level Geospatial Data Enhancement. The NGA will remain the "factory" for the majority of geospatial information, but the services have a role to play in terrain data generation. Before deployment, home station operations centers (HSOC) will provide custom products using available geospatial assets. At some point, as forces flow into theater, warfighters on the ground will be the true experts regarding knowledge of the terrain. New sensors—such as handheld personal digital computers—will provide a surge of information that will be captured at the service component level in theater, with data flows to the national level for archiving at NGA.

Geospatial Data Enhancement

The services will not build maps en masse for the NGA, since it is NGA's mission to build maps and other standard products. So if NGA is the factory for production of terrain data, what will the services do to contribute? Below are three examples of geospatial data enhancement that are taking place now, and that will increase in the future.

Urban Tactical Planner (UTP). The UTP is a digital product that provides detailed urban terrain information to users. TEC has built and distributed many UTPs over high-interest urban areas. UTPs can be used from remote sites via the Web or can be installed for use on individual workstations without the purchase of software licenses.

Analysis Feature Data. The Maneuver Support Battle Lab, Fort Leonard Wood, Missouri, in conjunction with other Training and Doctrine Command (TRADOC) organizations, is conducting experiments using NGA feature data that has good spatial accuracy, but limited attribution (right-click information). ERDC-TEC is building more attribution into this feature data and merging new features into the data set to facilitate the use of new terrain-reasoning capabilities in experimentation. ERDC-TEC will also examine the types of features and attributes needed for terrain reasoning, in conjunction with the U.S. Army Engineer School's Terrain Visualization Center, now located at the Technology Park at Fort Leonard Wood, Missouri.

Modeling and Simulation (M&S) Terrain Data. The Army has developed its own capabilities and infrastructure to convert NGA data into M&S formats. The Future Force will use M&S training capabilities in wargame scenarios before deployment, making Army forces more effective. The shortfall in detailed, high-quality terrain data directly impacts M&S applications, just as it limits C2 applications.

Relevance to the Warfighter

The availability of terrain data was a critical aspect in joint operations in Afghanistan and Iraq. Army terrain teams, working with joint and coalition forces, defined helicopter landing zones, avenues of approach, and trafficability analyses using geospatial data. After major combat operations ceased and nation building started, geospatial products were used for follow-on stability operations and support operations (SOSO). Mapping urban regions in more detail is very important, with route analysis and emerging urban terrain products becoming more relevant as lessons learned are incorporated into newer geospatial tools.

Implementation Plans

Past, current, and future operations can become more successful through the availability of high-quality geospatial products. There is clearly a need for joint geospatial data enhancement to build on NGA's terrain data. The Army is working at the joint level to increase the production of terrain data. At the service level, the Army is formulating plans to build more infrastructure for geospatial data enhancement, to include ERDC-TEC as the Army-level geospatial knowledge center; theater-level geospatial centers of excellence; and geospatial sensors and support capabilities at the unit level. The Army is considering how to implement a test bed to examine geospatial data enhancement processes. Joint Forces Command and the other services are initiating a Joint Geospatial Enterprise capability that uses distributed assets to meet the user's needs, not just at a single, centralized location. Trade studies are being defined by the NGA and the Army to determine the best mix of assets to meet geospatial shortfalls. All of these efforts will provide better geospatial support for the warfighter. In the meantime, the Army will use all in-house resources to provide the field with the best possible geospatial support and simultaneously push to get more finished products from the NGA.

Mr. Bergman is the technical representative from ERDC-TEC to the TRADOC Program Integration Office for Terrain Data at Fort Leonard Wood, Missouri. He has a bachelor's in science from the U.S. Naval Academy and a master's in science from George Mason University.

Mine and Explosive Ordnance Information Coordination Center Operations in Iraq

By Major William B. Blaylock II and Mr. Dorian V. D'Aria

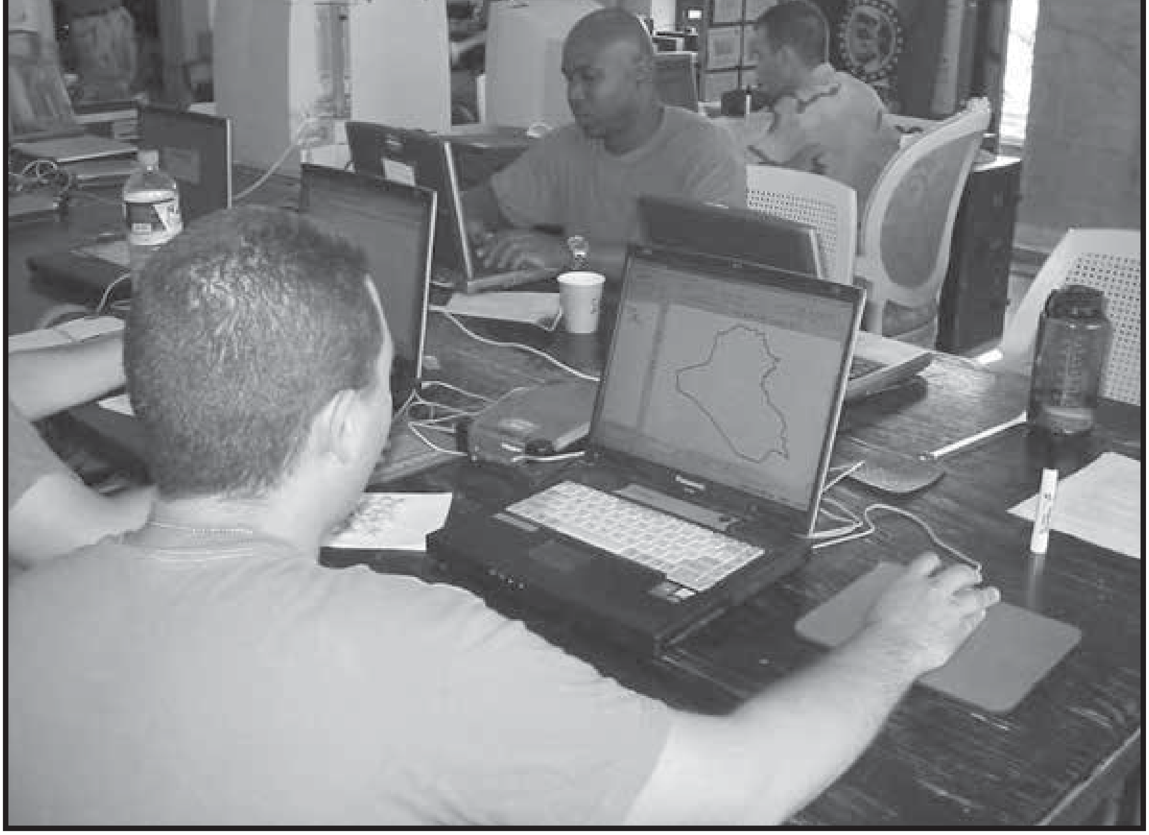
Since Desert Storm in 1991, U.S. forces have operated in numerous foreign areas—to include Kuwait, Somalia, Bosnia, Kosovo, Afghanistan, and Iraq—littered with land mines and the explosive devices of war. Each of these countries presented a unique set of explosive hazards, enemy activities, environmental conditions, and operational requirements for our soldiers. In each case, U.S. forces participated as part of the joint and multinational coalition community, often including military and nongovernmental organizations.

Historically, each area of operations might have had an ad hoc Mine Information Coordination Cell (MICC) to track explosive hazards, coordinate safe military movement in mined areas, support force protection through hazard awareness training, and occasionally provide oversight of indigenous demining activities. If humanitarian demining operations were active in the region, the United Nations often established a National Mine Action Authority (NMAA) to coordinate Mine Action Center (MAC) operations in theater.

Unfortunately, the U.S. Army does not have procedures or a doctrinal organization to conduct MICC operations, which often results in regional improvisation and diversity among units. Minefields and hazards might be tracked with Excel® spreadsheets, FoxBASE®, Access database, or Microsoft® PowerPoint® slides and a grease pencil. Often, relations between military MICCs and humanitarian demining activities were hostile, or at least strained. Coordination between coalition partners and U.S. ground forces had no common baseline for information dissemination and cooperation.

Anticipating these problems, U.S. Central Command (CENTCOM) Coalition Forces Land Component Command (CFLCC) staff engineer section (C7) contacted the U.S. Army Engineer School Countermine/Counter Booby Trap Center (CMCBTC) at Fort Leonard Wood, Missouri, for help in designing a theater MICC for Iraq and developing a training plan for its implementation. The C7 recognized that an active, functional MICC was needed to support military operations in Iraq, stabilize the nation, and reconstruct the country. It would

Soldiers of the 203d Engineer Battalion train to find mines as part of the extraction drill process. This helps soldiers safely extract themselves if they inadvertently enter a minefield.



Tactical Minefield Database System

require coordination with all ground forces and joint U.S. and coalition militaries, as well as humanitarian agencies, the United Nations, and numerous nongovernmental organizations.

Eventually, the Iraqi theater MICC was named the Mine and Explosive Ordnance Information Coordination Center (MEOICC) and its mission assigned to the 1138th Engineer Battalion (Missouri Army National Guard) on 31 March 2003. Since the MEOICC was a new concept, and the 1138th was designated as the first prototype, the unit was reorganized to satisfy the requirements of a MEOICC. The 1138th concluded its predeployment training at Fort Leonard Wood with a three-week MEOICC operations course presented by the CMCBTC. Training included tracking mines and explosive hazards with the Tactical Minefield Database (TMFDB) System, MICC operations and procedures, mine awareness instructor training, engineer-specific instructor training, United Nations demining operations and standards, information collection and analysis, incident investigation, an overview of mine detection dogs, and other topics to enable them to conduct their mission. Also, key members of the staff traveled to Bosnia to examine operations in an active MAC/MICC before departing for Iraq.

The 1138th Engineer Battalion deployed into theater on 23 May 2003 and was augmented with a U.S. Marine Corps explosive ordnance disposal (EOD) staff sergeant, a Mongolian captain, a Ukrainian major, and an Australian major to constitute the MEOICC. Throughout Operation Iraqi Freedom, the MEOICC provided a common operational picture (COP) and situational awareness of all known explosive hazards to enhance force protection and the operations of coalition forces. This information was provided to all coalition forces and to NMAA humanitarian operations that involved mines, unexploded ordnance (UXO), improvised explosive devices (IEDs), and booby traps in order to minimize injuries to friendly forces and civilians. Through the efforts of the 1138th, countless lives have been saved. Units have better awareness of explosive hazards in the area, and through explosive hazard awareness training, soldiers understand how to respond to explosive hazards.

The TMFDB was indispensable for tracking minefields, UXO, and IEDs. The system is based on ArcGIS™ (civilian software) and allows analysis of explosive hazards with greater ability than previous methods. (Historically, MACs had little ability to locate, track, and portray explosive hazards.) The TMFDB team provided geospatial products for the Coalition Joint Task Force-7 (CJTF-7), major subordinate commands, Task Force Restore Iraq Electricity, the captured enemy ammunition cell, the NMAA, and elements of the Coalition Provisional Authority. The TMFDB team posted overlays using Command and Control Personal Computer (C2PC) software, shape files for use in ArcGIS and FalconView™, spreadsheets containing explosive hazard data, and maps showing demining nongovernmental organizations working in theater.

A variety of units used this information. Brigade combat teams accessed information about nongovernmental organizations working in their battlespace. Since this information became available in late July 2003, there have been no incidents of coalition forces mistaking nongovernmental organization personnel for opposition fighters. (There had been one incident before this process was enacted.) The C5 Strategy, Policy, and Plans Section regularly uses TMFDB data to analyze IED attacks in the planning process, and the data was often used to prepare for military operations.

The MEOICC also included an Explosive Hazard Awareness Team (EHAT), which evolved over the deployment. At the outset, the program of instruction focused on mine and UXO awareness, but it soon became obvious that IED awareness training was critical. The officer in charge of the team and his trainers developed IED training to incorporate into the explosive hazard awareness program of instruction. Over seven months, the EHAT trained 4,500 soldiers on explosive hazard awareness and trained 279 soldiers as EHAT instructors for the brigades. These instructors undoubtedly caused a cascade effect in the number of soldiers trained. The Center for Army Lessons Learned has pushed an updated training package produced by the EHAT for use at all continental United States (CONUS) replacement centers. Again, the efforts of the MEOICC have helped to better protect U.S. and coalition forces.

Throughout the deployment, the MEOICC communicated with CJTF-7 entities such as the C3 Center for Army Lessons Learned, the C3 Training Cell, the IED task force, and the Topographic Cell and provided an electronics specialist to support the Combined Explosives Exploitation Cell (CEXC). The MEOICC improved information-sharing among the CEXC; EOD battalions; C2 (Intelligence) Coalition Analysis and Control Element; C5; the Antiterrorism Force Protection Agency, the National Ground Intelligence Center; and the IED task force. The result was a series of tactics, techniques, and procedures posted on the Secret Internet Protocol Router Network (SIPRNET) and Combined Enterprise Regional Information Exchange System (CENTRIXS) Network for subordinate units to improve force protection. Results speak for themselves. Since 1 October 2003, there has been a 5 percent reduction in the number of forces killed and wounded in action from IED attacks. On the other hand, the percentage of IEDs found has increased by 14.6 percent.

From deployment into theater until February 2004, the MEOICC played a pivotal role in the distribution of the Interim Vehicle-Mounted Mine Detection (IVMMD) System and the Buffalo mine-protected clearance vehicle. The operations section orchestrated the movement of these vehicles into theater for IED reduction in support of Task Force Right of Way, which uses the IVMMD, the Buffalo, D-7 dozers, and additional equipment to clear the shoulders and medians of main and alternate supply routes. Task Force Right of Way was first organized and tested in the 4th Infantry Division (4ID) area of operations. From 31 October 2003 to 9 January 2004, the percentage of IEDs found increased from 45.5 percent to 74.6 percent in the 4ID area of operations. Members of the MEOICC have frequently communicated with the Program Manager-Close Combat Systems to discuss additional technologies that could defeat IEDs.

While MICCs have existed in the past, this was the first time that a military unit was formed to support full-scale communication between civilian demining organizations, track explosive hazards in theater, conduct low-level analysis of data, and provide explosive hazard training. The MEOICC provided two liaison officers to communicate with the NMAA. The MEOICC developed a system to draw captured enemy demolitions for distribution to the nongovernmental organizations. The demolition stockage was critically low until this system was put in place. Now nongovernmental organizations draw captured enemy demolitions from bunkers maintained by NMAA and protected by coalition forces. This has greatly reduced the number of explosive hazards and UXO capable of injuring or killing civilians and coalition forces, while saving coalition explosives resources.

The cooperation and assistance provided by the MEOICC to the NMAA and other civil activities have brought considerable respect and support from numerous humanitarian agencies. These agencies have credited the U.S. Department of Defense and CENTCOM with supporting the reconstruction and humanitarian efforts of the international community.

