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Engineers Leading Transformation

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Front Cover:
Engineers in Transformation! The M113 armored personnel carrier through the Bradley fighting vehcle to the light armored vehicle show changes in the way engineers move.

Back Cover:
See page 73.

FEATURES

DEPARTMENTS

Clear The Way

By Major General Anders B. Aadland
Commandant, U.S. Army Engineer School

You can feel real excitement in the air as we head toward ENFORCE 2001! This issue is dedicated to the programs, initiatives, and dynamics that will receive top billing during this year's conference. It's all about change—the concept of "Engineers Leading Transformation" states our challenging case. With the assistance of our Regiment's outstanding leaders (active, reserve, and retired military; civilian; and contractor), bolstered by a rich slate of guest speakers, we are poised to peel this onion in every way we can. Be prepared to have fun, be steeped in camaraderie and branch revelry, and work to convey to your proponent the compelling requirements and priorities of our Regiment as it attacks the challenges of the Army's Transformation as a team. We hope to make profound steps toward our future during this year's conference and help resolve key issues regarding the Legacy, Interim, and Objective Forces.

Our ENFORCE 2001 theme clearly delineates our need to think strategically and plan proactively our branch azimuth and future needs as a vital member of the combined-arms team. As part of that process, the USAES leadership identified six breakout sessions to address key areas in which we need help from the field to analyze and develop recommended solutions. Each area is critical to the success of the Regiment and the Army as we pave the way toward Transformation. Here are just a few thoughts on each:

1. **Officer Development and Retention.** The Army has exciting things in store for our lieutenants. TRADOC just kicked off the pilot courses of the Basic Officer Leader's Course (BOLC) at Fort Benning for newly assessed 2LTs. The concept calls for all new 2LTs to attend BOLC—a field-oriented, leadership-challenging course—followed by basic-course attendance at their proponent school. The additional demands imposed by the Army's Transformation quest requires us to relook what we teach and how we teach our future leaders. We must prepare our young officers to be adaptive, imaginative, and fired up about being Engineers and Sappers. This breakout session will also review Engineer CPT attrition rates and initiatives to keep good officers in the Army.

2. **Combat Bridging.** We face many new challenges in attempting to meet the deployability and delivery requirements for assault gap crossing and bridging of the IAV and FCS-based forces. This breakout session will examine new methods, structures, and delivery systems to get the force across.

3. **Construction Engineering.** The IDIV Engineer organization will have organic horizontal and vertical construction assets that must fit into a C-130. What is the best ratio of vertical to horizontal capabilities for the Interim Force? Where should our priorities be for construction equipment—for today and tomorrow? This breakout session will seek to sort out the organization and materiel issues for our combat-heavy battalions of today and our construction requirements for the future force.

4. **IBCT/IDIV Engineers.** This breakout session will take a firsthand look at the Engineer units in the IBCT and IDIV and recommend changes to help us ensure optimal bang for the buck. This is an area we must get right the first time.

5. **Geospatial Engineering.** This is probably the area that is changing most rapidly. We are caught in the virtual opening of a new era, where the warfighter will not have those hard-copy 1:50,000 maps but can be inundated with terrain details that he would never dream possible. Does he want or need all that is available? Does the Engineer or S2/G2 provide the right stuff to the division/corps CG? How is NIMA helping the Army's Transformation of C4ISR?

6. **Mine/Countermine.** Will the Objective Force have mines in its arsenal? Now that we finally see conventional row minefields passing from the scene, what will be the mines and obstacles of choice for the future? How smart or brilliant will they become? On the countermine side, will we get beyond the heavy, brute-force breaching methods of the Legacy Force? What technologies show promise for the Interim Force breacher? How will the combined-arms maneuver force handle the mine threat? This breakout session will help us find answers to open the gates to mine warfare of the future.

ENFORCE 2001 week is full of important activities. For example, we look forward to the Engineer Regimental Review, where we will pay tribute to our great Regiment in a time-honored ceremony and see your unit's colors flying proudly. During the Army Engineer Association luncheon, we will welcome our new Honorary Colonel and CSM of the Regiment and say thanks to our outgoing pair. We will break ground for the Engineer Memorial Grove, which will be the future site of our Engineer AIT and OSUT Rites of Passage. This grove will help us remember our great heritage, those Engineers who served, and those who made the ultimate sacrifice for our country. As we execute the Army Transformation, we must never fail to look to our history as a guiding light.

So, we look forward to seeing you commanders, CSMs, DPWs, MACOM Engineers, DA civilians, and contractors of the Corps soon. Bring your running shoes and dress blues. Our Engineer Run will take us on a tour of the post that will prove to be challenging and worthwhile. The Regimental Ball will give us the opportunity to rest those achy feet as we honor the Itschner, Sturgis, and Grizzly Award winners and the Gold de Fleury Medal awardee for the year 2000. We cherish this outstanding opportunity for our leaders to come together as "One Corps, One Regiment, One Team." I appreciate the superb teamwork with USACE that makes a conference of this magnitude possible. We must proactively seek ways to overcome obstacles and be a part of the solution as the Army transforms over the coming decades. As I've said hundreds of times before, it is vital that we continue to speak with one voice throughout the Regiment. That does not mean we all agree; it means we meet and discuss divergent views, hash it out, and all emerge with a common understanding—that is our primary objective for ENFORCE 2001.

Happy 30th anniversary to this Engineer Bulletin! Thanks to our great staff for producing such a fine publication.

Essayons!

Lead The Way

By Command Sergeant Major Robert R. Robinson
U.S. Army Engineer School

It's that time of the year again, as we prepare for our annual ENFORCE Conference. I have always looked forward to this conference and sincerely hope that all the senior leaders of the Regiment can participate. It will be a very informative week, and hopefully a relaxing one as well, reuniting the key leaders of our Regiment.

We have refined the agenda for the Council of CSMs Breakout Session, which is available on the Engineer home page. Generally, our plan is to receive addresses from LTG Flowers, Chief of Engineers; MG Aadland, Commandant of the Engineer School and MANSCEN Commanding General; and BG Johnson, Assistant Commandant of the Engineer School and DCG of Initial-Entry Training and comments from the outgoing and incoming USACE CSMs—CSM Lugo and CSM Dils. We have also invited representatives from the Sergeants Major Branch and the Engineer Branch to give us personnel updates. These branch overviews will shed light on the results of the recent CSM/SGM and MSG selection boards and how those promotions will affect our Regiment. We will round out our agenda with other keynote speakers who will give presentations key to engineer leaders.

I want to spend the rest of our week focusing on issues that will support the future of our Regiment as we move through the Army Transformation process—which is also the theme for ENFORCE.

As we prepare to meet in May, I need all of you to think about some issues that we need to address. I will do the same based on some of my visits and the many e-mails and phone calls I get.

As I stated in January's video-teleconference, I want to hold a breakout session with selected CSMs and key leaders on our expectations of the Sapper Leader course. I truly believe that this is the finest leader-development course available to the junior leaders of our Regiment. We have evolved this course since its inception, periodically altering the course to meet the needs of our Regiment. It's time to do that again, but with a focus on how engineers will fight and be employed in the future. We need to blend what's practical for our units now with what's relevant for the future, while gaining a bigger "bang for the buck." Garnishing a more successful graduation rate for our soldiers and an improved level of execution at the junior-leader level will be our topics of discussion.

In February, I went to Fort Polk, Louisiana, to participate in the first-ever Sergeants Major Trends Reversal Conference hosted by the Operations Group, Joint Readiness Training Center (JRTC). About 30 school and proponent CSMs/SGMs, together with observer-controllers from the various training centers, convened to discuss negative trends as observed at JRTC. The objective of this conference was to identify trends common to the many Battlefield Operating Systems and determine strategies to correct these negative trends.

From an engineer's perspective, we are seeing many of the same issues observed as training weaknesses that we have been addressing for the last 10 to 15 years. Precombat inspections/checks, load plans, standard marking systems, integration of engineers into the brigade combat team/task force, range cards, and others have been and continue to be deficiencies observed in the training centers.

I would ask all of you to be able to talk about your units' most significant training deficiencies. We will, as a part of our CSM/SGM Breakout Session, discuss these deficiencies and determine which, if any, have root causes. I will offer that much of the problem, as I see it, stems from the inability to perform home-station training to standard. We all have our thoughts on what factors attribute to this deficiency; bottom line is that I want to address the issues that we can fix at the sergeant through sergeant first class and lieutenant levels. Another question to ponder is, How can we as a Regiment get our sergeants and staff sergeants to understand the importance and value of hip-pocket training to support individual and battle-task skills?

Other discussion topics will be personnel distribution, use of Ranger-qualified NCOs, attrition/transition trends of senior NCOs, and the implied expectations of service.

As part of our CSM Council, we will front-load the week's events with an informal dinner in honor of CSM Edward Lugo. On 6 May, we will gather as a body of senior NCOs and pay tribute to a soldier who has served our Regiment superbly. It will be our opportunity to recognize him and spend an evening with him in a social setting. I encourage all who can to arrive early to attend this dinner. We will conduct a Regimental Review on 9 May to honor the Regiment.

I look forward to seeing all of you again.

Engineers Lead the Way!

Engineer Force-Modernization Strategy

By Captain William R. Guevremont III

The quest for excellence continues in TRADOC to keep all U.S. Army engineers well organized and equipped so they can continue to be the best Corps of Engineers in the world. General Eric K. Shinseki, Chief of Staff of the Army, has shown us how we are going to move toward the future. The Engineer Regiment will transform itself in parallel with the Army Transformation plan. To accomplish this, our leadership has produced a clear bottom line for the transformation strategy for our Corps of Engineers. We will—

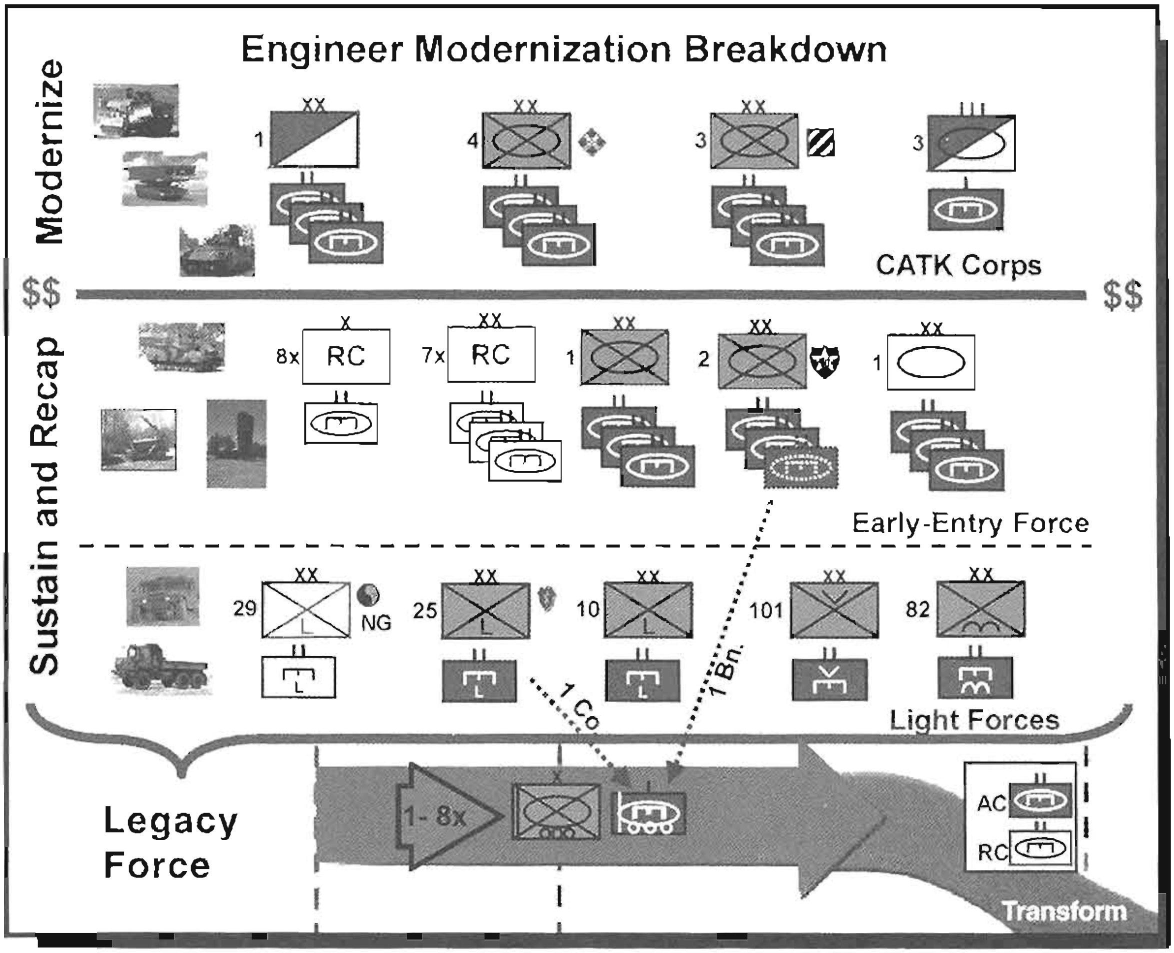
- Focus primarily on mobility, countermobility, and survivability systems.
- Continue integration of digital-terrain support through the current fielding schedule.
- Take risks in general engineering by only sustaining and recapitalizing the existing capabilities.

What does that really mean? In the figure on page 5, the first priority involves the engineers depicted on the top row. They will support the force called the Counterattack (CATK) Corps; continue with the Force XXI digitization; and be modernized with the Grizzly, Wolverine, and Bradley. The role of the CATK Corps is to follow the light and medium forces into theater to strike the decisive blow to threat forces, ending high-intensity conflict. The 1st Cavalry Division, the 3d Mechanized Division, the 4th Mechanized Division, and the 3d Armored Cavalry Regiment will see the best America has to offer in heavy "we-didn't-come-here-to-play" engineer equipment.

The forward-deployed engineers in Germany, Korea, and other OCONUS areas are part of the Early-Entry Force (second row of the figure). They will get deliberate sustainment programs to keep what they have in good shape. This means system depot-level rebuild programs and some replacement fielding of the same models these units have now. They are also the first to get the next-generation Future Combat System (FCS.) While they take good care of their M113 armored personnel carriers, they can look forward to radically changing warfare as we know it when they receive the FCS!

Not forgotten are our light engineers (third row of the figure). They are called the "Forced-Entry Force" with good reason. Seeing hundreds of helicopters and thousands of parachutes still stops the threat dead in its tracks. The current fielding of the deployable universal combat earthmover (DEUCE) and the high-mobility engineer excavator (HMEE) will keep the light engineers highly deployable and highly capable. They will also get some deliberate sustainment programs to keep current equipment going until transformation to the Objective Force.

Our engineers at Fort Lewis, Washington, bring into reality the deployable, lethal, and aggressive engineer company of the Initial Brigade Combat Team (IBCT) (see article, page 6). These engineers will define how future medium-equipped engineers will do business. Pursuit of the best equipment worthy of these pathfinders is the total focus of many here at Fort Leonard Wood, Missouri. Light rapid bridging, a new armored engineer squad vehicle, and the digitization of command-and-



control systems similar to Force XXI systems are what these engineers will use to support the IBCT.

Topographic engineers, the map makers of the past, are becoming the terrain-visualization experts of the future. Tailored hard-copy and digital maps will be there for the soldiers in the field who need them. They will be locally and specially made, giving information directly critical to the operation and situation (see article, page 10). But the cornerstone to producing information dominance for the Army is the large-screen digital displays that provide the maneuver force with instant comprehension of the terrain and its effects. The fielding of the series of Digital Topographic Support Systems (DTSS) is still on track, and we are dedicated to continue to keep topographic engineering a state-of-the art combat multiplier (see article, page 14).

Risk, as stated in the third bullet of our priorities, simply means that we will not upgrade the construction fleets in the near future. Our older fleets will be given the attention they need in the form of depot-level rebuild programs and limited replacement with like systems. We will take advantage of the modern civilian construction equipment that is available and buy it to replace our oldest models instead of developing our own. The lighter equipment will be aggressively sought to keep the light engineer force effective and deployable.

It is no accident that Reserve Component (RC) engineers are not on a separate row in the figure, but are a part of each row. These engineers will follow the Transformation pattern of modernization in sync with their force association. Engineers have always taken the Total Army concept to heart—76 percent of us who execute "Essayons!" are RC. These engineers are truly the strong arm of the Corps of Engineers, performing all those tasks that the Army depends on.

In every level of conflict, our engineer mission continues to be a primary enabler to Army operations. If you are not already deep into transition, take good care of the equipment that has served you well in the past, but also keep an eye on the future. The combat engineers of tomorrow will not fight as we do today—and the construction engineers will always be needed to perform the daily miracles of transforming chaos into civilization.

Captain Guevremont is a combat developments officer in the Directorate of Combat Developments, Maneuver Support Center, Fort Leonard Wood, Missouri. He was previously assigned to the 130th Engineer Brigade in Croatia and Germany and the 3d Armored Cavalry Regiment in Kuwait and Texas.

Concept and Organization of the IBCT Engineer Company

By Major Anthony O. Wright

The Army Transformation is highly visible at Fort Lewis, Washington, and no more so than with the engineers. From the first announcement on Transformation by Army Chief of Staff General Eric K. Shinseki, in October 1999, the engineers at Fort Lewis began work in earnest, receiving new personnel and equipment and turning in their legacy equipment. In September of last year, A Company, 168th Engineer Battalion, became the 18th Engineer Company—the first Interim Brigade Combat Team (IBCT) engineer company.

Structure

The structure of the engineer company in the IBCT is unique in the Engineer Regiment. It is a carefully tailored organization with a focused set of missions. It is important to understand the concept and mission of the IBCT and the engineer company's role within the brigade in order to understand its structure.

The brigade is designed as a full-spectrum early-entry combat force, optimized primarily for small-scale contingency operations in complex and urban environments.[1] The organizational and operational (O&O) concept emphasizes the need to balance the strategic responsiveness of the brigade against the requirements for battlespace dominance in determining the organizational structure. The organization must balance deployability, sustainability, and the in-theater footprint with lethality, mobility, and survivability. The IBCT's effectiveness is further enhanced by a design based on embedded unit capabilities—military-intelligence, signal, engineer, antitank, artillery, and combat-service-support (CSS) elements—that have been tailored specifically to the unique requirements of the unit's set of missions.

The brigade is an infantry-centric force with three motorized infantry battalions; a reconnaissance, surveillance, and target-acquisition squadron; an artillery battalion; a brigade support battalion (BSB); an antitank company; a signal company; a military-intelligence (MI) company; and the 18th Engineer Company (see Figure 1).

The organization and role of the engineer company is reflective of the embedded-unit-capability concept. When balancing the myriad missions an engineer unit may face against the deployability and sustainability of the brigade, the designers of the engineer company tailored the company to focus on providing mobility support to the brigade. Limited countermobility, survivability, and general-engineering capabilities are made possible using the same force structure required for the mobility mission. The engineer company supports the movement of combat forces to achieve a position of advantage with respect to enemy forces. Mobility operations maintain freedom of movement for personnel and equipment within the area of operations without delays due to terrain, barriers, obstacles, or mines. Combat mobility platoons are task-organized to maneuver elements to provide mobility support to mounted-maneuver, dismounted-assault, and urban operations.[7]

This focus on mobility support is evident in the company organization. The company is composed of three mobility platoons—each with three squads—and a mobility-support platoon with three sections. Figure 2, page 8, shows the objective organization and equipment.

The company has some limitations that are recognized in the O&O concept and its focus on mobility operations. The company has limited capability to support the brigade in major-theater wars or stability or support operations. In these environments, the IBCT requires additional engineer augmentation from the division or echelons above division.

Equipment

Each mobility squad will have an engineer squad vehicle (ESV), which is a variant of the infantry carrier vehicle. The ESV will be equipped with a remote weapon station M2 .50-caliber machine gun and mounted with obstacle-neutralization kits. The composition of the kits is not finalized, but it should include lightweight mine plows or rollers, a magnetic signature duplicator, and a minefield-marking system. Selection and delivery of the interim armored vehicle (IAV) is a future event. In the meantime, the company received nine light medium tactical vehicles (LMTVs), which are 2 1/2-ton cargo trucks equipped with advanced Single-Channel, Ground-to-Air Radio Systems (SINCGARSs) and situational-awareness systems to serve as surrogate squad vehicles until its ESVs are fielded.

Six of the nine ESVs tow mine-clearing line charges (MICLICs) and three tow Volcanos. To replicate the Volcano systems called for in the objective structure, the company mounted a four-panel Volcano system to a trailer. The Engineer School and Volcano product manager supported this endeavor by coordinating for safety testing and release at Aberdeen Proving Grounds, Maryland. The company is now able to replicate this capability while supporting the IBCT. The future system will be an M200 trailer-mounted Volcano that has recently been type-classified.

The company will eventually receive the Rapidly Emplaced Bridge System (REBS), which will provide responsive military load class (MLC) 30 gap-crossing capability for the brigade. Until the arrival of the REBS, the four common bridge transporters (CBT) in the engineer company are carrying medium-girder bridges, which provide 14.3 meters of MLC 30 bridging. This causes the only difference in personnel authorization between the current and objective structure, adding a military occupational specialty 12C30 to provide technical expertise on bridging.

The mobility-support platoon also has six small emplacement excavators (SEEs) and six deployable universal combat earthmovers (DEUCEs). The fielding of the DEUCE to Fort Lewis in July 2000 went very well, but during support to Infantry Company Situational Training Exercises, several of the DEUCEs developed a track problem. The problem was unique to Fort Lewis and was caused by the glacial soil building up between the drive wheel and the track and causing track damage. The DEUCE product manager and Caterpillar® quickly developed track-tension warning sensors and material shields which proved effective at preventing damage. The Engineer School concurrently provided a master operator to Fort Lewis to develop tactics, techniques, and procedures (TTP) to reduce material build up. Personnel in the Brigade Coordination Cell are working with Infantry School personnel to determine the

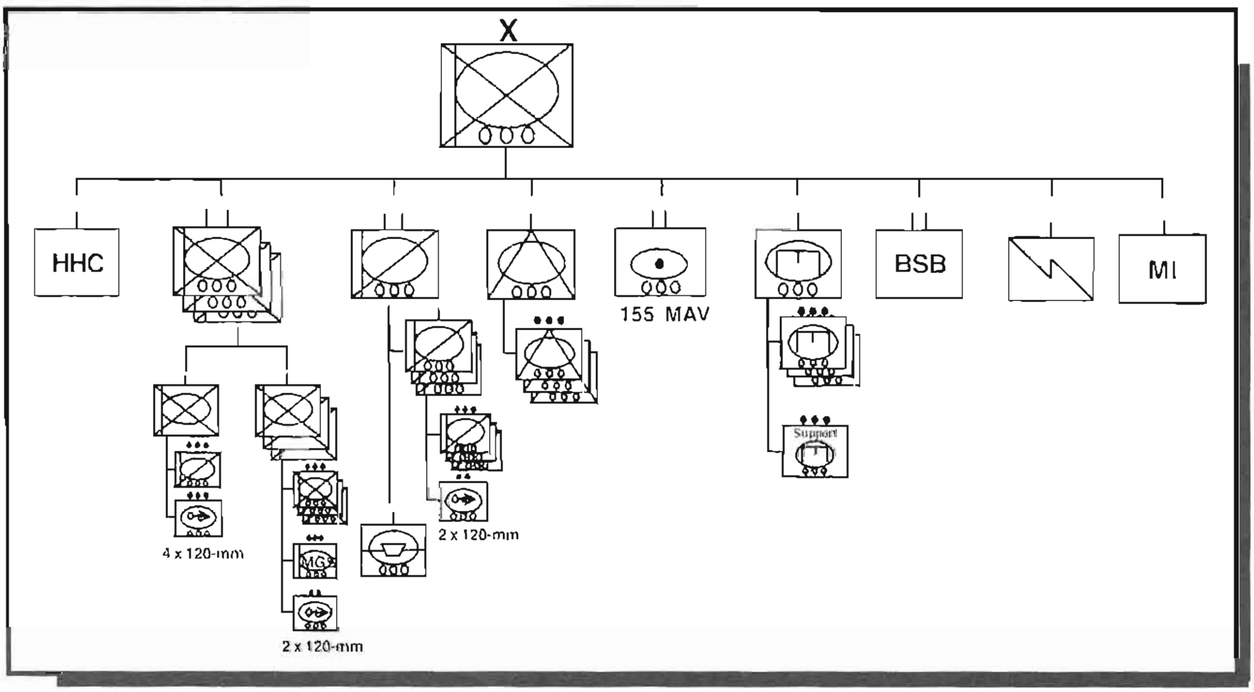


Figure 1. IBCT Structure

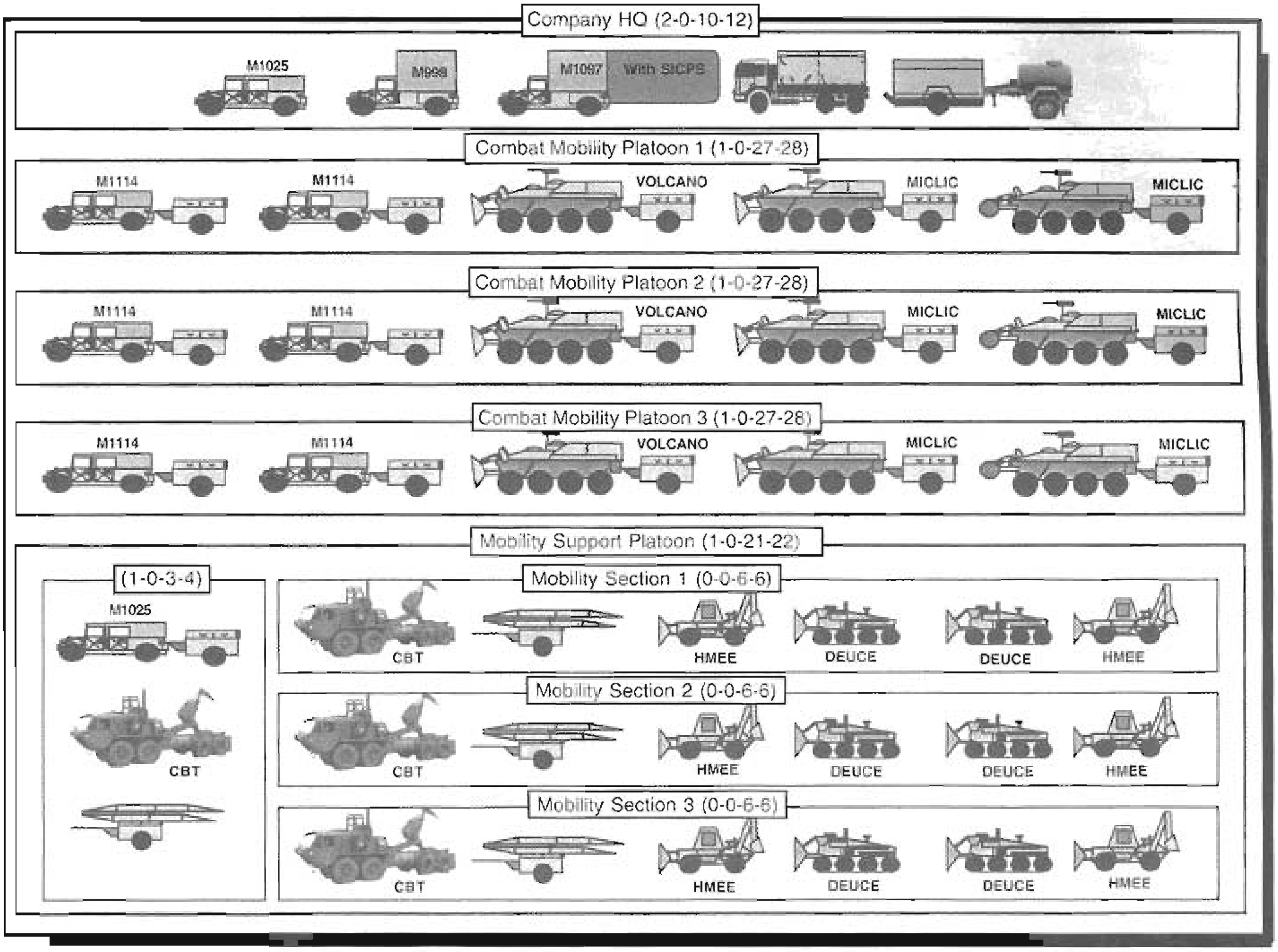


Figure 2. BCT Engineer Company Objective TOE (6-0-112-118)

doctrinally appropriate level of survivability support to the IBCT since the primary means of maintaining survivability in the brigade is through maintaining unit mobility and situational understanding.

Training

The company trains toward a centralized training task list (CTTL) that identifies the company-critical tasks. The platoons, squads, and sections have tasks that support the company CTTL. Currently, these tasks are to—

- Deploy/redeploy by air.
- Provide mobility support.
- Conduct battle-command operations.
- Provide limited survivability/countermobility support.
- Perform CSS operations.

Early in the Transformation process, the Engineer School provided teams of trainers to Fort Lewis to conduct a tactical-leaders course that focused on refreshing and reinforcing the skills that are critical to operation within the construct of the O&O concept.

The school also provided instructors for a course on military operations in urban terrain (MOUT) and demolitions, which gave concentrated instruction on TTP for supporting the force in complex and MOUT environments. The company received and trained on many new items from the major equipment described in previous paragraphs, to digital systems to gain and maintain situational understanding, to simple-but-useful items such as folding ladders that can be used to negotiate damaged stairways.

The maneuver companies and troops in the IBCT have conducted several iterations of situational training exercises. In each of these, the mobility platoons and mobility-support sections have demonstrated their worth as part of the brigade team, providing mobility, reconnaissance, and survivability support in varying environments.

Conclusion

The 18th Engineer Company and the 3d Brigade, 2d Infantry Division, are rapidly moving forward in Transformation. In March 2001, the 18th Engineer Company deployed to Fort Hunter-Liggett, California, for an extended field training exercise that stressed the company's ability to execute platoon-level combat-engineer missions. Transformation involves more than simply restructuring units and upgrading equipment. Transformation involves a mind-set change in how engineers fight as an essential force within

Soldiers conduct a MOUT demonstration during a training exercise.

an IBCT. The 18th Engineer Company is leading this effort for the engineer companies that are sure to follow. Engineers at Fort Lewis acknowledge that much has been learned over the past year—but there is still a long way to go. Hopefully, efforts in the 3d Brigade will prepare the second IBCT and its organic engineer company—A Company, 65th Engineer Brigade—for Transformation into another deployable, lethal IBCT.

Major Wright is the engineer operations officer in the Maneuver Division, Battlespace Training Directorate, Brigade Coordination Cell, Fort Lewis, Washington. Previous assignments include company trainer, Resident Training Detachment, 1457th Engineer Battalion, Utah Army National Guard; G3 war plans officer, aide-de-camp, and engineer plans officer, V Corps Headquarters; S3, 565th Engineer Battalion and 130th Engineer Brigade. MAJ Wright is a graduate of the Oregon Institute of Technology and the Engineer Officer Basic and Advanced Courses.

Endnotes:

[1] *Organizational and Operational Concept for the Interim Brigade Combat Team*, 30 June 2000, Chapter 1.

[2] Ibid, Chapter 9.1.

The Engineer Writer's Guide

We think engineers take a special pride in their profession, and *Engineer* is always looking for articles from readers who want to share their expertise, experience, and ideas. If you are a potential contributing writer, here are a few tips to steer you in the right direction:

Articles may discuss engineer training, operations, doctrine, equipment, history, or other areas of general interest to engineers.

We're especially interested in articles that have a "how-to-do-it-better" theme. For instance, we're not looking for articles telling readers how you conducted a routine field exercise. But if you think you have a "new-and-improved" way of conducting a tactical operation, training exercise, or other operational procedure that may prove helpful to other engineers, that's what we need.

Articles should generally come from contributors with firsthand experience of the subject being presented. Articles should be concise, straightforward, and in the active voice.

Length should range from 2,000 to 4,000 words. Generally, a double-spaced page should contain from 200 to 250 words. Provide either a 3 1/2-inch disk in Microsoft Word, along with a double-spaced copy of the manuscript, or send articles by e-mail to *bridgess@wood.army.mil*.

Articles containing attributable information or quotations not referenced in the text should carry appropriate endnotes.

Contributors are encouraged to include black-and-white or color photos, artwork, and/or line diagrams that illustrate information in the article. Include captions for any photographs submitted. Hard-copy photos are preferred, but we will accept digital images originally saved at a resolution no lower than 200 dpi. Please do not include them in the text. If you use PowerPoint, save each illustration as a separate file and avoid excessive use of color and shading. Please do not send photos embedded in PowerPoint.

Provide a short paragraph that summarizes the content of the article.

Include your full name, rank, current unit, and job title. Also include 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 stating that your local security office has determined that the information contained in the article is unclassified, nonsensitive, and releasable to the public. We do not require a hard copy of the clearance.

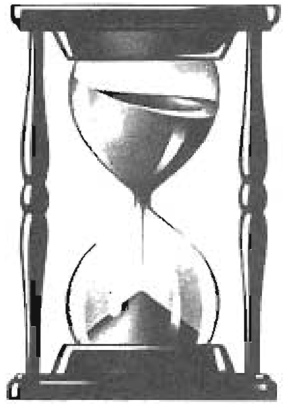
Reviews of books on engineer topics are also welcome.

Articles or book reviews may be mailed to: Editor, Engineer Professional Bulletin, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, Missouri 65473-8929.

All submissions are subject to editing.

If you have questions about an article you're working on—or considering writing—call Shirley Bridges, at DSN 676-5266, or commercial (573) 596-0131 ext. 35266. We look forward to hearing from you.

Note: Due to the limited space per issue, we do not print articles that have been accepted for publication by other Army professional bulletins.



Going, Going, Gone . . .