The 1138th Engineer Battalion also provided critical support to the C7. The logistics section organized hand receipts of all equipment purchased for the C7. The communications section designed the network schemes, installed wiring to support more than 120 C7 computers, ensured that systems functioned, and supported other units during the deployment. The section also established nightly videoteleconferences for the C7, which enhanced the ability of the engineers to stay synchronized across Iraq.

Additionally, the driver team provided security and transportation for the C7. These soldiers conducted convoy briefings, researched appropriate routes, trained personnel on communications requirements, and drove personnel throughout the theater. Without the support of the 1138th Engineer Battalion, the C7 would not have been as productive in its efforts.

In summary, the 1138th Engineer Battalion performed exceptionally well during its deployment and has laid the foundation for future operations and the establishment of MEOICC/MICC doctrine. Its contribution to the fusion of explosive hazard information, production of the COP, and explosive hazard awareness training has saved lives and combatted attacks from roadside bombs. This valuable commodity significantly supported planning for joint and coalition operations, helped bridge the gap between military and civil operations, and ultimately supported national objectives.

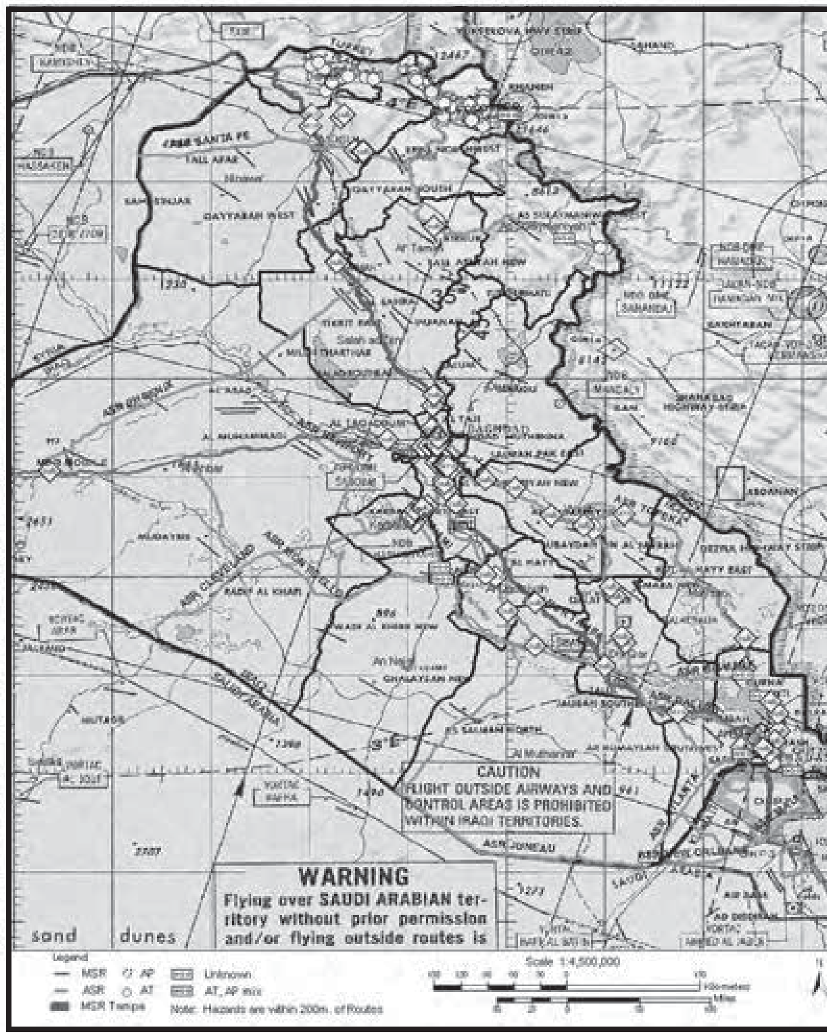
Major Blaylock is the executive officer of the 1138th Engineer Battalion and the instructional technology coordinator for the Rockwood School District in Eureka, Missouri.

Mr. D'Aria is the technical director of the Countermine/Counter Booby Trap Center at Fort Leonard Wood, Missouri.

TOOLS OF WAR

By Captain Trey Birdwell and Captain John A. Klemunes, Jr.

Successful future operations depend on lessons learned from previous operations. This implies incremental improvements and review of each process. Tracking explosive hazards during Operation Iraqi Freedom is an example of improving operations by using lessons learned from Operation Desert Storm and the stability missions in Bosnia and Kosovo. Minefields and unexploded ordnance (UXO) are battlefield hazards that remain long after combat operations have ceased. Tracking explosive hazards continuously throughout operations over an area the size of California is extremely important. Equally significant is the establishment of a system to disseminate this information to subordinate commands daily. The system used by the Coalition Forces Land Component Command (CFLCC) engineer staff section (C7) was the Tactical Minefield Database (TMFDB) System prototype, which gave engineers a way to track and disseminate explosive hazards information on the battlefield. Using the TMFDB, the CFLCC tracked the location of all air and ground cluster munitions, as well as new and previously recorded minefields. (Note: The CFLCC emplaced no minefields during Operation Iraqi Freedom.)



Hazard Analysis of Main and Alternate Supply Routes

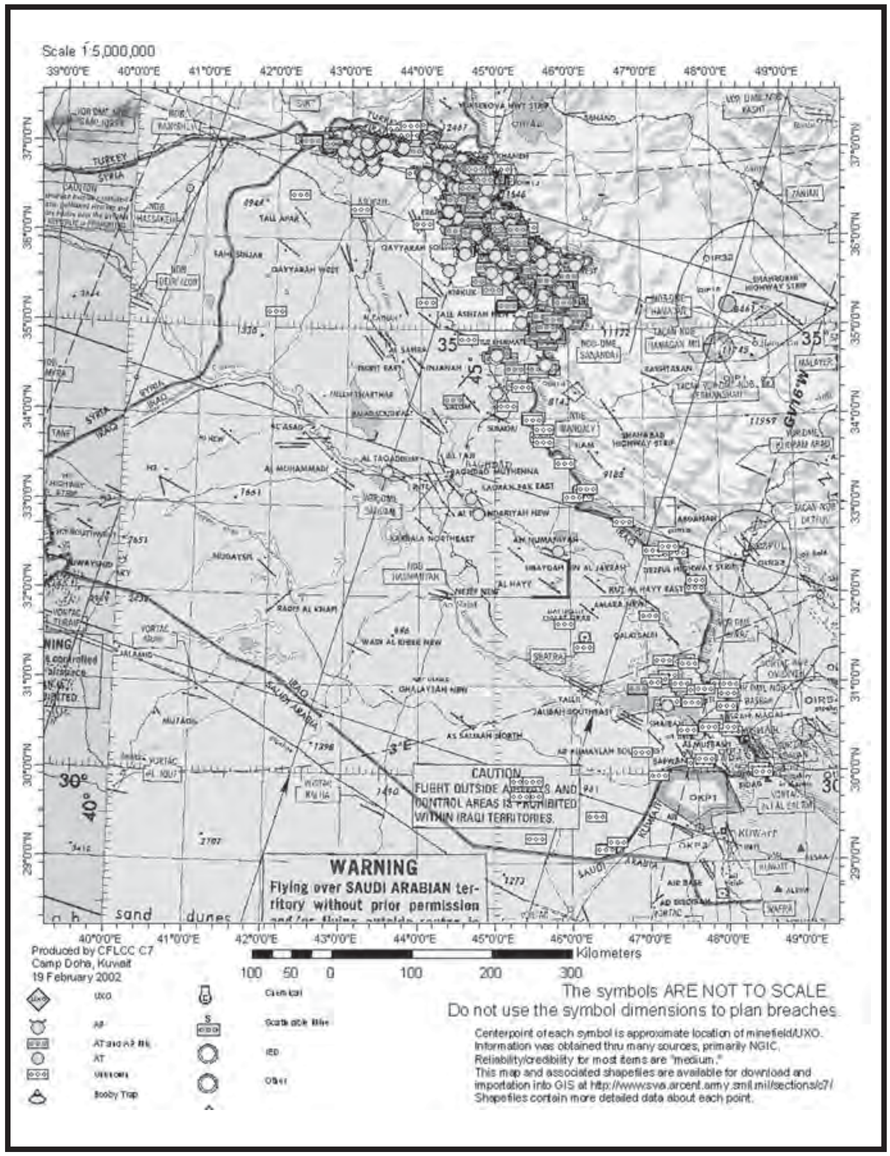
Tactical Minefield Database System

Before the TMFDB, Army engineers did not have an efficient, standard, automated method for recording, archiving, and disseminating enemy and friendly obstacles. During Operation Enduring Freedom in Afghanistan, Army engineers used Microsoft®Excel spreadsheets and grease pencils to track minefields and explosive hazards. This technique has not changed in the past 50 years and is used throughout the engineer community. Although this tracking technique archives valuable mine information, it does nothing more than simply save the information. What we have not done in the past is make this information available in a common digital format for viewing, nor have we placed it in a database format that is conducive to analysis.

Placing minefield information in a digital format known as the common operational picture (COP) and entering the information in a database for analysis were the objectives of collection during Operation Iraqi Freedom. A system had to be found that could share the information via the COP and put it in a database format. The search started with current systems used by the CFLCC, including the Command and Control Personal Computer (C2PC) and the Force XXI Battlefield Command-Brigade and Below (FBCB2) System. While these systems are appropriate for command and control functions, they cannot process and manipulate obstacle information as part of a functional database to the required level of detail. After studying the systems used by the CFLCC and not finding an appropriate program, the U.S. Army Maneuver Support Center (MANSCEN), Fort Leonard Wood, Missouri, was asked to help in the search.

MANSCEN then asked the project director of Combat Terrain Information Systems (CTIS) to develop and distribute the TMFDB. MANSCEN, CTIS, and TASC (a business unit of Northrop Grumman Information Technology [IT]), have developed a portable system that combines mapping and imagery with a minefield-obstacle database as a subset of the Maneuver Control System-Engineer (MCS-E). During Operation Iraqi Freedom, CFLCC C7 purchased multiple TMFDB Systems and provided additional computers to the Coalition Joint Task Force-7 (CJTF-7) for posthostilities explosive hazards tracking.

The fielding requirement called for the theater engineer cell to employ the TMFDB to develop the hazard database foundation for the Mine and Explosive Ordnance Information Coordination Center (MEOICC) and to provide immediate explosive hazard situational awareness to all forces. The TMFDB



Known or Suspected Minefield Locations

enabled the CFLCC C7 to accomplish this task and distribute hazard information to nongovernmental and humanitarian assistance organizations. Three days after the war began, the CFLCC C7 distributed to these agencies information about all known hazards in the database, including all known minefields and mine strike information, dual-purpose improved conventional munitions (DPICMs), and cluster bomb unit (CBU) munitions.

All the available data was placed in the database to establish a baseline, and daily data collection commenced. The CFLCC fire support element provided the impact grids and times for Army Tactical Missile System missions. Then the CFLCC had to locate munitions dropped by fixed-wing aircraft. This was slightly more difficult since there were several entities dropping cluster munitions during the air campaign. The separate air components provided mission reports for immediate tracking and future analysis. We received daily reports of all cluster munitions employed in theater. More than 5,000 explosive hazard areas, including cluster munitions and conventional minefields, had been reported by the end of the ground campaign.

Explosive hazards entered in the database exceeded 300 a day during combat operations. The sheer volume of information was staggering and quickly grew beyond the capability of one data entry person, so our coalition partners provided two soldiers to help. In addition, we received two American terrain analysts who analyzed explosive hazards and their impact on mobility. Without their expertise on the ArcMap® software, we would have been unable to supply many of the requested specialty products to the command. These included distribution of explosive hazards in each Iraqi province and analysis of explosive hazards on main and alternate supply routes. This database would not have been possible without the efforts of those soldiers.

Since the TMFDB was so new and had limited distribution, the CFLCC was forced to enter the data and top-feed information. The CFLCC received information from subordinate commands, entered it into the TMFDB, then sent updated reports to subordinate commands. While this system worked, it was not the preferred approach. All information should have been entered at division level or below and then forwarded to the CFLCC for compilation and dissemination. The CJTF-7 C7 is distributing TMFDB computers down to division level so a bottom-fed reporting system can be implemented, increasing the accuracy and timeliness of reporting.

The TMFDB is only beneficial if units in the field can use the data. TMFDB information, including shape files for topographers to create maps and hazard overlays for the C2PC, is distributed primarily through classified networks. The information is also posted on secure Web sites. In addition, an Excel spreadsheet is posted with all hazard information. One example of a major subordinate command using this information during operations was when the C2PC hazard overlay was used as part of the mission analysis for installing an Inland Petroleum Distribution System (IPDS) (see *Engineer*, July-September 2003, page 13.) A minefield was identified in the proposed location of the pipeline, so the location was changed before construction to reduce the risk posed to soldiers and to avoid a probable delay in construction. A second example of the practical use of TMFDB hazard information was the creation of maps showing hazard areas within 200 meters of all Iraqi pipelines and oil fields. These maps showed oil field repair teams where all the known explosive hazards were located in their area of operations so they could safely identify routes while assessing and repairing oil infrastructure.

As with any database, the output available is only as good as the input received. Engineer units must stress improved recording and reporting of explosive hazards. Accurate and timely data was very difficult to gather and assess during the campaign. An established reporting system would make the TMFDB a bottom-fed process, as desired. For this system to succeed and mature, a peacetime training plan must be implemented at the combat training centers to track dirty battlefields before, during, and after battles. This will exercise the users' understanding of the TMFDB and help report and track explosive hazards present on the battlefield. This effort will reinforce reporting chains and increase situational awareness of explosive hazards on the battlefield.

The TMFDB is a software program that uses a Geographic Information System (GIS) platform. The use of Environmental Systems Research Institute ArcGIS™ software is beneficial since it has been extensively integrated into the military topographic community. Using an existing commercial format and modifying it to meet current needs significantly decreased the fielding time to receive the system and put it into operation. In addition to its powerful computing capabilities, the system is very durable. Hardened computers are loaded with the software (TMFDB, ArcGIS, ArcMap®, ArcToolbox®, ArcCatalog®, FalconView™, MCS-E, Military Analyst, Windows® 2000 Professional, Microsoft® Office) necessary to perform the explosive hazard tracking mission. They also come with an external 200-gigabyte hard drive, loaded with maps and imagery for the entire area of responsibility. Additional hardware includes an uninterruptible power supply and two hard-shell Pelican transport cases.

The prototype TMFDB is the first release in a spiral development of MCS-E. Upon delivery, the database would not merge with other databases, nor would it export to C2PC. Northrop Grumman IT TASC programmers quickly fixed those problems, and the U.S. Army Countermine/Counter Booby Trap Center (CMCBTC) and the Topographic Engineering Center provided upgrades through telephone calls and e-mail messages. These two offices redirected funding and prioritized efforts when needed. Through their hard work, the database became fully functional with additional upgrades that increased the tracking capability of the software.

Although the TMFDB System was in the developmental stages when it was fielded, its capability to process and distribute hazard data proved to be a useful force multiplier. We expect future releases to continue to enhance the capabilities of this system. It was introduced in time to significantly enhance the survivability of our combatants during one of the most violent ground attacks in the history of modern warfare. Fortunately, forward thinkers saw to it that fielding, training, and integration occurred before this campaign commenced. We can attribute better battlespace management to the efforts of the individuals who made this possible.

Captain Birdwell was the CJTF-7 current operations engineer battle captain when this article was written. He is now in the Engineer Captain's Career Course.

Captain Klemunes is a reservist who is now on active duty. He holds a master's in civil engineering and is a licensed professional engineer in California, Virginia, Maryland, and Pennsylvania.

For further information, contact the U.S. Army Countermine/Counter Booby Trap Center, Fort Leonard Wood, Missouri, at (573) 596-0131, ext. 37224, or DSN 676-7224.

1437th MRBC Bridging In Iraq

By Sergeant First Class Robert Milligan

The 1437th Multirole Bridge Company (MRBC) of Sault Ste. Marie, Michigan, working jointly with the First Marine Expeditionary Force Engineer Group and the Naval Mobile Construction Battalion 7 (Seabees), has completed one of the biggest projects of its kind since World War II. The 1437th MRBC lent its experience and equipment in float bridge building to construct a 762-foot long Mabey-Johnson bridge across the Tigris River at Zubaydiyah. This is the longest floating span built in Iraq by military engineers. The bridge is a new type used by U.S. forces, and a representative of Mabey and Johnson Ltd. of England was on-site to assist with technical information throughout the construction.

Military engineers from the Army, Navy, and Marine Corps begin construction on a float bridge across the Tigris River.

Along with the 1437th MRBC, the Marine engineers, and Seabees, the project was assisted by a diving section from Naval Mobile Construction Battalion 133, Naval Construction Support Team 2, Amphibious Construction Battalion 1, and Amphibious Construction Battalion 2.

Coalition forces had destroyed the original bridge across the Tigris River at Zubaydiyah to deny its use by Iraqi forces. Though the bridge wasn't critical to the movement of coalition forces toward Baghdad during the war, it was rebuilt to restore a major transportation route used by civilians and coalition forces. The project, which took two weeks to complete, was opened on 28 June 2003.

A Seabee crane helps attach a section of Mabey-Johnson bridge to a pontoon.

The 490-ton bridge consists of six sections linked together—two 40-meter sections anchored at either bank, with four 33-meter sections pinned and welded in the middle. The sections sit atop 100-meter-long pontoons, which were then anchored to the river bottom through a kedge anchor system consisting of 20 anchors, each weighing 500 pounds.The faster the current, the deeper the kedge anchors dig into the river bottom, stabilizing the bridge's position.

The 1437th MRBC used many of its skilled boat operators throughout the project to place the pontoons for pinning and welding and to hold the bridge in place until the anchor system was complete. The current was swift, and it took all of their skill to keep the bridge steady. Steadying the pontoons to get the separate bridge decking in place was the critical part of the job. If anchoring hadn't gone well, the bridge wouldn't have been built. Soldiers had to keep adjusting their boats so the Seabees could drop the anchors.

The 1437th also ferried construction equipment across the Tigris River to facilitate the construction of the far shore bridgehead. Another mission the unit performed with Marines from the First Marine Expeditionary Force Engineer Group was using 28-foot powerboats to provide river reconnaissance and security for the bridge project. This allowed the bridge crews to work without being fired upon; no hostile incidents occurred at the site.

The last bridges built in combat by the Sault Ste. Marie unit were treadway bridges across the Pukkhan and Humsong Rivers by the 1437th Engineer Treadway Bridge Company during the Korean War. One of those bridges was built within 800 yards of combat between Republic of Korea and North Korean troops.

Engineers drive in the final pins to connect the near shore with the rest of the bridge.

Sergeant First Class Milligan is the 1437th Multirole Bridge Company's mess chief. The unit was mobilized from the 107th Engineer Battalion in support of Operation Iraqi Freedom from January 2003 through July 2003.

The Engineer Writer's Guide

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

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

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

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

Include a statement with your article from your local security office that the information contained in the article is unclassified, nonsensitive, and releasable to the public. Not only is *Engineer* distributed to military units worldwide, it is also available for sale by the Government Printing Office.

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 or 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 <*pbd@wood.army.mil*> or send a 3 1/2-inch disk in Microsoft Word, along with a double-spaced copy of the manuscript, to: Editor, *Engineer Professional Bulletin*, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929.

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

A Multifunctional Engineer Battalion

By Lieutenant Colonel Ed Jackson

The 54th Engineer Battalion (Corps)(Mechanized) (the"Dagger Battalion") performed every type of engineering support for the 3d Infantry Division (3ID) and 3d Armored Cavalry Regiment (3ACR) in Operation Iraqi Freedom from 21 March 2003 until its relief in place at the end of May. Whether it was combat, topographic, or general engineering support, the soldiers and attached members of the 54th did it all.

On 8 January 2003, the 54th was alerted for deployment to Kuwait in support of Operation Iraqi Freedom. Within five days, the battalion had assembled its companies and loaded its equipment on the train for its journey toward Baghdad. The 54th is assigned to the 130th Engineer Brigade, V Corps, in Bamberg, Germany. It has developed a training support relationship with the divisional cavalry squadrons of the 1st Infantry Division and 1st Armored Division, the 173d Infantry Brigade (Airborne), and the Allied Command Europe's Allied Mobile Force (Land). During Operation Iraqi Freedom, the battalion supported 3ID in much the same fashion. Headquarters and Headquarters Company (HHC) and Bravo Company, 54th Engineer Battalion, and two Reserve Component multirole bridge companies (MRBCs) were attached to the Raiders of 1st Brigade Combat Team (1BCT). Alpha Company was attached, for combat operations, to the Spartans of 2BCT, and Charlie Company to the Sabres of the 3d Squadron, 7th Cavalry Regiment. Throughout the war and subsequent stability operations and support operations (SOSO), the 54th gained and lost numerous company- and detachment-sized forces, and changed colonel-level commands nine times.

Crossing the Berm

On 21 March, the 54th crossed into Iraq with the 3ID. The mission of breaching, marking, and controlling five lanes through the complex border obstacle fell to 1BCT. The 54th Engineer Battalion (-), attached to 1BCT, served as the crossing area engineer. Marking breach lanes and manning traffic control points, the battalion managed traffic across the border for the majority of 3ID and several corps and theater enablers. The battalion's Bravo Company, the 1st Platoon of the 3d Military Police Company, and elements of the 299th MRBC manned traffic control points on both borders, ensuring smooth traffic flow and rapid vehicle recovery operations to keep the lanes clear. Using shipping containers mounted on MRBC common bridge transporters twelve feet above the ground and marked with orange panels, our soldiers funneled traffic from numerous unit staging areas and sent them onward to Iraq. Within hours, several thousand coalition vehicles streamed across the border. The soldiers in the 54th assured the mobility of 3ID forces, setting the conditions for rapid momentum in the initial stages of Operation Iraqi Freedom.

Attacking Into Iraq

Crossing the Iraqi border, the battalion moved quickly across open desert to keep up with the attack. Our routes were primarily along unimproved roads, which became a challenge for many of the MRBCs. The battalion was tasked to mark one of the two main supply routes for follow-on forces. The battalion also provided Team Panther to 3d Battalion, 69th Armor Regiment, and then to 317th Engineer Battalion, to clear Jalibah and Tallil Airfields in southern Iraq. Before combat operations, the battalion formed Team Panther, consisting of two M1A1 Panther II systems, a heavy equipment transporter, and a command and control high-mobility multipurpose wheeled vehicle (HMMWV). Team Panther leaders developed battle drills to maximize coverage of the roller team and to allow rapid connection and disconnection of the Panther's mine rollers. The Panthers self-deployed across the border with the roller nose cone attached. The team's mission was to clear unexploded ordnance (UXO) and land mines on both airfields. The 3ID planned to use Jalibah as a forward area refueling point to push attack aviation assets forward during the first day and Tallil as a logistics base throughout the rest of the operation. In 13 hours, the team cleared and proofed an area ten times larger than an entire combat engineer company could accomplish in the same time. Although the Panther system has long been used in Balkan area clearance operations, this is the first time the system was used in combat.

The Panther was used in combat for the first time.

Actions at An Najaf

After three days of continuous movement through traffic jams, enemy contact, and a dust storm, the battalion finally reached Tactical Assembly Area Raiders, outside An Najaf. There, the 54th built survivability positions with assigned armored combat earthmovers and dozers from the attached MRBC units. The battalion recovered vehicles and dug a mass grave for Iraqi soldiers killed in initial combat operations outside An Najaf. The battalion also conducted bridge reconnaissance in support of combat operations in An Najaf. At Objective Jenkins, Iraqi paramilitary forces had damaged a reinforced concrete bridge over the Euphrates River, threatening to trap U.S. forces in enemy territory. The 54th sent in its recon-naissance team, equipped with the engineer reconnaissance kit. The unit sent detailed information on the bridge to the Engineer Research and Development Center (ERDC) at Vicksburg, Mississippi, for detailed analysis and a solution. Although the solution was never implemented, we validated our reachback connectivity from Iraq to Mississippi.

Attacking to Objective Peach

Early on 1 April, the battalion attacked with 1BCT through the Karbala Gap to the Euphrates River. The 299th MRBC provided rubber assault boats, which the 11th Engineer Battalion used in the assault to ferry infantry troops across the river, under fire, to secure the far side and neutralize explosives on the fixed bridge. Unfortunately, retreating Iraqi soldiers detonated explosive charges, causing minor damage to one side of the bridge. The battalion again conducted a technical reconnaissance of the bridge, this time under mortar and small arms fire. The team transmitted the data via satellite to ERDC, which responded with a technical solution of using a single-story medium girder bridge. The 299th MRBC easily installed the bridge, bringing it up to full operational capability. In addition to the hasty repair of the fixed bridge, the 299th MRBC built a 200-meter float bridge, at night, near the fixed-bridge site. In a single day, 299th soldiers emplaced every piece of Class VII bridging they had carried across the border.

Soldiers observe damage at Objective Peach.

Actions at Objective Peach

Following the initial assault at Objective Peach, the 54th established a detailed traffic control plan and emplaced traffic control points throughout the bridgehead. Attached to the Engineer Brigade of 3ID, the 54th served as the crossing area engineer headquarters, executing the division and corps movement plan across the Euphrates River and

A HMMWV crosses a newly completed medium girder bridge at Objective Peach.

into Baghdad. The battalion also built the division enemy prisoner of war compound and operated it for approximately two weeks until relieved by 3ID military police forces. The fighting at Objective Peach inflicted great damage and loss of life on the local civilian population. In response, the 54th Engineer Battalion established an internal, ad hoc Civil-Military Operations Center. A small team met with local civilians to show them that the U.S. Army was there to help, not to hurt, innocent civilians. As a result of their efforts, the battalion identified and cleared a number of UXO fields and treated a large number of civilians who had been injured during the battle. Their actions helped create and maintain a friendly environment at the bridgehead.

Actions in the 3ID Rear Area

After several weeks of managing traffic, the 54th was given more responsibility in the 3ID rear area. The battalion reorganized under the 937th Engineer Group and became responsible for traffic control, security of the bridgehead east of the Euphrates River, maintenance of existing military bridges, and construction of a second military float bridge. The 671st MRBC built the bridge at Objective Chamberlain, outside a small farming community about 20 kilometers upstream from Objective Peach. The 3ID needed additional supply routes across the Euphrates River for enhanced logistics flow and chose this site because of its proximity to the division rear area and to Baghdad International Airport. The 671st overcame significant obstacles during bank preparation to emplace the bridge, which became more popular with the local populace than it was with 3ID.

The 54th reorganized HHC as a combat force and assigned it the mission of securing the eastern side of the bridgehead. The company had command and control of a Linebacker air defense artillery platoon, an Avenger air defense artillery section, and two battalion Panther II crews. HHC reorganized internally as well and integrated the entire support platoon into the security role. HHC conducted presence patrols, performed cordon-and-search operations, and operated traffic control points along the main supply route across Objective Peach. While HHC managed the eastern shore, Bravo Company conducted security patrols and cordon-and-search operations along the western banks of the river. Upon the return of Alpha Company to the 54th, they were given similar responsibilities in support of the Objective Chamberlain bridgehead. Alpha and Bravo Companies uncovered vast amounts of weapons and ammunition during search operations, including more than 33 Seersucker surface-to-surface missiles in an abandoned warehouse. These were destroyed with the assistance of the 937th Explosive Ordnance Disposal (EOD) Team. Bravo Company also cleared a runway for the 1st Battalion, 101st Aviation Regiment of the 101st Airborne Division. The 814th MRBC joined the 54th and performed traffic control and managed the digging assets across the division rear footprint.

Supporting 3ACR in Western Iraq

In late April, the battalion was reassigned to the newly arrived 3ACR in Area of Operations West. Charlie Company remained with 3-7 Cavalry Regiment for continued operations near Baghdad International Airport. For the mission in support of 3ACR, the battalion had control of a terrain team from the 320th Engineer Company; the 761st Ordnance Company (EOD); and Alpha Company, 142d Engineer Battalion, from the North Dakota Army National Guard. Our support of 3ACR was not only combat engineering but also infantry- and construction-related projects. Because the area of operations extended from the borders of Syria, Jordan, and Saudi Arabia to the outskirts of Baghdad, we assigned engineer companies to the maneuver squadrons. Alpha Company was attached to 1st Squadron for operations along the Syrian border and Bravo Company to the 3d Squadron for operations along the Jordanian border. The 2d Squadron did not receive any 54th Engineer Battalion augmentation since it had the 43d Engineer Company, which is organic to the regiment. The battalion tactical operations center (TOC) colocated with the regimental TOC in Ar Ramadi, and the remainder of HHC located at Al Asad Air Base, about two hours west, where it supported the Support Squadron and 4th Squadron of 3ACR. Each company was augmented with an EOD team to destroy caches and clear UXO.

Commanders had instructions to be the total force engineer for their squadron commanders. Combat engineers served as construction engineers building field latrines, hand-washing stations, and showers. They set up minor power grids, rewired lights and sockets, repaired air conditioners, and installed ceiling fans.

Engineers teamed with civil affairs teams for infrastructure assessments in local towns, looking at water and power production and distribution systems, sewage treatment facilities, and garbage collection. In addition, they identified numerous goodwill projects such as the construction of soccer fields, playgrounds, and central parks. Engineers assessed facility damage to schools and hospitals. HHC hired the former Al Asad base engineer (an Iraqi) and a team of local nationals to get the facility operating at prewar standards. Companies also operated traffic control points, conducted presence patrols and search operations, and helped civil affairs teams with civil servant wage distribution.