Bidding Farewell to the 1:50,000-Scale Topographic Line Map

By Colonel William Pierce

Knowledge of the battlespace is a prerequisite to any successful military operation. Maps provide that knowledge. At the National Training Center, Fort Irwin, California, the observer-controllers' recipe for success in battles and engagements is very simple: see the enemy, see yourself, and see the terrain. For more than 80 years, the Army has been using the 1:50,000-scale map, technically known as the Topographic Line Map (TLM), to see the terrain. The TLM has served us well in the past, but it has limitations that diminish its utility in this information age. The leaders at the National Imagery and Mapping Agency (NIMA) have found a better way. To achieve the Joint and Army Visions for information dominance, NIMA is undergoing a revolutionary change in how it provides terrain information to the Department of Defense. This article discusses the motivation for this change in direction, describes how the Army will benefit from the change, and outlines an implementation strategy.

NIMA's New Direction

Spurred by recommendations from the Defense and Army Science Boards in 1995, NIMA published a document called the Geospatial Information Infrastructure (GII) Master Plan in October 1997. Known as the Foundation Data (FD) Concept, this plan describes the changes that NIMA and the customers of mapping products must make to achieve the information-superiority tenets of the Joint Vision. The FD Concept is a revolutionary data-production scheme that is designed to provide warfighters exactly what they want when they need it. NIMA's old production strategy was based on a suite of standard products. NIMA made the Cadillac of maps—the 1:50,000 TLM. Unfortunately, there are several problems with this old friend.

First, the map was a predefined product. There may be features on the map a warfighter doesn't care about and new features that are important in planning. However, with the TLM, it did not matter what the warfighter wanted. He got the standard complete map or no map—nothing in between.

Second, NIMA produced these very expensive maps "just in case," based on commander-in-chief- or service-defined requirements. After production, the Defense Logistics Agency (DLA) updated the map catalogs, and the map sheets remained available for the warfighters in a DLA warehouse. After several years, the information on the map became dated. Updating TLMs is expensive and time- consuming. In fact, updating TLMs is unaffordable to the nation and unresponsive to the warfighters' needs.

Finally, the TLM isn't available worldwide. The current holdings of 1:50,000 and 1:100,000 TLMs cover less than 25 percent of the earth's surface. Over the past two decades, Department of Defense forces have begun operations without complete mapping coverage on several occasions (examples are Grenada, Desert Storm, and Somalia).

FD Concept Components

The first component is the foundation data. The foundation consists of a near-worldwide medium-resolution data set of imagery, features, elevation, and safety-of-navigation information (see Figure 1). Specifically, the foundation contains the following:

Imagery. This is both 1-meter stereo and 5-meter monoscopic imagery. These imagery data sets are relatively easy to make and can serve as a map background when grid lines are added. They provide the warfighter a view of the battlespace that is unavailable with a traditional map.

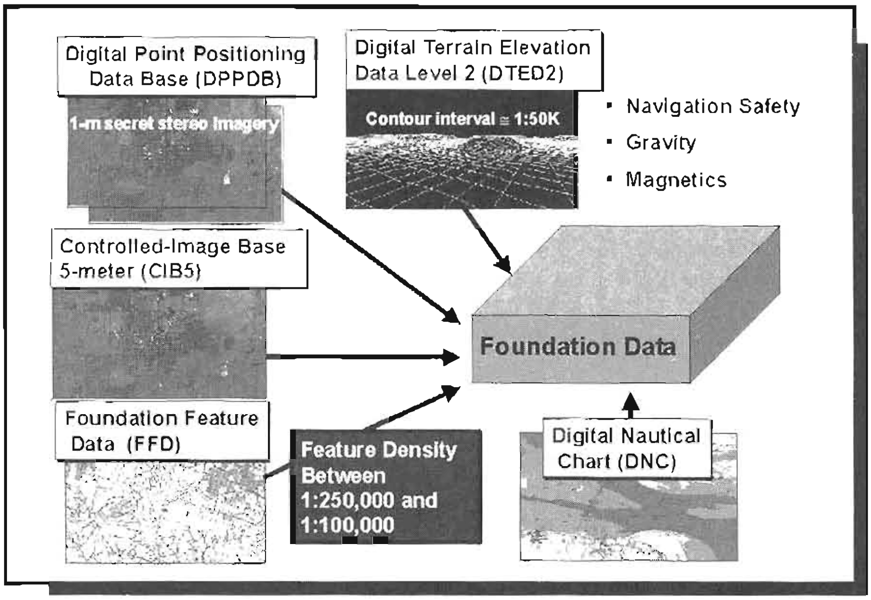


Figure 1. Foundation Components

Elevation Data. Based on the successful space-shuttle radar-mapping mission in February 2000, NIMA has the data it needs to cover all land between 80° south latitude and 84° north latitude with Digital Terrain Elevation Data Level 2 (DTED2)—meaning an elevation reading every 30 meters—by late 2003. DTED2 provides a contour interval approximately equal to that of a 1:50,000 TLM. Two main benefits of this elevation data are that—

- Warfighters can locate intervisibility lines in their area of operations using readily available line-of-sight algorithms.
- Warfighters can construct more accurate three-dimensional (3D) views and fly-throughs.

Foundation Feature Data (FFD). This component generates traditional map views. Collected at a resolution or density similar to a 1:250,000 Joint Operations Graphic (JOG) map, the data contains not only features —such as roads, vegetation, rivers, and lakes—but also attributes or descriptors of the feature—such as road widths, road/runway surface types, and tree types. These attributes are not restricted to the legend of the map but are an integral part of the database and can be called up by a few mouse clicks on the digital map.

Mission-Specific Data Set (MSDS)

Part of the revolutionary aspect of the GII Master Plan is the concept of an MSDS. Most warfighters would say that they could not conduct tactical operations using a 1:250,000-scale map. No one expects them to. While the components of the foundation provide enough information to conduct general planning and navigation, there is a clear recognition in the GII Master Plan that more information must be generated to satisfy the information needs of most commanders. This additional information is called mission-specific data (see Figure 2, page 12).

If a commander wants a higher-resolution data than the foundation components, he must ask for it. An MSDS is simply terrain data, *defined by the commander*, that answers the commander's terrain-information needs. As the terrain expert in the command post, the staff engineer must be able to translate the commander's needs into data requirements that NIMA can understand. Under this concept, NIMA can focus on collecting, processing, and disseminating data that is relevant to the commander's real interests (see Figure 3, page 13). Over time, as NIMA populates the database with foundation data and MSDSs, more and higher-resolution terrain information will be available to warfighters when they need it.

Another aspect of the plan is that all data sets are custom-made for warfighters. This makes the phrase "standard NIMA products" obsolete because there are no standard NIMA products. Even the FFD will vary in density depending on what is requested.

Benefits for the Army

The FD Concept will support the Army terrain-information needs in several ways:

- All foundation data and MSDSs will be tied to the same earth reference or datum. There are currently in excess of 100 datums in use worldwide. The datum used for each map sheet is listed in the legend of the map. One example of a common datum is North American Datum 1927 (NAD 27). The Department of Defense has defined the World Geodetic System 1984 (WGS 84) as the standard for military mapping. Thus, under the FD Concept, all data—whether digital or hard-copy—is tied to the same earth reference, providing a common view of the battlespace.
- Information learned about terrain for one operation is preserved for future use as it is incorporated into the NIMA database.
- The new data supports automated-decision support. The embedded attributes in the database will support automated analysis and generation of tactical-decision aids. Examples

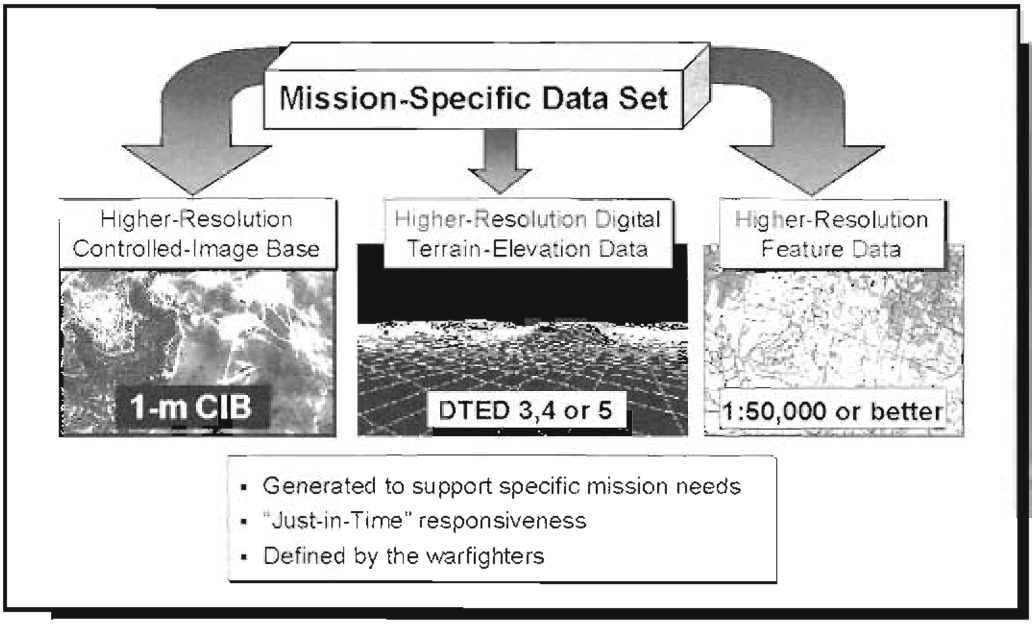


Figure 2. Mission-Specific Data Set

include cross-country-mobility analysis, automated route selection, slope analysis, 3D fly-throughs, and line-of-sight analysis. This attributed data will provide the link between command, control, communications, computers, and intelligence (C4I) systems and modeling and simulation (M&S) systems to support realistic mission planning and rehearsal.

- Commanders can specify the content of the high-resolution terrain information they need to make decisions.
- Under current production processes, changing a map is a laborious task. Under the FD Concept, it will be possible to integrate field-derived information in local and national databases. The result is that every soldier is now a potential collector of terrain information. Attributes that can be determined on the ground— such as stream velocity, bank height, and bridge classification—can be captured and saved.
- For most warfighters, maps have been the primary source of terrain information. Under the FD Concept, image-based maps that can be produced relatively quickly will be available to the commander.

Implementing the FD Concept

To implement the FD Concept, the Army had to define Army-specific MSDSs. With superb support from NIMA, the Army developed packages of terrain information that resembled the 1:100K and 1:50,000 TLMs. These packages contained the features the Army has traditionally required on the TLMs. In addition, they also included attributes that support the automated analysis described in this article. In 1999, NIMA made a comprehensive set of hard-copy and digital prototypes of these MSDS-defined packages. The prototypes were sent to the field for evaluation and, based on feedback, the Army was able to specify its terrain-data requirements.

All services had questions about NIMA's implementation strategy. Since the FD Concept is more than just a database, there were concerns about requirements management, data dissemination, and exploitation systems. In other words, who can ask for MSDS, how will the data be delivered, and how will warfighters view the data? In this concept, commanders are able to ask for specific features or attributes in an area of operations using some type of Web-based architecture. As NIMA continues to generate MSDS during an operation to satisfy a commander's information needs, there is a recurring requirement to send this new, updated information to the field. Once the data is received, soldiers must be able to view the data on their Army Battle Command System (ABCS).

In August 2000, NIMA initiated a joint forum to address the implementation concerns of the services. This forum developed a Geospatial Concept of Operations, an updated version of the GII Master Plan, and cost estimates to fully implement the FD Concept. While all of the accomplishments of the forum are outside the scope of this article, some conclusions are worth noting.

- Due to resource constraints, NIMA cannot continue to provide legacy products to the services and agencies while simultaneously populating the database with foundation data and MSDSs. At some point, NIMA must make a break from the legacy production processes.
- Neither NIMA nor the services are ready to move to an environment where the content of the map changes with every request. While this is the vision of the GII Master Plan, the challenges associated with this information environment will not be solved in the next few years.

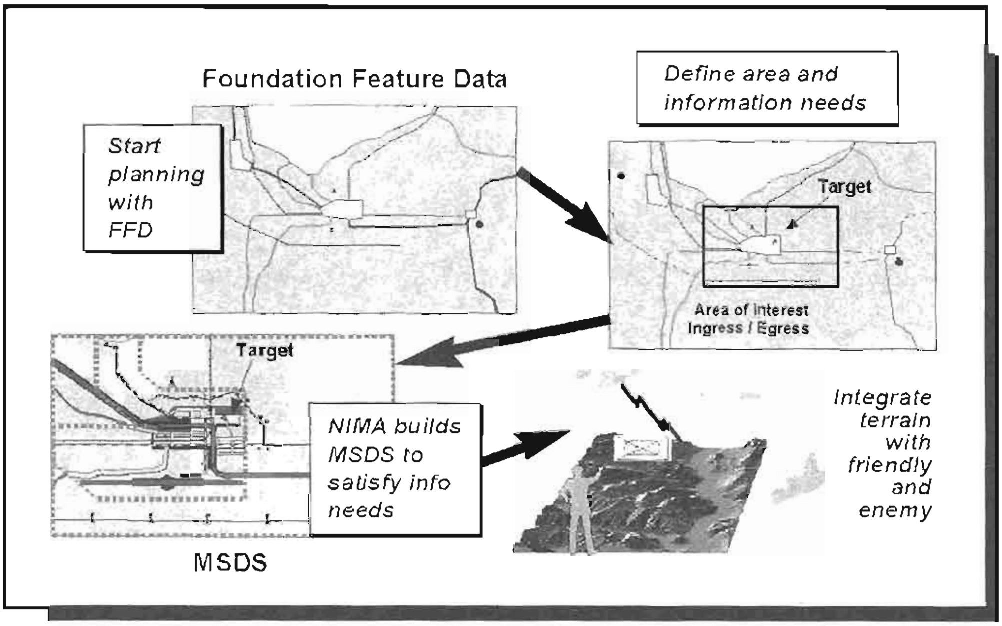


Figure 3. The Concept

- As a near-term transition step, the services-defined MSDS packages can serve as a bridge between the legacy products and the full implementation of the GII Master Plan.

Although this concept of treating MSDS packages like products seems to be a reasonable approach, it will be difficult for the services to move into the future for several reasons:

- NIMA is meeting most of its terrain-information needs with legacy products.
- Several aspects of the FD Concept require new training strategies. Modifying current topographic training is not sufficient. This new training will range from changes in technical topographic training and the military decision-making process, where ordering an MSDS is an explicit step, to basic map reading.
- NIMA's current holdings of this new data are relatively sparse.

The motiviation to make this transition may come from NIMA. The NIMA leadership is currently looking at a strategy to end production of the legacy TLMs in the next few years. It could happen as early as FY03. This does not mean that NIMA will no longer provide the geospatial information that tactical commanders need to accomplish their missions. The geospatial production elements in NIMA are developing a strategy to either maintain the TLMs that have already been produced or replace them with MSDS packages. The existing stock of TLMs will still be available to the services for several years. However, any new TLM mapping requirements will be fulfilled by an Army-defined MSDS package that looks like a TLM to users.

NIMA produced several 1:100,000 TLM maps of the National Training Center for the 4th Infantry Division Capstone Exercise in April 2001. These maps were generated from FFD but are indistinguishable from the legacy TLMs. The only difference is that these products were made using NIMA's new production processes.

The Bottom Line

NIMA's implementation of the FD Concept will result in a much more comprehensive and relevant view of the battlespace for warfighters and will provide the level of detail required for information dominance. While some of the implementation details remain unanswered, it is clear that NIMA cannot continue to populate the new database while supporting warfighter requirements for legacy mapping products like the TLM. The soldiers NIMA serves will have the geospatial information they need to accomplish their missions in a format that is familiar to them under the FD Concept. It is now time for engineers to learn this important part of their mission and help their maneuver commanders through this revolutionary transition.

Colonel Pierce is the TRADOC Program Integration Officer for Terrain Data. In this capacity, he is the Army's centralized manager for the coordination and synchronization of all Army digital terrain-data requirements. He previously commanded the 299th Engineer Battalion at Fort Carson, Colorado, and was assigned to USSPACECOM J36 as the team chief for the ACOM, STRATCOM, and SOUTHCOM Joint Space Support Team. A graduate of the United States Military Academy, Colonel Pierce holds a master's and a Ph.D. in civil engineering from Rensselaer Polytechnic Institute and a master's in military arts and sciences from the Command and General Staff College. He is also a licensed professional engineer in Virginia.

GEOSPATIAL ENGINEERING:

A RAPIDLY EXPANDING ENGINEER MISSION

By Lieutenant Colonel (Retired) Earl Hooper, Mr. Brian Murphy, and Chief Warrant Officer 2 Chris Morken

"Those who do not know the conditions of mountains and forests, hazardous defiles, marshes, and swamps cannot conduct the march of an army."

— *Sun Tzu*

Exploitation of geospatial information is revolutionizing business, science, and government. Aerial and satellite remotely sensed imagery, Global Positioning Systems, and computerized Geographic Information Systems (GISs) are increasingly becoming the driving force for decision making across the local to global continuum. Planning urban growth, managing a forest, assessing insurance claims, positioning an automatic teller machine, routing 911 vehicles, and assessing groundwater contamination are just a small sample of the broad impact.

The GIS emerged as a viable technology in the early 1980s. In the 1990s, it exploded into one of the fastest growing and most widely adopted technologies in the information age. (See article "GIS—The Bridge Into the Twenty-First Century," *Engineer*, April 2000, page 34.) It spans a diverse group of user communities ranging from small villages to federal agencies and the military. This exciting technological development integrates remotely sensed and ground-based information into powerful decision-making analytical tools.

Geospatial Information in Military Operations

"The want of accurate maps has been a grave disadvantage to me. I have in vain endeavored to procure them, and I have been obliged to make shift with such sketches as I could trace out of my own observations and that of gentlemen around me."

—*General George Washington*

Military commanders have long realized the interdependence of the earth's land features and success on the battlefield. Those who stand out in history have visualized the terrain and its effects on the battle's outcome. A part of information dominance, the commander's knowledge of the terrain allows him to obtain a superior advantage in shaping the battlespace.

Accurate enemy, friendly, terrain, and weather pictures are the promises of digital command and control. Geospatial information provides the framework upon which all the other relevant strategic, operational, and tactical information is layered.

Digital geospatial information is the foundation for a superior view of the battlespace. Sophisticated computer workstations utilizing digital geospatial information perform a variety of military functions, such as navigation, mission planning, mission rehearsal, and targeting. Because of the increased breadth and utility of map information, the term "geospatial information and services" has replaced "mapping, charting, and geodesy" in joint doctrine.

The Geospatial Engineering Mission

Geospatial engineering is the development, dissemination, and analysis of terrain information that is accurately referenced to precise locations on the earth's surface. It provides mission-tailored data, tactical decision aids, and visualization products that describe the area of operation.

Geospatial engineering is an expansion of the traditional role of topographic engineering and is necessary to support Force XXI digitization and Army Transformation. It is a key component of the Engineer Force Modernization Strategy, bringing four principle operational capabilities to the Army.

Geospatial Data Generation. Terrain doesn't change as the enemy and friendly situations do. What does change is the resolution of our knowledge of the terrain. The implementation of the Foundation Data Concept (see article, page 10) brings terrain information as a requested commodity to meet the critical needs of the warfighter. Army geospatial engineering is part of an integrated data production with a future focus at Corps level.

Geospatial Data Management and Dissemination. Bringing the geospatial data needed to empower digital command and control is the most complex of the new engineer missions. The engineer role includes integrating data from higher echelons with information from field reports and tactical sensors to produce a common view of the terrain. Engineers must resolve the differences between various reports (conflation of the terrain data) to render a single common representation of ground truth. This "common topographic operating environment" must then move horizontally and vertically in the battlespace. While the future focus of management is centered at the division level, the resulting data must reach the lowest Battlefield Operating System—the land warrior or weapons platform.

Geospatial Data Exploitation and Analysis. Traditionally terrain analysis has been done at the division level and above by engineer terrain teams under the control of an assistant chief of staff, G2 (intelligence). This continues, but with the excitement of new command-critical data flowing into the process. Semiautonomous operations by maneuver brigades (distributed maneuver) demand a clear understanding of the impacts of terrain and weather. To meet this challenge, experimentation with dedicated terrain-analysis support to maneuver brigades began with Force XXI and expanded to all maneuver brigades during the Division Advanced Warfighting Experiment. Brigade support is now standard for working concepts and carries over to the Initial Brigade Combat Team (IBCT).

Geospatial Services (Surveying and Printing). Services often are not noticed unless they are absent. Such is the behind-the-scenes work of the military occupational speciality (MOS) 82D geodetic surveyer and MOS 81L photolithographer. High-resolution geodetic control provides the spatial accuracy needed for precision fires and navigation. The geodetic survey is the critical starting point whether opening a tactical airfield or delivering precise artillery. Printing services take on new meaning with the rapid increase in terrain knowledge. Printing continues as an echelon-above-division capability, but the future is in highly deployable digital-printing modules based at Corps level. The modules will be deployed to the critical point of need on the battlefield and will link with the terrain assets under engineer control. These digital printing systems incorporate the technology (the high-volume map printer) proven during the Joint Contingency Force Advanced Warfighting Experiment held at Fort Polk, Louisiana, in September 2000.

Implications for the Future

Geospatial engineering is not new. It is a new term denoting a much-expanded engineer mission. It impacts every soldier on the battlefield, with the engineer officer still charged to be the local resident expert. It is not the mission of only a few centrally located experts (assistant Corps engineers and terrain warrant officers) within the Regiment. Engineer officers at theater, corps, division, brigade, and battalion levels must be the terrain experts, responsible for helping the commander visualize the impact of terrain. To learn how to do that, visit the Terrain Visualization Center's Web site at *http://www.wood.army.mil/tvc*.

The rapid growth of the geospatial-engineering mission can be seen in the first digital division. With the addition of brigade terrain support and embedded data management, the 8-soldier division terrain-analysis team expands to a 34-soldier comprehensive geospatial-support structure. The IBCT expanded the role even further by demanding data management at the maneuver brigade to exploit the robust reconnaissance, surveillance, and target-acquisition capabilities rapidly. This demanded a more experienced terrain-analysis staff, capable data management, and the ability to integrate new geospatial information rapidly. The IBCT contains a 5-soldier geospatial support element led by an engineer warrant officer. All of this expanded geospatial-support capability is under management and control of engineers rather than the G2.

Summary

Geospatial engineering is a functional name change from topographic engineering, but it is not a new engineer concept. Engineers still have the task of providing battlefield visualization through analysis, synthesis, and database management. Geospatial engineering provides the services of geodetic surveying and reproduction. As the Army expands its capabilities through automation methods, the role of the geospatial engineer expands significantly. As commanders rely on an accurate depiction of the ground to conduct military operations successfully, so they rely on geospatial engineers. Geospatial engineering is indelibly linked to information dominance and the success of the digital force.

Before his recent retirement, Lieutenant Colonel Hooper was chief of the Terrain Visualization Center, TRADOC Program Integration Office for Terrain Data, Fort Leonard Wood, Missouri. He currently manages a law firm in the Fort Leonard Wood area.

Mr. Murphy is a supervisory physical scientist (GS-13) and the deputy chief of the Terrain Visualization Center. He is the principle developer of the geospatial-engineering concept. He also coauthored (with the Intelligence Center) the "Army Imagery and Geospatial Information and Services (AIGIS)" concept, which is undergoing worldwide staffing. Mr. Murphy is a retired military officer with 17 years of federal service (much of which is combat-developments experience).

CW2 Morken is a terrain-analyst technician in the TRADOC Program Integration Office for Terrain Data. He was previously assigned to the 3d Infantry Division in Germany; the Topographic Engineering Center, Fort Belvoir, Virginia; and the 29th Engineer Battalion, Fort Shafter, Hawaii. CW2 Morken holds a bachelor's in geography.

Disseminating Digital Terrain Data to Warfighters

By Ralph M. Erwin

Maneuver, engineer, artillery, intelligence, combat-support, and combat-service-support leaders need accurate, current, and relevant digital terrain data for mission planning, situational awareness, and viewing the "common operational picture"—or annotated planning map—of the battlespace. These digital maps will be the future basis for visualizing the common operational picture and for all mission analysis. The challenge is to get these commanders and their subordinates on that common picture, which is passed down the chain of command and embellished by planners at every level. Ultimately the picture is shared—or disseminated—at all levels and forms a common understanding of the operation. This article describes the concept for digital terrain-data dissemination currently being implemented in the Army's digital forces. Dissemination will be through the Army Battle Command System (ABCS), from the tactical-operations center down to weapon platforms and soldiers—or Land Warriors.

Who Is Working This Concept?

The TRADOC Program Integration Office for Terrain Data (TPIO-TD) is coordinating and synchronizing directly with the Program Executive Office for Command, Control, and Communications Systems and the project director for Combat Terrain Information Systems to design, test, and implement this concept. These three agencies are focused on integration, interoperability, and commonality aspects of terrain data and products for developing, testing, producing, and fielding Army systems that require digital terrain data.

What Is the Engineer's Role?

Throughout the implementation of the concept, establishing the common topographic operating environment (CTOE) will depend on digital terrain-data dissemination. The CTOE is an interoperable, fully integrated network of standard system architectures, standard data and communications protocols, software tools, and other infrastructures that facilitate a common topographic view of the battlefield. The senior engineer officer, in coordination with the terrain technicians, must ensure that the CTOE is established within a command so that all automated systems are operating "on the same sheet of music." This is accomplished by employing strong data- and database-management practices and solid tactical standard operating procedures (TACSOPs).

Who Needs Digital Terrain Data?

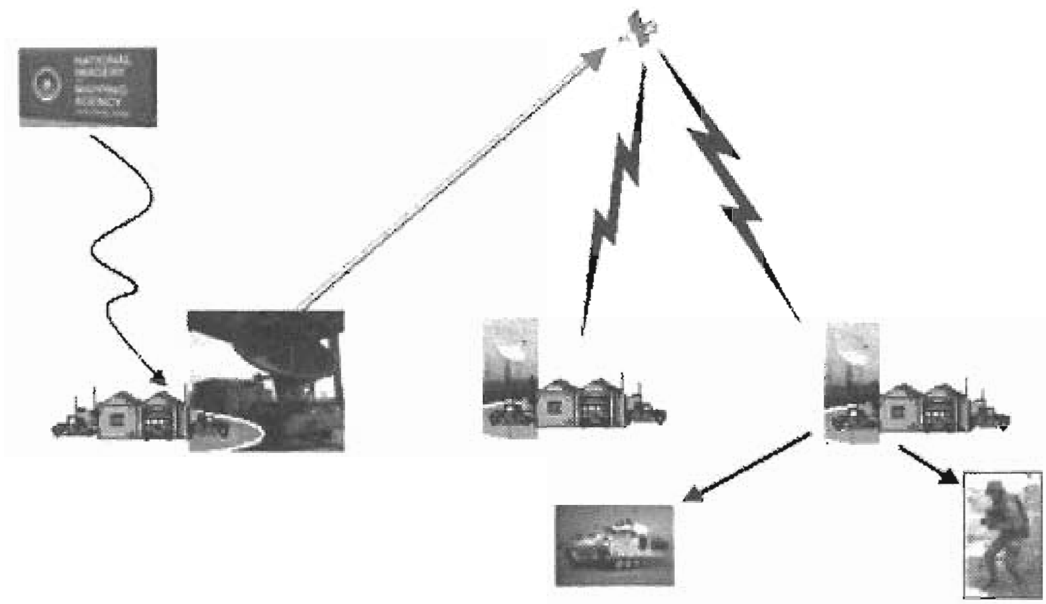
All warfighters have become consumers of the digital terrain data produced by the National Imagery and Mapping Agency (NIMA). Until recently, NIMA's primary Army customers were topographic-engineer companies and terrain detachments. Everyone understood that the right map was in a 155-millimeter canister that was managed and stored by the S2 or S4. Now, with the advent of the ABCS and other automated support systems, warfighters are "downloading" digital terrain data for near-real-time terrain evaluations, mission planning/rehearsals, and battlespace visualization. To establish and maintain the CTOE, the senior engineer officer should publish guidelines for subordinate units. This will ensure that units with Department of Defense activity address codes (DODAACs) and national stock numbers (NSNs) will adhere to the CTOE when they request digital terrain data and terrain products.

How Does Digital Terrain Data Get to End Users?

There are several levels and paths by which data flows to the battle-command systems and weapon platforms. The levels are the terrain technicians, the analysts, and the warfighters. The paths are basically a "push" or "pull" operation. Before we can discuss these operations, we must briefly explain the Foundation Data (FD) Concept (see article, page 10), which envisions that every unit will have the basic set (foundation data) of digital terrain data (a basic load, if you will) for a contingency area. This data consists of imagery, elevation, and feature information required for planning. The FD Concept further states that units will receive "just-in-time" digital terrain data that is relevant to their mission, unit type, and high-resolution digital terrain data. This Mission-Specific Data Set (MSDS) is the information that is collected, processed, and exploited by NIMA (and other collectors and analysis elements) and sent to the warfighters. The MSDS may reside in a database or may have been produced for another customer. There will be exceptions to this basic premise, but the sequence of foundation data preloaded and the rapid dissemination of the MSDS is the basis for the following discussion. Now, let's describe the push and pull of MSDS to the warfighters.

Digital Terrain Data Dissemination

Conceptual Sequence of Events



Terrain technicians and analysts are the Army's subject-matter experts in terrain analysis, topographic engineering, geospatial sciences, and cartography. They establish the push and pull methods to ensure that the right information is available to warfighters for mission planning and execution.

- Push: Topographic-engineer companies and terrain detachments will establish profiles with NIMA so that digital terrain data of concern to their area of interest is automatically pushed to them. This will include both foundation data sets and planned MSDSs.
- Pull: Often terrain technicians and analysts pull data based on a search of NIMA's Gateway (a military Internet-like link to terrain data) or order data using standard supply procedures. The management of all terrain data within a command (theater, corps, division, or brigade) is a critical task for terrain technicians and analysts.
- Push: Terrain technicians will "place" foundation data and the MSDS onto command-post map servers so that authorized command, control, communications, computers, and intelligence (C4I) systems can access a controlled set of digital terrain data.

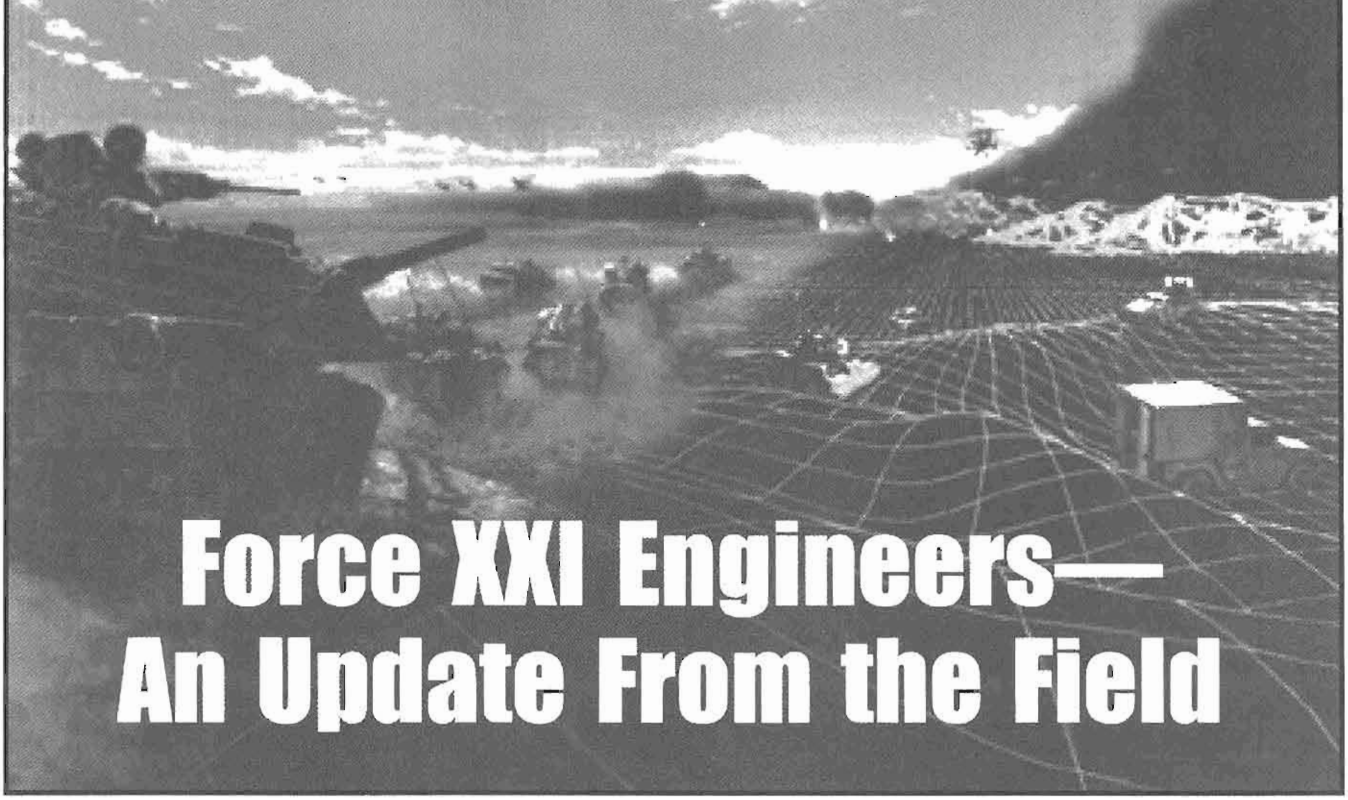
How Will the Digits Move?

The concept and implementation methodology currently accepted by the Army depends on a robust satellite-communications system to handle the dissemination of the MSDS from a division (or higher) command post to multiple receivers. The joint system being developed is the Global Broadcast Service (GBS), which will be used to disseminate data from a higher controlling authority to a "local map server." The GBS provides the bandwidth and data throughput to satisfy the broadcast dissemination of required MSDSs to warfighters. Some evaluations are being conducted during phase two of the 4th Infantry Division's Capstone Exercise in 2001. The exercise is considered the culminating exercise of the FDD.

Warfighters, the end users of digital terrain data, will—

- Pull data from the local map server that supports the command post. The majority of ABCSs will use the digital terrain data to visualize, analyze, and evaluate the terrain. Some mission-data load-preparation systems will also pull digital terrain data and make packages to export to weapons platforms with digital-map displays.
- Push data using a removable media, like an encryption keying device, which will be uploaded at designated command posts and/or downloaded at air, ground, and soldier platforms as often as it is required. Not only will digital terrain data be disseminated this way but also other items like signal operating instructions, system passwords, and operations overlays. Some recipients of this data will have portable systems installed in high-mobility, multipurpose wheeled vehicles (HMMWVs) and

(see Disseminating Terrain Data, page 48)



Force XXI Engineers— An Update From the Field

By Lieutenant Colonel Jeffrey A. Bedey

As the Army begins its Transformation, the decision was made to continue modernizing the Counter-attack Force–III Corps while sustaining and re-capitalizing both the Early-Entry and Containment Forces. For mechanized combat engineers, the modernization effort includes the decision to field both the Wolverine and M2A2 Operation Desert Storm (ODS) Bradley throughout the Counterattack Force.

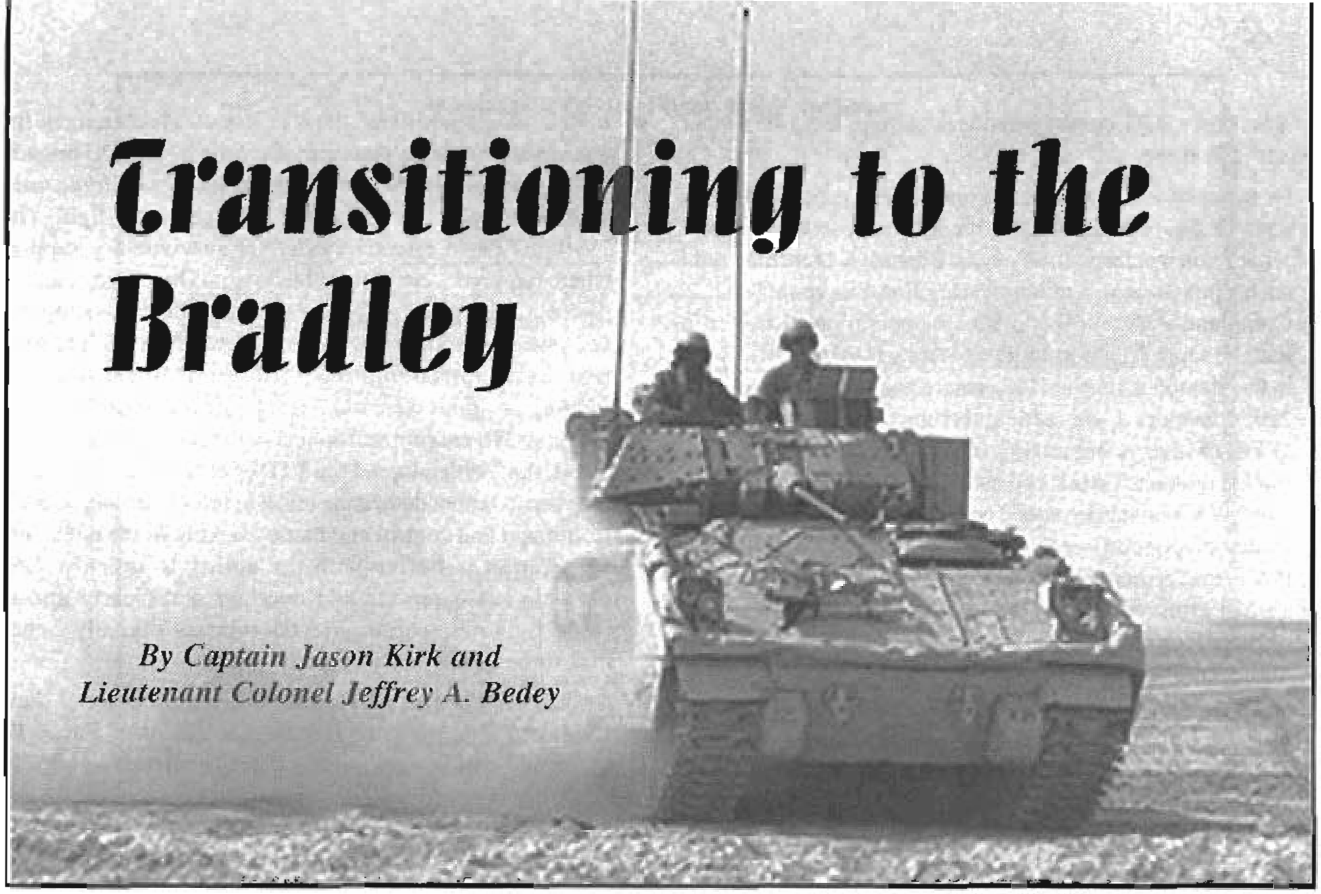
"Force XXI Engineers–An Update From the Field" is a series of three articles. They are intended to be the catalyst for both discussion and the subsequent review of engineer-force structure as it relates to the fielding of both Bradleys and Wolverines as a part of the Force XXI engineer battalion. These recommendations are based on more than 6 years of experimenting, testing, fielding, and fighting the first Force XXI engineer battalion.

In "Transitioning to the Bradley," page 19, we recommend a force structure that we believe best complements the Force XXI concept. The structure is predicated on two 8-man squads per line platoon and 12 M9 armored combat earthmovers. Additionally we propose the method by which we would include, as a part of the modified table of organization and equipment, an engineer scout platoon.

In "Facing the CSS Challenge," page 22, we propose transitioning the engineer support element to an engineer support company. This article describes, in detail, the shortfalls we experienced in fighting with the current organization and also takes into consideration the logistical impacts of fielding Bradleys in the Force XXI engineer battalion. We believe that setting the combat-service-support (CSS) structure is paramount to success on the battlefields of the twenty-first century. Our current structure is not adequate, and if we do not make the requisite adjustments now, fielding the Bradley into engineer battalions will preclude engineer support to the Army's Counterattack Force. We will be severely crippled as we attempt to provide the battlefield functions of mobility, countermobility, and survivability across the expanded Force XXI battlespace.

In "The Engineer Scout Platoon: A Necessity," page 29, we not only recommend the structure but also share with you our experiences while organizing, integrating, training, and fighting the engineer scout platoon at the National Training Center Rotation 00-10. Engineer scouts that are equipped with the Force XXI Battle Command Brigade and Below (FBCB2) System and task-organized in support of the brigade-reconnaissance-troop structure enable instant digital engineer situational awareness forward of the forward line of own troops (FLOT). These enablers and experiences validate that the engineer scout platoon is truly a necessity on the Force XXI battlefield.

Lieutenant Colonel Bedey commands the 299th Engineer Battalion, 1st Brigade, 4th Infantry Division (Mechanized), Fort Hood, Texas. Previous assignments include platoon leader, company executive officer, and battalion maintenance officer in the 78th Engineer Battalion (Corps Wheeled); assistant S3 and company commander, 15th Engineer Battalion, 9th Infantry Division (Motorized); and battalion executive officer, 62d Engineer Battalion (Combat Heavy). LTC Bedey is a graduate of the Engineer Officer Advanced Course and Command and General Staff College and holds a bachelor's in construction engineering from Montana State University and a master's in construction management from Colorado State University.



Transitioning to the Bradley

By Captain Jason Kirk and Lieutenant Colonel Jeffrey A. Bedey

As our Army begins the journey of Transformation, the other major developmental initiative—Force XXI—has matured into a combat-ready organization. Early in FY02, the Army's first Force XXI division, the 4th Infantry Division (Mechanized), Fort Hood, Texas, will assign its 1st Brigade Combat Team—with its organic 299th Engineer Battalion—the division ready-brigade mission. This mission is one in a long line of critical missions that the 1st Brigade and the "Proven Pioneers" of the 299th have completed for the Army over the past decade. From March 1994 to December 2000, the Force XXI 1st Brigade and the 299th have experimented, tested, and now fielded Force XXI digital systems. The 299th reorganized under two significant modified table of organization and equipment (MTOE) changes as the conservative heavy-division design evolved. The 299th—along with A Company, 588th Engineer Battalion—also deployed the Army's first Bradley fighting vehicle-equipped engineer company to the National Training Center. The significant lessons learned during all of these missions are vital to the Engineer Regiment as additional combat-engineer battalions become digital and as the Force XXI engineer table of organization and equipment (TOE) evolves again with the fielding of the M2A2 Operation Desert Storm-Engineer (ODS-E) Bradley.

Fundamental to the Force XXI concept is a smaller force that achieves increased lethality through enabling systems. The force-structure decrease has taken the mechanized division from an 18,000-soldier organization to one with just over 15,000 soldiers. The divisional combat-engineer battalion has downsized from 442 soldiers to 288 as of the FY01 TOE. (This number is 312 in the FY02 TOE, which includes manning for the yet-to-be-fielded Grizzly breacher (see article, page 36). Critical enablers fielded within the 299th Engineer Battalion include the digital command-and-control systems—the Maneuver Control System (MCS) and the Force XXI Battle Command Brigade and Below (FBCB2) System. The other vital enabler in the 299th is the engineer scout platoon. These digital systems and the well-resourced and trained engineer scout platoon have enabled the Force XXI combat engineers to truly do **more** with **less**—and do it **better**—as they support the maneuver brigade fight across an expanded battlespace.

The increased situational awareness that the commander achieves through the MCS at the battalion tactical-operations center and the FBCB2 System mounted on all combat vehicles enables increased reliance and more efficient use of dynamic obstacles throughout the battlespace in both offensive and defensive operations. This increased situational awareness—shared throughout the digitized force—also greatly decreases the likelihood of casualties from mine strikes. (Information on observed enemy obstacles, as well as planned or emplaced friendly obstacles, is shared instantaneously.)

There are two critical areas where the Force XXI engineer battalion has made reductions—manpower and equipment. Additionally, the Force XXI engineer battalion no longer has an organic support platoon that provides maintenance, food-service, and distribution functions. Rather, the supporting forward-support battalion—in the form of an engineer support element—provides these logistical functions. As the 299th adopted this leaner organization, it developed methods to **improve** combat-engineer operations:

The Force XXI combat-engineer platoon has two sapper squads, not three.

- In *offensive operations*, combat-engineer platoons continued to provide effective mobility support by increased reliance on mechanical, as well as explosive, breaching with each squad towing a mine-clearing line charge (MICLIC). Command and control of breaching operations is **better** in that the sapper platoon sergeant is now forward—mounted in the platoon's fourth M113 armored personnel carrier. The 299th developed the tactics, techniques, and procedures (TTP) of always organizing sapper platoons in breaching stacks, with each stack consisting of a proofing blade (M1 tank plow), a sapper squad with a MICLIC, the platoon leader or platoon sergeant for command and control, a Wolverine/armored vehicle-launched bridge (AVLB), and an M9 armored combat earthmover (ACE). Force XXI engineers are able to provide **better** mobility support by immediately broadcasting a "breach-lane-report overlay" or a "scatterable-mine bypass-report overlay" to all FBCB2 System-equipped units in the maneuver brigade. The engineer scout platoon further reduces our reliance on conventional breaching methods by providing detailed mobility intelligence.
- In *defensive operations*, increased situational awareness and focused training enabled the 299th to deliver **better** synchronized countermobility effort with no decrease in linear frontage covered (cited by National Training Center engineer trainers) despite having fewer sappers on the ground. Increased planning synchronization achieved through the Digital Terrain Support System, the MCS, and the FBCB2 System facilitated more effective employment of the full menu of scatterable mines—ground- and air-delivered Volcanos, artillery-delivered aerial denial artillery amunitions/remote antiarmor mines (ADAMs/RAAMs), air-delivered Gators, and ground-emplaced Hornets and Modular Pack Mine Systems (MOPMSs). Countermobility training focused on scatterable-mine employment, putting the obstacles at the right place at the right time. The engineer scout platoon trained to effectively employ the Hornet and MOPMS munitions, the line companies focused training on ground-delivered Volcano and MOPMS employment, and the battalion's engineer-support-area personnel (led by the battalion S4) trained to serve as a launching and reload point for air-delivered Volcano platforms. The Force XXI digital systems, coupled with this focused training effort, enabled the 299th to achieve the Force XXI imperative to shape the battlespace.

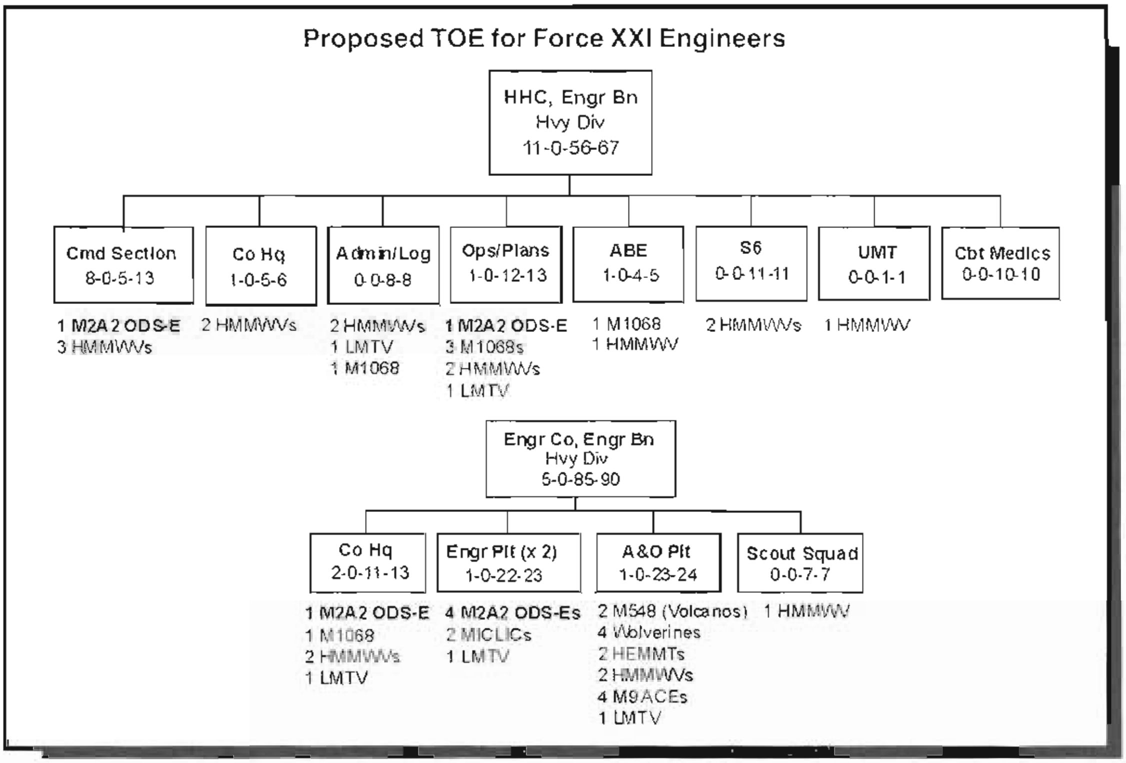
The Force XXI assault-and-obstacle (A&O) platoon has four M9 ACEs, not seven (a total of 12 in the battalion, not 21).

- In *offensive operations*, each of the four M9s is attached to a sapper squad. While the company as a whole has lost redundancy in blades, this organization is **better** in that it has a decreased sustainment requirement—another imperative of Force XXI operations.
- In *defensive operations*, there is less of a requirement for vehicle-survivability positions since the Force XXI brigade fights more dispersed and maintains the flexibility to truly defend in sector and reposition throughout the fight. The 299th's TTP to effectively deliver survivability support where required were to form blade teams by pairing each of the attached echelon-above-division combat-support-equipment platoon's D7 dozers with an M9 ACE. The M9s that were not committed to digging turret-defilade fighting positions were used to dig tank berms or deception positions. To maximize frontage in the countermobility dig effort, the 299th adopted the TTP of digging levels 1 and 2 tank berms before dedicating effort to full-depth tank ditches. Command and control and battle tracking of the defensive preparation is **better** with the ability to quickly send obstacle-status reports and overlays and clearly understood fighting-position grid coordinates digitally rather than through FM voice communications.

As the Army begins its Transformation, the Chief of Staff decided to continue modernizing the Counterattack Force–III Corps while sustaining and recapitalizing both the Early-Entry and Containment Forces. For mechanized combat engineers, the modernization effort includes the decision to field both the Wolverine and M2A2 ODS-E throughout the Counterattack Force. The Bradley fielding plan calls for a one-for-one replacement of the current 28 M113 armored personnel carriers in mechanized combat-engineer battalions beginning with the 91st Engineer Battalion, 1st Cavalry Division, in FY02. (In addition, the fielding plan includes an M2A2 ODS-E for the engineer battalion S3, a requirement validated during the breach-focused National Training Center Rotation 00-10 in August 2000, for a total of 29 Bradleys.)

The M2A2 ODS-E will provide increased mobility, lethality, survivability, and sustainability as Force XXI engineers conduct combat operations alongside their infantry and armor counterparts. Since Force XXI engineers are employed as another maneuver element in the brigade combat team—per the emerging doctrine in FM 5-71-3, *Brigade Engineer Combat Operations (Armored)*—the M2A2 ODS-E is the right platform from which combat engineers can fight and win on the twenty-first-century battlefield. Incorporating the lessons learned in successfully employing the 288-soldier combat-engineer battalion, the 299th proposal for the Bradley TOE is a 333-soldier organization. Critical to the success of this organization in support of the Force XXI maneuver brigade is the establishment of an engineer support company—resourced and manned to provide combat service support (CSS)—and the engineer scout platoon.

The Force XXI engineer battalion no longer has an organic support platoon that provides maintenance, food-service, and distribution functions. An engineer support element that is organic to the base support company of the maneuver brigade's forward-support battalion now provides those functions. The 299th's lessons learned and recommendations regarding CSS are outlined in detail in the article "Facing the CSS Challenge"



on page 22. This article describes, in detail, the shortfalls we experienced in fighting with the current organization and also takes into consideration the logistical impacts of fielding Bradleys in the Force XXI engineer battalion.

The Force XXI organization dedicates a brigade reconnaissance troop (BRT) within each maneuver brigade to provide the commander with responsive intelligence and security across a battlespace with an expanded width and depth. To fully support the engineer-specific reconnaissance requirements across this battlespace—and to take advantage of the capabilities of the Hornet, MOPMS, ADAM/RAAM, and air-delivered Volcano scatterable-mine systems—the 299th organized with dedicated engineer scouts. By organizing, equipping, and training these engineer scouts (whether organized as a platoon under control of a battalion or a brigade), they became an integrated element of the BRT, and the 299th provided better and more effective engineer reconnaissance and dynamic point-obstacle emplacement. The engineer scouts are truly both a countermobility and a mobility enabler on the Force XXI battlefield. Because the FY01 TOE has authorized 24 soldiers for the not-yet-fielded Grizzly breacher, there was an opportunity to incorporate a 22-soldier engineer scout platoon into our organization. The figure above shows our recommended engineer Bradley TOE, which includes the engineer scouts organized under each line company either to fight as a squad under a task force or as a platoon with the BRT. The 299th's lessons learned and further recommendations concerning the engineer scouts are further outlined in the article "Engineer Scout Platoon: A Necessity" on page 29.

This proposed Force XXI engineer TOE allows the battalion to take full advantage of the enabling capabilities that Force XXI digital systems provide. The dedicated engineer scout platoon provides increased versatility to the maneuver commander in employing dynamic obstacles and in providing focused engineer reconnaissance that facilitates freedom of maneuver on the expanded Force XXI battlefield. Mounted in the more survivable, mobile, and lethal Bradley fighting vehicle, Force XXI combat engineers will be more capable to facilitate the dominant maneuver of the brigade combat team. With lessons learned and then refined in warfighting experiments and testing that began in the late twentieth century, this proposed TOE is the right evolution for Force XXI engineers in the twenty-first century.

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Facing the CSS Challenge

Transitioning the Engineer Support Element to an Engineer Support Company

By Captain William L. Judson, Major Richard J. Muraski Jr. and Lieutenant Colonel Jeffrey A. Bedey

For many, the term Force XXI has only one meaning—digitization. But for those who serve in the Army's first Force XXI division—the 4th Infantry Division (Mechanized) at Fort Hood, Texas—Force XXI has many implications. This article focuses on only one of the challenges of being a Force XXI organization—combat-service support (CSS). Under the old Army of Excellence modified table of organization and equipment (MTOE), CSS was organic to the mechanized engineer battalion in the form of a battalion support platoon found in the headquarters company. The support platoon consisted of a food-service section, a distribution section, and a maintenance section. Force XXI changed all of that. No longer is CSS organic to the engineer battalion; instead, support has been reorganized under the command and control of the forward-support battalion (FSB). Today, the engineer support element (ESE) provides CSS to the engineer battalion.

The engineer battalion was not the only organization in the division to undergo such a change. CSS to maneuver battalions was also reorganized under the command and control of the FSB. However, there were some fundamental differences between the CSS to maneuver battalions as compared to the engineer battalion. The reorganization established forward-support companies (FSCs) for each supported maneuver battalion, while the ESE—initially an engineer support platoon (ESP)—was established to support the engineer battalion. The ESE—which is not a company—is, in fact, subordinate to the base support company. This subtle difference has a significant impact on how CSS is provided to the engineer battalion.

The Army leadership knowingly took significant risks with engineer CSS structure several years ago. Experiences at National Training Center (NTC) Rotation 99-05, Fort Irwin, California, proved that this risk was so great that it placed the overall maneuver mission at risk, and the initial ESP was upgraded to an ESE.

ESE Organization

The multifunctional ESE operates on a centralized CSS concept, providing all classes of supply, food service, distribution, and tactical field maintenance to the engineer battalion and to itself. The ESE leader is capable of cross leveling between the engineer repair sections/teams to weight the main effort as the mission dictates. The three forward engineer repair sections (FERSs) and three engineer combat repair teams (CRTs) provide the immediate capability and task-organization flexibility to support our Force XXI engineer battalions (see Figure 1, which is from FM 5-71-3, *Brigade Engineer Combat Operations [Armored]*).

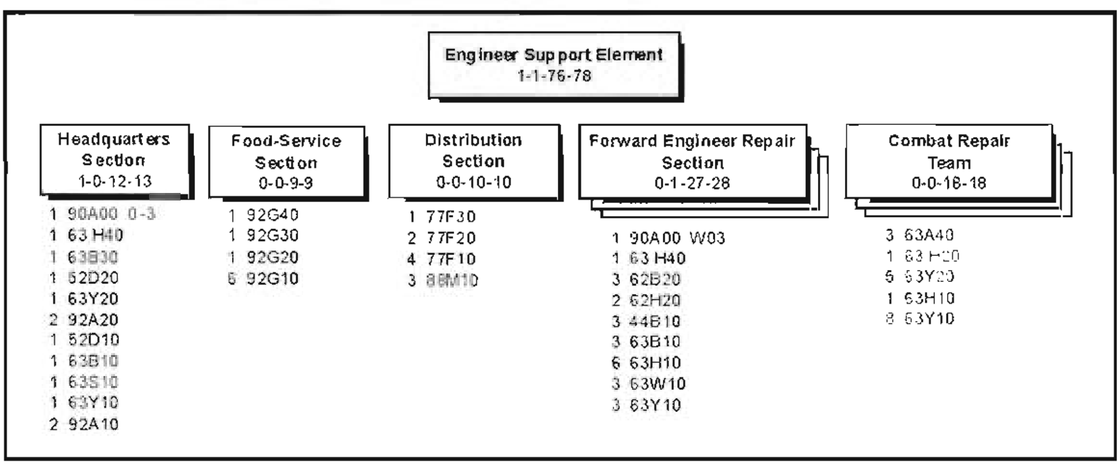

Figure 1. Engineer Support Element Personnel TOE 63108F00

Headquarters Section — Provides command and control and overall supervision of the element and its assigned or attached personnel. Through the direction of higher headquarters and the allocation of a logistics officer (O3/90A00) as the leader and an E7 as the senior equipment-maintenance NCO and operations sergeant, the headquarters section is designed to provide a flexible command-and-control environment.

Food-Service Section — Plans and conducts food-service support to the engineer battalion along with Class I support, using its assigned mobile-kitchen trailer. The food-service section can be modularized to support companies task-organized in an attached command relationship.

Distribution Section — Provides petroleum, oil, and lubricants (POL) and supply-point distribution to the engineer battalion. This section, like the others, is capable of being modularized. Of note is the extremely limited distribution capability outside of bulk POL (see Figure 2).

FERSs/Engineer CRTs — Provide maintenance support for engineer equipment. Each of the repair sections provides command and control for the repair teams. The engineer repair technician (W3/919AO) and the senior maintenance-section NCO provide maintenance and task-organization expertise. Each engineer CRT is organized with mechanics; recovery assets; contact trucks; cargo trucks; and forward repair systems, heavy (FRSH) and is supported with surge capability (the ability to push more maintenance support forward) in the FERS. Regardless of the task organization, each company CRT is always collocated with the engineer company to provide immediate forward repairs, and the team "works for" the engineer company first sergeant, even though its higher headquarters is the ESE. Additionally, mechanics in the Force XXI division are now multifunctional—or capable of providing unit-level and direct-support maintenance—with the theory being that they are now able to complete levels –20 and –30 maintenance without delay to the customer.

CSS Personnel (Current)

Forward Support Company Armor Pure		Forward Support Company Infantry Pure		Engineer Support Element	
Strength		**Strength**		**Strength**	
Officers	5	Officers	5	Officers	1
Warrants	1	Warrants	1	Warrants	1
Enlisted	166	Enlisted	159	Enlisted	76
Total	172	Total	165	Total	78
Maintenance Personnel (less 45 series)		**Maintenance Personnel (less 45 series)**		**Maintenance Personnel (less 45 series)**	
All positions	70	All positions	70	All positions	50
Maintenance sections	67	Maintenance sections	67	Maintenance sections	47
Senior NCO (E6+)	13	Senior NCOs (E6+)	13	Senior NCOs (E6+)	6
PLL Clerks	8	PLL Clerks	8	PLL Clerks	4

CSS Equipment (Current)

Forward Support Company (Armor Battalion) MTOE 63115FFCM4		Forward Support Company (Infantry Battalion) MTOE 63115FFCM4		Engineer Support Element (Engineer Battalion) TOE 63108F100	
Maintenance-Control Section		**Maintenance-Control Section**		**Headquarters Section**	
12-ton semi van, supply	1	12-ton semi van, supply	1	M1031 contact truck	1
5-ton expansible van	1	5-ton expansible van	1	M984 HEMTT wrecker	1
SAMS-1 computer	1	SAMS-1 computer	1		
Recovery Section		**Recovery Section**		**Forward Engineer Repair Sections (3 teams)**	
M88A2 Hercules	3	M88A2 Hercules	3	HSTRU trailer	3
M984 HEMTT wrecker	1	M984 HEMTT wrecker	1	Welding trailer	3
5-ton wrecker	1	5-ton wrecker	1	MTV cargo carrier	4
Service Section		**Service Section**			
M113 APC	1	M113 APC	1		
M1031 contact truck	1	M1031 contact truck	1		
Welding trailer	1	Welding Trailer	1		
2 1/2-ton truck	7	2 1/2-ton truck	7		
5-ton cargo carrier	4	5-ton cargo carrier	4		
2 1/2-ton shop vans	4	2 1/2-ton shop vans	4		
Combat Repair Teams (3 teams)		**Combat Repair Teams (3 teams)**		**Combat Repair Teams (3 teams)**	
M113 APC	3	M113 APC	3	M113 APC	3
M88A2 Hercules	3	M88A2 Hercules	3	M88A2 Hercules	3
M1031 contact truck	3	M1031 contact truck	3	M1031 contact truck	3
1/2-ton cargo carrier	3	2 1/2-ton cargo carrier	3	MTV cargo carrier	3
5-ton cargo carrier	3	5-ton cargo carrier	3	PLS transporter	3
HCMTP (FRSH)	3	HCMTP (FRSH)	3	HCMTP (FRSH)	3
Distribution Section		**Distribution Section**		**Distribution Section**	
M978 HEMMT fueler	7	M978 HEMMT fueler	9	M978 HEMMT fueler	6
M977 HEMMT cargo	10	M977 HEMMT cargo	11	M977 HEMMT cargo	3

Figure 2. Compare and Contrast - CSS Personnel and Equipment

ESE Field Test

In late January 2000, the 299th Engineer Battalion deployed to the field for 2 1/2 months of continuous field training. The primary focus of the training was the Force XXI Battle Command Brigade and Below (FBCB2) System Limited User Test. However, the 1st Brigade Combat Team saw this time as an opportunity to conduct its NTC train-up and test the new CSS redesign.

The new ESE leader came in March, with much experience under the Force XXI CSS design. Since he had previously served as a battalion maintenance officer and a support-operations officer in an FSC (supporting a maneuver battalion in the Force XXI design), he believed he knew how this element was supposed to operate. He had the concept but did not have the personnel or equipment with which to implement his plan. He discovered this the hard way when he went to the field for the first time with the ESE. Observing the engineer forward-support area and its growing unit maintenance-collection point, it became clear to the ESE leader that maintenance was the major concern for the ESE during the field exercise.

During the first week of the test, 90 percent of the battalion's armored vehicle-launched bridges (AVLBs), which drove an average of 37 miles and maintained an operational-readiness rate of about 78 percent, were parked in the engineer forward-support area and remained there for the entire field exercise. The M113 armored personnel carriers (APCs), which averaged more than 430 miles during those 2 1/2 months, suffered through an average operational-readiness rate of 78 percent.

The design faced many challenges and was off to a rocky start. One of the obvious reasons was that only one officer was responsible for the entire support system for the engineer battalion. To maintain long-term operations, it was almost impossible for him to focus on one area with any proficiency. The ESE leader thought he would be able to concentrate on the other classes of supply (I, III, and V), but Class IX and maintenance operations became the focus from day one. Managing the design places a tremendous burden and responsibility on even the most seasoned maintenance warrant officer. Additionally, the ESE had to help with maintenance on equipment such as the FRSH. The ESE had limited lift and welding capabilities but had the same amount of equipment to maintain as a maneuver battalion. The battalion executive officer, the S1, and the S4 had to turn away from their assigned duties and focus on maintenance so the ESE leader could focus on logistical support. Essentially, this pulled three staff officers away from their traditional missions and prevented the battalion from using the administrative and logistical-operations center as another command-and-control node for tactical operations.

The maintenance technician spent most of his time resourcing parts and attending maintenance meetings at the brigade support area when the executive officer wasn't available. This kept him from his job of providing technical expertise in the direct-support arena within the engineer forward-support area. The motor sergeant spent most of his time going forward to take parts to the CRT and acting as a backup for the battalion maintenance technician.

The CRTs spent more time going back to the engineer forward-support area for parts and supplies than they spent staying forward, which kept the teams from diagnosing and fixing problems in the forward area. As a result, critical systems were constantly being evacuated and returned to the fight after a lengthy stay in the engineer forward-support area—if they returned at all. Since most of the senior leadership was occupied with looking for parts and trying to manage maintenance operations, little emphasis was placed on mission-specific logistics planning for support of the battalion. The initial extended test revealed some obvious limitations in the new ESE design.

CSS Challenges

After operating for 2 1/2 months, the battalion completed an in-depth analysis of why the CSS was so challenging. The analysis was narrowed to the following areas: personnel and equipment resources, senior leadership, and the command and control within the ESE and its relationship with the engineer battalion.

Resources. With 78 soldiers authorized, the ESE is substantially smaller than the FSCs that support the armor and infantry battalions, which have 172 and 165 personnel respectively. The food-service and distribution sections in the FSCs are larger since they admittedly support larger battalions. But the disparity is not limited to these sections.

Including tanks, Bradleys, mortar carriers, command-post (CP) vehicles, and APCs, both the armor and infantry battalions have 66 tracked vehicles. The Force XXI engineer battalion also has 66 tracked vehicles: 8 M577/M1068 CP vehicles, 28 M113 APCs, 12 AVLBs, 12 M9 armored combat earthmovers (ACEs), and 6 M548 cargo carriers with Volcanos.

Similarly, armor battalions have 40 wheeled vehicles, infantry battalions have 38, and the Force XXI engineer battalion has 41. Despite comparable vehicle strengths in all supported battalions, the armor and infantry battalions are supported with 67 maintenance personnel in the FSC maintenance sections (not counting turret mechanics), while the engineer battalion is supported by only 47 maintainers—less than 70 percent of the maneuver-battalion strength. Eight Unit-Level Logistics System (ULLS) clerks support the maneuver battalions, while the ESE has only four.

The ESE also lacks the tools to support the engineer battalion, although this is mostly a supply—rather than an MTOE—issue. It has only one of three authorized common number-one tool sets. It has no FRSH or Palletized Load System (PLS) transporters (three trucks and six racks are authorized). It is also nursing three aged M88A1 medium recovery vehicles in an attempt to continue providing recovery and lift support to the battalion. This lack of tools has a direct impact on the ability of the ESE to provide responsive support. There are also MTOE disparities: the FSC prescribed load listing (PLL) sections operate out of expandable vans, have 12-ton van trailers to carry PLL, and have a SAMS-1 computer to order direct-support parts. None of these items are authorized for the PLL section of the ESE.