The battalion served with the 761st Ordnance Company (EOD), which embraced our engineer/EOD integration. Although there were not extensive combat operations at Area of Operations West, there were numerous UXO, arms and ammunition caches, and major ammunition supply points in the sector. Leaders developed plans to consolidate and remove captured ammunition. Engineers were used effectively to handle UXO inside towns and the many ammunition supply points looted by locals. Using FalconView® software, the battalion also developed a tool for tracking the numerous cache locations to template and refine search operations for engineers and maneuver forces. The 320th Engineer Company produced topographic products for the squadrons, to include town studies, infrastructure analyses, border-crossing analyses, population density studies, and detailed products to help units plan raids and seizure operations. Alpha Company, 142d Engineer Battalion, supported the regiment through force protection improvements and quality-of-life upgrades at the regimental TOC and the regimental rear area at Objective Redskins and for the troops of 1-5 Field Artillery Battalion.

The 54th Engineer Battalion S3 established an internal construction management section (CMS) that established contracts for improved life support for the regimental TOC and for the soldiers of the 1-5 Field Artillery Battalion, living

Soldiers construct a latrine at Ar Ramadi, west of al Fallujah.

near the university in Ar Ramadi. Improvements included emplacing gravel, paving, installing an improved power grid, and air-conditioning tents and dining facilities. The battalion exercised engineering muscles rarely used in peacetime. With help from the 130th Engineer Brigade CMS and a small U.S. Army Corps of Engineers Forward Engineer Support Team (FEST), the battalion made great strides in engineering assistance to Area of Operations West and 3ACR before our relief in place by the 122d Engineer Battalion (Corps) (Wheeled) in late May/early June. Our time with 3ACR reinforced the need for engineer units to supply the full spectrum of engineer services to the maneuver force. These missions tested our creativity, imagination, and ability to make something out of nothing.

Conclusion

Soldiers from the 54th Engineer Battalion executed tasks covering the full spectrum of engineer operations in Operation Iraqi Freedom, including combat, construction, and topographic engineering. The flexibility the battalion gave maneuver commanders helped assure mobility during high-intensity combat and SOSO. The ability to accomplish a myriad of tasks made the 54th a combat multiplier and a true multifunctional engineer battalion.

Lieutenant Colonel Jackson is the commander of the 54th Engineer Battalion. He previously served in engineer staff positions at Personnel Command; in Korea; and in Europe; as well as in the 4th Engineer Battalion at Fort Carson, Colorado; the 554th and 5th Engineer Battalions at Fort Leonard Wood, Missouri; and the 41st Engineer Battalion at Fort Drum, New York. Lieutenant Colonel Jackson is a graduate of Clemson University.

FIRST ENGINEER STRYKER UNIT

By Sergeant First Class Rhonda M. Lawson

It's not unusual to see an engineer element accompany an infantry unit on a mission. Even in the mountains of Afghanistan, engineers are frequently called on to clear mines and destroy weapons caches. However, a Fort Lewis, Washington, unit is breaking ground as the only engineer company assigned to the Army's new Stryker Brigade Combat Team (SBCT). Soldiers of the 18th Engineer Company, 3d Brigade, 2d Infantry Division (SBCT), have traded in their old light medium tactical vehicles (LMTVs) to become the only engineer company in the Army to drive the new Stryker engineer squad vehicle (ESV). This has changed the way they do business.

The ESV has the same power as the Stryker infantry carrier vehicle (ICV), making it easier to negotiate rough terrain. In the past, the unit would go on missions using an LMTV, which made keeping up with the infantry a challenge. Now it can negotiate the same terrain. Aside from power, the ESV shares other similarities with its Stryker brethren: It is equipped with two Javelin missiles and a .50-caliber remote weapon station with a screen that allows the gunner to shoot from inside the vehicle. It also has a digital video camera that allows the driver to see what's going on outside the vehicle. In addition, the squad leader has a screen that allows him to see what both the gunner and driver see.

The ESV makes it easier to use the unit's main tool, the mine-clearing line charge (MICLIC). This device contains nearly 2,000 pounds of C4 explosive, which shoots out 100 yards ahead of the vehicle to clear mines from a

A soldier checks the remote weapons station screen in the Stryker ESV.

The ESV can be outfitted with a mine plow (left) or a mine roller (right).

14-meter-wide area. Once the MICLIC is fired, another ESV with attached mine plow goes through the area, making sure all mines are cleared. Soldiers then follow, placing lane markers so the ICVs can pass safely. Ideally, all this can take place without anyone leaving the vehicle. The ESV can also be outfitted with a mine roller to clear and proof mined areas.

The 18th Engineer Company, along with the rest of 3d Brigade, 2d Infantry Division (SBCT), is now operating in Mosul, Iraq, as part of Task Force Olympia. The SBCT deployed to Kuwait in November, crossed into Iraq in early December, and conducted its first month of operations in Samarra and Ad Duluiyah. The SBCT moved north to Mosul in January, where it and the rest of the units in Task Force Olympia replaced the 101st Airborne Division (Air Assault). This is the first operational deployment for the Army's first SBCT.

A Stryker ESV is shown at the National Training Center, Fort Irwin, California.

Sergeant First Class Lawson was the noncommissioned officer in charge of the 28th Public Affairs Detachment when she traveled with the SBCT for its precertification and certification exercises. She now serves with Task Force Sinai as part of the Multinational Force and Observers.

Photos by Sergeant First Class Rhonda M. Lawson.

Personnel Notes

Officer HRC Update

By Colonel Mike Rossi and Lieutenant Colonel Pete Mueller

"The future ain't what it used to be."

—Yogi Berra

We'd be surprised if at least two other contributors to this issue of *Engineer* do not lead off their articles with the same quote by the famous Yankee manager. In the time that passes between submitting this item and its publication, the Army leadership will make several decisions on the structure and mission of our active duty engineer battalions and brigades. These decisions will have a significant effect on the assignment options, command opportunities, and professional development timelines of our Corps. This article presents a snapshot of what we've learned from past selection boards, what we know today about professional development in our Corps, and initiatives we anticipate for the future.

Change, Change, Change

First, we're now HRC, not PERSCOM. On 2 October 2003, the United States Total Army Personnel Command (PERSCOM) and United States Army Reserve Personnel Command (AR-PERSCOM) were combined to form a single, unified command—the United States Army Human Resources Command. HRC is a result of the Army leadership's vision to streamline headquarters, create more agile and responsive staffs, reduce layers of review and approval, focus on the mission, and transform the Army. HRC's activation is the first step in consolidating personnel services throughout the Army.

What does it really mean from a personnel perspective to be an "Army at War – Relevant and Ready"? It means that we are *not* going about "business as usual." We are not simply thinking outside the box for academic purposes—we're creating policies and procedures which will ensure that we contribute to increased combat effectiveness and readiness, while enhancing your stability and predictability. It means that our No.1 priority is to support the Global War on Terrorism. We assign officers to meet Army priorities and requirements first, then we balance professional development needs. Deploying units will not deploy at less than full strength. Once deployed, we will not cause unit turbulence. It means that we slate the best officer to a unit based on experience and skills. Officer preference is important, but it is not the driver.

When we can, we will support the high school senior stabilization program, *Joint Domicile,* and summer moves. It means we will not move you just because you've been on station a certain amount of time, and we will increase your opportunity to return to the same location. "Homesteading" is no longer bad—it is okay to stay at a location you enjoy, unless the needs of the Army or your professional needs require a permanent change of station (PCS). It means the personnel system now has a unit focus versus an individual focus. Rather than breadth, we look to develop more depth in an officer. We're looking to keep experts in their jobs longer.

Lieutenants

The great news for the Regiment and our future is that our lieutenants are getting the best professional development the Army can offer—operational experience. What's important for you is to learn as much as you can, do your absolute best, and do not be afraid to fail. Promotion rates to captain are near 99 percent and, once selected, your lieutenant Officer Evaluation Reports (OERs) are masked before future boards. You truly get a fresh start once you make captain.

As with junior captains, all your duties should be performed with the goal in mind of developing the skill sets you need to be a great company commander. These skills include leadership (platoon leader, executive officer), personnel (S1), training and tactics (assistant S3), planning and battle tracking (assistant brigade engineer, brigade engineer, assistant division engineer liaison officer, supply (S4), and maintenance (battalion maintenance officer). The more skills you master in these disciplines, the better commander you'll make. Even with the home-basing initiative, you can seek professional development jobs with a short-tour assignment or a PCS. Now is the time to jump on professional schools—such as the Airborne, Air Assault, and Ranger Schools and the Mechanized Leader Course.

Captains

Company command is the *critical node* in your career. A year in command is branch qualification, and boards have shown no prejudice to 1-year commanders on past boards. Command queues are well over 3 years in all, but a very few installations and captains should expect their command tours to be closer to 1 year rather than the traditional 18 months. Our position at the Engineer Branch is that the boards look for two command reports rather than the number of months an officer commanded. As explained above, all lieutenant and captain development leads to it and the level of success you achieve as a commander defines your near-term opportunities—nominative assignments, advanced civil schooling (ACS), and promotion to major. Knowing this, battalion commanders bear tremendous responsibility to cycle junior officers into "tailor-made" developmental jobs; to coach, train, develop, and spotlight serving company commanders; to advise senior raters as to who are the absolute best of their commanders; and to counsel their commanders about follow-on opportunities to serve the Regiment and the Army.

The jury is out on the Engineer Captain's Career Course (ECCC) and what shape and form it will take. A decision after this writing, but before publication, may render the discussion below obsolete, but here is the current thinking: From the assignment perspective, there are really two options available to the officer corps—a PCS or a temporary change of station (TCS) for non-home-based officers or temporary duty (TDY) and return for home-based officers. The figure on page 50 captures the timelines for the two options. In this case, "CC" is the U.S. Army Training and Doctrine Command common core curriculum; "BS" is branch-specific courses, which are taught at the U.S. Army Maneuver Support Center, Fort Leonard Wood, Missouri, for engineers; and "CA" is combined arms experience, which is taught at the National Training Center, Joint Readiness Training Center, or Combat Maneuver Training Center.

ACS remains a success story for the Regiment. Roughly 80 percent of our captains seek and receive master's degrees while at the ECCC. In addition, we've had a number of captains pursue another ACS opportunity. This year—

- 20 will go to ACS then teach at the United States Military Academy.
- 13 will go to ACS with utilization in the U.S. Army Corps of Engineers (USACE).
- 5 will go to ACS at Georgetown with utilization on the Joint Staff.
- 1 will go to ACS at Harvard with follow-on to the Army G3.
- 1 is an Olmsted scholar.

No other branch has had as much success this year in the ACS arena.

Once a captain completes company command, he or she can expect reassignment to one of the many jobs that meet other critical Army needs. Those assignments include ACS, Reserve Officer Training Corps (ROTC), Active Component-Reserve Component (AC-RC), Project Warrior, small-group instruction, or recruiting company command. In each case, officer preference is considered, but the needs of the Army must be first met.

Majors

The big news for senior captains and majors is the Army's Universal Military Education Level 4 (MEL4) initiative. Greybeards will remember MEL4 as Command and General Staff College (CGSC). More recently, the Fort Leavenworth, Kansas, experience is known as Command and Staff College (CSC). In the future, it will be known as Intermediate Level Education (ILE). In the past, we selected roughly 50 percent of a year group (YG) of officers to attend resident CSC; the remaining 50 percent completed the course by correspondence. Starting with YG94 in the fall of FY05, 100 percent of officers will attend some form of resident ILE. For the operations career field—that's engineers—this means a PCS for 10+ months to Fort Leavenworth. The Engineer Branch will schedule majors in one of the first two available classes to their YG. We will only support deferring attendance twice in very rare occasions or, obviously, for stop loss/stop move. If you are YG93 and not selected for resident CSC, you must complete the course by correspondence before your lieutenant colonel board or, as history has shown, you will not be selected for promotion.

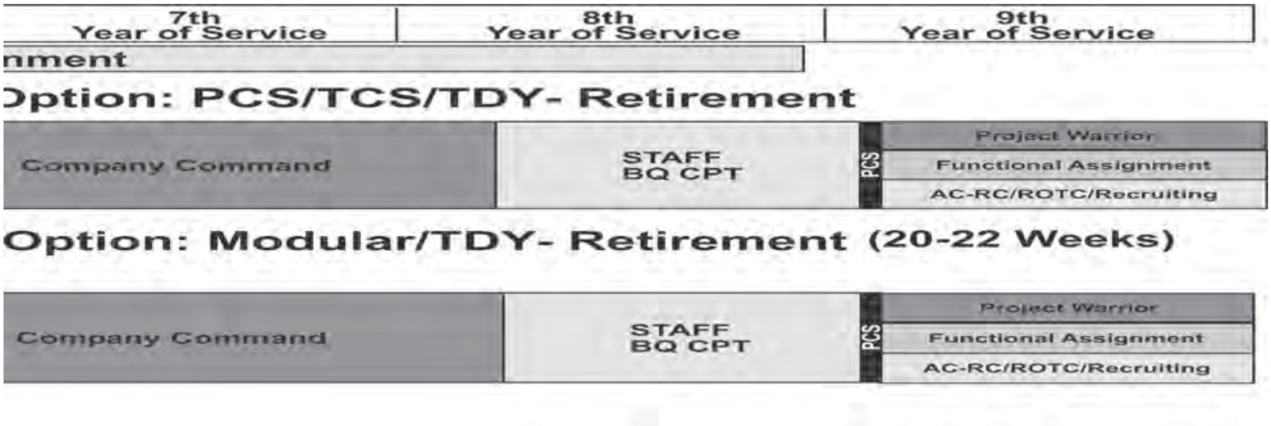
The results of the last four lieutenant colonel boards have shown that the key to promotion is performance as a major. Resident or nonresident CSC, the type of branch-qualifying (BQ) majors' job, or company command reports are negligible factors in comparison. BQ positions for majors are shown in Department of the Army Pamphlet 600-3, *Commissioned Officer Development and Career Management*, and are assistant division engineer, battalion- or brigade-level S3/executive officer, regimental engineer (Ranger, cavalry regiments), Special Forces group engineer, Director of Public Works (DPW), or Deputy District Engineer. Once again, performance as a major—shining periodically in your reports, particularly in BQ positions—is the key to making lieutenant colonel.

Lieutenant Colonels

If you are a lieutenant colonel in today's Army, you are a success! My sense of the boards, regulations, guidance, and selection history is that all are geared toward making you a lieutenant colonel; if you don't make it, both you and the Army are disappointed. But everything after lieutenant colonel is gravy—battalion command, colonel, War College, colonel command, and beyond. The Army knows there are more officers qualified for these selections than there are positions available and makes its best effort to pick the officers to serve at these levels. They are all tremendously tough cuts.

Battalion command remains the most selective gate in our Regiment. Roughly 40 percent of a cohort YG will be selected for lieutenant colonel command. With rare exceptions, all centrally selected (command selection list [CSL]) battalion commanders will attend Senior Service College (SSC)—the War College. Also rare is when a non-CSL battalion commander will be selected for resident SSC. So, if you're not a battalion commander, you should consider the nonresident SSC option, if offered.

Lieutenant colonels serve the Army. We'll always do our best to find the right job for senior officers, to include joint, Department of Defense, or Department of the Army staffs; DPW; training support battalion; and provisional battalion command. We'll spend much time seeking key strategic jobs



Blended Modular Captain's Career Course

for our outgoing battalion commanders to capitalize on their experience and professionally develop them for future service.