Figure 2, page 23, shows that, compared to the FSC, the ESE has 70 percent as many mechanics, 50 percent as many PLL clerks, and less than 50 percent as many senior NCOs. This design does not posture the ESE to successfully support an engineer battalion. These shortages cause Class IX operations to suffer, and quality assurance (QA) and quality checking (QC)—as they relate to the verification of faults, repair work, and scheduled services—are substandard. Furthermore, the requirement for these same NCOs to train and develop the junior enlisted soldiers only exacerbates the problem.

In garrison, scheduled services are conducted by the FERS, which leaves the CRTs to perform unscheduled maintenance. In the field environment, the CRTs fix forward with the supported engineer company while the FERS remains in the unit maintenance-collection point located in the engineer forward-support area to provide direct-support-level maintenance and recovery. An engineer line company CRT goes forward in an M113A2 APC, an M1031 contact truck, and an M88A1 medium recovery vehicle, while the FERS maintains a 5-ton truck and a high-mobility, multipurpose wheeled vehicle (HMMWV). The CRT that supports the headquarters and headquarters company (HHC) and ESE maintains a 5-ton truck; an M984 heavy expanded-mobility tactical, truck (HEMTT) wrecker; and an M1031 contact truck. Figure 2 shows the contrast between the FSC and the ESE in both numbers of personnel and equipment.

Leadership. The ESE has one officer authorized, compared to five officers authorized in each FSC (commander, executive officer, supply-and-transport [S&T] platoon leader, maintenance-platoon leader, and maintenance-control officer). The ESE is authorized seven maintenance leaders in the grade of staff sergeant or higher: a warrant officer and six NCOs. In contrast, the FSCs are authorized a warrant officer and 14 NCOs (13 NCOs for armor battalions). The impact of the leadership shortfall in the ESE is threefold: QA/QC is constrained, focusing on multiple missions (for example, deadlined pacers vs. services) is more difficult, and continued training of mechanics suffers. When the 45-man ESP was reorganized in January 2000 as the 78-man ESE, much of the manning fill was junior soldiers—privates and privates first class. This fill of junior soldiers made training and QA/QC extremely difficult.

Command and Control. The MTOE does not provide clear guidance for the command or management of maintenance elements within the ESE. There are five mechanics in the ESE headquarters that are responsible for maintaining the vehicles of the engineer-battalion HHC. The remainder of the mechanics are in three FERSs and three CRTs. This organization is clearly intended to support each of three line engineer companies with one FERS and one CRT. But the warrant officer and one E7 are identified by MTOE to supervise the FERSs, while the CRTs are each led by an independent E7, falling under the control of the ESE headquarters. This organization is flawed in two ways: If the three FERSs are consolidated according to the MTOE, FERS mechanics may not be responsive to the needs of the CRTs and their supported companies. However, if each FERS is under the control of a CRT chief, the ESE forfeits the ability to mass mechanics on engineer-battalion priorities.

Although a captain leads the ESE, this position is not considered a company command. The ESE is subordinate to the brigade support company (BSC) in the FSB. The ESE leader does not have the same access to the parent battalion as the FSCs supporting the maneuver battalions. As a subordinate to the BSC, which provides general support to the brigade, the ESE is subject to being tasked to support the brigade or FSCs. The ESE also remains subject to support BSC taskings and training priorities. Regardless of its desires to provide the best possible support to the engineer battalion, the ESE is bound by chains of command to support BSC ranges, formations, and inspections. The tie to a second chain of command, short-notice taskings, and required training make it difficult to make long-range plans for the ESE and to shield mechanics from outside distracters.

With the knowledge gained while in the field, the engineer battalion, along with the ESE leader, organized the ESE to best support the battalion. This organization, represented in Figure 3, page 26, creates the modularity discussed in FM 5-71-3. The company support teams are aligned to help establish habitual support and working relationships with the companies. The CRTs and FERSs are for the garrison, while the distribution and food-service sections operate under the separate section NCOICs.

Adjustments

The battalion took the shortfalls within the ESE as an opportunity to develop a feasible solution. The first barrier to overcome with the ESE was its shortage of leadership and experienced mechanics. In May, the battalion pulled a captain from an authorized MTOE slot and moved him into an unauthorized battalion-motor-officer (BMO) position to work alongside the ESE leader. The goal was to free the ESE leader to concentrate on logistics, and the new BMO would oversee maintenance operations. The BMO was in a better position to set the priorities for the battalion and provide a better conduit of information into command channels. To move the battalion forward again, a consolidated service team was created out of the FERS teams to work on scheduled services for the entire battalion and not focus on one company. Until this time, services on some vehicles were severely outdated due to the previous design of an ESP that had only 45 personnel and could barely keep up with unscheduled maintenance, much less services. The battalion—with the support of the division—was able to contract out all wheeled services, and the consolidated battalion service team focused on the tracked vehicles.

Services were now a battalion-resourced training event that was scheduled on the battalion training calendar and took priority over all other training. Platoon leaders were required to brief the battalion commander on their respective service plans.

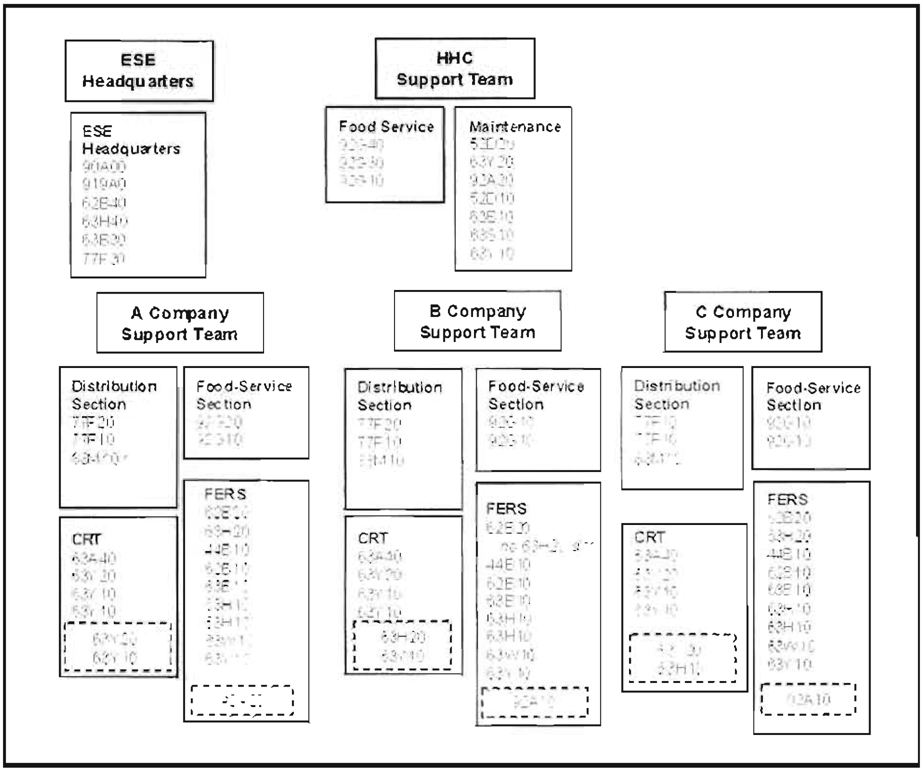

Figure 3. Manning of the Engineer Support Element Against the TOE

Between May and mid-July 2000, the battalion completed all but one line-platoon service before deploying to the NTC in August. This last platoon—deploying to the Joint Readiness Training Center, Fort Polk, Louisiana, the later part of August—conducted services to integrate new M113A3 APCs after the battalion deployed to the NTC.

Another area that needed emphasis and reengineering was Class IX operations. After the Limited User Test, the PLL section was down to three clerks. The battalion augmented the section with four military occupational specialty (MOS) 12B clerks, one from each company. This allowed the PLL clerks to concentrate on ordering parts and reestablishing the Class IX recoverable-items flow back to the FSB. With the BMO in place, the maintenance technician and the motor sergeant could get back into the "trenches," where they could direct the priorities set by the BMO and mentor the mechanics. These actions were necessary to prepare the battalion for combat operations and the upcoming NTC rotation.

Results of Adjustments

The battalion tested the adjustments made to the ESE during NTC Rotation 00-10. The NTC provided an opportunity to see if the adjustments would change the outcome from that of our experiences in the field during the early part of the year. While operating tempo was high—the M113 fleet averaged more than 317 miles, the M9s more than 302 miles, and the M548 and M1068 more than 160 miles—the results were nothing short of unbelievable!

Augmenting the structure and implementing different programs allowed the battalion to emerge out of reception, staging, onward movement, and integration with a 100 percent operational-readiness rate on all home-station combat systems (M113A2 APCs, M9 ACEs, M1068 CP vehicles, M548 cargo carriers, mine-clearing line charges [MICLICs], and Volcanoes). Throughout the rotation, there were periods (often on non-battle days) when operational readiness fell below 90 percent. However, faults were quickly identified and equipment repaired, allowing the battalion to consistently cross the line of departure with a 90 percent or better operational-readiness rate for each battle and end the rotation on training day 14 with an operational-readiness rate in excess of 93 percent.

The Solution

The ESE is not adequately resourced to provide logistical requirements unique to an engineer battalion that is embedded in a maneuver brigade. Again, the 299th Engineer Battalion—with assistance from the 1st Brigade and the 4th Infantry Division—successfully overcame these resourcing shortfalls by making the following adjustments:

- Contracting wheeled services.
- Assigning an officer out of an MTOE position to be the BMO.
- Assigning four (PLL school-trained) MOS 12Bs to augment the PLL clerks in the ESE.
- Creating a consolidated battalion service team.

However, an ESE with 70 percent of the mechanics, half the PLL clerks, and less than half the senior NCOs of an FSC remains inadequately resourced to support an engineer battalion, either in garrison or during continuous operations. The only viable option is to convert the ESE to an engineer support company (ESC) and remedy the shortfalls in personnel, equipment, and leadership.

Transitioning From ESE to ESC

With the Army's recent decision to field the Bradley to the Force XXI engineer battalions, it is imperative that we use the lessons learned from our experiences in fighting the ESE. These lessons are vital in order to identify a recommended design for an ESC that is capable of sustaining all logistical requirements of a Bradley-based engineer battalion. Figure 4 shows the major equipment found in a Bradley-based engineer battalion, as well as a comparison of equipment densities found in armor, infantry, and engineer battalions.

The recommended organization of the ESC is based on the following design considerations:

- We used doctrine (FM 5-71-3, Change 2, page 6-5) as a foundation for the proposed organization. The ESC must "*operate on a centralized CSS concept, providing all classes of supply, food service, distribution, and tactical field maintenance to the engineer battalion and to itself.*" The ESE (now the proposed ESC) must be "*capable of cross leveling between the engineer repair sections/teams to weight the main effort as logically required. The three FERSs and three engineer CRTs provide the immediate capability and task-organization flexibility to support our Force XXI engineer battalions.*"
- We examined the logistical requirements for sustaining a Force XXI engineer battalion equipped with the M2A2 Operation Desert Storm-Engineer (ODS-E) Bradley instead of the M113. Additionally, we accounted for the fielding of the Wolverine and nine additional M9 ACEs.
- We incorporated our experiences in fighting the ESE over an extended period of time in a multitude of environments. Experiences that highlighted the impact(s) of such things as having only four PLL clerks, being improperly equipped to environmentally protect ULLS-Ground (ULLS-G) boxes, conducting maintenance operations with a shortage of senior NCOs and mechanics, and lacking recovery and lift assets.
- We used the organizational structure of the FSC that supports a Bradley infantry battalion as the basis for our recommended organization. The reason was twofold: The engineer battalion will be a Bradley-based organization and, as an organic member of the brigade, we thought it was important that the CSS structure that supports all organic battalions be fundamentally structured the same.

Armor Battalion		Infantry Battalion		Engineer Battalion	
Tracked Vehicles		**Tracked Vehicles**		**Tracked Vehicles**	
M1064A3 mortar carrier	4	M1064A3 mortar carrier	4	M577/M1068 CP vehicle	8
M577/M1068 CP vehicle	8	M577/M1068 CP vehicle	8	M2 ODS-E	29
M113 ambulance	10	M113 ambulance	10	M113 ambulance	3
M1 tank	44	M2 BIFV	44	Wolverine	12
				M9 ACE	21
				M548 transport	6
Subtotal	66	Subtotal	66	Subtotal	79
Wheeled Vehicles		**Wheeled Vehicles**		**Wheeled Vehicles**	
Tractor/semitrailer	3	LMTV	12	HEMMT	6
LMTV	10	HMMWV	20	5-ton cargo carrier	8
HMMWV	21	Scout HMMWV	6	HMMWV	27
Scout HMMWV	6				
Subtotal	40	Subtotal	38	Subtotal	41
Total Vehicles	**106**	**Total Vehicles**	**104**	**Total Vehicles**	**120**
Forward Support Company Personnel	**172**	**Forward Support Company Personnel**	**165**	**Forward Support Company Personnel**	**139**

Figure 4. Compare and Contrast - Supported Forces (Future)

Figure 5, page 28, shows the proposed ESC design, which would increase the number of personnel supporting an engineer battalion from 78 to 139—a net increase of 61 personnel.

The headquarters platoon consists of the minimum personnel to operate a company. The addition of the executive officer, first sergeant, and operations NCOs brings the required leadership to run the company effectively.

The support platoon, made up of the food-service and distribution sections, can now coordinate efforts under the command and control of a dedicated officer and NCO to provide necessary logistical support. This is especially critical with fuel, because of the 12 Wolverines. The addition of four Load-Handling Systems (LHS) (the M985 HEMTT cargo truck replacement) will provide the capability to haul 25-millimeter ammunition and critical engineer supplies.

The maintenance platoon requires the greatest change. The maintenance-control officer and the maintenance technician can work in unison to command and control the maintenance effort and tackle critical issues. It is clear that the Bradley requires more mechanics to maintain; it takes 57 man-hours to service a Bradley compared to 7.6 for an M113, 40 for a Wolverine, and 22.2 for an AVLB. Additionally, the complexity of the Wolverine—along with the increase of nine M9 ACEs—also indicates a need for more mechanics. Three additional M88A2s (the Hercules, which is now being fielded to replace the M88A1) are in the design to allow the fix-forward concept to work. The service-and-recovery section can be the link between the CRTs and the FERSs that are located either in the engineer forward-support area or the task-force support area. They can act as a not-mission-capable vehicle-transfer point, allowing the original three M88A2 Hercules to remain forward with the supported company.

Conclusion

The current ESE structure was to be outfitted with time- and labor-saving enhancements designed to support an engineer battalion with modern equipment. Because both the ESE and the engineer battalion have not been fielded with the complete complement of enhancements and must maintain legacy equipment, the small organizational size and structure do not fully support Force XXI engineer battalions.

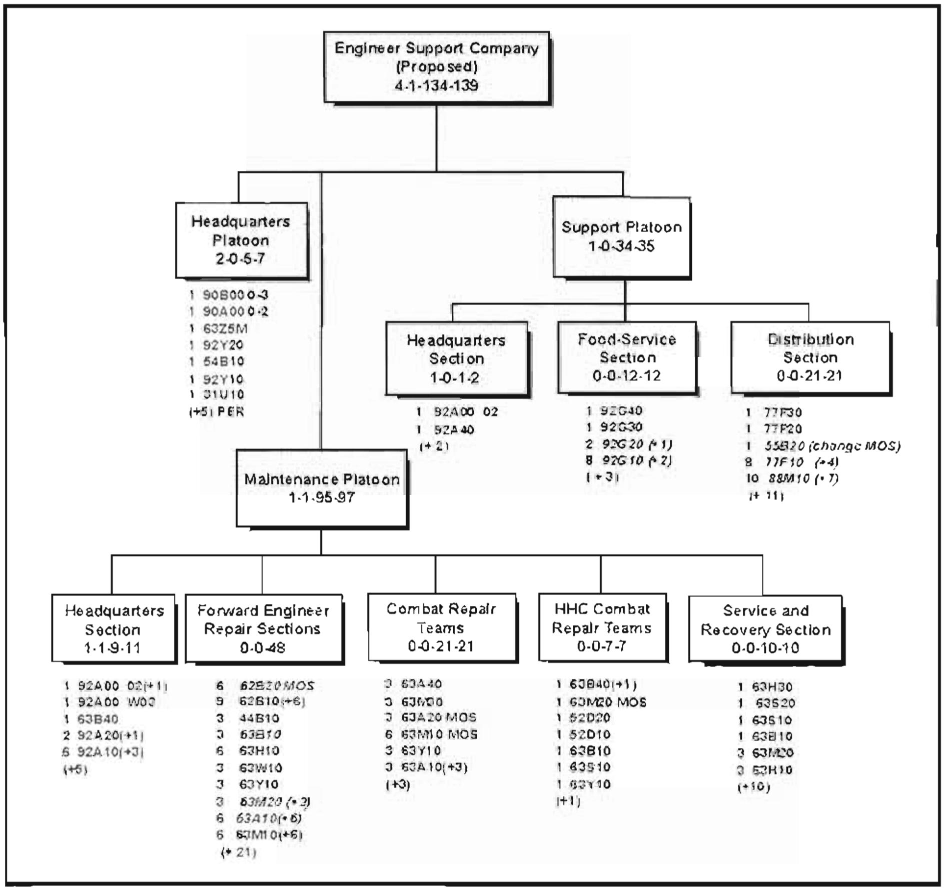

Figure 5. Proposed Engineer Support Company Structure

Because of this—and the Army's decision to field Bradleys in the engineer battalions—the structure and organization of the ESE must change; otherwise, we risk resorting to techniques that are not in consonance with the Force XXI concept.

Our experiences at both Fort Hood and the NTC proved that the ESE is still insufficient and that an upgrade of the ESE to an ESC is needed that will match the paradigm already established for infantry and armor battalions. Transforming the ESE to an ESC will—for the first time—ensure that the FSB is both properly resourced and structured to provide the logistical requirements of fixing, arming, and fueling the Force XXI engineer battalion. While many may be critical of this change, consider the following: If no adjustments are made to the CSS structure that supports the Force XXI engineer battalion, the logistician and the engineer will be placed in an untenable position. The battlefield functions of mobility, countermobility, and survivability will—at the very least—be degraded, putting at risk successful mission accomplishment and—more importantly—the lives of our soldiers. An increase of 61 personnel—with the associated equipment—is a small price to pay so that our soldiers can fight and win on the battlefields of the twenty-first century.

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The Engineer Scout Platoon: A Necessity

By First Lieutenant Jason Derstler and Captain Aaron Reisinger

"...three men behind the enemy are worth more than 50 in front of it."
— Frederick the Great
Eighteenth-century Prussian king and military genius

It was 7 February 2000, and the entire 299th Engineer Battalion was deploying to the vast wilderness of Fort Hood, Texas, to begin the train-up for National Training Center (NTC) Rotation 00-10 in August. All line and assault-and-obstacle platoons prepared for combat-engineer missions such as task force breaches, minefield emplacements, and demolitions under the task organization of two task forces. However, while five of the line platoons deployed to the field to operate as conventional engineers, one platoon began a different journey—1st Platoon, Charlie Company, deployed as an engineer scout platoon.

The requirement for engineer scouts is well documented. For example, the Sidewinder Team Situation Report in the July 1998 issue of *Engineer* reported that, historically, brigade-directed reconnaissance-and-surveillance (R&S) plans are centered around locating enemy combat power while looking passively at enemy countermobility efforts.

The engineer scout platoon is a critical enabler to the Force XXI brigade. As the force structure of the Force XXI engineer battalion has decreased, information requirements have increased. This platoon provides the brigade commander an additional set of eyes that focus on the mobility and countermobility aspects of the deep fight. As the Force XXI engineer battalion has decreased from three to two squads per platoon and from seven to four M9 armored combat earthmovers (ACEs) per company, our reliance on situational obstacles has increased. With Force XXI enablers, we are a much more agile force. Therefore, we require agile and dynamic obstacles throughout the width and depth of the battlespace. The engineer scout platoon provides the Force XXI brigade the ability to shape enemy maneuver deep with the effective and timely employment of situational obstacles such as the Modular Pack Mine System (MOPMS), the Hornet, the air- and ground-delivered Volcanos, and the aerial denial artillery munition/remote antiarmor mine (ADAM/RAAM). We no longer can depend on fixed conventional minefields to support a force that relies on its ability to reposition and mass at the critical point on the battlefield.

The engineer scout platoon also serves as a mobility enabler to the Force XXI brigade. Enemy obstacle intelligence is even more critical to the force than before. The loss of 30 percent of the engineer battalion's breaching assets from Force XXI redesign and the addition of the digital enablers to the force make us extremely reliant on accurate and timely obstacle intelligence. We do not have the engineer force required to sustain multiple breaches through the enemy's main defense. This platoon provides the brigade with the expert ability to conduct deep route and enemy-obstacle reconnaissance. The platoon searches out and finds either the bypass or the weakness in the enemy's defense and reports immediately to the entire brigade through our digital capabilities. This intelligence greatly increases the agility of the brigade and lessens our reliance on hazardous breaching operations.

The engineer scout platoon provides flexibility to the brigade insomuch as it can be task-organized in a myriad of ways. For example, it can be attached to the brigade reconnaissance troop (BRT) or—depending on the situation—to an individual task force. A well-integrated and -trained engineer scout platoon is required to consistently execute the brigade's deep mobility and countermobility fight. The platoons must be integrated with the BRT for all training and deployments. An organized engineer scout platoon, outfitted with the appropriate equipment and personnel, is necessary to develop the relationship with the BRT from the beginning. The BRT must concentrate on enemy combat power while the engineer scout platoon executes the deep mobility and countermobility tasks for the brigade. The critical battle tasks of the platoon are as follows:

- Execute/support situational-obstacle emplacement.
- Conduct engineer reconnaissance (route and enemy-obstacle).
- Conduct a covert breach.

Integration With the BRT

During the 299th Engineer Battalion's last experience with the engineer scout platoon, we did not fully integrate the platoon with the BRT. The shortfalls that occurred because of this led to emphasis on early and complete integration between the two elements. Specific examples of problems that occurred included battlespace-management conflicts that almost caused fratricide. Enemy triggers for situational obstacles were also difficult to accomplish because the platoon provided its own eyes forward. To remotely activate a Hornet munition, 36 minutes must expire between the time a soldier sends a code on the M71 Remote-Control Unit (RCU) and the time the mine is armed. This time standard was not met at times because the team did not identify the enemy movement soon enough. Because of these lessons, the leadership committed to establishing a habitual training relationship between the platoon and the BRT.

Since all of the soldiers in the engineer scout platoon were military occupational specialty (MOS)12B engineers and had never participated in scout operations, the train-up for the NTC had to begin from step one. We not only had to create a working tactical standing operating procedure (TACSOP) for our NTC rotation and beyond but also integrate into the daily operations of the BRT, tactically and socially. The BRT is an aggressive and close-knit cavalry scout (MOS 19D) organization that had never operated with an engineer unit attached to it for training. We had to prove that we could perform our engineer missions competently without compromising the BRT or ourselves while operating close to or behind enemy lines. In a matter of months, our platoon had to transform from a mobility-focused mechanized line platoon to an M998 high-mobility multipurpose, wheeled vehicle (HMMWV)-mounted scout platoon capable of covert operations.

The train-up began by conducting fire-support training with the Striker platoon and scout operations with the two scout platoons. We began and finished our train-up with 19 soldiers plus a medic, 3 HMMWVs, and an M923 5-ton cargo truck. Two weeks of platoon- and BRT-level training opened our eyes to the scout world. Before we could begin to execute our engineer missions, we had to learn scout tactics such as establishing observation posts (OPs); performing mounted and dismounted tactical night movements; and conducting actions on contact, tactical resupply, and casualty evacuation forward of the forward line of own troops (FLOT). These skills laid the foundation for how we would perform our engineer-specific missions. Once we felt comfortable operating as scouts, we began to integrate our engineer missions into the overall BRT missions.

The missions started off simple but became more complex as our abilities and knowledge increased. Our first missions were for mounted squads to set up a single MOPMS, establish an OP, emplace Hornet mines in 5-to-10-munition clusters or gauntlets, and set up overwatch. Once we understood how to emplace both mine systems while mounted, we began to operate with dismounted teams. We discovered that carrying five Hornets with a three-man dismounted team was the effective limit. When one soldier carried the team's Single-Channel, Ground-to-Air Radio System (SINCGARS), the M71 RCU, and one Hornet and the other soldiers carried two Hornets (at 35 pounds each) and their personal equipment, the weight became a limiting factor. We had to find a balance between setting up an effective obstacle and maintaining our ability to move tactically behind the enemy. When a squad (two teams) operated with the HMMWV, we could carry up to 10 Hornets and a MOPMS or 2 MOPMSs without the Hornets.

Because of the amount of equipment we were required to carry, the operational load plan changed daily. However, by the end of the train-up, we established the load plan and incorporated it into our TACSOP. The key was proper utilization of our 5-ton truck. Although this truck was not used as an infiltration vehicle, it proved to be a great asset for maneuvering equipment loads back and forth based on a thorough mission analysis. After a mission, we would reconsolidate at a BRT assembly area. Upon receiving the next order, we could switch equipment and place all the excess on the truck.

After effectively training on our countermobility mission of emplacing situational obstacles, we trained on our mobility mission of reconnoitering complex obstacle belts with enemy overwatch. We set up lanes with one team building an obstacle and set up an overwatch position with another team performing route reconnaissance and attempting to conduct a covert breach on the obstacle. The teams were tasked to identify all intelligence requirements and then wait for permission from higher headquarters before breaching, thus duplicating the process during actual operations. Often, the team simply marked the proposed breach site and called in eight-digit grids. Since

FM 90-13-1, *Combined-Arms Breaching Operations*, describes covert breaching by a squad or platoon, we had to develop an SOP for a three-man breach.

After conducting weeks of covert-breach training, we discovered that it could be inherently dangerous yet rewarding. In a covert breach, there is no suppressive fire. The three-man team works independently, so stealth is the team's only security. We assigned two teams to an individual breach location so that one team could overwatch the breach activities of the second team and provide backup in case of casualties. This allowed the primary team to focus on breaching and marking the obstacle quickly and effectively. The overwatch team would alert the breach team of enemy compromise at night by signaling with an infrared flash from their night-vision goggles. The last member of the breach team would scan his rear sector with goggles every 10 to 20 seconds to acquire the set signal. After receiving this message, the breach team moved off the obstacle and reconsolidated at a predesignated rally point away from the overwatch team. Once the breach team successfully broke contact and arrived at the rally point, a decision based on the enemy situation was made as to where the two teams would link up.

The end state of conducting obstacle reconnaissance and covert-breach training was that our main focus needed to remain on providing an accurate enemy-obstacle picture to the maneuver-brigade and engineer-battalion commanders. The ability to execute a covert breach was definitely an asset but remained secondary to the primary mission. Most of the time, we provided suggested points of penetration (eight-digit grids) based on our reading of the obstacle and enemy combat power. We could then conduct dismounted maneuver past the enemy minefield and emplace situational obstacles to disrupt the repositioning of enemy forces along key avenues of approach.

Early in the train-up of the engineer scout platoon, we experimented with scout-team organization to determine what would provide the most flexibility in emplacing effective shaping obstacles. During our early missions, we only split into three teams. However, as the capabilities of our platoon increased and our specialists and sergeants became more confident, we transitioned to a six-team organization. (See Figure 1; each box represents a team.) This allowed for three mounted and three dismounted OPs consisting of two to three soldiers each. With a total of 3 MOPMS, 20 Hornets, and 6 antitank weapons at our disposal, each team was capable of disrupting 3 to 4 tracked vehicles. Additionally, the soldiers in obstacle overwatch were able to call for fire and, therefore, were able to disrupt a company of tracked vehicles at any one of our six locations on the battlefield. On two occasions during the train-up, we were able to disrupt and destroy the entire combined-arms reserve. We had now established that the optimal disrupt obstacle could be achieved by a dismounted team placing five Hornets or one MOPMS at a choke point tied in with indirect fires. Our task organization and employment methods made the engineer scout platoon a true enabler to the brigade fight, not only increasing intelligence collection and situational awareness but also providing a means to affect the enemy's decision cycle.

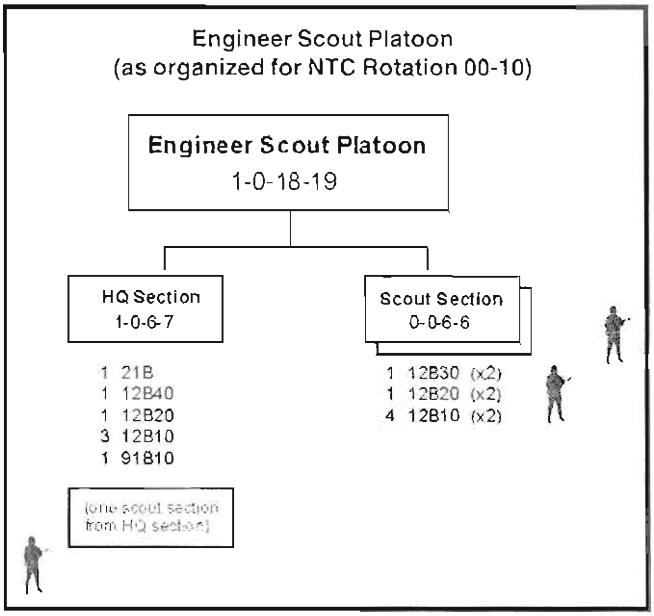


Figure 1

The Optimal Scenario

We discovered that situational obstacles, along with indirect fire and antitank weapons, could create an extremely effective engagement area. In the optimal countermobility scenario, we would establish the engagement area at a choke point that restricted enemy-vehicle movement to columns. For each identified targeted area of interest (TAI)/engagement area, the BRT would establish a named area of interest (NAI) that supported the situational-obstacle trigger. The BRT team position was usually 5 to 10 kilometers in front of our engineer OP, providing the required early warning (accounting for the 36-minute remote arming time on the Hornet). Upon identification of enemy vehicles in the NAI, the overwatching BRT leader would send in reports through the BRT radio net, which the leader of the engineer scout platoon would monitor. If the enemy spot report met the established trigger, the platoon leader would alert the engineer team observing the associated TAI and request obstacle-emplacement approval from the brigade tactical-operations center (TOC).

Once approved, the platoon leader would direct the engineer scout team to deploy the minefield. As the lead enemy vehicle was destroyed by the Hornet or MOPMS strike, the engineer scouts would fire antitank-4s/Vipers at the last vehicle in the column. With the column halted, the engineer scouts would call indirect fire on the preset target reference points to destroy the remainder of the enemy vehicles. Any other vehicles that attempted to bypass the destroyed vehicle would be hit with the remaining Hornets and MOPMSs.

After completing a countermobility mission, the teams would maintain their OPs and continue to call in enemy situation reports. If a Hornet or MOPMS was not deployed, recycle approval would be requested through the brigade until the battery life of the munition expired. Figure 2, page 32, shows the reporting channels.

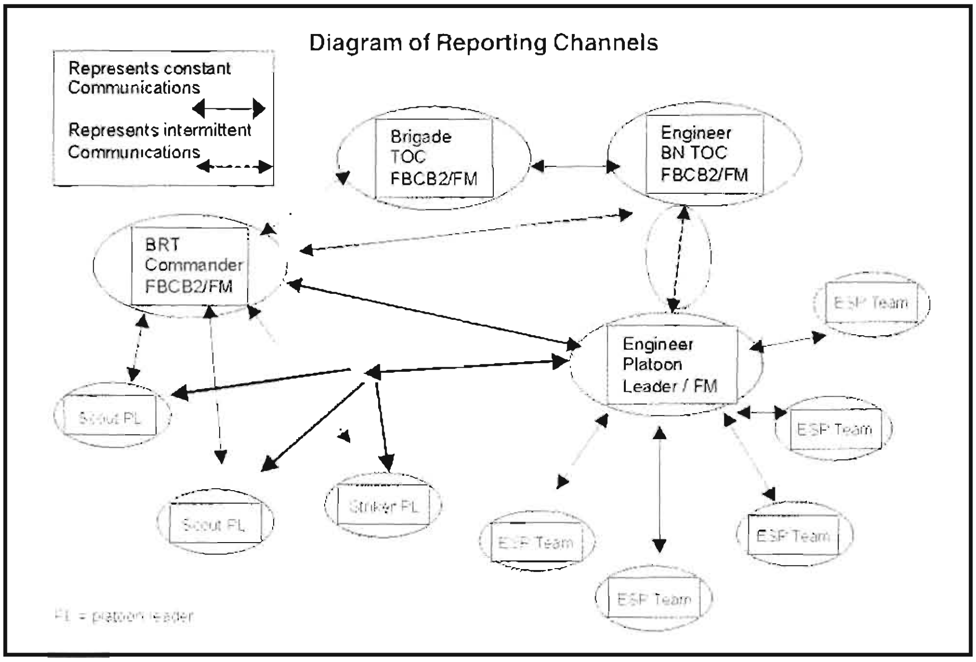


Figure 2

Integrating Into the Brigade R&S Plan

While we grappled with mastering our basic skills, the engineer plans team developed methods for integrating us into the brigade fight. During the military decision-making process, the assistant brigade engineer (ABE) section worked directly with the brigade plans team to create and assign our missions. The ABE section consisted of a captain and a first lieutenant. The ABE concentrated on the terrain analysis and enemy-engineer analysis to support the engineer-scout planning and integration during the war-gaming process. The deputy ABE worked closely with the R&S and fire-support (FS) planners to integrate the engineer scouts into the R&S and FS annexes. The deputy ABE worked the details of safety/danger zones, priority-of-information requirements (PIR), triggers, OP and target locations, fire planning to support situational obstacles, and the reporting and tracking process.

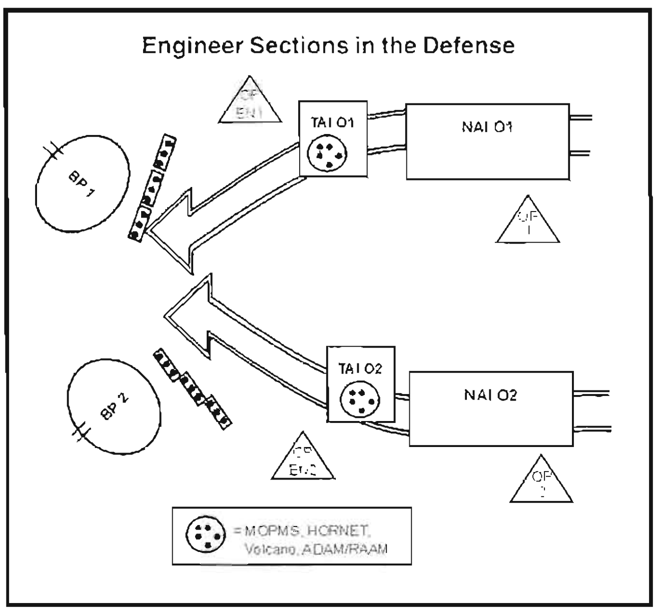


Figure 3

A thorough engineer-scout intelligence preparation of the battlefield (IPB), a solid working relationship within the brigade planning cell, and a brigade commander that supported the engineer-scout concept led us to effectively integrate the engineer scout platoon into the brigade fight. We used a basic approach for developing missions for the platoon. During defensive missions, we concentrated on meeting the intent of the brigade commander's deep fight (see Figure 3). Based on thorough terrain analysis and understanding how the enemy would fight, we assigned brigade-directed situational obstacles to disrupt enemy maneuver deep. The situational obstacles, coupled with an effective indirect-fire plan, proved a deadly deep shaper. During the war-game process, we focused on either taking an enemy course of action away, disrupting an enemy element long enough to cause him to piecemeal his attack, or mitigating risk by employing the engineer scouts at a location where the brigade commander was taking a maneuver risk.

The keys to defensive planning for the engineer scouts were—

- Analyzing the terrain (pinpointing the best location to attack maneuver and conducting time/distance analyses).
- Establishing an effective surveillance plan (identifying the required NAIs, PIRs, and triggers).
- Integrating the engineer scout plan with the R&S and FS plans.
- Briefing the brigade situational-obstacle plan at the brigade operations-order briefing.
- Reporting via FM radios and the Force XXI Battle Command Brigade and Below (FBCB2) System.

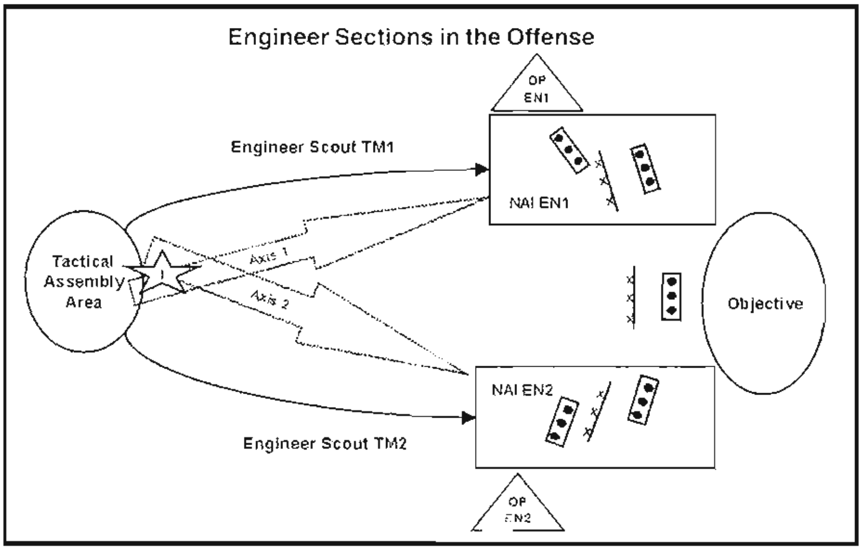


Figure 4

The ability of the engineer scout platoon to attack enemy maneuver deep with either the Hornet, MOPMS, or ADAM/RAAM and/or the air-delivered Volcano gave the engineer planners numerous effective options when planning the defense.

When the brigade went on the attack, we changed the focus of the engineer scout platoon (see Figure 4). After the S2 and the ABE templated the enemy battle positions and obstacles, we proposed possible points of penetration. These points became targets for the engineer scouts. We established NAIs on the points of penetration and assigned them to the platoon. It was the responsibility of the engineer scouts to confirm or deny the planners' template of the enemy obstacle belt. Additionally, the engineer scouts were to provide detailed information such as soil conditions, picket spacing, tank-ditch depth, mine types, and obstacle orientation and configuration. This information was critical in determining exactly how to attack the obstacle—either with mechanical, explosive, or manual means—or bypass it.

We also used the engineer scouts to conduct reconnaissance of routes, fording sites, and natural obstacles forward of the FLOT during the attack. Normally, the brigade had a follow-on mission to establish a hasty defense after a successful attack. After the reconnaissance mission was completed, we planned for the engineer scouts to employ situational obstacles on the brigade's flank to protect against counterattack or to move deep and prepare to employ air-delivered Volcano or ADAM/RAAM to disrupt counterattacks along high-speed avenues of approach.

Movement to contact was approached in much the same way as the defense. However, instead of using the engineer scouts strictly to attack enemy maneuver, we also planned for the scouts to go deep to prepare situational obstacles that we could eventually fight from, with maneuver forces moving forward in the zone. The engineer scouts gave the brigade planners a tool to disrupt enemy maneuver long enough to allow friendly forces to gain critical terrain and establish support-by-fire positions.

Two inherent risks were associated with the movement to contact: survivability of the air-delivered Volcano and prevention of fratricide as friendly forces moved forward into the zone. To mitigate the air-delivered Volcano risk, we ensured that engineer scouts were on the ground in the vicinity of the target location and in direct contact with the aircraft. The engineer scouts verified the location of any enemy forces to the pilots and helped verify the employment of the Volcano. The FBCB2 System allowed us to mitigate the fratricide risk. As the engineer scouts employed a scatterable-mine system, the obstacle was added to the graphics on the FBCB2 System's map screen. Immediately, every combat system in the zone had the obstacle on its map screen and knew the obstacle's location.

The engineer scout platoon developed into a powerful tool for the brigade plans team. The platoon was always a focus of the brigade's deep fight. It allowed engineer planners to truly plan throughout the width and depth of the battlefield. The platoon also greatly enhanced our flexibility; we were able to plan for up to six teams, each with its own target. Planning for the platoon depended on a thorough IPB process. Analyzing the terrain, understanding enemy capabilities and order of battle, and knowing the engineer-scout capabilities were critical to the planning process. Because we integrated the platoon 6 months in advance of our NTC rotation, both the brigade and engineer planners had a clear understanding of the platoon's capabilities.

Lessons Learned

Overall, the 6-month train-up was an essential element to developing the TACSOP for operations at the NTC and future combat operations. Because of the lack of doctrine on engineer-scout operations, each unit should experiment with developing, outfitting, and training before going to the NTC.

An essential upgrade that we did not have during the train-up, but used at the NTC, was the .50-caliber machine-gun mounts on our HMMWVs. This addition to our vehicle load increased our survivability and allowed us to repel attacks from enemy counterreconnaissance efforts as we traveled into sector.

The 5-ton cargo truck was another critical element to our success. We could carry our mission-essential equipment on our load-plan-challenged HMMWVs and place everything else on the truck, which was operated by the platoon sergeant.

An important change that began to take place toward the end of the train-up and into the NTC rotation was the use of brigade aviation assets to emplace engineer-scout-platoon teams. Once aviation assets became available on a regular basis, we used them to place teams at key terrain features much faster and safer than before. This became our preferred method of

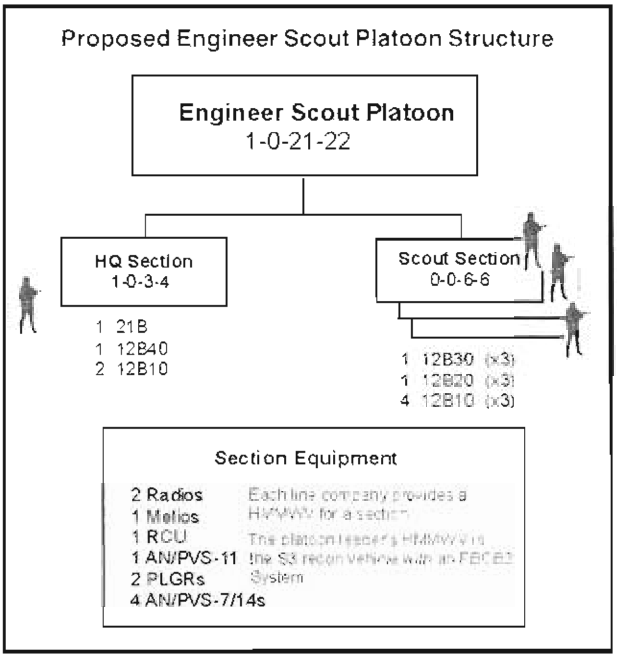


Figure 5

insertion and allowed us, on occasion, to get deep enough to sabotage Class IV/V sites before the enemy began to set up his obstacles. This method of inserting teams also was the best tactical solution in a countermobility mission of shaping the deep battlefield.

One addition that must be included in the scout vehicles is the FBCB2 System. With the SINCGARS, we could not communicate while on low ground or 20 kilometers from the engineer TOC. The ability to instantaneously communicate reconnaissance information to the brigade while located anywhere on the battlefield would allow engineer planners more time to possibly change the existing plan and breach another location. It would also ensure 100 percent accuracy of detailed intelligence from the scout with eyes on the obstacle to the ABE or brigade engineer.

Another improvement would be to increase the number of HMMWVs from three to four while maintaining the 5-ton truck. This would allow each operational scout section to have a HMMWV and allow the platoon leader to maintain the command post without deploying a squad and losing communications with other teams.

Although we operated with 19 soldiers plus a medic, the ideal task organization requires three more soldiers. Three HMMWVs with six-man sections in each; another HMMWV with the platoon leader, driver, and a gunner; and the 5-ton truck with the platoon sergeant, driver, and medic would bring the total number necessary to 1/0/21/22. We believe this organization is ideal and provides the most flexibility and redundancy while remaining small enough to operate covertly.

Proposed Engineer-Scout Platoon Structure

The 299th Engineer Battalion is now fielding an engineer scout platoon as detailed in Figure 5. This 22-soldier platoon is a major enabler in the Force XXI organization proposal. The battalion has resourced the additional personnel from the newly authorized eight-man assault sections in each assault-and-obstacle platoon. Each line company transferred equal equipment to the headquarters and headquarters company (HHC), including a HMMWV from each of the line platoons. Weapons, along with essential equipment, are under the control of the HHC commander and the scout-platoon leader. These scout sections now have the ability to support a task force operating independent of the brigade alongside its parent line company or consolidate alongside the BRT.

Conclusion

The most important aspect of creating an effective engineer scout platoon is the training and relations with the brigade and/or maneuver scouts. The fact that we were able to learn the right way to operate as scouts before we started anything else helped us establish a solid relationship with the BRT and build the correct foundation to accomplish complex missions. We struggled at times and shined during others, but throughout the entire process, the BRT was our mentor. After 7 months of training together, we gathered as one team 2 weeks before leaving for the NTC at the emotional BRT dining in and earned the distinction of being the first engineers to add sapper ingredients to the troop grog. That July night truly defined the lasting and trusting relationship that had been built and was pivotal to our joint success at the NTC.

Engineer scout teams can be incredible assets. With a modified table of organization and equipment proposing to field 22 scout positions and continue to train engineer scouts with the BRT, the emergence of these teams in doctrine is certainly very close. From this point, more efforts from other battalions need to be attempted to validate our concepts. The more that the armor and infantry communities put eyes on what these teams can accomplish at the major training centers—and possibly in combat—the greater the future of engineer scouts will become.

First Lieutenant Derstler, the executive officer for A Company, 299th Engineers Battalion, was the engineer scout platoon leader during NTC Rotation 00-10. A graduate of the Ranger Course, he holds a bachelor's in mechanical engineering from the Illinois Institute of Technology.

Captain Reisinger, commander of C Company, 299th Engineer Battalion, was the 1st Brigade assistant brigade engineer during NTC Rotation 00-10. Previously he was assigned to the 14th Engineer Battalion, Fort Lewis, Washington, where he served as a platoon leader, executive officer, and battalion maintenance officer. A graduate of the Ranger Course and Engineer Officer Advance Course, CPT Reisinger holds a bachelor's in mechanical engineering from West Point and a master's in engineering management from the University of Missouri-Rolla.

554th Engineer Battalion—

Looking for Outstanding Officer Platoon Trainers

By Captain Kristy Wolfe

The 554th Engineer Battalion at Fort Leonard Wood, Missouri, is seeking highly qualified first lieutenants and captains to serve as Engineer Officer Basic Course (EOBC) platoon trainers for 8 to 12 months, or at least two full 17-week cycles. We need quality officers to coach, mentor, and develop our junior leaders to ensure the continued success of our Regiment. We need officers who are dedicated to serving the Engineer Regiment and the United States Army. Our officer platoon trainers must be the best of the best. They must be tactically and technically proficient, have a sound understanding of Army doctrine, and care about the future leaders who will take forth our Regiment. A lieutenant's initial professional development depends highly on the officer platoon trainer.

To emphasize the importance of the officer platoon trainer position, let me first explain their duties and responsibilities. Platoon trainers are responsible for 40 to 70 lieutenants; logistical and administrative support to facilitate training; coaching, mentoring, counseling, and teaching; planning and conducting soldierization training, to include basic rifle marksmanship (specifically range operations), physical training, and drill and ceremony; planning, conducting, and evaluating field and situational training exercises; evaluating lieutenants on their performance; and serving as subject-matter experts in all facets of engineering, from bridging to combat engineering to construction. On any given day, officer platoon trainers may find themselves evaluating a student-taught physical-training session; answering questions about follow-on assignments; discussing the tenets of breaching; or planning an upcoming Sapper Stakes competition—all while managing a myriad of other tasks. The students respect the knowledge of the officer platoon trainer and use it to better prepare themselves as future platoon leaders.

The ideal officer platoon trainer has served at least 12 months as a platoon leader and 6 months as a company executive officer and has some battalion-staff experience. In addition, we also need a mix of combat, combat-heavy, bridging, topographic, and light-fighter experience. The students, much like the platoon trainers, come from distinctly varied backgrounds, to include the U.S. Army Reserves, the Army National Guard, the Reserve Officer Training Corps, the Federal Officer Candidate School, or the U.S. Military Academy. The conglomerate of students makes the job of a platoon trainer nothing short of interesting. Therefore, the experience brought by the officer platoon trainers needs to be as diverse as the lieutenants they are responsible for training.

So why does it benefit you to volunteer to be an officer platoon trainer? First and foremost, you are shaping the future of the Engineer Regiment. The lieutenants you mentor and train are your future platoon leaders. You can personally impact the quality of officers in our Regiment. Secondly, you will be able to refine the skills you may have lost since the basic course. For instance, if you served in a combat mechanized battalion for 4 years, your construction skills may be lacking. By working with the basic-course students, you are able to redevelop those skills, which may be exactly what you need for your command. Finally, you get the opportunity to work with individuals from the U.S. Army Engineer School. Being at the home of the engineers, you can make some great contacts here that will benefit you during your command tenure.

Please understand that if you volunteer to serve as a platoon trainer, it will NOT be a PCS move to Fort Leonard Wood. You will still be under a PCS status to attend the Captain's Career Course, but your follow-on assignment will not be affected.

As you can see, Engineer Officer Basic Course officer platoon trainers play a formidable role in the development of newly commissioned engineer lieutenants. Platoon trainers are extremely influential figures to second lieutenants as they begin their diverse careers in the Corps of Engineers. Platoon trainers develop and train these new officers. Whether they are active duty, National Guard, Reserve, or international officers, the 554th Engineer Battalion prides itself in developing the best lieutenants in the military. If you are interested in becoming a platoon trainer before attending the Captain's Career Course, please contact the battalion executive officer at (573) 596-0787 or DSN 676-0787. For more information on the 554th Engineer Battalion, go to its Web site at *http://www.wood.army.mil/554th/554.htm*.

Captain Wolfe is the commander of A Company, 554th Engineer Battalion, Fort Leonard Wood, Missouri.

The Grizzly: A System of One

By Colonel Michael K. Asada, Lieutenant Colonel Theodore L. Jennings Jr., and Wesley L. Glasgow

The Grizzly, a critical complex-obstacle breaching system for the twenty-first century, is nearing the end of its developmental phase in the acquisition cycle and remains at risk for continuation due to funding priorities. The system promises to become one of the Army's most versatile and important combat-support vehicles to the maneuver commander. The Grizzly's technology also has the potential to enhance future Objective Force equipment performance. It is the only system directly designed to facilitate the rapid and decisive movement of combat forces through even the most complex engineering obstacles. The system is vital to U.S. forces because rapidly emplaced complex obstacles are a low-cost means—and perhaps the most effective mechanism—the enemy can employ to shape the battlefield and frustrate U.S. operational objectives. Skillful employment of these obstacles can erase the effectiveness of millions of dollars invested in winning the information war and impeding the key U.S. battle objective of ***dominant maneuver****. Formidable obstacles at the right time and place can severely hamper friendly-force momentum, and their reduction—using the current suite of breaching equipment during battle—ultimately means lost time and heavy casualties. Today's breaching capability, without the Grizzly, is only marginally adequate for conducting deliberate or hasty attacks and cannot be executed without losing the momentum needed to support future heavy- or medium-brigade operations. The Grizzly, however, has specialized equipment, mobility, and protection that enable it to be an integral part of the combat team, preserving the commander's flexibility and preserving dynamic maneuver options for the Legacy, the Interim, or the Objective Force.*

Despite the dramatic successes of Field Marshals Rommel and Zhukov, General Patton, and others in the employment of armored forces in World War II, U.S. Army officials in a postwar assessment observed one glaring weakness in the use of these forces when they commented, "In the end… an armored force that encountered a minefield usually had to attack at the pace of a crawling soldier."

Although huge strides have been made in the effectiveness of armored warfare since World War II, one area that has not improved much is the stultifying effects of the properly emplaced minefield on mechanized maneuver. Complicate minefields with other obstacles—such as wire entanglements, antitank ditches, natural and devious man-made devices—in the right place, and even the most powerful tank will have its greatest asset—mobility—slowed or reduced to a standstill.

These combinations of "reinforcing" obstacles, called "complex obstacles," are deliberately designed to force the enemy either to bypass them or devote time, personnel, and equipment to defeating them. Depending on the scope and location of the obstacles and how they are defended, the enemy hopes to force high casualties on the assault force, or worse, completely defeat the breach attempt. Or the obstacle could be a means, possibly the only means, for the enemy to buy time—to retreat, to reinforce, to counterattack elsewhere, or even to sow frustration and impatience in the mind of the American public.

The Bypass Decision

Obstacle complexes are serious impediments to maneuver. The Army's approach to obstacles is to bypass them or, if that is not possible, to conduct a breach to support either a hasty or deliberate attack. Either type of breach features a common sequence of events. Each begins with a near-total cessation in momentum as the commander discovers the obstacle (often when the lead element encounters a mine). The next step is to marshal intelligence about the defenses and scope of the obstacle and assemble the right breach equipment and trained elements to cope with it. These assets may be ready at hand, "one terrain feature back," or perhaps days, even weeks away from ready use. Chances are that the commander's proximate combat units are not fully up to the task for the larger obstacles faced, so he must call on trained engineer soldiers to get the task done. If he is lucky, these soldiers are ready at hand with the right equipment to conduct a breach and not slow the momentum of the attack. If not, or if the complex obstacle is too extensive, the task devolves into a more difficult breaching operation. Meanwhile the momentum of the armored thrust is stalled, and the task organization is literally moving at or less than the "crawling-soldier" analogy—often because exposed soldiers are actually

> **"The maneuver force still has a valid requirement for (the) Grizzly, especially the Counterattack Force."**
> **—Mechanized Force Modernization Plan**

crawling through the obstacle carrying explosives or probing for mines with a bayonet to create a lane.

A breach in support of a deliberate attack is one of the hardest and most complicated tactical operations a commander faces because of the difficulty in successfully synchronizing and protecting the unique assets needed to execute the breach. The resources required are also costly to the maneuver commander in terms of combat power. For example, an armor battalion employing the Battalion Countermine Set (BCS) of special plows and rollers requires that 30 percent of its combat assets be directly dedicated to the task in addition to the engineer breaching assets needed to clear two lanes successfully. Much more is needed to suppress enemy fires or seal off the area so the operation can proceed.

Historical Obstacles

Breaching obstacles to support deliberate attacks is nothing new. It has always been the bane of maneuver. Without freedom to maneuver, the course of the campaign or even the entire war can be decisively impacted. One doesn't need to go far to observe the historical significance of obstacles and fortifications. Medieval fortresses often frustrated campaigns of warrior kings when no means was available to defeat them. Robert E. Lee's Army of Northern Virginia arguably extended the American Civil War 2 years with the tenacious use of simple field obstacles. Kaiser Wilhelm II expended the flower of his army in the futile attempt at battering through the Verdun fortified zone in World War I. The significance of the French Maginot Line was not lost on the Germans in 1940. Unfortunately, the line didn't extend into Belgium so the Germans simply bypassed it. Would Rommel have stopped at El Alamein and waited for the inevitable British buildup, or could he have pushed to Suez if a ready means to pierce the obstacles without losing momentum had been at hand? Might the greatest tank battle ever fought—Kursk—have turned out differently if the German Army Group South could have rapidly and decisively dealt with Zhukov's Russian obstacle belts? Even the prospect of high casualties in defeating Saddam Hussein's obstacle belts on the Kuwait frontier in the Persian Gulf War gave pause and caused allied leaders to shift large forces far to the west. Obstacles have had and continue to have a profound effect on tactical and even strategic operations.

Does the situation improve with the recent development of a lighter-force concept? Unfortunately, no! The lighter, enhanced mobility systems will still be stopped dead by complex obstacles that will still have to be dealt with by the crawling-soldier approach. The promise of greater speed and agility of U.S. forces ironically means a likely adversary will employ more obstacles with greater sophistication to remove the U.S. speed and knowledge advantages.

Fortunately, the situation is not hopeless. A system is being developed today with the promise to breach even the most complex obstacles without losing momentum—the Grizzly Combat Obstacle Breaching System. The Grizzly is a vital element to the combat force. As stated in the Mechanized Force Modernization Plan, "The maneuver force still has a valid requirement for (the) Grizzly, especially the Counterattack Force." However, at the drafting of this article, its future remains unclear because of funding priorities. If the Grizzly program is funded this year, and the program is allowed to continue, its employment promises that the lethal and agile mechanized force of today's and tomorrow's Army can progress beyond the crawling soldier and fully exploit dominant maneuver. The technological advances included in the Grizzly design may also have application in systems being developed in the Army's Transformation.

The Grizzly promises the versatility and capability to finally permit the dismounted soldier or sapper to sheath his antimine bayonet. It allows the armored force to counter the delay tactics of the enemy commander and multiplies the effects of our impending revolution in digitization and situational awareness. The system is absolutely essential in permitting the Army to accomplish its operational objectives.

Capabilities and Mission

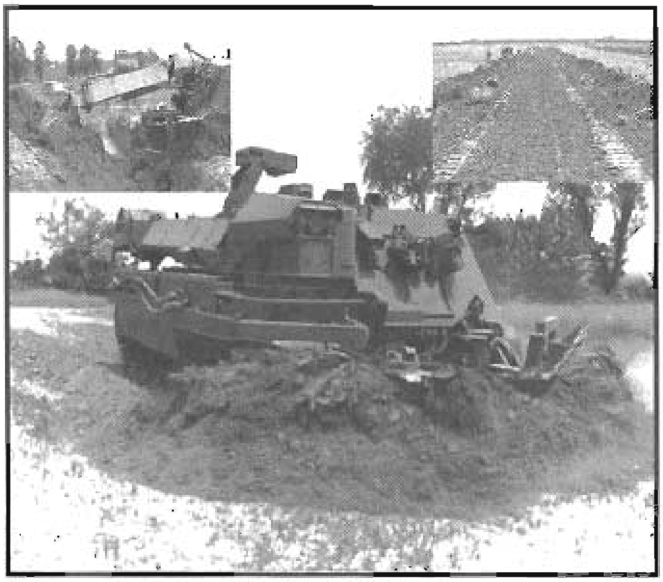
The Grizzly (shown in the photo on page 38) is specifically designed to breach simple and complex obstacles without losing momentum, a capability simply nonexistent in any single vehicle today. The vehicle incorporates both countermine and counterobstacle capabilities into a single survivable system that, in a single pass, creates a full-width assault "lane" that is immediately trafficable by the entire maneuver force.

The Grizzly defeats a wide range of obstacles, to include natural obstacles (streams, dry gaps, rocks/boulders, and fallen trees), simple/man-made obstacles (wire, bomb craters, berms, abatis, rubble, and constructed structures such as log cribs, antitank ditches, and minefields). and complex obstacles (combinations of natural and simple obstacles in mutually reinforcing arrays).

The Grizzly is a full-tracked, heavily protected vehicle that can go into harm's way far better than the specialized engineer obstacle equipment now in use. It integrates M1 Abrams main battle tank chassis technologies, the latest Army communications components to instantaneously broadcast its progress in the lane, and its unique Grizzly mission modules. Mobility is equivalent with the M1 tank, and survivability features include an overpressure collective protection system for nuclear, biological, and chemical operations. It employs a wide variety of standard combat-vehicle components integrated into the system through an aggressive technology-insertion initiative. The Grizzly has an integrated open-systems vehicle electronics (Vetronics) architecture that includes the very first "drive-by-wire" controls; a mine-clearing blade equipped with terrain-following, automatic depth-control sensors and controllers; a power-driven arm for obstacle reduction; and a sophisticated vision system for operating the Grizzly in the "closed-hatch" mode. The technology associated with the Vetronics and depth-control sensors may have application to other systems being developed for the Objective Force.

Laws of Physics

The development of the Grizzly's design centers on meeting clear operational requirements based on known deficiencies existing in current methods and equipment. The Grizzly is designed to clear—within 21 minutes—a full-width lane (analogous to a wide pathway rather than two separate left- and right-side wheel tracks) through a designated complex-obstacle system of 600 meters in depth (length) that includes antipersonnel wire, an antitank ditch, and antipersonnel and antitank mines laid to standard densities and depths. Its mobility and survivability correlates with that of the heavy mechanized force, and while its weight approaches the 70-ton gross-vehicle-weight threshold, this size and the power of the Abrams suspension components are absolutely essential for the Grizzly to achieve the mechanical forces necessary to remove deeply buried mines (greater than 12 inches in depth). The laws of physics dictate the requisite inertia necessary to achieve this level of performance. Therefore, a lighter vehicle simply cannot physically generate enough plow force to clear mines without sacrificing much of its weight for power or without sacrificing survivability.


A Grizzly perfoms a mine-plowing mission.

The tactical advantage afforded by the Grizzly's survivability and mobility is enormous. It permits the maneuver commander to employ the Grizzly at or near the very forefront of the battle. As obstacles are encountered, the unit can immediately employ relatively simple Grizzly battle drills to counter the obstacle while the armored forces cover the breach site with appropriate fires. Even before the breach is completed, tanks and armored vehicles can follow right on the heels of the Grizzly. This tactic would be particularly effective against the artillery- or air-delivered scatterable minefields the enemy desperately employs to impede our advance. Many significant advantages result from this capability, as shown in a likely scenario in the inset on page 39 compared with today's tactics, techniques, and procedures.

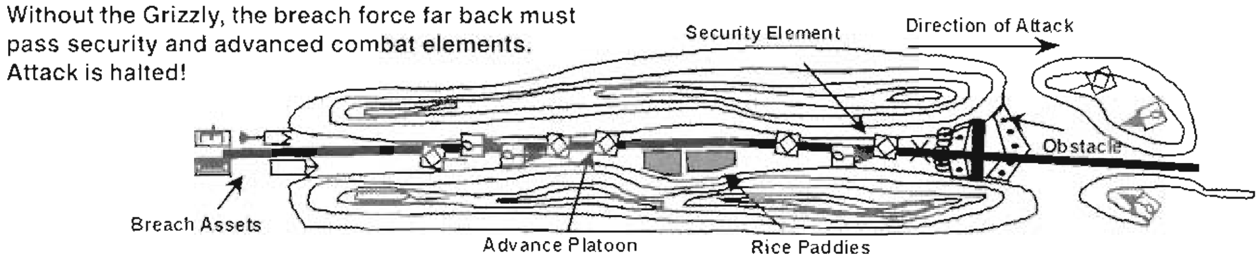
The Orchestrated Ballet

Today's techniques for defeating complex obstacles consisting of antipersonnel wire, minefields, and antitank ditches require a very complex operation involving several types of specialized equipment that do not offer the mobility and survivability of the Grizzly—and none possesses the flexibility of equipment to defeat all of these types of obstacles. Since multiple equipment types must be used *while in the middle of a minefield*, the operation simply cannot be accomplished as rapidly as the tempo of modern battle requires.

Exactly what may be involved in defeating complex obstacles today depends on the scope and configuration of the obstacle—thereby complicating task organization and mandating the requirement for lengthy reconnaissance and rehearsals. Essentially, five types of equipment are or can be involved in the operation, depending on the scope of the obstacle, and often result in the maneuver commander having to unnecessarily sacrifice equipment or personnel that would otherwise be used to provide combat power. These include—

- Dismounted engineer soldiers (called sappers) to deal with wire entanglements and provide mine detection/clearing.
- Multiple M58 mine-clearing-line-charge (MICLIC) shots to detonate pressure mines over the depth of the minefields.
- M1 tanks equipped with BCS components for clearing/detonating residual mines and "proofing" the lane.
- An M9 armored combat earthmover (ACE) or bulldozers to destroy/move earth cribs and concrete obstructions or fill in antitank ditches.

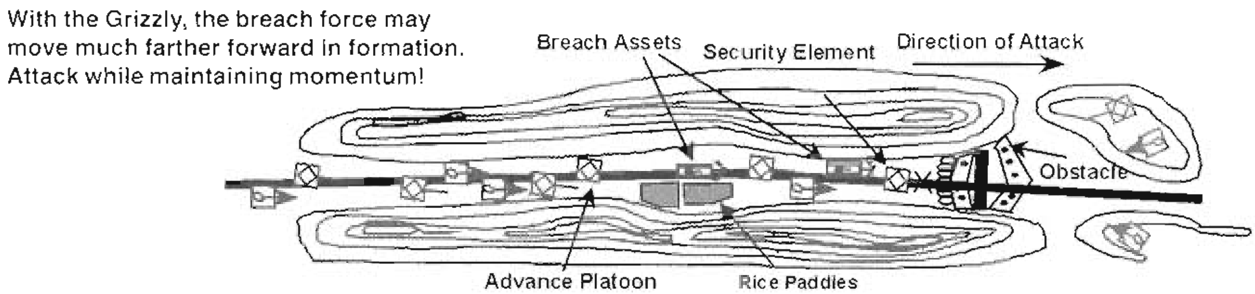
Operational Advantages of the Grizzly



The Grizzly preserves tactical options and flexibility for the commander. Here, in constrained terrain such as Korea, where parallel ridges are common and almost all arable areas are under cultivation with crop areas such as rice paddies, roadways are extremely narrow and even tanks can get bogged down if they leave the road surfaces.

These areas are ideal locations for the enemy to construct complex obstacles. Since the terrain is constrained, "bottleneck" zones are easy to find where minimal assets are required to emplace obstacles that would pose extremely difficult tactical problems in continuing the tempo of the advance. As shown above, the attack is essentially stopped while the necessary engineer assets have to pass the length of both the advance platoon and the security element before they can get to the obstacle. These assets do not travel far forward because of their vulnerability and lack of mobility.

The scene below shows the advantage of the Grizzly. It can be right with the security element as the unit approaches this terrain. Upon encountering the obstacle, the Grizzly can immediately deploy to defeat the obstacle, preserving attack momentum.



- A heavy assault bridge (HAB), such as a Wolverine, or an armored vehicle-launched bridge (AVLB), for spanning the antitank ditch or the wire entanglements.

This does not include the manuever forces that must suppress enemy overwatch elements while these vulnerable systems negotiate their very trying missions.

All of this equipment must be collected and synchronized, which requires considerable time for reconnaissance, planning, assembly of equipment/personnel, rehearsals, etc., often taking hours, days, or even weeks to complete. The actual conduct of a breach doctrinally follows some variation of suppressing the enemy force that is overwatching the obstacle and obscuring the view, securing the obstacle and reducing it with lanes through it, and securing the far side. If the complex obstacle begins with antipersonnel wire or barriers to a minefield, dismounted soldiers or sappers deploying bangalore torpedoes, detonation cord, or other means are currently employed and may include using an AVLB to clear or bridge them. Their efforts may be complicated by the presence of antipersonnel mines or explosive antihandling devices in the wire.

Once a lane in the wire is created, a series of MICLICs, each weighing more than 1,500 pounds, with the telltale signature of a rocket propellant in-flight, must be fired into the minefield. The number depends on the linear depth of the minefield. After each MICLIC is fired, a lane must be proofed by other means before it can be assured as safe. The current practice requires that tanks equipped with mine plows or rollers be dedicated to clearing a track-width lane (one small lane for the left and one for the right track) and defeating residual mines missed by the MICLIC detonations. These tanks, while performing this mission, are necessarily lost to the maneuver commander for their primary combat role—and sometimes until after they are repaired from the damage sustained during a breaching mission.