Colonels

As of February 2004, there are 185 active duty colonels on the rolls of the Engineer Regiment, serving our nation in a time of war. This includes the addition of 19 promotable lieutenant colonels announced in December 2003. Considering anticipated retirements through next summer, our rolls could drop below 160. Our colonels are assigned to SSCs and worldwide in 110 authorized engineer colonel and numerous branch-immaterial positions. Authorizations for continental United States (CONUS) DPWs were dramatically cut during the Total Army Analysis 2009 (TAA09) process. In 2003, there were 12 colonels assigned to DPW positions within CONUS. The Personnel Management Authorization Document for 2005 includes only 4 CONUS DPWs. The other 8 DPW positions are being transformed into Department of the Army civilian positions.

In 2003, the Regiment's promotion rate to colonel was lower than the Army average and about 45 percent less then in recent years. Promotions within branches of the Army are tied to both structure and inventory or, more simply, authorized requirements and the health of a YG or population. Reductions in authorizations in combination with a larger-than-average population can translate into a reduced requirement for BS promotions as determined by the Army G1. This can also translate into increased requirements for branches that may experience the opposite trend.

One impact the field may have on this is the timely submission of retirement requests. Late requests could mean that a snapshot before a promotion board could reflect an unusually healthy population, with follow-on consequences for the Regiment. Army Regulation 600-8-24, *Officer Transfers and Discharges*, dictates that "voluntary retirement requests may be submitted up to 12 months before the requested retirement date and not later than 6 months prior to the projected start date of transition leave."

The impacts of the Army's priorities—fighting the Global War on Terrorism and The Way Ahead Campaign—are also affecting the management and assignment priorities for engineer colonels. The establishment of the USACE Gulf Regional Division and the USACE District in Afghanistan are examples of five new 21Z (combat engineering senior sergeant) Directed military overstrength (DMO) assignments. Along with the rest of the Regiment, in assigning engineer colonels, we must first consider the priority needs of the Army and assign officers based on depth versus breadth of experience. The Army's stabilization plan, along with stop loss/stop move for deploying units, will impact colonels along with the rest of our soldiers. CSL brigade-level commanders could see command deferments based on timing of unit deployments for contingency and combat operations.

The Glass Ball

Battalion and brigade commanders are accustomed to juggling numerous "glass balls"—maintenance, training, and personnel come to mind immediately. And while these are all absolutely critical, commanders and units can usually overcome shortcomings and mistakes in these areas. Last quarter is soon forgotten, and you focus on the future. Writing OERs and managing your (and your rater's) Senior Rater Profile are *THE* glass ball. The reason is simple—mistakes last forever! A poorly written report will remain in an officer's file throughout his career and will have an influence on every board. You must get this right. We've provided a primer on writing an effective OER on the Engineer Branch home page. The link is

<*https://www.hrc.army.mil/OPeng/OERinfo.htm*>. There are examples of various comments with the intended board effect, as well as thorough explanations.

The most important take-away from that primer is that although a center-of-mass report is not a discriminator for most boards, not all center-of-mass reports are viewed equally. It is very important that you include the following in each narrative: enumeration, promotion potential, schooling recommendations, and next command/position recommended. A rater or senior rater may elect to leave one or more of these four components out of a narrative, but they should understand that they risk sending an unintended (and not positive) message to a board. Rated officers should watch for these items in their OERs and question their rater/senior rater if they notice an omission during their counseling. The omission may be intentional, and it's certainly within the purview of the rater/senior rater to make this call. Or the rater/senior rater may have unintentionally left these comments out and can add them as a result of this dialogue.

Additionally, senior raters need to amplify their potential box checks by using the narrative to clearly send the appropriate message to selection boards. Board members relate that the first and last lines in the senior rater's comments are the most important factors in their assessment—so spend time on these portions. Some senior raters fill their box and hide potential comments. This is not good (don't make it time-consuming or difficult for the board members). A center-of-mass OER with the right comments about potential and future assignments is more valuable than an above-center-of-mass report that doesn't enumerate performance or contain key bullets about the ability to command or about school selection.

Communications

Our tool for communicating with you is the Internet and Army Knowledge Online (AKO). If we need to contact you specifically, we'll e-mail you via your AKO account address. We cannot recommend more highly that you forward your AKO account to your work account address, or that you check your AKO inbox regularly. Often, we'll notify you about assignments, boards, corrections, or questions on your file by e-mail. It begins the discussion between you and your assignment officer.

We update elements of our branch Web page weekly. In it, we provide links to board results, dates for branch visits, hot or late-breaking assignment opportunities, or useful personnel tools for your use. The link is <*https://www.hrc.army.mil/OPeng/enmainpg.htm*>. The homepage also leads you to the Automated Preference System and allows you to see the available assignments for your grade and one grade up, real time (you see them when we see them). Through this system, you can open the dialogue with your assignment officer on your preferred next assignment.

The Officer Engineer Branch exists to serve you, the Regiment, and the Army. Essayons.

Colonel Rossi has been the Engineer Officer Branch Chief, HRC, since June 2002. His assignments include company commander, battalion executive officer, and G3 Training in the 101st Airborne Division; commander, 65th Engineer Battalion, 25th Infantry Division (Light); and Deputy District Engineer-Military for the Sacramento District, USACE. He holds master's degrees from MIT and the National War College and is a professional engineer in the Commonwealth of Virginia.

Lieutenant Colonel Mueller has been the Engineer Colonels Assignment Officer, HRC, since July 2003. Assignments include company commander, 24th Infantry Division (Mechanized); assistant division engineer and battalion executive officer, 101st Airborne Division; Congressional Fellow; and commander of the Charleston District, USACE. He holds a master's from MIT and is a professional engineer in the Commonwealth of Virginia.

Army Values

"We are, have been, and will remain a values-based institution. Our values will not change, and they are nonnegotiable. Our Soldiers are warriors of character. They exemplify these values every day and are the epitome of our American spirit. They are the heart of the Army."

—General Peter J. Schoomaker, Army Chief of Staff, arrival message July 2003

Loyalty - Bear true faith and allegiance to the U.S. Constitution, the Army, your unit, and other soldiers.

Duty - Fulfill your obligations.

Respect - Treat people as they should be treated.

Selfless Service - Put the welfare of the nation, the Army, and your subordinates before your own.

Honor - Live up to all the Army values.

Integrity - Do what's right, legally and morally.

Personal Courage - Face fear, danger, or adversity.

Personnel Notes

Enlisted HRC Update

By Lieutenant Colonel Margaret W. Burcham

This past October, PERSCOM became the Human Resources Command (HRC), and the Enlisted Engineer Branch turned over a few personnel as well. The assignment managers are here to serve you. So if you have questions, please contact them through our Web site at <*https://www.hrc.army.mil*>.

MOS Changes

In August 2003, the Deputy Chief of Staff, Army G1, approved the deletion of military occupational specialty (MOS) 21F, crane operator. All duties currently performed by MOS 21F personnel will be incorporated into MOS 21J, general construction equipment operator. This change will take effect in fiscal year (FY) 2006.

Promotions

The conditional promotion—that is, a 1-year period to pin on the next rank without meeting Noncommissioned Officer Education System (NCOES) requirements—is suspended until further notice. Soldiers may now pin on rank as soon as they have orders, following success at the promotion board and adequate promotion points, regardless of their completing the applicable NCOES. However, sergeants must complete the Primary Leadership Development Course (PLDC), staff sergeants must complete the Basic Noncommissioned Officer Course (BNCOC), and sergeants first class must complete the Advanced Noncommissioned Officers Course (ANCOC) before they will be considered for promotion to the next higher rank. The calendar year (CY) 2004 Master Sergeant Promotion Board convened from 3 - 27 February 2004. The next board, FY05 Master Sergeant Promotion Board, will convene from 5 - 29 October 2004.

Army Knowledge Online

We at HRC are making greater and greater use of Army Knowledge Online (AKO). It is especially important that your AKO account be forwarded to your work account if you have one or that you have access to AKO and check your account from time to time. For soldiers who are deployed, it is our primary means of contact. We will notify you of assignments or provide options when we can. Soldiers should also use the Army Satisfaction Key (ASK), found on the HRC Web site to update assignment preferences. We use these preferences in making many decisions regarding a soldier's next assignment. A great new tool for NCOs on AKO is access to their Enlisted Record Brief (ERB) via our Web site. In March 2004, AKO will be used as a medium for four new personnel initiatives:

- E-mail notification of assignment, deletion, or deferment actions, which will eventually replace HRC-GRAMS (formerly PERSGRAMS).
- E-mail reminders to update assignment preferences and contact information in ASK within 3 months of permanent change of station (PCS) and again 18 months before the date eligible for return from overseas (DEROS) for soldiers outside the continental United States (OCONUS) or after 2 years time on station (TOS) for soldiers in the continental United States (CONUS).
- E-mail acknowledgements when volunteer or assignment preference information is updated in ASK.
- Ability to view Personnel Key Information through ASK. This includes spouse information, MOS, NCOES history, Enlisted Force Management Plan (EFMP) status, assignment location and report date, and pending training course information.

Retention

Many new bonuses are in effect now, especially for those currently deployed in support of Operation Iraqi Freedom and Operation Enduring Freedom, as well as those volunteering to remain in, or reenlist for, Korea. Learn more about these from your unit retention NCO.

Assignments

As you read about force stabilization below, you will see that overall the pace of PCSs will be slowing down. We will tend to leave soldiers where they are unless there is a compelling need to move them, such as for promotion, DEROS, schooling, or to fill a higher-priority position. We will attempt to increase the *depth* of a soldier's knowledge and experience and be less concerned with increasing the *breadth* of that soldier's experience.

One assignment problem we are dealing with is that of back-to-back assignments, meaning an assignment to a deploying unit or to an unaccompanied tour within 1 year of that same kind of assignment. While we try to avoid this situation whenever possible, with the current pace of deployments and the fact that the majority of the Engineer Regiment has been deployed, it is not possible for us to completely avoid back-to-back assignments. Many of you have experienced this. Of course, we will work with soldiers who volunteer for these assignments.

Stop loss/stop move is in effect for units that are currently deployed as well as for those moving into Operation Iraqi Freedom Phase II and Operation Enduring Freedom Phase IV. This measure will remain in effect for those units until 90 days following their redeployment. If you are serving in a table of distribution and allowances (TDA) assignment or otherwise have not deployed, you should expect to be assigned to a deploying unit on your next assignment. We will attempt to assign redeployed soldiers to the TDA assignments to get recent combat experience into the training and recruiting base. Exceptions to this include the following:

- Soldiers currently programmed to end their 3-year recruiting tours this year have now been extended to a fourth year.
- Soldiers scheduled to complete their 2-year drill sergeant duties between 1 May 2004 and 30 April 2005 have been extended to a third year.

This is a temporary measure to ensure that we have adequate fill in those critical positions during this period of stop loss/stop move.

Several new Stryker Brigade Combat Teams (SBCTs) will be standing up over the next year, to include SBCT3, 1st Brigade, 25th Infantry Division; SBCT4, 2d Light Cavalry Regiment (formerly 2d Armored Cavalry Regiment); and SBCT5, 2d Brigade, 25th Infantry Division. Due to the extensive equipment fielding and training time required, soldiers assigned to these units must remain in place throughout a significant stabilization period of several years. Therefore, soldiers currently assigned to those units who do not have enough time remaining on their enlistment must either extend to meet applicable dates or will be reassigned to other units. Soldiers with questions regarding assignments to SBCTs should contact their assignment manager.

Force Stabilization

The Army has some great initiatives to increase unit readiness and to make it easier to have greater predictability in the lives of soldiers and their families. Force stabilization is a system designed to decrease personnel turbulence for units and set conditions for increased unit readiness, combat effectiveness, and cohesion.

Why Force Stabilization?

This initiative will—

- Increase overall Army readiness.
- Slow down the force (fewer PCS moves).
- Cause homesteading to become a *good* thing!
- Increase unit cohesion.
- Stabilize families and provide more predictability to soldiers.

How Does Unit-Focused Stability Work?

Beginning in October 2004, brigade combat teams will be set on 36-month life cycles, which will—

- Align the soldier's tour with the unit's operational cycle (36 months).
- Minimize soldier moves/losses for deployed units.
- Provide cohesion for all levels of soldiers and leaders.

There are three phases in the life cycle:

- **Reset** (30 - 90 days). This is the time following a major deployment and 90 days stabilization when soldiers who have reached their estimated time of separation (ETS) or are retiring will depart the unit, some will PCS to other assignments due to promotion or for professional development, and others will join the unit to replace the departed.
- **Training** (6 months). During this period, the unit will be at 100 percent strength and will train with set crews to perform its wartime mission. Training will be individual through collective and will wrap up with a certification exercise.
- **Ready** (25 - 29 months). Throughout this phase, the unit is available for employment.

One new initiative intends to place first-term enlistees, as well as newly commissioned lieutenants, at their first duty station for a total of about 7 years. During that time, the soldier may leave the base for deployments with their unit or TDY for schooling, but will then return to their initial posting. Families will remain at the initial post throughout the 7-year period, giving them continuity in their community and a sense of stability.

To learn more about force stabilization, visit the G1 Task Force Stabilization (TFS) Web site at <*https://www.stabilization.army.mil*>.

Lieutenant Colonel Burcham is chief of the Enlisted Engineer Branch at the Human Resources Command.

Moving?