The presence of the antitank ditch adds serious complications since neither the BCS-equipped tanks nor the MICLICs are effective against this obstacle. This means that this equipment must be *backed out of the lane* and the M9 ACE, AVLB, or bulldozer brought forward. Operation of these vehicles can be greatly complicated by mines in the vicinity of the ditch. If one of these vehicles is disabled, it becomes itself a formidable obstacle to the breach, which may then require another armored vehicle or recovery vehicle to move in and extract or move it from the lane. Once past the ditch, the presence of more mines may force these earthmoving vehicles to carefully *back out of the lane* so that MICLICs and BCS-equipped tanks can again be employed past the ditch. Since the lane must be kept clear so the vehicles can move forward as needed, few—if any—exploitation forces can move into the breach until it is entirely clear. This means that the vulnerability to counterattack action by the enemy is very high because of his almost certain knowledge of where the attack will occur.

As one easily senses from the previous description, this "parade" of various types of specialized equipment, described by some as "an orchestrated ballet of farm implements," entails enormous risk to the mission. The failure of one system may nullify or even block the remaining effort. Meanwhile, the overall operation or even the entire campaign may fail. The whole operation—under easily imaginable combat conditions of fire, smoke, and the dangers of hidden mines—may simply require too much sheer guts on the part of the soldiers earmarked to accomplish it, even under the most benign circumstances where only pressure mines are the threat. The risk of failure heightens tremendously when non-pressure-sensitive and/or smart mines exist in the mix, which can frustrate the operation and cause many casualties in the breach force. It is readily apparent that such an operation cannot be conducted without losing momentum, even by the most modern mechanized forces.

A Utility Knife for Obstacles

The Combined Arms and Support Task Force Evaluation Model (CASTFOREM) modeling and analysis have amply demonstrated the success of the units equipped with the Grizzly. The time that forces are exposed to enemy fire during a normal breach is reduced by nearly two-thirds. The probability that a task-force two-lane breach will be successful is increased nearly six-fold. The loss-exchange ratio is half that without the Grizzly in the force. The use of the Grizzly preserves combat power while decreasing friendly losses, reducing exposure of soldiers to enemy fire and actually presenting a bonus to the commander because he now has all of his tanks available for combat—not damaged by mines in the breach or simply unavailable due to diversion to the breaching role. In addition, all the other engineer equipment mentioned—such as the bulldozers, M9 ACEs, and HABs—is now available for its primary mission functions.

A point worth mentioning with regard to the Army's Transformation is that variants of our current inventory of Abrams tanks and Bradley fighting vehicles will be used by U.S. Army soldiers for 30 years or more from today. The Army's Transformation, as we all know, has three parallel axes (Legacy, Objective, and Interim Forces), and the Grizzly system is part of the Legacy Force. By many estimates, the Legacy Force systems will remain in the Army's inventory until 2032, which means that the requirement for the Grizzly to conduct complex-obstacle breaches will be valid for many years to come. Additionally, as long as the Army's Counterattack Force packs the punch of today's armored equipment, the maneuver commander will need the Grizzly to ensure that he can maintain dominant maneuver on the battlefield.

What If We Had a Grizzly?

We've mentioned a few historical instances where obstacles have been decisive or played a major role in the outcome. Some are worth conjecture from a what-if standpoint. For example, at Verdun, the Germans expended millions of shells and suffered hundreds of thousands of casualties but could not break through. Even without extensive minefields in that campaign, a protected engineer system like the Grizzly could have unhinged the French. The first tank offensive by the British at Cambrai bogged down because the primitive tanks couldn't negotiate the terrain in-depth. A Grizzly-like system could have had a role there. Rommel's North African campaign frequently featured encounters with complex obstacles in-depth. Rommel seemed to always outflank them in the featureless desert—that is until the Quattara Depression anchored the Commonwealth left flank at El Alamein. A Grizzly system may have provided other options to the "Desert Fox." The Germans at Kursk, even with tanks that greatly outclassed the Russians, were decisively defeated when the panzers could not negotiate the extensive complex obstacles employed in-depth by Marshal Zhukov's armies. Admittedly, putting the Grizzly into these historical instances is a stretch, but what about a more recent example such as the Persian Gulf War? The inset on page 41 depicts the actual experience of the U.S. Marines in breaching an Iraqi obstacle zone.

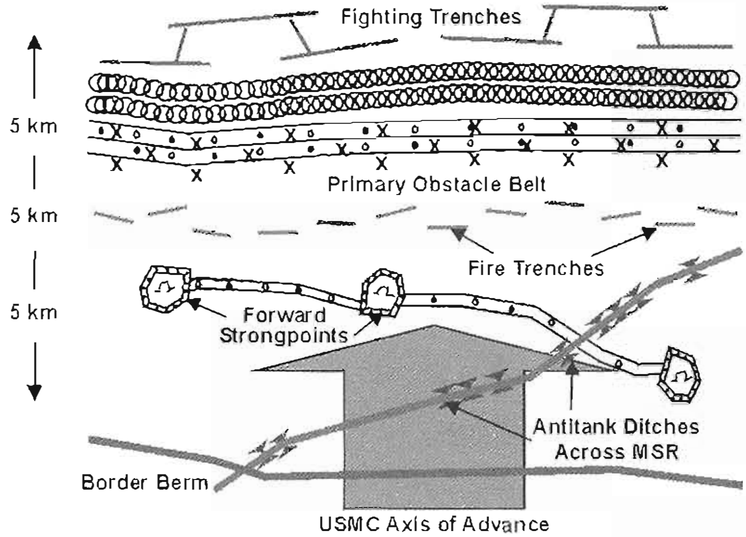
Where Is the Grizzly Now?

The Grizzly is well on the path toward making the concept of conducting a breach without losing momentum a reality. Already fully engaged in the Engineering and Manufacturing Development phase of the acquisition life cycle, prototype vehicles have been produced by the prime contractor, United Defense Limited Partnership, and have demonstrated solutions to many of the technical challenges presented by the Grizzly's challenging mission. The terrain sensors and onboard blade controllers have been employed with survivable mine-plow-blade components to remove seeded mines to a depth of up to 12 inches at speeds capable of meeting established standards. Minefield breaches where the blade depth was manually controlled have also been successfully demonstrated with the Grizzly prototypes. Clearly, the progress and performance of the system to date are impressive and unprecedented.

The power-driven-arm technology is an adaptation of commercially available equipment. While in and of itself not a challenge, closed-hatch vision throughout its full range of motion and anticollision software development add to the complexity of its integration. This requires the use of external cameras and the electronics required to bring the video to the operator to permit day, night, and all-weather operations.

Additional effort is needed to ensure that the system progresses beyond the prototype stage and meets standards in government Live-Fire Test and Evaluation, Initial-Operational Testing, and Production-Verification Testing. The opportunity to bring this critical technology to the force in the field, however, is fleeting. The team is now assembled to solve any residual challenges that need to be faced to get this system to the field. The potential to meet the challenge will inevitably dwindle and

Iraqi Defensive Obstacle Belts in Front of the 2d U.S. Marine Division



In the Persian Gulf War, elements of the 2d U.S. Marine Division were tasked with penetrating Iraqi defensive positions arrayed in-depth as depicted in the diagram. The complex obstacles deployed by the Iraqis included antitank and antipersonnel minefields, berms, wire and point obstacles, antitank ditches astride the existing all-weather road, and reinforcing trenches and strongpoints for defenders of the lanes through the obstacles.

The Marines conducting the operation had several weeks to prepare for the breach mission. Each obstacle was treated as a separate simple obstacle with the appropriate equipment brought forward to deal with obstacles individually. Even though the breach was unopposed due to the previous withdrawal of Iraqi forces, each simple obstacle took from 30 minutes to 3 hours to defeat. These obstacles included several dummy minefields. Dismounted Marines proofed the lanes. The time it took for each task force to clear two lanes through the belt was 2.5 to 9.5 hours. It took 1 to 2 days for friendly elements to pass through to the other side of the obstacle.

Track-width mine-plow tanks were employed, and 9 of 11 vehicles that hit mines during the operation suffered mobility kills. These tanks had to be repaired before they could rejoin their units in the advance. Of the 45 MICLICs used, 20 failed to remove all the mines, and supplementary action was necessary to clear or proof the lanes.

may disappear unless the requisite fiscal support for this critical system is forthcoming. It would be a tragedy for the Army to make a great investment in a revolutionary new concept of lighter and harder-hitting combat systems but still be reduced to the pace of the crawling soldier in the face of a mundane complex obstacle. Unfortunately, this condition is a reality today unless the Grizzly achieves its potential and allows the Army to fully exercise its dominant maneuver characteristics.

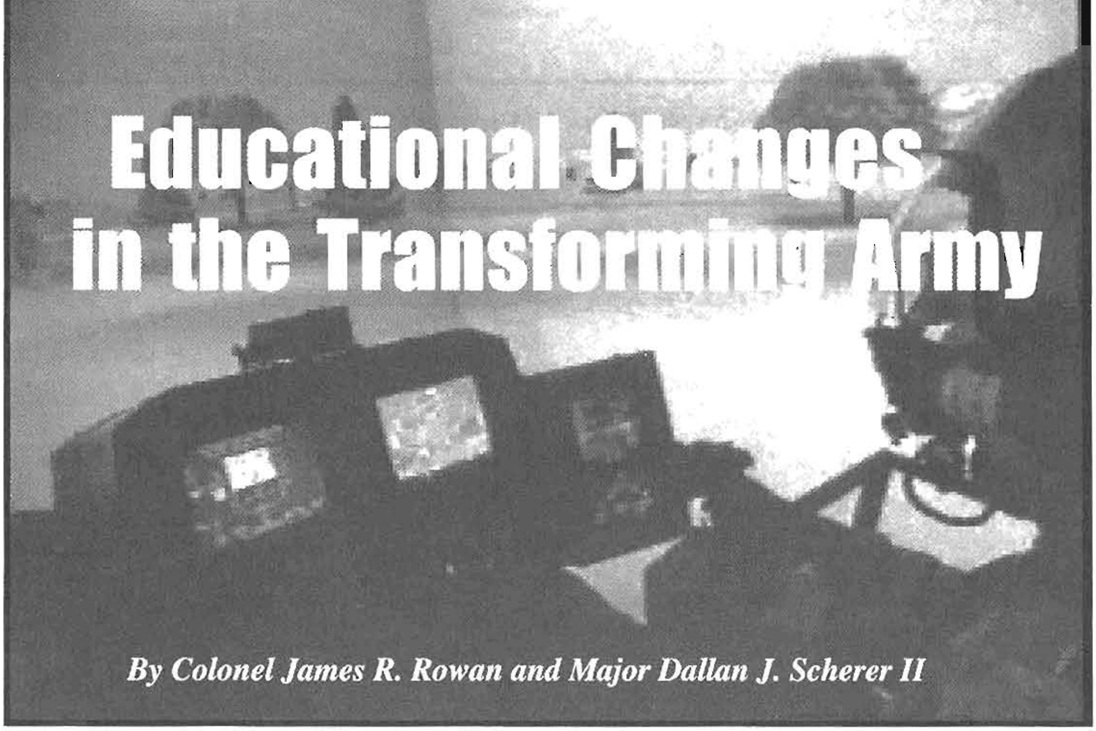
Summary

The Grizzly program provides a unique and heretofore nonexistent capability to the force—the ability to defeat complex obstacles, from the march, while maintaining the pace and momentum of the attack. When successful, the benefits provide a synergistic influence to simultaneous combat objectives—dominating maneuver and winning the information war. Its success in its intended role will substantiate the Grizzly's combat importance to the maneuver commander and its operational benefit. It is a vital system for controlling key dimensions of the future battlefield: speed, space, and time. The Grizzly's technology also has the potential to enhance future Objective Force equipment performance. The program-management office continues to work to bring the system to fruition as early and as economically as possible but needs support from all those who are knowledgeable and interested in ground-mobility issues. Let us not be left with the agonizing question to answer, "If not the Grizzly, then what?"

Colonel Asada is the Project Manager for Combat Mobility Systems, U.S. Army Tank-automotive and Armaments Command, Warren, Michigan. He is an armor officer and a member of the Army Acquisition Corps. COL Asada is a graduate of the U.S. Military Academy and holds a master's in mechanical engineering from the U.S. Naval Postgraduate School.

Lieutenant Colonel Jennings is the Grizzly Product Manager, U.S. Army Tank-automotive and Armaments Command, Warren, Michigan. He is an engineer officer and a member of the Army Acquisition Corps. His acquisition assignments include Assistant Project Manager for the Common Bridge Transporter and for Mines (Antipersonnel Landmine-Alternatives). A graduate of the Command and General Staff College, he holds a bachelor's in civil engineering from Auburn University and a master's in metallurgy from Georgia Tech.

Mr. Glasgow is a military equipment analyst and technical writer with Camber Corporation, headquartered in Huntsville, Alabama, with offices in Warren, Michigan. As a former U.S. Army officer, he trained as a research, development, and acquisition specialist with assignments as an operational tester at Fort Sill, Oklahoma, and materiel developer at the U.S. Army Tank-automotive and Armaments Command, Warren, Michigan.



Educational Changes in the Transforming Army

By Colonel James R. Rowan and Major Dallan J. Scherer II

The Army Vision: *We are about leadership; it is our stock in trade, and it is what makes us different. We take soldiers who enter the force and grow them into leaders for the next generation of soldiers. We will continue to develop those leaders through study in the institutional schoolhouse, through field experiences gained in operational assignments, and through personal study and professional readings.*

General Eric K. Shinseki
Chief of Staff of the Army

Army Transformation has been well underway for more than a year now. Most people with any interest in the Army are very aware of the three-axes model depicting the Legacy Force, the Interim Force, and the Objective Force. The Interim Brigade Combat Team (IBCT) at Fort Lewis, Washington; the Interim Armored Vehicle; and the Interim Division (IDIV) are also recent headline news. Less well known are the changes that TRADOC and the proponent schools are making in military training and education systems and their impact on soldiers of the current and future Army. The leader-development operational and organizational document covers all proposed leadership educational transformations (such as the Noncommissioned Officer Education System and the Warrant Officer Education System).

The first part of this article highlights some of the current training challenges for lieutenants, captains, and majors and then focuses on the transformation of the Officer Education System (OES) and the rapid changes occurring within TRADOC.

Current Officer Education System

The current OES has served the Army well for many years. Very few large organizations in the world are able to devote the time and resources the Army does to ensure that its leaders are developed and prepared for increased responsibility. General Lesley J. McNair, often referred to as the "educator of the Army" and the "trainer of the Army," had an enormous impact on our current education model for training officers, NCOs, and soldiers. The McNair Model, developed for World War II mobilization, produced large numbers of soldiers and leaders to meet requirements generated by a 100-division Army (see endnote, page 48). While this training strategy has served our nation well through the end of the Cold War, where World War III European scenarios required large numbers of personnel replacements, it is simply not efficient enough to meet the needs of today's force. With a smaller, busier, and resource-constrained Army, a new training paradigm is being realized.

As we progress into the twenty-first century, the United States finds itself without peer competitors. The battlefields of this century are not likely to be total wars but small-scale contingency operations at various flash points around the world. The hostilities of the future may be more like our experiences in Bosnia or Kosovo and less like our involvement in the Gulf War.

Over the last two decades, the Army has continually reduced its manpower, but missions and deployments have steadily increased. In the past, we had the luxury of following an "alert, train, deploy" model for most of our major deployments. But the transformed Army—in order to meet General Shinseki's aggressive timelines for brigades and divisions to be operational in theater—must now move to a "train, alert, deploy" model. This places much tougher requirements on training institutions and operational units throughout the Army.

The current Army officer educational model is based on the three pillars shown in Figure 1: institutional training, self-development, and operational assignments.

Institutional Training

The institutional piece of officer training is well established. TRADOC has set precommissioning requirements that are accomplished through the Reserve Officer Training Corps, the United States Military Academy, or the Officer Candidate School. After being commissioned, officers attend the basic course of their branch. While the lengths of branch courses vary considerably, their common goal is to train second lieutenants on the leadership and technical skills they must possess to meet the challenges associated with their first unit assignment. It's important to note that lieutenants are not taught every critical task while attending the officer basic course. The Engineer Officer Basic Course (EOBC), for example, only covers about 65 percent of the critical tasks for junior engineer officers. Accordingly, field commanders must build upon the lieutenants' newly acquired skills and train those tasks not covered during their initial officer training, thereby ensuring that these officers are competitive for promotion and increased responsibility.

After their promotion to captain, officers attend the Captain's Career Course (CCC), which is usually at their branch school. This course is taught primarily in a small-group environment and is one of the real highlights of an officer's education. Officers who attend the Engineer Captain's Career Course (ECCC) bring a wide variety of experience and knowledge from their previous assignments and are trained by a carefully selected team of small-group leaders. When they complete training at Fort Leonard Wood, Missouri, most captains attend the Combined Arms and Services Staff School (CAS3) at Fort Leavenworth, Kansas. Additionally, many officers participate in the cooperative graduate-degree program through the University of Missouri at Rolla (UMR) or the University of Missouri at St Louis (UMSL). After 24 to 33 weeks, these officers are ready to serve on a brigade or battalion staff and command company-sized units. Clearly there is a disconnect here since many of these officers have already been primary staff officers at a battalion or brigade and, for a number of reasons, a key part of their training may be coming too late.

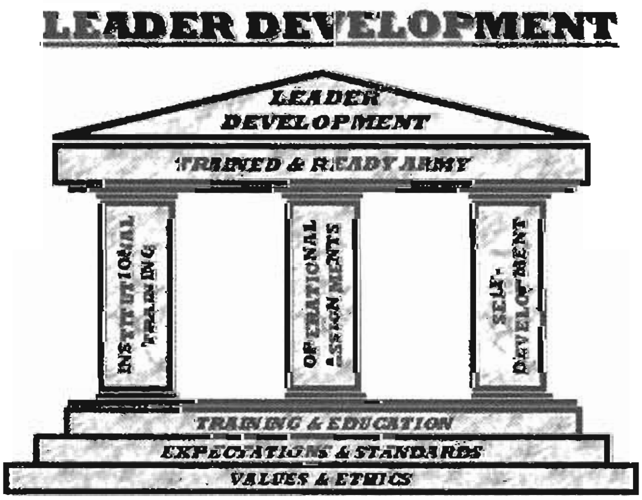
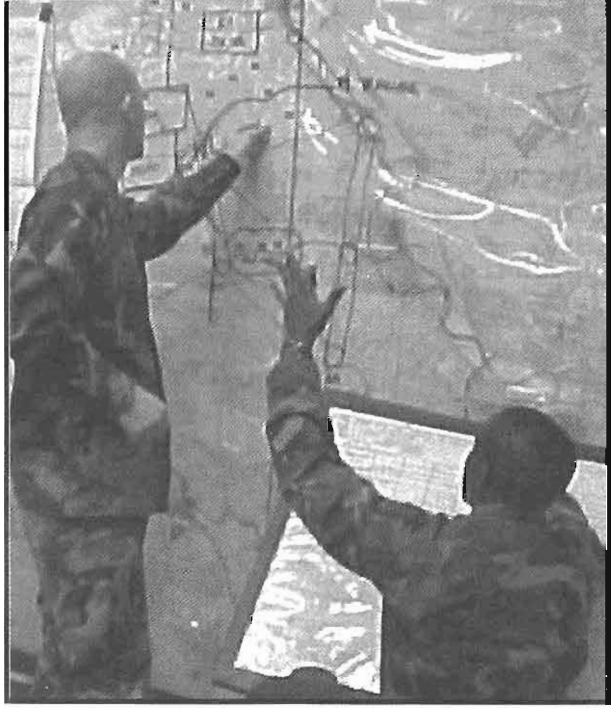


Figure 1



Small-group instruction and hands-on exercises are fundamental to the ECCC.

Institutional training for majors is still at the Command and General Staff College (CGSC) at Fort Leavenworth. One of the key provisions of Officer Personnel Management System (OPMS) XXI is the transition to a universal military education level (MEL)-4 qualification, but this still has not been implemented. After promotion to major, a Department of the Army board looks twice at officers' records to determine which of them will attend resident CGSC training. However, about 50 percent of each year group still completes MEL-4 through nonresident studies. Consequently, the perception in the force is that these officers have been taken out of the running for key leadership positions at the major and lieutenant colonel ranks. Whether we agree or disagree with it, the reality is that this is our current institutional OES.

Self-Development

The existing self-development phase of officer education is arguably the weak link in the chain. While a number of officers are actively engaged in correspondence courses, developmental-reading programs, and other individual professional initiatives, success is strictly a function of each officer's personal desire to learn and grow. Most units have an established professional-development program, but success is very localized and generally inadequate across the Army or Engineer Regiment. These shortcomings are a result of various causes and effects but are generally related to operating tempo (OPTEMPO) and officer shortages.

Operational Assignments

It would seem that the current high OPTEMPO and shortage of officers in several grades would provide a tremendous opportunity for officers to benefit from operational assignments. But in actuality, this may have just the opposite effect. With units that are extremely busy and trying to juggle many glass balls, there is less opportunity for senior officers to train.

develop, and mentor junior officers. Ample evidence reveals that company-grade officers perceive that they are not getting enough interaction with their superiors.

During the past few years, most units have had more lieutenants assigned than their modified table of organization and equipment (MTOE) or table of distribution and allowances (TDA) allows. The obvious effect is that a generation of officers is being deprived of valuable platoon-leader experience that everyone recognizes as critical to junior-officer development. Additionally, more lieutenants fill validated captain's positions; these officers struggle to accomplish assigned tasks in which they have no formal training or experience. Lieutenants who are cast into a captain's position may not have had the opportunity to see "what right looks like." Unless their leaders (who may be in the same situation) can ensure that they are working and training to standard, the education gained through operational assignments may be built on a more fragile foundation than it was just a few years ago.

Proposed Changes

One proposal is to review the captain's critical task list, identify those skills that now apply to lieutenants, and shift/train these skills during the officer's initial training. Other proposed changes include the following:

Basic Officer Leader's Course

One of the most sweeping changes—and one that will occur quickly—is the establishment of the Basic Officer Leader's Course (BOLC). All second lieutenants will attend this course after they are commissioned but before they attend their basic branch course. The BOLC, which focuses on small-unit leadership in a field environment, is taught at Fort Benning, Georgia. The proposed course design is based on the U.S. Marine Corps model and establishes a common standard for all junior officers. Training will encourage junior officers to gain the identity of an "Army officer" rather than an identity of "engineer (or infantry, or armor, or finance...) officer," reviving the warrior ethos. Current branch basic courses are not inadequate nor are they failing at their task; but rather the clear goal for BOLC is simply "better is better."

The Infantry School has already conducted a BOLC pilot class composed of all infantry officers. A second all-infantry pilot class was scheduled for later in FY01. However, the class has since been revamped to include 40 noninfantry officers. Three of the officers are engineers who will attend the EOBC after completing the BOLC. Full-up implementation of the course for all officers is scheduled to begin in FY03. The length of the BOLC is still being determined, but it is expected to be between 6 and 8 weeks long. The critical aspect is that officer initial-entry training (BOLC plus the branch course) will not exceed 19 weeks and 4 days. This cap is necessary to decrease the population in the OES Trainees, Transients, Holdees, and Students (TTHS) account. The current account records 65,000 man-days per year, which is clearly too high a percentage of our force.

The goal of BOLC is to encourage lieutenants to gain the identity of an "Army officer" and revive the warrior ethos.

Engineer Officer Basic Course

The EOBC will also undergo major changes with the implementation of the BOLC. The proposed model calls for proponents to provide requisite technical and tactical training for lieutenants. A portion of the current TRADOC common-core subjects will be trained at Fort Benning; therefore, the focus of branch schools is on branch-specific critical tasks. As a result, proponents will use whatever time remains to complete these requirements. This is a major concern for the Corps of Engineers, demanding tough calls to determine what is trained during the EOBC. Our goal is to continue to train officers for the diverse engineer missions they will encounter, such as combat engineering, bridging, construction, topography, and light-engineer operations. Based on the time available, there will be some threshold where we can provide only the specific training our junior officers will require in their initial assignments. This threshold is still undetermined and is a primary concern as we make this major transition. The Engineer School has a breakout session scheduled during ENFORCE 2001 to address the EOBC restructuring issues associated with implementation of the BOLC.

Captain's Career Course

Significant changes for training captains is also under review with implementation expected in the near future. The current ECCC model is well known. Upon promotion to captain, officers submit a DA Form 4187, *Personnel Action*, requesting attendance. Training prerequisites and academic requirements required to attend training are minimal. The course consists of an 18-week program at Fort Leonard Wood, followed by 6 weeks of TDY for CAS3 at Fort Leavenworth. Over the past FY, in excess of 50 percent of officers then return to Fort Leonard Wood as students and complete their master's through UMR or UMSL. As we transition, these graduate programs remain essential and must be continued; they fill a critical need for our branch by providing an opportunity for our officers to complete a master's during the career course.

Another essential element of the CCC that we must retain is small-group instruction, which uses small-group processes, methods, and techniques to stimulate learning and promote group dynamics. This method of instruction places the responsibility of learning on individuals through participation and interaction. Officers from various backgrounds, cultures, and experiences are grouped into small teams led by a select group of branch-qualified company-grade officers that serve as role models, coaches, and mentors. Distance learning or large-group lecture settings cannot duplicate the obvious advantages provided by this small-group environment.

Proposed resident school curricula will increasingly focus on teaching the nature of war as opposed to only the scientific conduct of war. The modern operational environment demands leaders who can reason and make decisions in new and unexpected situations.

The curricula will teach leaders *how* to think and not *what* to think. TRADOC initiatives direct that future training focus on technology to leverage information in a variety of ways that increase the Army's warfighting capability. The training vision involves increasing training opportunities, optimizing training availability, and incorporating multiechelon events that prepare leaders to meet the demands and challenges of tomorrow's battlefield. Our units require adaptive, flexible, intelligent leaders who are comfortable and competent in potential future complex operations. Training must prepare our leaders to lead units to fight and win in combat across the entire spectrum of conflict. This requires that all leaders understand and enforce high standards of combat readiness through realistic, multi-echeloned, combined-arms training that challenges and develops individuals, leaders, crews, and units. The future career course will focus on this and will be designed around FM 22-100, *Army Leadership*.

Combined Arms Battle School

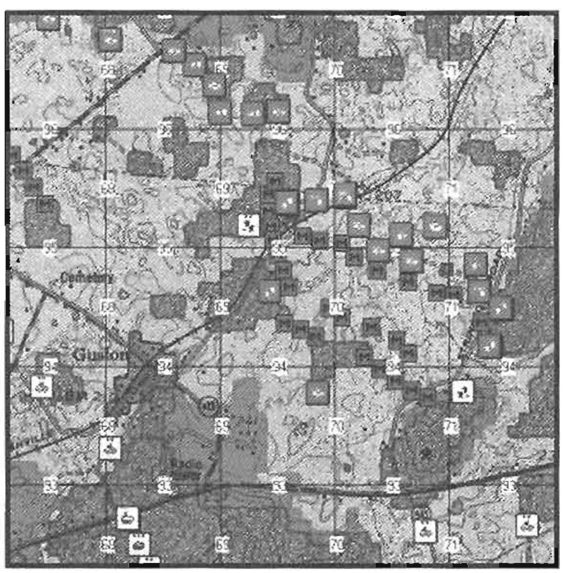
The Armor School at Fort Knox, Kentucky, is charged with designing, overseeing, and developing the future Advanced Officer Leader/Battle Captain Course (AOL/BCC). The school is preparing to implement a pilot course for 4th quarter FY01 and has dubbed it the Combined Arms Battle School (CABS).

The continuing reduction in resources dictates an education system that eliminates redundancy and focuses leader-development efforts where they can best be accomplished. An example of one of the challenges is to evaluate the CAS3 program of instruction (POI). The goal is to identify training redundancies, identify and embed pertinent critical tasks into the future officer AOL/BCC, and determine what tasks can be eliminated or transitioned to other leadership courses. Additionally, planners must not exceed the current CCC length of 24 weeks when designing the AOL/BCC. The proposed CABS is targeting a 20- to 24- week timeframe and will include critical tasks identified from the current 24-week CCC model (combined officer advanced course (OAC) and CAS3). Overall savings can be realized by eliminating the need to send officers TDY to CAS3 and hopefully train all OAC and CAS3 critical tasks in less time.

The CABS will be a battle-based, combined-arms leadership school. Small groups should consist of about 14 students (3 armor; 3 infantry; 1 engineer; 2 field artillery; 1 aviation; 1 air defense, military intelligence, or signal; 1 Marine; and 2 or 3 international officers). The proposed instructor base will consist of 2 armor, 2 infantry, 1 field-artillery, 1 engineer, and 1 aviation officer. Additional support will be required from air-defense, military-intelligence, and signal instructors.

The purpose of the AOL/BCC is to train combined-arms officers who are self-confident, adaptive commanders and battle-staff officers who can lead companies and staff teams who can solve complex problems across the entire spectrum of conflicts. These officers will be capable of performing in both legacy (modernizing) and interim combat units. The design increases leadership opportunities through constructive, virtual, and live simulations and maximizes the integration of the multiechelon, multigrade, battle-focused leadership experiences encompassing all nine leader actions.

Constructive Simulation. Constructive Joint Army/Navy Uniform Simulation (JANUS) and Tactical Operations (TACOPS) Simulation training is planned for the CABS. Using computer simulations, student leaders can plan, prepare, and execute battles. These exercises are conducted in a small-group environment where combined-arms officers test their abilities to plan and execute combat operations. TACOPS is an off-the-shelf (with enhancements), PC-based computer simulation that enables students to load and fight their tactical plans. Using a standard laptop or desktop computer, student officers can fight one another (or the computer) and "validate" their plans through execution. Normally, when training troop-leading procedures or the military decision-making process, training stops after a plan is published. By taking full advantage of of TACOPS, small-group leaders can provide a training environment that enhances the orders process from receipt of a mission through its execution. This flexibility increases the ability of student officers to fight a plan through execution



TACOPS simulation training

numerous times using various environments. The flexibility that TACOPS brings to the small-group environment has huge advantages over the one or two opportunities most officers currently experience using the limited JANUS facilities. TACOPS is quite similar to JANUS and even allows playback or reexecution of the fight to reinforce discovery learning and thereby enhance small-group-leader-facilitated after-action reviews.

Virtual Simulation. Virtual simulation is incorporated using systems such as the Close Combat Tactical Trainer (CCTT) and Simulation Network (SIMNET). These combat-vehicle simulators allow leaders to plan, prepare, and execute company-level missions in a multiechelоned virtual environment.

Live Simulation. Live simulation training provides battle-focused leadership experiences using multiple-command situational-training exercises that challenge leaders under the most realistic battlefield conditions possible.

Distributive Learning. Individual training is increasing by using advanced technology outside of the educational environment. Future preresident/postresident courses will provide soldiers the flexibility to receive critical, mission-essential, and professional-development instruction via a mix of distributed-learning instruction. Presentation mediums can be resident or nonresident—Classroom XXI-based, Web-based, CD-based, a mix, and/or traditional-based. These packaged courses can be tailored to individuals to enhance their knowledge base and/or prepare them for a specific assignment.

Because approximately 28 engineer officers a year attend the CABS, the Engineer School has been involved in the design of the course from the start. Future branch AOL/BCCs will not be identical in design or execution to the CABS, but the overall intensity and training environment will be very similar. As we continue to advance in technology, we must find a way to leverage it to our advantage without taking away the vital interactive learning processes gained through personal interaction. By analyzing and carefully studying pilot programs such as CABS, future training technologies and initiatives, and the continued efforts of training development, a balance of the right skills—taught at the right time and place—can be realized. Already, we can train soldiers while they are still in their units or even while they are deployed. The result enhances soldier/leader educational opportunities and reduces the overall time soldiers are away from the force and, more importantly, their families. In essence, we can transform current classrooms into a world-class campus without walls.

Future Engineer AOL/BCC

As for the future of the engineer officer's AOL/BCC, one concept that is under consideration is shown in Figure 2. This planning draft is for a 22- to 24-week course that eliminates redundancy with the CAS3 POI and includes additional future critical tasks. Additional time is allocated to digital training and integration of the Army Battle Command System (ABCS). The proposed course will also maximize the use of constructive, virtual, and live simulations to incorporate various force

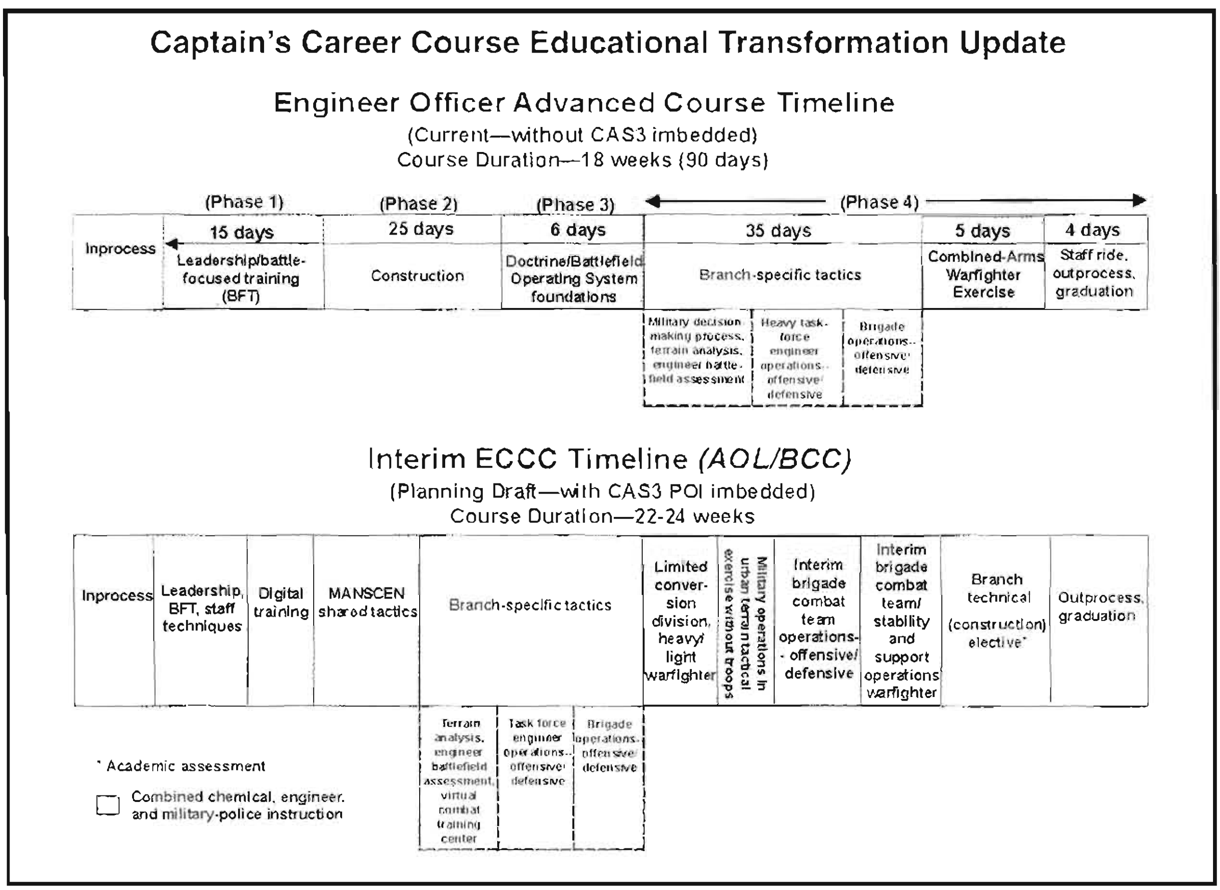


Figure 2

structures and environments. Some of the current training will transition to distributive learning, but careful analysis and study is ongoing to ensure that the right critical skills remain in the resident phase.