Did your unit move recently, or is your *Engineer Bulletin* addressed incorrectly? To correct your mailing address, send us the following information:

Old Address: ______________________

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New Address: ______________________

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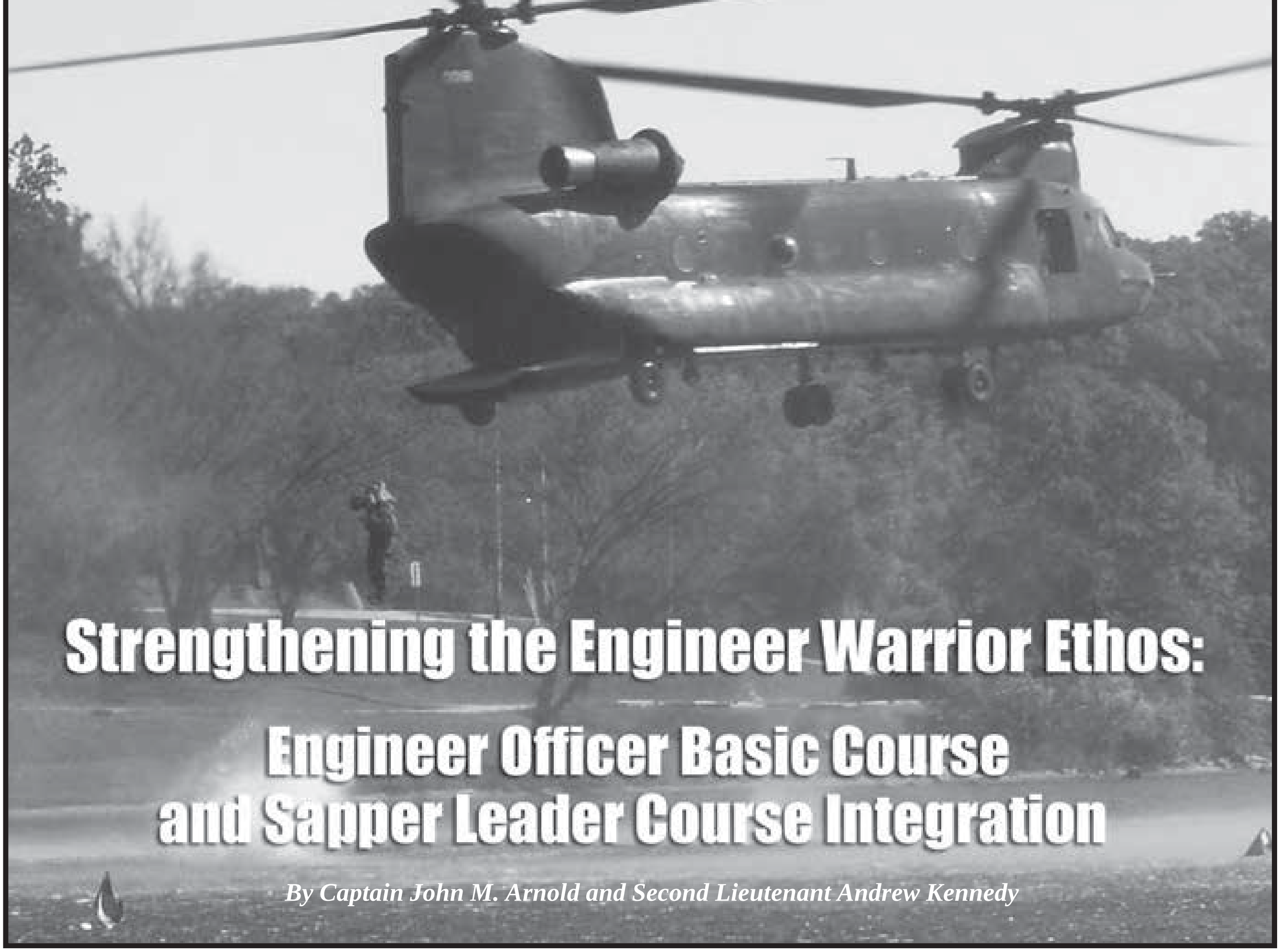
E-mail: <*pbd@wood.army.mil*>
Telephone: (573) 563-4104, DSN 676-4104
Address: U.S. Army Maneuver Support Center, ATTN: ATZT-DT-DS-B (Engineer), 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929



Strengthening the Engineer Warrior Ethos:

Engineer Officer Basic Course and Sapper Leader Course Integration

By Captain John M. Arnold and Second Lieutenant Andrew Kennedy

"Warrior Ethos—summarized in Army training material as a commitment to victory, an emphasis on mission, a refusal to quit, and a commitment to never leave an American behind—will also be emphasized after training is over in everything soldiers do in their regular units."

—General Kevin P. Byrnes
Commander, U.S. Army Training and Doctrine Command

Transformation has been the buzzword for the Army since the turn of the millennium. The 21st century Army has adopted a specific mentality for its leadership so the Army can become a faster, more lethal, and more adaptive fighting force. That mentality is known as Warrior Ethos, a mind-set for every soldier to be first and foremost an infantry soldier with fighting skills to match a tremendous fighting spirit. The new Basic Officer Leader Course, set to begin in the next few years, is an Armywide initiative to instill the Warrior Ethos from the beginning of an officer's career. But with the technical and diverse role of today's engineers, the Engineer Regiment is going one step further to merge Warrior Ethos with the modern, high-operational-tempo combat engineer. The U.S. Army Engineer School has started to send to the Sapper Leader Course (SLC) all lieutenants headed to combat engineer units after the basic course. Fueling this initiative is the need for officers who are as combat-ready as possible before arriving at their first unit. There is no better vehicle for this transformation than the SLC.

The SLC mission is to train engineers in the leadership skills, combat engineer and infantry battle drills, and specialized engineer and infantry techniques required for a sapper unit to perform as a member of a combined arms team.

Soldiers take notes during a class at the SLC.

Embedded in their mission are the course objectives—to enhance technical proficiency, unit cohesion, confidence in self and equipment, and physical and mental toughness—everything the Warrior Ethos is and the engineer leader needs.

The general studies phase of the SLC includes a road march.

In today's contemporary operational environment (COE), every engineer is at the heart of operations to clear the way to victory for our maneuver forces, assuring their mobility. This environment has no battle lines and features smaller-scale force-on-force combat against an enemy who fights from the shadows. The Engineer Regiment has always played a significant role in combat and the SLC builds on that significance with real-world training under combat conditions. All training is current and relevant to operations in the COE alongside our combat arms brethren. On today's nonlinear battlefield, our soldiers need leaders who are more efficient, diverse, agile, and adaptive to rapidly changing situations. The Engineer School has taken that initiative to heart.

The SLC enhances the engineer and infantry skills of leaders in the Engineer Regiment. Instructors accomplish this through an intensive 2-week *general studies phase* that includes physical training, mountaineering, field-expedient demolitions, water-crossing operations, and a class on small arms used throughout the world. Other instruction includes classes on booby traps, field-expedient antennas, medical techniques, and air operations. Two important parts of the general studies phase are the 20-kilometer road march, said to be one of the toughest in the Army, and land navigation. The next 2 weeks are dedicated to the patrolling phase. This phase starts with instruction in hand-to-hand combat and operations order preparation before the class heads to the field for 10 days. Of those 10 days, one is a day of instructor-led missions, and the other is a practice day of student-led missions. The next 8 days are dedicated to a 4-day situational-training exercise and a 4-day field-training exercise. Between the exercises is a class focused on teaching sappers to clean and prepare small game, enhancing their survival skills.

Since students do not have to be combat engineers to attend the course, the demolitions class starts with the basics of demolition calculations and placement. Sample problems, both on paper and in practical exercises, ensure that everyone has a working knowledge of demolitions. The next 2 days are spent at the demolition range, making field-expedient demolitions from materials that sappers may be limited to in real-world situations. Nontraditional emplacement and use of these charges are emphasized. The demolitions studied include field-expedient claymore mines, platter charges, shaped

Student sappers engage in hand-to-hand combat training.

Sappers practice the jumar ascent, using a mechanical device to climb a rope.

charges, satchel and crater charges, and low-standoff breaching charges that can be used indoors in urban warfare.

Every SLC student becomes proficient in mountain operations. Knots are the first part of instruction and every knot learned is used during mountain operations. Group success often depends on properly tying one knot. On the rappelling tower, sappers learn the basics of descending and ascending vertical obstacles. A fall wall is used to teach them to properly belay climbers and to teach them what to do if they fall. Descent techniques include wall and free rappels performed with and without gear, fast rope descents, and the "Aussie" rappel, in which students descend face first. Ascent techniques include the prusik ascent, which uses a knotted rope attached to the rappelling rope, and the jumar ascent, which uses two mechanical devices in tandem. Sappers learn to build an A-frame to move gear or injured personnel up a cliff. They also learn to conduct solo, buddy, and stretcher rappels to move injured personnel down a cliff or other vertical obstacle. Students learn to construct a one-rope bridge to move gear or personnel across a body of water or large crevasse. The final rappel is made over a 90-foot cliff with full field gear while patrolling at night.

Sappers learn to cross water obstacles effectively during the SLC. They also learn the correct use of Zodiac boats and crossing- site reconnaissance as well as other methods for crossing large water obstacles. After sappers receive instruction on water-proofing their gear and constructing poncho rafts, they swim in full gear, pulling their poncho rafts behind them. After the 1.5-kilometer swim across the Lake of the Ozarks Recreational Area, their success or failure at properly constructing the raft is apparent.

Students learn to cross large water obstacles effectively.

To aid sappers in survivability, the SLC covers the most common weapons used by our enemies. To overcome enemy-emplaced obstacles, sappers learn to identify enemy mines. (The SLC instructor has also taught the course to soldiers in Afghanistan.) Each student completes a mine identification lane that includes locating, marking, and identifying ten enemy mines. Sappers also learn to disassemble, assemble, and fire an AK-47 and to identify several types of small- and large-bore weapons used around the world. Firing an AK-47 on full automatic is an opportunity that most soldiers never have.

After the general studies phase of the course, sappers move into the 2-week *patrolling phase*, which focuses on troop-leading procedures, patrolling fundamentals, and applying the knowledge gained in the previous 2 weeks. Students spend 3 days in the classroom learning the principles of patrolling and presenting an operations order. Most participants are from different units, so there are no standard operating procedures at the SLC. Because of this, the operations order must include every step of the mission and state task and purpose, by name, for every individual. Actions on the objective alone usually take an hour to brief. This format is new to most sappers, so extra practice is required to complete the brief in the field successfully, especially after 3 days of no sleep and little food. The amount of sleep sappers get depends on how well everyone works together and how fast they move. If everyone works well together, the class may get 30 minutes of sleep a night. If a mission takes longer than expected, or if there is a break in contact during movement, it is unlikely that anyone gets any sleep. Each student "hits bottom" at some point, but most people have a few hours where they shine. Teamwork is essential to individual success during patrolling.

The evaluation system at the SLC is a combination of points and required training events, some of which are retestable. To graduate, a sapper must earn 700 out of 1,000 points and achieve a "GO" on all required events. An initial "NO-GO" in a required event does not mean immediate dismissal from the course, since there is still training value for everyone, even for students who may not graduate. Sappers who do not earn the required number of points, or who fail a required training event, still receive a certificate of completion. Students have the opportunity to retake written exams, the 20-kilometer road march, and the land navigation course, and successful retests can earn them the right to graduate. The largest attrition rate during the course is during land navigation. Injury or refusal to train are the only ways to be removed from the course. Not everyone can avoid an injury, but everyone should be able to overcome their personal fears and complete all training, especially if they plan to be leaders.

The SLC exposes sappers to technical issues from current operations in Iraq and Afghanistan. Some of these issues are sensitive site exploitation, intelligence gathering, and civil affairs integration. The course also trains students on new obstacles and how to recognize them in the field. One leader who recently deployed to Iraq credits the course's instruction on improvised explosive device (IED) recognition for helping save his convoy from an attack. Before taking the course, the construction soldier admits, he didn't know what an IED was and probably wouldn't have known how to react. Because of his SLC training, however, his efforts saved the lives of soldiers in his convoy.

The SLC is a leadership course. Although some may mistake it for being just another Ranger program, it's much more focused on learning and instructor interaction to become the best engineer leader possible. The program involves more than just execution and evaluation; it is a detailed training program that doesn't end in the classroom. The SLC provides challenging experiences and demanding training that can tremendously increase leadership proficiency and minimize unit integration time. In today's Army, where a soldier may deploy the day he arrives at a new duty station, soldiers must be as combat-ready as possible. The SLC exposes students to the physical and mental rigors of combat under a controlled, learning-oriented environment. It's like performing on the battlefield without being on the battlefield.

Second lieutenants show up at their units and are expected to perform as the new task force engineer. They are going to tell the maneuver commander what he can and can't do for the combat forces, and the SLC gives the lieutenant the tools and, more importantly, the confidence to do just that. New lieutenants have always been thrown into task force engineer positions, but gone are the days of a 4-month integration and train-up period for deployments. When officers arrive at their units, they're caught up in other mission-essential tasks such as railhead and dock loading and unloading operations and other critical tasks for successful deployment. The SLC builds and intensifies a soldier's core learning, resulting in a more confident and technically competent leader.

The Army is focused on strengthening the Warrior Ethos mentality to better position its leaders for any mission on today's ever-changing battlefield. The Engineer Regiment is leading this change with the SLC and Basic Officer Leader Course integration as the tip of the sword. The Army's future depends on superb leadership, and by supplying today's leaders with tools like the SLC, those leaders can become more mission-ready than ever before. The integration of these two entities may be the key to the future operation of our Regiment as part of a dominating combined arms team.

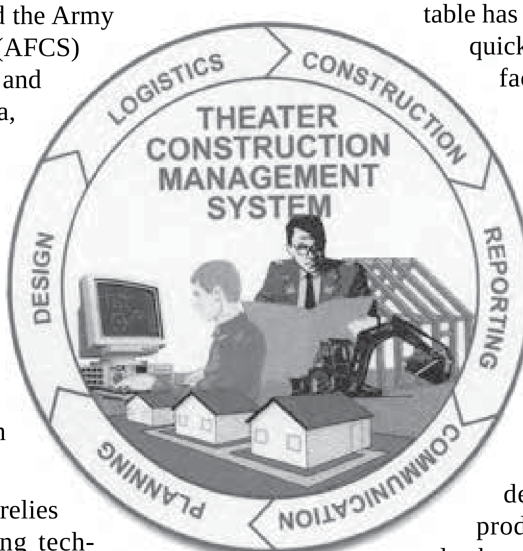
Captain Arnold is currently assigned to an Active Component-Reserve Component position supporting the 648th Engineer Combat Battalion (Mechanized), Georgia Army National Guard. When this article was written, he commanded Bravo Company, 554th Engineer Battalion (Engineer Officer Basic Course), Fort Leonard Wood, Missouri.

Second Lieutenant Kennedy, a graduate of the Sapper Leader Course, completed the Engineer Officer Basic Course in March 2004. He has a bachelor's in political science from Kansas State University.

THEATER CONSTRUCTION MANAGEMENT SYSTEM

By Mr. Chris Boyd

In September 2002, the U.S. Army Corps of Engineers (USACE) challenged the Army Facilities Component System (AFCS) branch of the USACE Engineering and Support Center, Huntsville, Alabama, to overhaul the planning and design tool called Theater Construction Management System (TCMS) version 1.2E. The Huntsville AFCS team released TCMS version 2.0 on 1 December 2003. This release is a complete overhaul of the TCMS structure and the underlying AFCS database, making version 1.2E obsolete and incompatible with version 2.0.