Future proposed engineer AOL/BCC models will also require that officers show proficiency on specific critical gate tasks before being allowed to enroll and subsequently graduate from the advanced course. Every effort to maintain the post-graduate schooling opportunities (at UMR and UMSL) will be expended to ensure that future leaders understand that continuing education remains the highest priority. Expect the future advanced engineer leaders' training to maximize the use of technology and constructive, virtual, and live simulations to maximize performance-oriented, experience-based training at all levels and across the entire spectrum of operations.

Future Command and General Staff College

The transformation of training for majors primarily involves the implementation of OPMS XXI initiatives. A universal form of MEL-4 will replace the current model of approximately half of each year group being selected to attend the resident CGSC. This is an overdue initiative that needs to be set in place as quickly as possible. The current stratification of year groups into the resident and nonresident MEL-4 is dividing year groups immediately after officers are selected for promotion to major. The spin-off is causing stress to officer career development at all levels. Universal MEL-4 must be incorporated and the appropriate training be determined by the officer's career field as quickly as possible. Many people recognize this as critical, but it does not have the same urgency and emphasis that some of the other officer-education transformation initiatives are receiving.

Concerns

There is tremendous momentum in TRADOC to transform the OES. There is great merit in most of these proposals. But there are also several areas of concern that could be easily overlooked as these courses are planned, developed, and implemented through pilot programs.

The first concern involves a major change in our culture. Schools are, by design, moving toward a shorter, more intense, and more demanding atmosphere. For years, the institutional school environment has provided both an educational opportunity and an opportunity for students and their families to enjoy the lower OPTEMPO, regular hours, and relaxed environment associated with schools. These embedded benefits are currently paid for through TDY costs and the Army's TTHS account. But if we move to a system where our career schools are "academic Ranger schools," we risk even greater junior-officer-retention problems in the name of efficiency and cost effectiveness.

Another potential risk is the goal of eliminating all redundant training. This is another concept that briefs well and is appealing to leaders who measure success in terms of only cost savings or course reductions. An excellent example may be our attempt to embed CAS3 into the CCC without increasing the course length. Practical exercises that require students to progress through stages of the military decision-making process are included in both the CCC and CAS3. Course subjects like the military decision-making process clearly require repetitive training for students to gain insight and achieve a higher degree of understanding. The tough call between wasteful and redundant training versus the benefit of reinforced training cannot be assumed away as we press forward with transformation. As CAS3 is embedded into the CCC, we also accept a reduction in the experience and grade of the trainer. Originally, and almost exclusively, former battalion commanders trained CAS3 students. It is still taught by experienced field-grade officers, so even if the tasks are carried over to a different course, we will lose some of the wisdom and experience as the instructors change from lieutenant colonels to captains. It is impossible to directly measure how much will be lost due to the structure change.

Another concern, and one of the key facets of current proposals, is the implementation of rigorous entrance requirements. Operational units are busy. Adding more requirements to officers while they are fully engaged is a tempting target, but the dangerous implications of this are obvious. Even if officers and their units are able to make the time for distance learning or Web-based courses to be completed, there is little argument that these courses are generally not as rewarding or beneficial as classes taught under the traditional design. We will make this transition, but care must be exercised to ensure that we convert the correct number and type of courses to distance learning. Some training, leadership and command-climate classes, for example, require the interaction of a diverse group to really gain the insights necessary for a student to benefit.

Challenges

Today's military missions and operational and strategic policies dictate that we produce skilled, self-confident, adaptive leaders who can win on any battlefield across the full spectrum of conflict. Focused, tailored training is key, whether it is preresident, resident, or postresident training. Providing expertly packaged, more frequent training for shorter periods allows the mind to better absorb and understand concepts and, overall, increase retention. Incorporating the key learning elements—visual, auditory, and kinesthetic (hands-on practical exercises)—into training improves overall learning as well. This can be accomplished best by providing the right combination of distributive-learning multimedia technology and capitalizing on combat-training-center and unit training. Our challenge will be to wisely use the limited resources we have to develop the most effective and innovative training feasible. We must incorporate the fundamental learning concepts while keeping the concerns presented on the forefront. The ongoing analysis and design of our distributive-learning plan, and leveraging the use of technology to improve training, are therefore essential to successfully transform our educational system and ensure that we maintain the most realistic and challenging training possible.

Colonel Rowan is the Director of Training at the Engineer School. A former commander of the 16th/54th Engineer Battalion in Germany, he also served with the 7th, 82d, and 299th Engineer Battalions and was an assistant professor of mathematics at West Point. COL Rowan is a graduate of the Army War College and holds a master's in operations research from Georgia Tech University and a master's in military science from the Command and General Staff College.

Major Scherer is a small-group leader for the Engineer Officer Advanced Course at the Engineer School. A former commander of A/94th Engineer Combat Battalion (Heavy) in Germany, he also served as an engineer observer/controller at the Combat Maneuver Training Center and with the 130th Engineer Brigade and the 4th Engineer Battalion. Major Scherer holds a bachelor's in automotive technology and management from Western Michigan University.

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Endnote:

As commandant of the Command and General Staff College 1919-21, Colonel/Brigadier General (temporary) McNair initiated changes that prepared the college's graduates to meet the upcoming challenges of World War II. In 1939, 18 years after serving as an instructor at the General Service School at Fort Leavenworth, Kansas—during which time he graduated from the Army School of the Line—he returned to Fort Leavenworth to reform and update the instruction. In 1942, as a lieutenant general (temporary), he was designated Commanding General, Army Ground Forces. Once he was satisfied that the Army could operate in large bodies, he concentrated on revising training to simulate the conditions that the Army was facing in North Africa. General McNair, known as "educator of the Army" and trainer of some three million troops, was about to take command of Allied ground forces in Europe under Eisenhower, when he was killed in combat in Normandy on 25 July 1944. After his death, it was said of Lieutenant General McNair that he did more than train men; he realized that no army could be fully effective unless it was properly organized, correctly equipped, adequately led, and completely trained. His insistence on these fundamentals, especially realistic training, helped save untold thousands of American lives. Because there has been no compilation of his papers, no biography has been written about General McNair to help him become known to the country that he loved and served. In 1954, Congress promoted him posthumously to the rank of general.

(Disseminating Terrain Data, continued from page 17)

heavy-equipment transports (HETs), moving map displays in cockpits of helicopters, integrated terrain display systems in armored vehicles, and backpacked soldier systems. Operators of these systems will be able to overlay operational graphics, weather data, friendly and suspected/known enemy locations, or even weapons fans on this accurate digital terrain data that is managed by the terrain team down as low as the maneuver-brigade level.

After warfighters have the digital terrain data, they will use the Joint Mapping Tool Kit (JMTK) or Tactical Mapping Tool Kit (TMTK) within the ABCS to manipulate and display the data. The Digital Topographic Support System (DTSS) terrain analysts will manage the data and database and establish the CTOE at the division and brigade levels. At the battalion level, the operations section performs these tasks. The senior engineer officer, the terrain-visualization expert, will continue to assist with establishing and maintaining the CTOE. He will work with the commander and staff to define the types of terrain data and detail of terrain analysis needed based on the planning requirements of the unit being supported.

What Types of Data Does the Concept Cover?

Several types of digital terrain data are required by the ABCS, weapon platforms, and land warriors to visualize an area of interest. Weapon platforms and the land-warrior system must identify the specific terrain-data requirements for foundation data and MSDSs. This article describes the established implementation plan for the dissemination of digital terrain data. While the concept and implementation plan appear sound, it depends on several developing systems and capabilities (such as the ABCS, the GBS, the JMTK, and the TMTK) that have yet to be tested in a full-up realistic training exercise. The devil is in the details. The role of engineer officers and terrain technicians is to help warfighters understand the FD Concept, establish a CTOE, and get digital terrain data to battle-command systems, weapon platforms, and Land Warriors within their organizations.

Mr. Ralph M. Erwin is the deputy director of the TRADOC Program Integration Office for Terrain Data (TPIO-TD). He was previoiusly a senior systems-integration engineer for Lockheed Martin Corporation and Computer Sciences Corporation. Mr. Erwin holds a degree in mathematics from Cameron University in Lawton, Oklahoma.

Correction

In the February 2001 issue, page 9, the e-mail address for requesting the mine-awareness video is incorrect. It should be *Douglas.Langrehr@polk-emh2.army.mil.*

The Adaptive Engineer Leader

By Lieutenant Colonel Christopher J. Toomey

As leaders and managers face rapidly changing environments and circumstances—at a pace accelerated by the dramatic influx of information that literally assails decision makers in the digital age—the search for new methods leads to a rethinking of leadership approaches needed to exercise command and control in our increasingly information-oriented Army.

Adaptive leadership postulates an approach that best fosters success in today's environment. In this article, I will define adaptive leadership, identify why it is useful for engineers, and identify some strategies that we can use to help nurture and grow adaptive leaders.

Defining Adaptive Leadership

There are a great many views on adaptive leadership within the literature. According to the Center of Army Leadership, an adaptive leader is—

> *"A leader who can influence people—by providing purpose, direction, and motivation—while operating in a complex, dynamic environment of uncertainty and ambiguity to accomplish the mission and improving the organization."*[1]

A major characteristic of adaptive leadership is the internalization and application of adaptive thinking. Adaptive thinking is the key to the art rather than the science of war. Adaptive thinking is characterized by—

- The ability to react to unexpected changes during operations.
- Knowing how to think rather than what to think.
- The ability to attain a multidisciplinary conceptualization of battlefield events and use this understanding to decide and act.[2]

In addition to these views on adaptive leadership and thinking, FM 22-100, *Army Leadership*, identifies four leadership skills that define the adaptive leader:

- Interpersonal – dealing with people.
- Conceptual – handling ideas and information.
- Technical – employing job-related abilities.
- Tactical – solving unit combat problems.[3]

Maximizing these skills within the context of adaptive thinking, it is evident that adaptive leaders are proactive and exert influence over their environment, not merely reacting to situations. Adaptive leaders use available information and their knowledge of their units to generate creative solutions to complex problems. By encouraging innovation and junior leader/soldier involvement in solving problems (rather than merely dictating top-down solutions), they create the conditions where their units actually grow and get stronger while meeting challenges.

But how does adaptive leadership apply to the engineer leader? Arguably, engineers traditionally perform well-defined tasks and missions. Our success is often predicated on what some consider near-mechanical execution.

Do we need adaptive leaders? To see a need for adaptive leadership and the need to develop adaptive leaders, we must identify the changing environment and situations that face our engineer leaders and then see how adaptive leadership can help.

The Engineer Challenge

If Army engineers only had to deal with their mission-training-plan-based tasks, then our need for adaptive leadership would perhaps be limited. All we'd need to do is train each soldier and subordinate leader to be a cog in a well-oiled machine. Most engineers would only embark upon tasks within the limits of their technical specialty. Combat-heavy engineers perform construction. Sappers prepare to breach and conduct demolitions. Perhaps an over-simplification, but by and large, engineers have often occupied and acted within a very well-defined and highly evolved niche within the military organization—deliberate operations in highly static environments that intentionally minimize ambiguity.

Today's reality is different. Today, we ask much more of our engineer leaders. We face innumerable and often conflicting challenges. Given the nature of small-scale contingencies (SSCs) and stability and support operations (SASOs), the same unit that must be expert in conducting the combined-arms breach must also be able to rapidly transition to rough vertical construction. Sappers who normally train with a mine detector find themselves building tent pads.

Few branches in our Army face more diverse challenges within the context of a single operation than the Engineer Regiment. Typically working with ad hoc units that are combined, joint, multicomponent, and include both military personnel and civilians, Army engineers are expected to face challenges as diverse as minefield clearing to demolitions to road construction. Engineers are expected to be troop leaders, technicians, diplomats, financiers, and moralists. Any examination of the role of engineers within SSCs and SASOs reveals that engineers are asked to "step up to the plate" across the spectrum of combat, combat-support, and combat-service-support functions.

Consider engineer operations in places such as Haiti or the Balkans. Aside from being prepared to conduct combined-arms operations before deployment, the same engineer leaders are thrust into situations where they must execute the full range of engineer missions, often with soldiers who are not routinely trained in the tasks. They work lines of communication, develop force-protection measures, oversee demining operations, and build/design bridges. They must do this in rapidly changing and often unpredictable environments—environments with multiple degrees of freedom that include competing objectives and pressures from nongovernmental and governmental agencies, tribal and ethnic groups, and often less-than-unified coalition forces.

Engineer leaders and units must have an ability to change to meet the mission, to learn new skills and grow to the occasion. Success requires leaders who are able to deal with ambiguity by applying initiative within intent.

Training Adaptive Engineer Leaders

Engineers must consciously work to develop adaptive leaders. There are initiatives in place to integrate adaptive thinking and techniques into the formal Officer and NCO Education Systems. However, units currently have an opportunity to help develop adaptive leaders and adaptive thinking through imaginative use of their existing training programs.

Adaptiveness requires leader versatility. Nowhere is this more certain than in the engineers. Unfortunately, we often do not spend time developing versatility. Rather, engineer units often intentionally narrow their training focus. The drive toward specialization—perhaps overspecialization—is strong, particularly when so many of our units occupy "one-mission niches" in training environments such as the combat-training centers.

We do a great job of developing leaders within these particular niches—so much so that leaders often see themselves as specialists rather than gaining the breadth required of the generalist. Often junior engineer officers perceive themselves as "construction types," "topo experts," or "sappers only." NCO leaders—who by necessity and military occupational specialty are expected to have a greater degree of specialization—are also bound by their experiences. Yet, we must develop leaders who are familiar with the broad range of skills expected in SSCs and SASO.

Outside the unit, it is possible to expect service schools to build curricula that provide greater breadth. Versatility is also developed through a career of varied assignments. Yet, leaders at battalion level and below can use their own resources to develop the versatility and flexibility that define adaptive leaders.

Adaptive leaders use a mix of interpersonal, conceptual, technical, and tactical skills.

"Adaptiveness requires leader versatility. Nowhere is this more certain than in the engineers."

One method is through a carefully orchestrated unit professional-development program. Varying subjects and resisting the urge to focus professional development strictly on short-horizon unit requirements can build a degree of technical and tactical versatility. For example, sapper units can dedicate occasional professional development to construction-management techniques while combat-heavy units can expose their leaders to obstacle planning.

Traditional professional-development programs, normally 2 to 3 hours per month, may not be enough. Consider the benefits of encouraging and supporting more time-intensive individual-development programs. In order to be a success, support needs to come with resources in both time and funding and a method to accurately assess and monitor progress.

Varying missions, particularly in home-station training, can actively develop versatility. Volunteer to build a concrete-masonry-unit building if you are a sapper unit. Construct obstacles and emplace the occasional minefield for the local personnel unit if you lead a unit with a communications-zone focus.

Other nontraditional approaches can include programs such as the 555th Combat Engineer Group's Junior Officer District Intern Program (see article, *Engineer*, October 2000, page 34). The Fort Lewis, Washington, program places junior officers with engineer districts for 3 to 4 weeks at a time. Not only is technical versatility fostered, but the junior officers also get to work with various groups to include Corps civilians and contractors, thus expanding interpersonal and conceptual skills.

Perhaps a greater challenge is creating the conditions where leaders can develop the interpersonal and conceptual skills necessary to foster adaptive thinking. Using the spectrum of unit events from field exercises to discussions based around vignettes, junior leaders are exposed to evolving situations that are carefully varied to present leaders with carefully escalating complexity and dilemmas.

While often trying to isolate the technical/tactical requirements of an event, an observation is that many home-station exercises are essentially oriented around battle drills and are stripped of the complexity junior leaders will routinely face during an SSC or SASO. Commanders should strongly consider the benefit gained from building increased ambiguity and asymmetric threats into their training scenarios. Factors to consider include introducing the media, nongovernmental organizations, force-protection issues, information operations, Active Component/Reserve Component integration, and refugees. In addition, situations that challenge our Army Values will cause leaders to give greater thought to their actions.

Exercises do not need to be resource-intensive field exercises. One technique that is used successfully in the Initial Brigade Combat Team at Fort Lewis is to have a series of seminars and discussion periods based around vignettes that challenge the leader's ability to develop adaptive thinking. The vignettes are not focused on one rank or level of command. Rather, they are geared to simultaneously engage multiple levels of command.

Mentorship and coaching play a key role in developing adaptive thinking. In developing adaptive leaders, mentor involvment must go beyond conducting after-action reviews and evaluating post-event performance. To maximize effectiveness, mentors must not only provide information and traditional feedback but also take on the role of coach and even fellow learner. This role is enhanced by the use of techniques such as scaffolding [4] to introduce new concepts. Scaffolding is the selective and incremental insertion of information at critical times during the problem-solving process. The effect is a continuum of feedback during the training event that leads the audience in working through the dilemmas encountered.

Summary

This article is a cursory effort to stimulate thought on adaptive leadership and how it may apply to engineer leaders. Clearly, the Regiment has a need to fully embrace adaptive thinking and must do so. Through adaptive leadership, units will be able to more effectively meet the challenges of today's rapidly changing environments. However, units need not wait for a top-down guidance on developing adaptive leaders. Rather, leaders at all levels should seek to understand adaptive thinking and work to integrate it into their training and professional-development programs.

A 1981 graduate of the United States Military Academy, Lieutenant Colonel Toomey commanded the 14th Combat Engineer Battalion and now serves as Chief C4ISR/Battle Command with the Army's Transformation Task Force.

Endnotes:

[1] "Defining Adaptive Leaders in the Strike Force Environment: THE ENDSTATE – A Doctrinal Approach," draft, 10 May 1999, p. 8.

[2] Dr. Karol G. Ross, "Training Adaptive Leaders, Are We Ready?," *Field Artillery Journal*, September-October 2000, p. 16.

[3] FM 22-100, *Army Leadership*, Fort Leavenworth, Kansas: U.S. Army Combined Arms Center, 31 August 1999, pp. 2-25.

[4] Ross, p. 16.

Transforming the 130th Engineer Brigade...

One Step at a Time

By Colonel Todd T. Semonite and Major Russ LaChance

In this day and age of Army Transformation, how do you transform its largest forward-deployed engineer brigade? The answer is—one step at a time, with existing equipment but new, deployable packages. The task of transforming U.S. Army Europe (USAREUR) and V Corps's 130th Engineer Brigade might seem to be quite overwhelming. The brigade's roots are firmly entrenched in the General Defense Plan days of Germany's forward-deployed heavy divisions. In those days, units didn't have to be strategically responsive or rapidly deployable beyond border assembly areas in eastern Germany.

As a member of the Legacy Force serving in the "Containment Corps," it will be several years before any of the revolutionary advances in technology or equipment evolving in the Interim Force at Fort Lewis, Washington, or the Digitized Corps at Fort Hood, Texas, appear in Europe. While several initiatives are taking place in engineer structures within our new Interim and Objective Forces, as well as potential changes to the current divisional force, the current echelon-above-division Legacy Force is not expected to change for the next 6 to 10 years. Change must come through creating a deployment mind-set in every soldier; modifying our capability packages with existing doctrine, equipment, and manning; and forcing our units to be trained and ready in task-organized, modular, mission-tailored packages.

In the last 6 years, each unit of the 130th experienced multiple deployments to the Balkans for extended rotations. Shorter deployments have stretched throughout the European Command's (EUCOM's) 98-country area of responsibility—from Former Eastern Bloc countries to humanitarian missions in Africa and the Caucasus. In the past year alone, the130th's soldiers and units deployed to seven countries, sometimes with only a few day's notice. Each time we deployed, whether alone as engineers or as a member of a combined-arms force, our engineers had to rush to form nondoctrinal ad hoc teams that were trained and resourced at the last minute to meet the specific mission requirements. Although we were "versatile, lethal, survivable, and sustainable" (four of the broad goals of Army Transformation) during the execution of these missions, our strong reliance on rail or sea movement prevented us from being "responsive and deployable"— two key ingredients in the Transformation philosophy. While highly trained and tailored for a variety of high-intensity or peacekeeping missions, our echelon-above-division assets have been hesitant to adapt to rapidly deployable, airlift-configured modular packages to be on the ground when the mission was received.

Force-Enhancement Modules

In response to a call to create a rapidly deployable early-entry force in 1999, USAREUR developed the Immediate Ready Force (IRF) consisting of the M1-based Heavy Immediate Ready Company (HIRC), the M113-based Medium Immediate Ready Company (MIRC), and four unique-function "plug-and-play" Force-Enhancement Modules (FEMs). The purpose of the FEMs is to provide tailored capabilities for the IRF to perform its mission in a variety of environments. The IRF and the supporting FEMs are not new units but new capabilities, designed around rotational Brigade Combat Teams from the two USAREUR divisions. Building on intratheater airlift, the IRF and the FEMs are designed to move on C-130s organic to the theater with designated pre-positioned equipment warehoused at USAREUR's Deployment Processing Center in Ramstein. A deployment timeline of 7 days involves unit notification, movement to the deployment site, deployment processing, issuance of contractor-maintained equipment, and air-load and transit on C-130 airlift. Unfortunately, this relatively new concept was limited to divisional capabilities and did not include a role for the 130th Engineer Brigade in its present state. However, it provided the catalyst to begin the long road toward Transformation.

The 130th Engineer Brigade has proposed several FEMs to meet the needs of the IRF or to serve as stand-alone packages

> **"...while this initiative is not revolutionary or recommended as a permanent modification to our engineer force structure, it is the way that our brigade must adapt to meet the changing role of our forward-deployed units in USAREUR."**

for other Southern European Task Force (SETAF), USAREUR, or EUCOM missions. We have eagerly taken this first step toward Transformation by simply packaging our existing forces and equipment into small, responsive, capable, deployable, agile, and versatile FEMs. This first step doesn't call for sweeping modified table of organization and equipment (MTOE) changes or force-structure manipulations. It simply helps us put plans on the shelf to establish training and movement packages, integrate members of several units into one cohesive and focused team, and build a spirit of readiness and deployability in our everyday routine. All FEM equipment is located at the home station, and FEM soldiers from various units are battle-rostered and trained in both the FEM mission and the deployment process. No personnel will be put on a heightened alert posture until a EUCOM warning order or deployment scenario is imminent. Once a quarter, each FEM will be processed through the USAREUR Deployment Processing Center with possible training missions via C-130 airlift conducted as part of a deployment or training exercise.

A critical piece of the 130th Engineer Brigade FEMs is the Tele-Engineering Suite communication package. This two-part package purchased from U.S. Army Corps of Engineers Waterways Experiment Station at Vicksburg, Mississippi, will accompany any deployed FEM. The nondeployable "base station" will be collocated with the sending battalion, and the deployable "suitcase" package enables secure communication anywhere in the world via satellite. The deployable package, which can run off of a high-mobility, multipurpose wheeled vehicle (HMMWV) battery, includes the ability to transmit not only voice, e-mail, and computer data but also conduct live, real-time video teleconferencing and send pretaped videos to the home station. The stand-alone nature of the package allows reach-back analysis, design, or technical expertise from the supporting battalion without any dependence on remote-location or IRF communication. Just recently, the 94th Engineer Battalion successfully incorporated the Tele-Engineering Suite on a reconnoiter to Mozambique. In addition, the Tele-Engineering Suite provides connection to the three Corps of Engineers Laboratories located in the Continental United States.

Each of our battalions carefully developed unique FEMs based on four major disciplines of our Regiment: combat engineering, construction, bridging, and topography. The following articles from three battalions in the 130th Engineer Brigade—the 94th, the 54th, and the 565th—provide more detail on how each battalion is meeting the Transformation intent as well as insight for other units' professional development. It is important to point out that while this initiative is not revolutionary or recommended as a permanent modification to our engineer force structure, it is the way that our brigade must adapt to meet the changing role of our forward-deployed units in USAREUR. If we hope to be value-added to our maneuver commands, Army engineers have to be the "phone call of first choice" over validated contractor capability or already-tailored sister services. While echelon-above-division force structure and equipment modifications are years away, this brigade is not going to wait to meet the current Army Vision and the Transformation process. Readiness, versatility, agility, and responsiveness are more mind-sets and battle cries than adjectives derived from your MTOE, Unit Status Report, or alert posture—the real Transformation we need to make as engineers is to become more relevant *today* with the tools and structures we have on hand. Internalizing that mind-set is the hardest step down the road of the twenty-first-century engineer—one that this brigade is going to take, one step at a time.

The Road Ahead

Each time the heavy force of the 130th Engineer Brigade has deployed, we have experienced our share of growing pains and challenges. Teams *have* been made, trains *have* been loaded, and the mission *has* been accomplished—but only through a great deal of stress, hard work, and nonstandard operations. Our new standardized FEM concept will reduce those growing pains and allow us to be more responsive in the future. We have already taken several steps toward implementation of the brigade's FEM concept. The V Corps commander and deputy commander, who were briefed in January, observed four of the actual FEM teams (members and equipment) and approved implementation of the concept. Coordination has been ongoing with USAREUR deployment staffs and the EUCOM J4 engineer shop on the enhanced capabilities.

FEMs will be activated in two bands: the first series will be the Medium Construction FEM, the Survey FEM, the Terrain-Analysis FEM, and the Engineer Reconnaissance FEM. Others will follow later in the year. Initial focus for the second and third quarters will be finalizing the teams, developing training and deployment procedures, and receiving supporting equipment.

The 54th Engineer Battalion is currently training soldiers on the miniflails. The Tele-Engineering Suite arrived in the brigade in February. HMMWV shelters were procured for the Terrain-Analysis and Survey FEMs in March, and the Panthers arrived in April. The final validation of the four FEMs will be programmed for early summer through the normal IRF validation exercise held by USAREUR at the Deployment Processing Center. The brigade is currently seeking EUCOM and USAREUR prefunded missions throughout Europe and Africa to allow full exercise and validation of the concept.

This first step of tailored FEMs with existing troop structures, predominantly MTOE equipment, and resourced training and deployment packages is our way of putting our brigade on the road to Transformation. This brigade must meet the goals and intent of the Army Vision, as well as the goals and intent of the USAREUR and V Corps commanders, to leverage the full potential of our outstanding soldiers and units. While continuing to be an active player in future engineer force structure and equipment initiatives within the engineer community, we will attempt to do everything in our power to meet the standards of quicker deployment and smaller, tailored, air-delivered packages when the EUCOM and USAREUR commanders need our services. Our brigade needs FEMs. Our Regiment needs to focus on leveraging those members of the Legacy Force to be relevant to today's requirements—not stuck in the Fulda Gap of the 1980s. We need to take this one step at a time.

Colonel Semonite commands the 130th Engineer Brigade, Hanau, Germany.

Major LaChance is the S3 of the 130th Engineer Brigade.

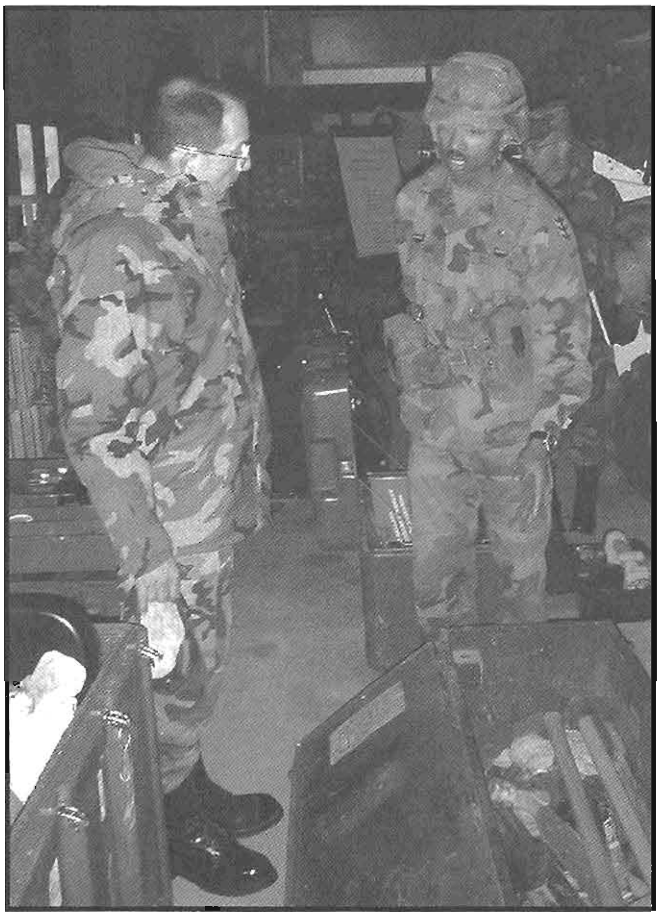
94th Engineer Battalion (Combat) (Heavy) FEMs

By Captain Brian Baraniak

The 94th Engineer Battalion created three FEM packages to provide rapid, initial-entry construction capability until heavier, more robust engineer forces can close on the area of operation. These packages can also be the sole response to less resource-intensive contingency operations. The construction FEM packages introduce versatility and deployability that is normally not associated with combat-heavy units. The construction FEMs provide maneuver commanders with a unique capability utilizing construction assets with minimal impact on logistical resources.

Three packages, each building on the previous (or lesser) one, make up the 94th's FEMs: light, medium, and heavy. The table on page 55 provides a summary of the packages and their capabilities and some sample construction missions.

The FEM packages utilize a wide range of construction-engineer equipment. This includes the MTOE-authorized 763 Bobcat skid-steer loader. The Bobcat's special attachments (forklift, bucket, backhoe) provide limited earthmoving and lifting capabilities. Each package also includes M998 HMMWVs; M929A3 5-ton dumps trucks; various sets, kits, and outfits; standard integrated command-post shelters (SICPS); communications systems; surveying equipment; a shower unit; and a 5 kW generator. As the size of the FEM package increases, so does the construction capability. The medium package adds a hydraulic electric tool outfit (HETO) trailer with a 3.5 kW generator and numerous hydraulic tools. The heavy package has all equipment in the medium package plus a FLU 419 small emplacement excavator (SEE) and two M105 trailers. Depending on mission requirements, it is possible that the FEM package might include the bill of materials for



A soldier briefs the V Corps commander on the 94th Engineer Battalion's Medium Construction FEM package.

Construction FEM - 3 Packages

	Light	Medium	Heavy
Mode	3 x C-130	4 x C-130	12 x C-130
Time to DPC	<96 hours	<7 days	<7 days
Mission Duration	<30 days	30-45 days	45-90 days
Personnel	15	30	60
Base-Camp Size	Tier II 150-man camp 10 x bunkers	Tier II 250 man camp 17 x bunkers	Tier II 1,000-man camp or SEAHuts 450 man camp 25 x bunkers + berms
Missions	Bunkers Culverts Headwall Airfield matting Limited electrical utilities Water distribution Limited drainage operations	Light + Sewage systems Small concrete structures	Medium + Repair bridges Steel frame structures Coupled pipelines Excavation operations Combat roads Tank ditches Vehicle fighting positions Berms Revetments Helipads

Mission Examples

- Schools
- Clinics
- Storage facilities
- Base camps
- Refugee camps
- Forward operating bases
- Force-protection structures
- Multipurpose facilities
- MWR facilities
- Detention facilities
- Housing
- QA/QC
- Surveying
- Materials testing

94th Engineer Battalion Construction FEM

prefabricated bunkers, guard towers, tents, or latrines preconfigured and stored in home-station warehouses.

With the help of the 130th Engineer Brigade, the 94th is currently considering additional equipment for the FEM packages. This equipment includes a 15-ton tilt-bed trailer, which is extremely useful in transporting the 763 Bobcat and other equipment and is small enough to fit on a C-130. Future plans might involve the acquisition of two C-130-deployable JD 450/550 dozers to increase the earthmoving capabilities of the heavy package.

The potential of the construction FEMs is a more versatile, deployable, and capable engineer construction capability. Continued development of the FEM package and the addition of new technology and equipment will make this unique USAREUR rapid-construction capability a compelling combat multiplier.

1-800-BASECAMP. When the 94th Engineer Battalion gets called to provide humanitarian assistance to Mozambique during a severe flood, it is postured to respond almost immediately with a well-trained and -resourced team. The medium FEM package offers a diverse construction capability that flies soldiers and equipment downrange or worldwide within 7 days to build emergency life-support facilities. By incorporating FEMs into battalion deployment and training plans now, the unit can rapidly respond to EUCOM missions at least as expediently as our sister services.