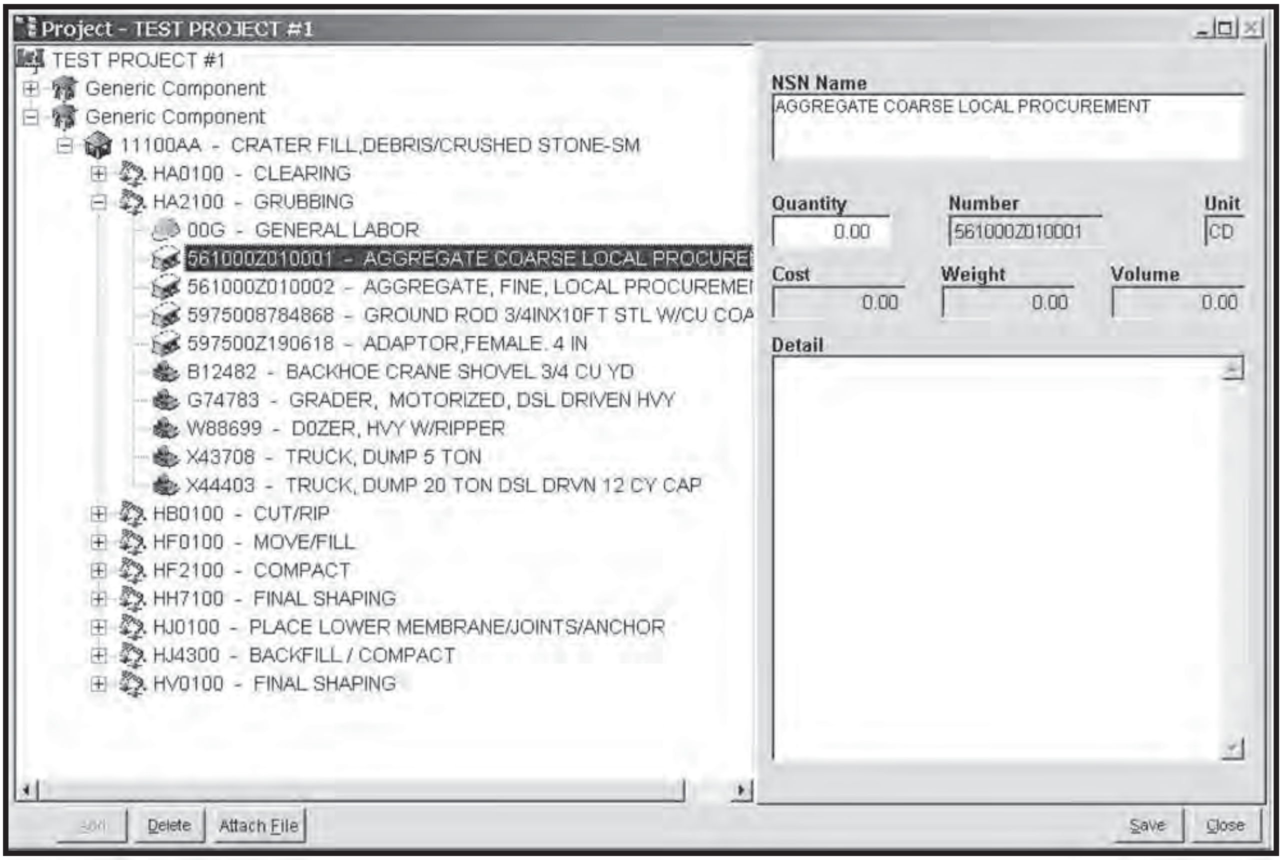


The significance of this overhaul relies on the knowledge of the underlying technology. The Construction Engineering Research Laboratory developed the early programming for TCMS more than 20 years ago to access the existing AFCS digital database. That version of the program was based on a Microsoft® disk-operated system that used external drives and was limited by floppy disks and hard drive space. The AFCS branch added functions and interface options within the 16-bit Microsoft Windows® operating system. However, each change was an add-on instead of an integrated, planned programming adjustment. This created an unstable operating environment and limited the enhancements that users needed. TCMS stayed 16-bit-based until 2003, even though 32-bit programming was introduced in 1995. This meant that version 1.2E and earlier versions of TCMS are limited to old and outdated commercial off-the-shelf (COTS) software, while the overhauled version 2.0 can interface with the latest version of Microsoft Project and AutoCAD® and run on a native Microsoft Windows XP environment. This lets users take advantage of current COTS.

TCMS interfaces seamlessly with the AFCS database and COTS software. There are tables that allow users to search or query the AFCS database. The "facility" table enables users to look up various facilities and view the bill of materials (BOM), labor, or drawings associated with that facility. (Note: TCMS uses the term "facility" to identify any item that serves a purpose and contains a construction sequence. This could be a warehouse, an administration building, hardstand, a 1-mile increment of road, 1,000 feet of fence line or runway, bomb damage repair, a latrine, or a dining hall.) The facility table has a search filter that makes finding items quick and easy. There are more than 4,700 facilities in TCMS, including initial or temporary construction standards, various types of construction materials, and different climates and terrain. Vertical and horizontal construction are represented in the extensive database. The drawing table accesses more than 2,000 AutoCAD drawings which, when drawn into a computer-aided design (CAD) program, allows users to adapt a standard drawing to the site or situation. Items such as truss plate detail, material takeoffs, and detailed production drawings are included in the database. This resource alone gives users a leg up on construction planning and execution. The program views CAD drawings with an internal viewer, letting users view and print drawings without leaving the TCMS environment. TCMS also allows the transfer of data mined from AFCS to Microsoft Project in logical sequences. This transfer of data in construction sequence, along with the import of user-defined resources, gives a decent Gantt chart without much of the stubby-pencil entry normally associated with developing such charts.

The AFCS database is the digitized information from Technical Manual (TM) 5-301, *AFCS Planning*; TM 5-302, *AFCS Design*; and TM 5-303, *AFCS Logistics Data and Bills of Materials*. These TMs were called the "Red Book" because of the red bindings encasing the standard drawing sheets. It took a footlocker to carry the TMs on a deployment, and it was a labor-intensive task to update and maintain them. They gave users information in the form of BOMs and labor for the facility, as well as drawings. The annual distribution of the TCMS replaced the publishing of the Red Books, and the Internet allows users to periodically update TCMS at *<http://www.tcms.net>*. This sometimes eliminates the need to mail new CD-ROMs. The Web site is also the place to go for technical information, program updates, training requests, and general TCMS information.

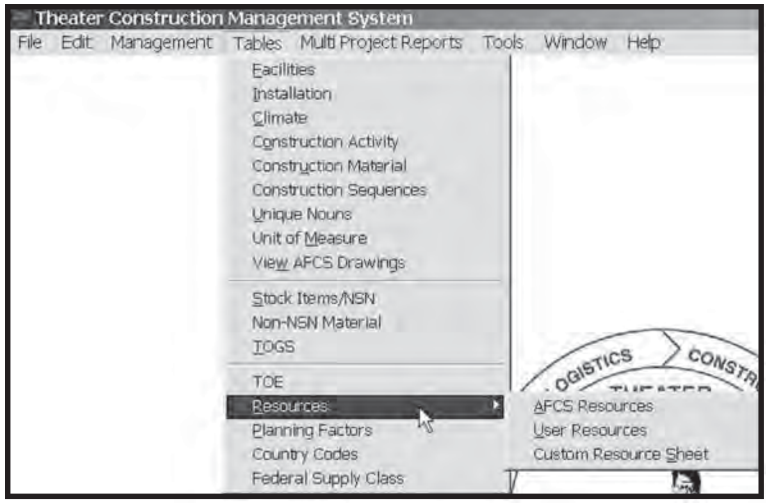
Changing TCMS meant thinking outside the box for the development team. Each part (programming, data, and drawings) could not be changed separately; each would



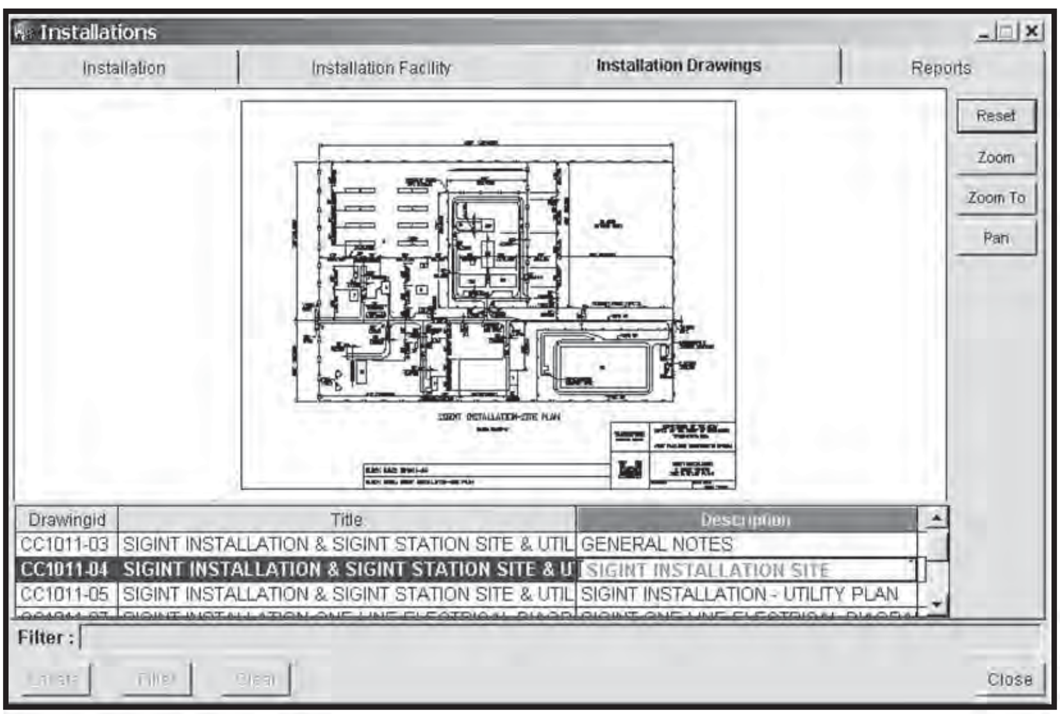
Sample Project Screen Shot

happen simultaneously. The tough part was not knowing if everything would work when all the parts were put together. The programming was updated to Visual FoxPro®. This was a major adjustment because 32-bit programming language allowed the arcane keystrokes method of version 1.2E to be supplanted by "point-and-click" commands. The programming also changed the way projects are viewed, using a graphic tree structure and icons. Seeing the relationships among component, facility, construction sequence, BOM, and labor allows users to make "drag-and-drop" project edits, as well as quantity changes, without losing sight of the overall project. Having multiple windows or tables open at the same time no longer locks the system. Using 32-bit programming ensures the life cycle of TCMS for years to come and allows it to interface with other 32-bit COTS software, giving the user access to the productivity gains associated with COTS. As the programming of TCMS/AFCS was being changed, the data structure of a facility was changed from the subfacility format to sequence. This change allowed the user to logically relate facility information. Each facility would now contain at least one construction sequence that would contain the labor to perform that sequence along with any materials that might be used during the sequence. For example, approximately seven construction sequences are used to build a warehouse. The drawing database expanded from 700 to more than 2,000 blocks, allowing the inclusion of production drawings and drawing details not previously available in TCMS. Including cross sections of various road types, building footings, new campsite plans, Hesco® bastions, trusses, and other items, the database of drawings is a wealth of information. Combining all three changed elements created TCMS32, an engineering platform.

The engineering platform of TCMS32 allows the user to input local purchase materials by Federal Supply Code and country code. The user can input local labor resources and combine those into resource sheets for use in Microsoft Project. A feature that has limitless possibilities is the "attach file" function, which allows the user to attach any electronic file to the project. Now geographic information system (GIS) data, real estate data, contracts, after-action reviews, pictures, and any other file that can be found with Microsoft Internet Explorer can be archived within the project. Since a project is actually a TCMS32 ZIP file, those documents become a part of the project itself. Project labor production rates are adjustable, based on user input. The locally purchased materials list can be exported to other TCMS32 users, allowing the theater engineer to avoid bidding wars, inflated prices, and material shortages by using the same listing across an area of responsibility. Editing the locally purchased material listing for price, nomenclature, volume, and weight is quick and easy. The AFCS planning factors are now accessible in their own easy-to-find table. The biggest new feature is the "export" function under project reports. This allows the user to convert various BOM and labor project reports into Microsoft Excel, Microsoft Word, portable document format (PDF), or hypertext markup language



Screen Shot of Table Menu



Screen Shot of Internal CADD Viewer

(HTML). The project progress report and the project summary can also be converted to other file formats. This enables the user to send project information to other persons in formats they can use outside of TCMS32. Development is underway to add Web-based training and application execution.

Future additions to TCMS32 should include a custom design function, allowing the user to quickly create from scratch a new three-dimensional design in minutes, including BOM, labor, and production drawings. It will also allow the user to change construction material on the fly and automatically adjust the BOM and labor. The COTS software for this exists today. TCMS32 should have a GIS capability to site-adapt facilities; a heating, ventilation, and air-conditioning module to forecast heating and cooling designs for buildings; and a module to address the power requirements for base camps and individual facilities. The ability to interface with current Army reporting systems and TeleEngineering will help engineers provide TCMS32 data across the battlefield. These items are part of the future development of TCMS32. The planning for TCMS64, a 64-bit version, will occur in fiscal year 2005. This will ensure that TCMS as an engineering platform will not be outdated by improvements in technology. With continued funding, these planned updates will become reality.

Mr. Boyd is a military planner with the AFCS branch of the USACE Engineering and Support Center at Huntsville, Alabama.

CTC Notes

National Training Center (NTC)

Changing the Environment at NTC

By Captain Timothy R. Vail

NTC has made significant additions to the contemporary operational environment (COE) in support of three recent stability operations and support operations (SOSO)-focused rotations. The most distinctive addition has been the creation of 12 villages across the desert.

Of the villages populated on the NTC battlespace, some are more prominent than others and, based on the scenario, some may be completely abandoned or thriving, based on economic conditions of the area. (Note: Village names may change with each rotation.) It is an ever-changing, growing, and realistic COE. The 11th Armored Cavalry Regiment (Opposing Force [OPFOR]) provides the civilians and paramilitary forces and, based on the unit and the training objectives of senior trainers, they can replicate any number of world regions, cultures, and religions.

Village Overview

- **Red Pass Ranch**: Formerly known as El Grazio, near Red Lake Pass—30 structures, an airfield, and 11 buildings recently added.
- **Eastland**: At the NTC east gate—19 structures, all recent additions.
- **Millersville**: Formerly known as Range 23—3 structures, no recent additions.
- **Silverlakes**: Formerly known as Range 24—4 structures, no recent additions.
- **Cave Springs**: Formerly known as Limaville—9 structures, no recent additions.
- **Citadel**: At the racetrack landmark—14 structures, all recent additions.
- **Tiefort City**: South of Hill 780 landmark—45 structures, all recent additions.
- **Junction City**: At the four-corners landmark—13 structures, all recent additions.
- **Langford Wells**: East of Langford Lake—19 structures, all recent additions.
- **Rockpile**: West of the Crash Hill landmark—13 structures, all recent additions.
- **Lakeside**: Formerly known as Nelson Lake Mining Camp—31 structures, an airfield, 5 buildings recently added.
- **Pioneer Valley**: Demilitarized communications complex—3 structures, to include an 81-foot-diameter communications dish.

Village Infrastructure

Each village contains varying levels of infrastructure, as discussed below. Through effective urban assessments leading to engineer support to the town infrastructure, the rotational units can win the support of the local populace.

- **Power**: Each village is outfitted with local generators for electricity. The buildings added most recently have 20-amp circuitry tied into the local generator supply.
- **Roads**: The larger villages of Tiefort City, Lakeside, Eastland, and Red Pass Ranch have received rotational unit support through gravel operations to reduce dust in the areas. However, roads remain generally unimproved.
- **Water**: Each village maintains local supplies of potable water with no local distribution networks.
- **Sewage/Waste**: Each village transports sewage and waste to Irwin Military City for treatment.
- **Drainage**: Nearly all road networks are susceptible to degradation due to heavy rainfall.
- **Structures**: There are four dominant styles of structures in the villages. Figure 1 depicts the locations and type of structures located at each of the villages. The annotations of *A*, *F*, *B*, and *S* correspond to the number of buildings that are formed, from 40-foot mobile buildings, preexisting facilities, railroad boxcars, and sheds, respectively. For examples of each, see Figure 2, page 62.

Engineer Support Makes a Difference

Figures 3 and 4, page 62, show the scope and size of two of the larger villages—Tiefort City and Lakeside. Within Tiefort

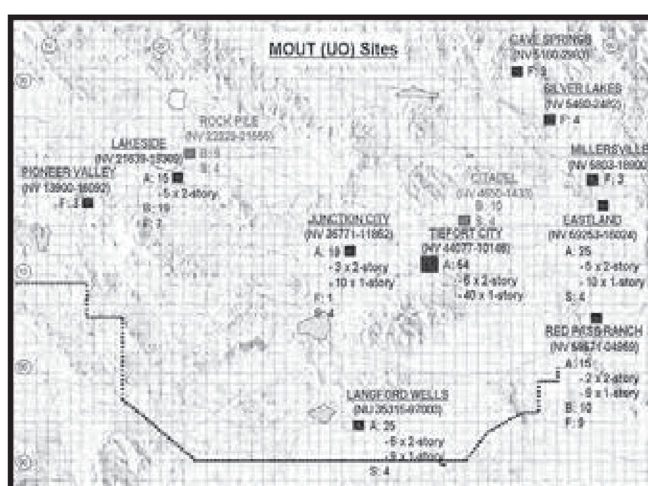


Figure 1. NTC Town Distribution

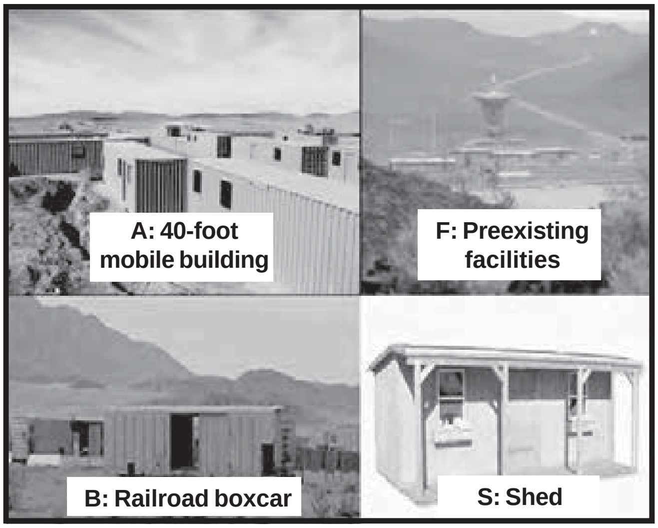


Figure 2. NTC Facilities

Figure 3. Tiefort City

Figure 4. Lakeside

City, rotational engineer units have routinely improved roads and added buildings to support local economies and education. Tiefort City replicates the regional capital for the area, and long-term plans include continuous expansion of the town into a small city.

Lakeside has seen recent growth as well due to engineer effort, to include airfield improvements, dust control, and the construction of a schoolhouse. The framework of the local roadways is easily identifiable, and it continues to evolve as the town grows.

Conclusion

The COE at NTC continues to transform to meet the needs of the force. The addition of these villages to the battlespace and the adaptive nature of the 11th Armored Cavalry Regiment continue to ensure that units are prepared and ready for a wide variety of operational deployments.

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Emerging Threats at NTC

By Captain Mark R. Faria and Sergeant First Class Charles J. Maxwell

The Army has quickly transitioned from offensive operations to stability operations and support operations (SOSO) in current theaters of operation. This transition has brought new threats to our soldiers in the form of paramilitary forces and their weapon of choice—the improvised explosive device (IED). NTC has changed its training program to incorporate these new threats and train soldiers on conditions they will face in Iraq and Afghanistan.

Paramilitary Forces

Paramilitary forces normally operate from patrol bases in rural areas and are resupplied by a logistics network operating from Irwin Military City. Paramilitaries regularly visit NTC's villages to influence the populace as well as to get supplies. They store weapon caches in the rural areas but keep mortar caches very close to firing positions.

Paramilitary forces are very mobile, conducting combat operations 10 to15 kilometers away from their bases using BRDMs (a Russian combat reconnaissance patrol vehicle), desert-colored high-mobility multipurpose wheeled vehicles (HMMWVs), and civilian vehicles for transport. Paramilitaries will drive unarmed through the areas of operation, link up with their logistics support at a predetermined location, secure their weapons, and then begin their combat operations. They have the ability to recruit from the urban center of Irwin Military City, as well as from civilians on the battlefield from towns in the area.

Paramilitaries are suspected of having three elements under centralized command and control (C2). Each element has

Paramilitary Camp

platoon-sized formations of 20 soldiers each. Centralized C2 provides additional mortars; intelligence, surveillance, and reconnaissance (ISR) assets; C2; and logistics support. Embedded within the platoons are terrorist cells that carry out suicide missions. Within each element, two platoons sleep during the day and conduct military operations at night, while one platoon conducts combat operations during the day and sleeps at night. Paramilitary forces, sometimes posing as civilians in civilian vehicles, maintain constant surveillance on U.S. forward operating bases (FOBs), looking for key systems and identifying patterns. Paramilitaries will target key systems such as logistics, C2, and collection assets. Some paramilitary tactics, techniques, and procedures (TTP) are to—

- Throw grenades and satchel charges, while posing as civilians.
- Fire 12 rounds of mortars, then displace.
- Fire mortars within minimum range of Q36/Q37 radars, preventing acquisition.
- Reconnoiter, identifying 8-digit grids for key systems such as tactical operations centers (TOCs), radars, and collection assets.
- Target logistics, C2, retransmission, and intelligence collectors.
- Assassinate pro-U.S. civilians.
- Use IEDs on main supply routes (MSRs).
- Conduct ambushes along MSRs and choke points, focusing fires on soft vehicles.
- Throw satchel charges from moving vehicles onto U.S. vehicles.
- Conduct suicide bombings on vehicles and personnel, normally one per day.
- Coordinate attacks on multiple FOBs, all taking place within 30 to 60 minutes of each other.
- Attack FOBs (10 to12 paramilitaries); when casualties mount, single vehicles attack or 2 to 3 paramilitaries throw grenades.

Improvised Explosive Devices

In current theaters of operation, IEDs are becoming a weapon of choice. It is paramount that units develop TTP on how to deal with this hazard during training, rather than when they are faced with the real threat. NTC employs IEDs to achieve this objective.

Brigade combat teams (BCTs) face IEDs that are command-detonated in support of ambushes and attacks. They also face IEDs that are left to injure soldiers and civilians and instill terror among the populace. The ability to safely handle this threat greatly impacts the BCT’s relationship with the civilians in their area as well as ensuring the force protection of their soldiers.

Typical IEDs at NTC

Paramilitary forces have used the following methods of IED emplacement:

- Roadside ambushes.
- Protecting weapons caches.
- Events that cause mass casualties and instill terror.
- Suicide bombers (vehicles, vests, and satchel charges) to kill U.S. forces.

To deal with the IED threat, units should—

- Analyze enemy ordnance order of battle (EOOB) to determine the types of threats.
- Plan for explosive ordnance disposal (EOD) response with dedicated security assets.
- Ensure that soldiers are trained on IED recognition, reporting procedures, and actions on contact.
- Analyze the complementary technical intelligence report (COMTECHREP) completed by EOD personnel to conduct pattern analysis and determine trends.
- Plot and track the IED threats on the battlefield and ensure that all units are aware of them.

Conclusion

NTC continues to transform in order to properly train BCTs on emerging real-world threats that our soldiers face in current theaters of operation. Paramilitary forces and IEDs continue to cause casualties in Iraq and Afghanistan; but by training these scenarios at NTC, units will deploy better prepared and have TTP on hand to counter these threats.

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Stability Operations and Support Operations

By Captain Christopher J. Tatka

NTC has recently conducted three rotations focused on stability operations and support operations (SOSO) in order to train units for deployments to support the Global War on Terrorism. This new NTC SOSO environment mirrors the areas of operation for potential deployments. Units operate out of forward operating bases (FOBs) and conduct operations in towns recently constructed in the NTC training area. This environment poses several challenges to the rotational units, which include—but are not limited to—paramilitary forces, civilians on the battlefield, and improvised explosive devices (IEDs). Typical missions where engineers support brigades in the SOSO environment are route clearance and cordon-and-search operations, force protection of FOBs, and general engineering.

Route Clearance

At NTC, units are not currently conducting route clearance as a combined arms operation, because engineer platoons serve as the support force, security force, and sweep force. As stated in Field Manual (FM) 3-34.2, *Combined Arms Breaching Operations*, route clearance is a "combined arms operation typically executed by an infantry company or cavalry troop." Task organizing for route clearance is similar to that required for breaching operations. Appendix E, FM 3-34.2 with Change 1, addresses in detail the planning and execution of route clearance operations. It discusses the clearance methods (linear, combat, and combat route), as well as the four sweep levels that should drive the brigade and battalion organization for route clearance operations.

Cordon and Search

The engineers' greatest contribution to cordon-and-search operations is the ability to use mine detectors in assisting with the search phase of the operation. In villages, paramilitary forces bury caches that may consist of weapons, ammunition, mines, and explosives. Engineer squads (divided into two search teams) are usually the unit of action (UA) to support the maneuver forces. When engineers use mine detectors to search an area, the tempo of the search slows; however, a much more thorough search is conducted. Engineer elements must conduct rehearsals with their maneuver units in order to address concerns associated with the time it takes to conduct a thorough and complete search.

Two sweep teams are recommended, with one team leader and two soldiers per team. The recommended makeup and training of the teams is as follows:

- Four mine detectors (AN/PSS-12 Mine Detector or Handheld Standoff Mine-Detection System [HSTAMIDS]).
- Mine probes.
- Marking materials.
- Face shields.
- Mine detector calibration training.
- Mine detector techniques training (Safety of Use Message [SOUM] 02-001 for the AN/PSS-12 Mine Detector).

Force Protection of FOBs

Units conduct SOSO from an FOB that may or may not have existing force protection measures in place. These measures may include berms, survivability and fighting positions, triple-standard concertina fencing, or other protective obstacles. Engineer planners must recommend survivability and countermobility priorities to the brigade commander early in the planning process, based on their analysis of friendly engineer capabilities.

Examples of priorities for survivability and countermobility in and around FOBs include—

- C2 nodes.
- Q36/Q37/Sentinel radars.
- Indirect fire assets.
- Class III (B) supplies (fuels).
- Captured ammunition holding areas (CAHAs).
- Gates.
- Perimeter berms.
- Individual fighting positions with overhead covers.
- Ammunition holding areas (AHAs).

General Engineering

Engineer units are challenged by planning, controlling, and executing general engineering tasks. Engineer staffs that are trained in planning combat engineering operations have a difficult time transitioning into general engineering in support of SOSO. A suggested way of approaching the planning process is to plan general engineering as if planning for a defensive operation. The following tasks are critical:

- Identify village requirements.
- Know friendly capabilities (do not promise the world).

- Ensure that the engineer battlefield assessment (EBA) reflects friendly capabilities (including contractors).
- Pass the EBA down to subordinates to support.
- Allocate engineer forces (mass effort).
- Prioritize general engineering in the brigade combat team (BCT).
- Determine the best method to control assets (centralized versus decentralized).
- Develop and monitor the timeline.
- Check and confirm general engineering plan(s).
- Report progress (subordinates should keep the commander informed).

Before conducting general engineering support to villages, engineer battalions must establish a method of obtaining assessments they need in order to adequately plan the engineer effort. Current trends are as follows:

- Engineer battalions do not know what information they need or do not provide requirements to subordinate units conducting assessments.
- Units have no standard assessment method.
- Engineer units are not trained at conducting village assessments.
- Units do not know what tools and personnel are required to conduct the assessment.

Examples of information needed from village assessments are shown in the chart to the above right. This list could also include the following:

- Town diagram with structure numbering system.
- Required measurements in each category.
- List of tools and resources required to complete assessment.
- How to identify power generation.
- Waste disposal system.
- Engineer skills and capability of local population.
- Location of explosive hazards (unexploded ordnance [UXO], mines).
- Resources that could be used by U.S. forces (engineer equipment, materials, and tools on-site).

The finalized assessment should be placed in the engineer company/battalion tactical standard operating procedure (TACSOP).

Tracking the progress and managing assets to support general engineering can be challenging for a commander. The chart in the lower right column is an example of a commander's card that engineer battalion staffs can update every 12 to 24 hours, based on the current battle rhythm.

Village Assessment

A. Personnel
Male _____
Female _____
Children _____

B. Assumptions
Water _____
Roads _____
Structures _____

C. Water Requirements
Quantity of storage _____
Type of storage _____
Truck-delivered _____
Well-delivered _____
Gravity-fed _____

D. Power Assessment
Buildings with _____
Buildings without _____
Buildings need _____

E. Generators
3-kilowatt _____
5-kilowatt _____
10-kilowatt _____
Other _____

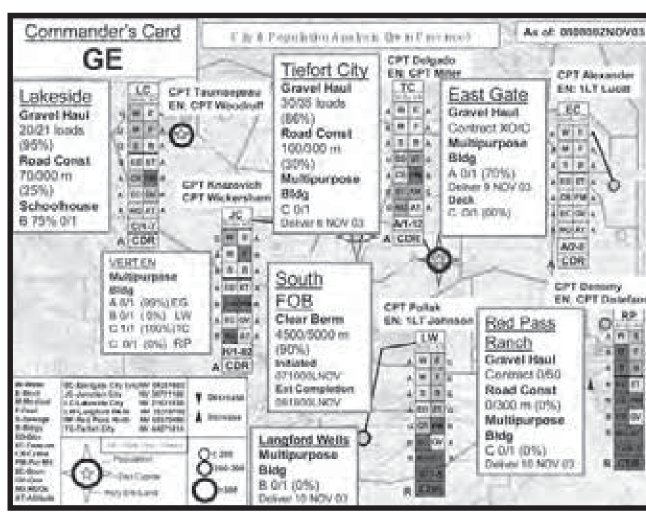
F. Transmission (Power)
Type of line _____
Length _____
Fuel required _____
Distance from generator _____

G. Appliances needing fuel
Cooking _____
Heating _____
Generator _____
Other _____

H. Roads
Approximate length _____
Damaged roads _____
Road cover type _____

I. Structures
Housing _____
Commercial _____
Need repair _____

J. Types of repair
Roof _____
Structural _____
Doors _____
Windows _____
Porches _____
Fences _____



Commander's Card

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