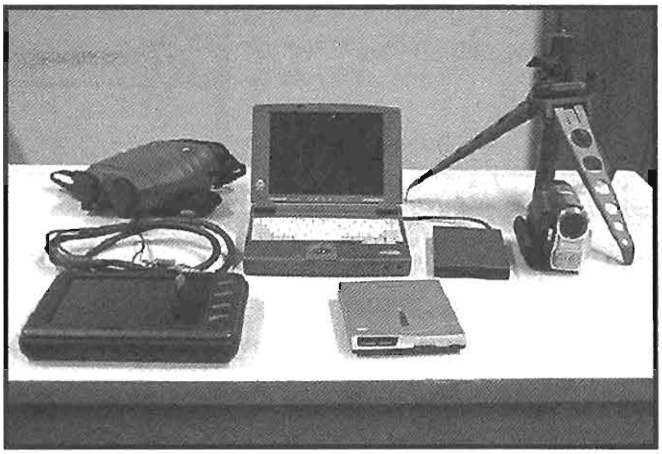
Captain Baraniak is the S3 Plans Officer, 94th Engineer Battalion, Vilseck, Germany.

54th Engineer Battalion (Combat) (Mechanized) FEMs

By Lieutenant Colonel Bill Rapp

Currently, the combat-engineer contribution to the rapid-deployment capability of USAREUR is the "Sapper FEM." This package consists of four M113A3 armored personnel carriers and a robotic, trailer-mounted miniflail. A line platoon from the divisional engineer battalion of the "ready" Brigade Combat Team rotates monthly to perform the Sapper FEM mission. The platoon comes to the fight with its usual complement of AN/PSS-12 mine detectors, demolitions kits, and selected pioneer tools. This platoon has no specific training on robotic mine-clearing vehicles like the miniflail and has the training and equipment necessary to conduct only rudimentary, nondigital engineer recon.

While the current Sapper FEM provides the MIRC or HIRC commander with critical mobility skills in an austere environment, the package has serious shortcomings. In addition to supporting USAREUR's IRF, the 54th Engineer Battalion's relationship with SETAF has generated several new requirements for engineer forces that cry out for rapidly deployable packages of engineer capability not offered by its organic light sapper detachment. The intent of the 54th Engineer Battalion's Engineer Reconnaissance FEM and Countermine FEM is to provide USAREUR's initial-entry force with additional tools greatly needed to facilitate follow-on-force entry into EUCOM's area of operations.



Equipment in the Engineer Reconnaisance FEM

Engineer Reconnaissance FEM. In order to bring heavier forces into the area of responsibility, rapid but thorough recon of transportation infrastructure is essential. As USAREUR found when bringing forces into Kosovo through Albania in 1999, detailed recon of routes, bridges, water crossings, and critical facilities is a first step in heavy-force entry. That kind of recon, with the capability to send data and photos of critical structures back to experts in both EUCOM and the U.S. Army Corps of Engineers, does not currently exist as a planned package for rapid deployment. The Engineer Reconnaissance FEM provides that capability on one C-130 transport.

The Engineer Reconnaissance FEM centers on a suite of automations and communications equipment known commercially as the Penmap system, which is on hand in the 54th Engineer Battalion. The following features, shown in the photo above, comprise this reconnaissance system.

Laser binoculars, called Vipers, attached to a standard precision lightweight Global Positioning System (GPS) receiver (PLGR), give precise grid coordinates of lased objects. The Viper's internal software package also computes bridge heights, facility widths, road slopes, and a host of other critical measurements. The Windows-based computer, currently loaded with Penmap software and with an associated Sunscreen handheld display, allows the operator to write directly on a digital map of the area while simultaneously recording key measurements on digital forms. Digital still and video cameras capture photographs of facilities and key structural members for reach-back analysis by nondeployed subject-matter experts. All of the digital information thus recorded—the measurements and images—can be transmitted through both a standard Single-Channel, Ground-to-Air Radio System (SINCGARS) using DataBurst or through the deployable Tele-Engineering Suite that will be part of the Engineer Reconnaissance FEM.

Six soldiers, two M998 HMMWVs, and one 3/4-ton trailer make up the base configuration of the Engineer Reconnaissance FEM. An engineer lieutenant leads the team and is focused on coordination with the IRF leadership, tactical employment of the team, and logistics. Two separate recon teams, each led by an engineer sergeant and assisted by a military occupational specialty (MOS) 12B sapper, conduct the actual recon missions. An MOS 31U communications specialist provides the expertise for transmitting the digital data to subject-matter experts and higher staffs. The FEM is expandable to eight soldiers if an MOS 62N30 horizontal-construction supervisor and U.S. Air Force Combat Control Team member are needed for a more detailed assessment of roads and airfields respectively.

The configuration and capabilities of the Engineer Reconnaissance FEM provide a superior intelligence capability for the follow-on-force commander and planners.The Reconnaissance System Suite of electronic tools can be easily adapted to vehicle or man-packed operational recon, if required by the force, in addition to the standard engineer recon of transportation infrastructure and terrain. The compact size of the FEM is also its primary shortfall. It lacks heavy weapons and armor for self-protection and has only minimal sustainment

The miniflail will clear, neutralize, or otherwise destroy all types of surface-laid or shallow- buried antipersonnel mines.

A soldier from the 54th Engineer Battalion demonstrates the capabilities of the Reconnaissance FEM, which includes Viper laser binoculars and digital still and video cameras.

capabilities. However, as part of a larger IRF insertion, this FEM provides the tools necessary for planners to bring in a more robust ground presence.

Follow-On-Force Entry: As the Army transforms to be more deployable and immediately salient to the CINCs, rapid assessment of the existing road, bridge, and airfield infrastructure in places like Albania or the flood-ravaged countryside of Mozambique will be the linchpin to successful heavy-force entry in coming years.

Countermine FEM. While the Engineer Reconnaissance FEM is ready to deploy now with all equipment on hand, the 54th Engineer Battalion's Countermine FEM is an evolving package dependent on fielding countermine equipment to the unit. At its end state, this FEM will consist of a tailored package centered on an enhanced sapper platoon and robotic mine clearers. What makes this package different from the standard Sapper FEM will be the inclusion of the Army's newest countermine equipment, such as the Handheld Standoff Mine-Detection System (HSTAMIDS), the follow-on handheld mine-detection system, and other equipment found in the Countermine Capabilities Set (CMCS). The 130th Engineer Brigade is currently working with the Engineer School to posture a CMCS in Europe as well as procuring other engineering countermine systems.

In July-August 2001, two M1 Abrams Panther robotic mine proofers will be fielded to the 54th Engineer Battalion for training and possible support to the heavy company of the IRF, if needed. With the assets of the CMCS and robotic mine clearers, the 54th is postured to become the countermine center of expertise for contingency operations in EUCOM's area of responsibility.

At present, A Company, 54th Engineer Battalion, possesses and is trained to use the miniflail mine clearer. As shown in the photo on page 56, the miniflail is a lightweight, self-propelled, robotic mine clearer designed to clear footpaths or small areas of antipersonnel mines. Although the miniflail is currently included in the Sapper FEM, long-term training proficiency and subject-matter expertise are prevented by the monthly rotation of units. The 130th Engineer Brigade is currently developing a proposal to align A Company soldiers as the permanent miniflail team inside USAREUR's Sapper FEM.

As more components of the CMCS are procured and fielded to the 54th Engineer Battalion, a more robust, stand-alone countermine package will be created for contingency operations. Eventually, this will become a sapper platoon capable of providing point and lane countermine support to both combat forces like the IRF and contingencies in low-intensity environments, such as embassy support and assistance to humanitarian-relief missions in disputed regions.

Countermine Experts: When the 1st Armored Division Engineer Brigade's task force deployed to Bosnia in the winter of 1996, the 54th Engineer Battalion was one of three engineer battalions to conduct initial-entry operations in the Zone of Separation. Throughout the early '90s, the battalion had served as USAREUR's countermine experts, proficient on several fielded systems that had very unique capabilities not present or trained in the divisional battalions. On countless occasions, small trained packages of unique capability were deployed to perform countermine missions using specially tailored equipment. This FEM reestablishes that subject-matter expertise in a dedicated unit having rapidly deployable, trained teams with unique systems needed to support maneuver commanders.

Lieutenant Colonel Rapp commands the 54th Engineer Battalion, Bamberg, Germany.

565th Engineer Battalion FEMs

By Major George Simon

The 565th Engineer Battalion has a unique structure that gives us the flexibility to develop diverse engineer modules. The battalion consists of three separate engineer companies: the 38th Engineer Company (Medium Girder Bridge [MGB]), the 320th Engineer Company (Topographic), and the 502d Engineer Company (Assault Float Bridge [AFB]). With these companies, we developed four different FEMs to expand engineer support to the USAREUR IRF or to the SETAF commander.

The four engineer teams include two topographic teams and two bridging teams. The topographic teams are a survey module and a terrain-analysis module. The bridging teams are a fixed-bridge reconnaissance/bridge-construction module and a float-bridge rafting module. All teams use existing equipment and soldiers within the battalion. The only additional equipment required is the 130th Engineer Brigade's deployable Tele-Engineering Suite.

Survey FEM. The mission of the survey module (Table 1) is to deploy, on order, within the EUCOM area of responsibility to provide survey control points, conduct airfield surveys, and provide points for map orthorectification. Artillery and air-defense units use these very accurate survey control points to calibrate their positioning systems before firing. This is especially important when operating in an environment where civilians are present.

In undeveloped areas, the survey team can lay out airfields and provide aviators with obstruction data for the airfield. Since topographic land maps do not exist in many areas of EUCOM, the survey team will establish control points with which the

The Survey FEM provides survey control points, conducts airfield surveys, and provides points for map orthorectification.

National Imagery and Mapping Agency can develop military maps from satellite imagery. The survey team operates from a specially configured HMMWV modeled after the Digital Topographic Support System-Survey (DTSS-S), which is still in the concept stage of fielding.

Survey

Personnel		Equipment
Surveyor	DTSS-S	1 x M998 with shelter and SINCGARS
1 x SSG 82D30		1 x Laptop computer with printer
Surveyor		1 x General-purpose (GP), small tent
1 x SGT 82D20		4 x Global Positioning Systems (GPSs)
Surveyor		2 x Night-vision goggles (NVGs)
2 x SPC 82D10		2 x Total station (survey - AISI)
		1 x Tactical satellite (TACSAT) and Tele-Engineering
Aircraft requirements 1 x C-130		1 x Trailer-mounted tactical quiet generator (TQG)

Concept - Establish 4th-order survey control ISO Field Artillery Deep Attack (tested at Task Force Hawk, Task Force Falcon, and Victory Strike), map updates/registrations, or airfield surveys.

Table 1

Life Flights: After more flooding in several African countries, the United States Agency for International Development starts food and medical supply shipments via C-130 aircraft. Before the aircraft arrive, the Survey FEM has established survey controls on numerous dirt airstrips so the C-130s can land and deliver their much-needed cargo.

Terrain-Analysis FEM. The terrain-analysis module's mission is to deploy, on order, within the EUCOM area of responsibility to provide terrain-analysis products and small quantities of topographic maps to deployed headquarters. The team creates the terrain-analysis products on-site, operating from the supported unit's tactical-operations center with computers, graphics software, and map-printing capability. Sample products include modified combined-obstacle overlays (MCOOs), lines-of-communication maps, bridge/road maps, elevation maps, large-scale (1:25,000: 1:15,000) maps of the area of operations, satellite-imagery maps, anaglyphs (three-dimensional [3-D] red-blue maps viewed with 3-D glasses), fly-through videos, and almost any other type of map the commander may want.

If the requirement exceeds the time available or technical capability of the deployed FEM, the workload can be electronically transferred to the 320th Engineer Company's base station for reach-back capability. Once an electronic product has been completed, it can be sent secure via the deployable Tele-Engineering Suite and printed out at the remote site for the maneuver commander. The terrain-analysis team operates from a specially configured HMMWV ambulance modeled after the Digital Topographic Support System-Light (DTSS-L) (to be fielded to the unit in FY03).

Terrain Analysis

Personnel		Equipment
Terrain analyst 1 x SGT 81T20 Terrain analyst 2 x SPC 81T10	DTSS-L	1 x M998 with shelter and SINCGARS 1 x Laptop computer with printer 1 x GP, small tent 1 x GPS 2 x NVGs 1 x HP Kayak system with plotter 1 x TACSAT and Tele-Engineering 1 x Topo database 1 x Trailer-mounted TQG

Aircraft requirements
1 x C-130

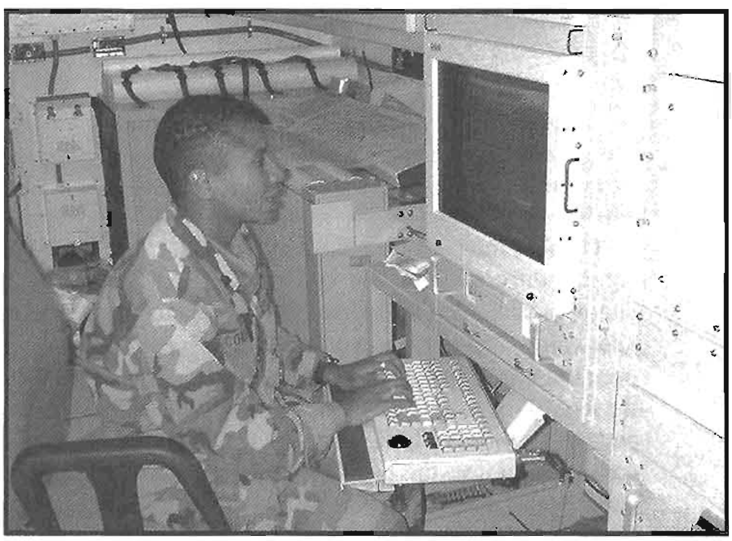
Concept - Provide an enhanced digital terrain-analysis capability to the IRF or any deployed force up to brigade-size; product list includes MCOOs, elevation tints, 3-D maps, overprints, topographic line maps (TLMs), fly-throughs, etc.

Table 2

Deep Strike: As the 173d Infantry Brigade (SETAF) prepares for a counterinsurgency mission in Kosovo, the Terrain-Analysis FEM—a part of the initial deploying forces—identifies drop zones, landing zones, dismounted infiltration, and attack routes and produces limited maps and overlays of the area of operations.

These two topographic module prototypes have been extensively tested in many recent deployments and training exercises. The personnel and equipment for the terrain-analysis module are shown in Table 2.

Fixed-Bridge-Reconnaissance/Bridge-Construction FEM. The third team from the 565th Engineer Battalion is the fixed-bridge-reconnaissance/bridge-construction module. The mission of this module is to deploy, on order, within the EUCOM area of responsibility to conduct bridge reconnaissance and to provide technical expertise and supervision in the construction of fixed bridges using U.S. Department of Defense (DoD) or host-nation labor. The capabilities of the fixed-bridge module include determining the load classification of existing bridges, estimating the need for and extent of repair to existing bridges, and calculating the materials required for new bridges, specifically the Bailey bridge, the Mabey-Johnson (Compact 200) bridge, and timber-trestle bridges. The soldiers of the team will supervise the construction of the new bridges using DoD or host-nation armed forces or host-nation contracted labor. Because of the cost and size of the medium-grider bridge, the team will generally not use it for host-nation support. This team will operate from a HMMWV.



A soldier operates the computer hardware and software included in the Terrain-Analysis FEM.

In February 2001, the battalion exercised the fixed-bridge-reconnaissance/bridge-construction FEM during Operation Ice Bridge, a battalion-level FTX that included a company-level external evaluation (EXEVAL) of the 38th Engineer Company (MGB) and platoon-level EXEVALs of the 502d Engineer Company (AFB). The MGB company sent the FEM to link up with the "mayor" of a town that needed a Bailey bridge to replace a destroyed bridge. The FEM NCOs directed "unskilled local labor" (soldiers from the AFB company) in the construction of the Bailey bridge. Since most of the soldiers from the AFB company were not proficient with the Bailey, this was a good first test of the FEM. Potential future tests involve sending the FEM to Portugal to examine a collapsed bridge or to Poland as part of V Corps's Victory Strike exercise to examine and improve bridges over which the Multiple-Launch Rocket System (MLRS) vehicles will cross. The personnel and equipment associated with this module are shown in Table 3, page 60.

Fixed Bridge

Personnel	Equipment
Combat bridge crewman 1 x SSG 12C30	1 x M998 with SINCGARS
Combat bridge crewman 2 x SGT 12C20	1 x Laptop computer with printer
Combat bridge crewman 1 x SPC 12C10	1 x GP, small tent
	1 x GPS
	2 x NVGs
	1 x Fixed-bridging manual set
	1 x TACSAT and Tele -Engineering

Aircraft requirements
1 x C-130

Concept - Conduct bridge and route reconnaissance and supervise construction of Mabey Johnson/Bailey bridges.

Table 3

Float-Bridge Rafting

Personnel	Equipment
Combat engineer 1 x OIC 21B	2 x M998s with SINCGARS
Combat bridge crewman 1 x SSG 12C30	1 x Laptop computer with printer
Combat bridge crewman 5 x SGT 12C20	1 x GP, medium tent
Combat bridge crewman 15 x SPC 12C10	1 x GPS
	24 x NVGs
	3 x MK1/MK2 bridge-erection boats (BEB)
	2 x Ramp bays, bridge, floating (RBBF)
	5 x Interior bays, bridge, floating (IBBF)
	1 x TACSAT and Tele -Engineering
	2 x Rubber boats (RB)-15
	1 x ISU-90
	10 x M945 bridge transporters

Aircraft requirements
6 x C-17s

Concept - Provide a wet-gap crossing capability for the MIRC and HIRC or for a humanitarian-assistance operation (6-bay raft = MLC 70).

Table 4

Bridge the Gap: The series of recent earthquakes in Turkey destroyed most bridges, rendering many roads impassable. With the United States sending fixed bridges like the Bailey bridge into remote areas of the country, the Fixed-Bridge FEM NCOs direct and assist Turkish forces in constructing the bridges. Finally, relief supplies flow into the ravaged towns.

Float-Bridge Rafting FEM. The final team from the 565th Engineer Battalion is the float-bridge rafting module. The rafting module will deploy, on order, within the EUCOM area of responsibility to provide a water-obstacle crossing capability to U.S. or host-nation forces. The rafting module is designed around a six-float raft that will support both the MIRC in USAREUR (M113-based) and the HIRC (M1- and M2-based). The module can also be used in humanitarian as well as peacekeeping operations. Potential missions include conducting evacuations and river patrols and ferrying equipment and personnel.

The rafting module is much larger than the survey, terrain-analysis, and fixed-bridge modules, as shown in Table 4. Given the size of the rafting equipment, many more airframes are required for transport. This module can be further reduced, if necessary. We will exercise this module during the summer of 2001.

Ride the Wave: The USAREUR rapid-reaction force deploys to a contingency in the EUCOM area of responsibility. The enemy has destroyed the one bridge on the river dividing the country. The rafting FEM deploys, allowing U.S. forces to cross the river. Later, the rafts transport refugees to safety during a mass exodus from the area of fighting.

The four modules from the 565th Engineer Battalion will significantly enhance the ability of USAREUR's rapid-deployment forces to operate in a contingency theater of operations. The survey and terrain-analysis modules have been tested in both deployments and training exercises, while the fixed-bridge and rafting modules were tested in February and will be again in June 2001. These engineer modules will continue to move the battalion along the road to the more versatile and deployable Army of the future.

Major Simon is the S3 of the 565th Engineer Battalion, Hanau, Germany.

Sappers Transformed

By Captain Daniel J. Taphorn

During the annual ENFORCE conference at Fort Leonard Wood, Missouri, in May 2000, I listened to some of the Army's top leaders speak on the future of the Army and the Engineer Regiment. As I learned of the developments taking place within the Army and specifically the Regiment, I could not help but wonder at the monumental task this undertaking has become. Those of us who have stayed relatively informed of Army Transformation initiatives have feelings of excitement, intrigue, and skepticism. After all, with change comes an element of uncertainty and, as soldiers, we have an understandable reluctance about our mission if there is ambiguity lingering in the air. Nevertheless, the future is coming, and all of us will have a chance to play a role in its formation.

During ENFORCE 2000, the Chief of Staff of the Army, General Eric K. Shinseki, talked about the future fighting force of the Army as one yet to be defined but possessing several qualities. It must be responsive, deployable, agile, versatile, lethal, survivable, and sustainable to support our requirements for the full spectrum of conflict.[1] Consequently, the Initial Brigade Combat Teams (IBCTs) are being task-organized to meet these requirements. But what exactly are these new brigade combat teams?

They are roughly defined as highly mobile, full-spectrum-trained, logistically sustainable, rapidly deployable forces whose strengths come from the exploitation of technology and speed. They aptly support General Shinseki's three rules of warfighting: (1) win on the offense, (2) initiate on our own terms, and (3) build momentum rapidly.[2] With the future operational landscape increasingly being small-scale contingencies, peacekeeping operations, and peace-enforcement operations on urban terrain, I—as well as others—have concerns about engineers supporting mobility requirements for these IBCTs.

Sappers Forward

Ask any steely-eyed sapper what engineers do in the offense, and he'll tell you that we breach hard and fast. Survival in the breach is a difficult prospect for sappers. Add in the complexities of an urban environment, and the bar is raised—which is why I believe that these selfless sons and daughters of America deserve the best training and the most technologically advanced equipment the Army can afford.

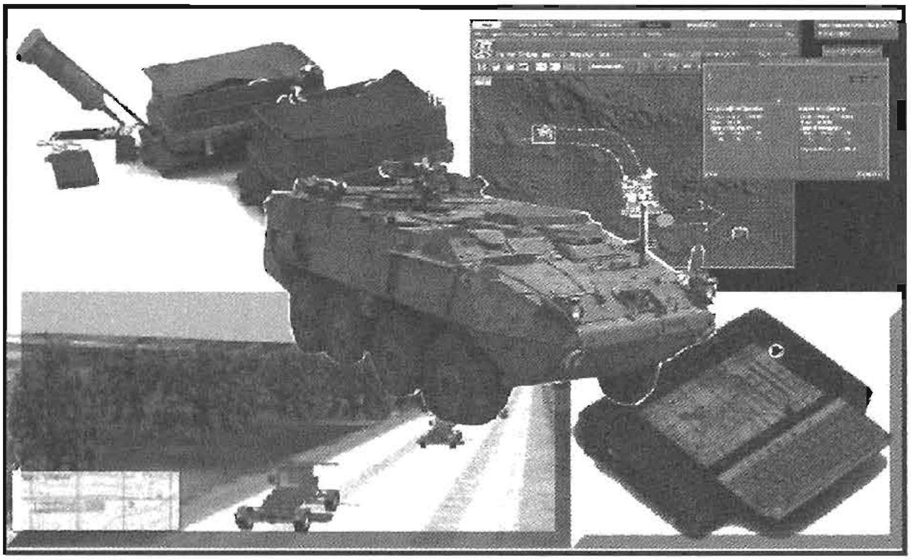
One area that is being improved is countermine training. Currently, we have engineers deployed in 73 countries around the world, and several of these soldiers are supervising, and conducting training on, humanitarian demining operations. In the former Yugoslavia, there are perhaps as many as 6 million mines littering the countryside, or roughly 15 mines for every square kilometer. (See article "Mine Threats in Mission Areas" in *Engineer*, February 2001, page 4.) The different types of mines number in the thousands. There are some unassuming mines out there that are cleverly disguised and employed in unorthodox manners. Our soldiers need to know this.

As a platoon leader in the 326th Engineer Battalion, 101st Airborne Division, Fort Campbell, Kentucky, my maneuver task force played opposing force (OPFOR) on one occasion for one of the infantry brigades. My platoon was responsible for countermobility operations in support of the OPFOR. Although I requested Class IV/V supplies, my platoon was left to fend for itself. So we gathered a miniscule amount of training mines and wire from our own stocks and set off to emplace some point obstacles along potential Blue Force (BLUEFOR) avenues of approach. To make a long story short—with a little sapper ingenuity, my poorly equipped OPFOR engineer platoon managed to stop a brigade maneuver element for several hours while its leaders figured out how to breach our obstacles.

How did we do it? We used whatever we could find. We created rubble obstacles with large rocks and fallen trees that we placed across roads and anchored with pickets and wire. And we threw in a few buried mines in the rubble for good measure. Unorthodox—yes; realistic—definitely.

Despite our success, the whole episode upset me—a brigade in the most powerful Army in the world was stopped by my unequipped sapper platoon. Needless to say, there were some lessons learned that day, but all I could think of was what might have happened if we had been properly equipped? And how would my platoon have fared if the shoe had been on the other foot? It was then that I wondered, Why aren't there OPFOR minefield/obstacle kits that we could use in tactical scenarios?

Granted, the sheer number of foreign mines would make it difficult, if not impractical, to reproduce training mines for all of them. But it would be helpful to be able to see, feel, emplace, and breach a VP-13 Seismic Mine Control System, a PMA-3, or an MRUD/PMA-2 booby trap. These are some of the numerous


Engineer Developmental Systems

antipersonnel mine systems used in Bosnia and Kosovo where currently some 11,000 U.S. troops are deployed and rotating on a regular basis.

In humanitarian demining, we have the luxury of having time to be methodical and deliberate in order to reduce the risks to our soldiers to a tolerable level. This luxury, however, doesn't exist in countermine operations when you're taking fire and blowing down doors to clear hostile buildings in an urban environment.

Imagine going to the Training Support Center and drawing several large plastic boxes like the ones that hold Multiple Integrated Laser Engagement System (MILES) equipment. You open the lid and there, separated neatly and encased in foam, are several of the most common types of foreign mines used in a specific geographic area. Upon further examination, you find that there are instructions with each type of mine system with a complete history of the mine, its employment, and how it's armed and disarmed. Just when you thought it couldn't get any better, you find out that you can actually arm the mines by emplacing a small explosive cap--similar to the cap guns that you played with as a kid. Now you have the ultimate foreign-mine training system. Soldiers will tell you that those mine-identification cards are helpful, but show him something similar to what I described, and those cards will become vivid reminders of the three-dimensional killers they are attempting to avoid or are seeking to destroy.

The above proposal addresses only one aspect of our mobility tasks and just scratches the surface of engineer Transformation issues. I only raise the countermine-training issue as an example because of its significance to the Engineer Regiment. There are equally important Transformation issues that apply to our other Battlefield Operating Systems. However, the fact remains that we're putting a heavy burden on the shoulders of our soldiers. So shouldn't we make it as easy as possible for them to learn and absorb information so they can truly become masters of their trade?

Soldiers Are the Bedrock

During ENFORCE 2000, then Maneuver Support Center (MANSCEN) Commander Major General Robert B. Flowers pointed out in his "State of the Engineer Regiment" presentation that one of the major characteristics of the Objective Force is versatility and that this is and will be a great leadership challenge.[3] At the same conference, TRADOC Commander General John N. Abrams explained, "As we push more power into the hands of fewer people in smaller organizations, the importance of each individual's contribution and effectiveness will remain."[4] My translation: Engineers get more technologically advanced equipment, are expected to know more, do more, and still get the job done.

Sure, we're going to have more complex scenarios, rules of engagement, operational environments, equipment, and—undoubtedly—more complex tactics, techniques, and procedures (TTP) and "asymmetric forces," and engineers will continue to be experts in their trade. But the truth is, this isn't just an engineer challenge. If history is any indication of things to come, soldiers Armywide will embrace the new challenges and, when the time comes, will step up to the plate and perform admirably as they have always done.

By the way, the time is now, and soldiers like those involved in engineer platform testing have been energetically participating in the transformation process. The technology being tested, if properly utilized and designed, should make our jobs easier. But just ask any computer user; it's a love-hate relationship, and it's likely to remain that way as we go through this process and work out the bugs.

The Directorate of Training Development (DOTD), the Directorate of Combat Developments (DCD), the Countermine Training Support Center (CTSC), and other agencies at Fort Leonard Wood are taking positive steps toward supporting the future engineer force. The Warrior Department of DOTD is laying down the foundation for a Master Breacher's Course, which is still early in development. The Countermine Capability Set (CMCS), Ground Standoff Minefield-Detection System (GSTAMIDS), Interim Vehicle-Mounted Mine Detector (IVMMD), Handheld Standoff Mine-Detection System (HSTAMIDS), and numerous other initiatives are big steps toward increasing our survivability and maintaining our mobility in our future operational environments. But as then Major General Flowers pointed out at ENFORCE 2000, "We are several years away from being able to neutralize every mine we come across."[5] That is assuming first that we are prudent, informed, and trained well enough to identify them beforehand.

In an article in the February 2001 issue of *ARMY*, Retired Brigadier General Huba Wass de Czege and Major Jacob D. Biever listed "guidelines for the Army's future Transformation." One of several key points in the article was that "Soldiers—not technology—are the key to continued superiority."[6] In TRADOC Pamphlet 525-5, *Force XXI Operations*, former TRADOC Commander General William W. Hartzog iterates the fluid nature of Army Transformation. "Change is so rapid, so pervasive, and so complex that the work of crafting the Army for the next century is now everyday work for us all."[7] The Army Vision (*http://www.army.mil/armyvision*) states first and foremost that "The Army is People." The Engineer School (*www.wood.army.mil/eschool/*) Web site has a link, "One Voice," which documents top engineer priorities. In his article "One Regiment, One Fight" in the April 1999 issue of *Engineer*, now retired Lieutenant General Joe N. Ballard, then Chief of Engineers, wrote, "Without a dedicated effort at every level, unity cannot be achieved. Ultimately, the future of the regiment is in your hands. We can continue working in our isolated cells and performing marginally, or we can realize the benefits of applying our collective power to the Regiment's problems."[8] The roles that soldiers play on a day-to-day basis are critical, and when those efforts are combined, the Army realizes its greatness.

Lend Me Your Ears

As a platoon trainer for the Engineer Officer Basic Course, I've mentored nearly 200 second lieutenants who, I'm sure, are all doing great things for the U.S. Army and the Engineer Regiment. I hope that those of you who read this article will pay special attention. You are down where the rubber meets the road, and your combined input from the field is essential toward doctrinal and technological development. If you're not already playing some role in Army Transformation, take the time to educate yourself and your soldiers, because the Army of the Future is yours, theirs, and mine. Our battalion commanders may not be around to see it, so we should take on the responsibility of making this Army what it is envisioned to be.

After all, isn't that what the new Army Motto, "Army of One," is trying to get across—that you or I, the soldier, can make a difference? Isn't it about empowerment and through that power fulfilling our obligations and living up to the Army Values? Despite the controversy surrounding it, I believe that the new motto is well-suited to the issue at hand, because the accomplishments and contributions of individuals over the years have been largely responsible for making this Army great. I believe this trend will continue.

Where do we start? The Fort Leonard Wood Web site is an excellent resource. Several departments within the MANSCEN and the Engineer School play roles in Army Transformation, including the Directorate of Training (DOT), DCD, and DOTD. The Engineer Concepts Tiger Team, under DCD, has the mission of ensuring that the engineer force is properly integrated into the IBCTs. You can download a copy of Field Manual (FM) 5-2, *Initial Brigade Engineer Combat Operations*, at this site to get the in-depth look at engineers in the IBCT.

An excellent resource for general Army Transformation knowledge is "The Hooah Guide to Army Transformation" in the February 2001 issue of *ARMY*. If you haven't read it, you can go to (*www.ausa.org/armyzine*) and click on "Army Magazine Archive" to view the issue. The Army home page has several links. For information on Army Transformation, see (*www.army.mil/armyvision/chain.htm#transform*). There are several other links on the Web, but these will get you going in the right direction.

Engineer School/MANSCEN Web Sites

Directorate of Training
www.wood.army.mil/DOT/dot.htm

Directorate of Combat Developments
www.wood.army.mil/DCD/dcd.htm

Directorate of Training Development
www.wood.army.mil/DOTD/dotd.htm

Engineer Concepts Tiger Team
www.wood.army.mil/econcept/

Center for Engineer Lessons Learned
www.wood.army.mil/cell/index.htm

ENFORCE Conference
www.wood.army.mil/eschool/e2001

Council of Colonels Conference
www.wood.army.mil/eschool/CofC/revision.html

Finding the Way

How do you get your engineer ideas across? First, ask your chain of command to review your recommendations for accuracy, completeness, and quality control. Although contacting departments in the Engineer School directly with your issues is a good way to give constructive feedback to the school, finding the right department can be a daunting task. Look at the MANSCEN Web site to find appropriate points of contact through the "Departments and Directorates" link.

Issues concerning changes to engineer publications—FMs, mission training plans (MTPs), soldiers training publications (STPs)—should be submitted using the DA Form 2028, *Recommended Changes to Publications and Blank Forms*. The DOT's Doctrine Development Division in the Engineer School, through the Center for Engineer Lessons Learned (CELL), collects information from the field and ensures that feedback gets to the right agency. If the issue is clearly a training issue, then it should be routed through the Training Development Integration Office for the Directorate of Training. There's also the Doctrine, Training, Leader Development, Organization, Materiel, and Soldiers (DTLOMS) Integrator and the Chief of Staff of the Engineer School, who ensure that issues are broken down and handled by the appropriate agencies. Issues that require higher visibility because of their controversial nature, because they address a theater-wide concern, or because they represent a major departure from current doctrine may be brought to the Engineer School by your chain of command during the ENFORCE Conference or the Council of Colonels meeting.

(see Sappers, page 69)

Photo courtesy U.S. Army Engineer School History Office

THE U.S. ARMY ENGINEER SCHOOL

By Dr. Larry Roberts

As with the Corps of Engineers, the Engineer School traces its roots to the American Revolution. General Headquarters Orders, Valley Force, dated 9 June 1778, read, "Three captains and nine lieutenants are wanted to officer the Company of Sappers. As the Corps will be a school of engineering, it opens a prospect to such gentlemen as enter it...." Shortly after the publishing of the order, the "school" moved to the river fortifications at West Point, New York. With the end of the war and the mustering out of the Army, the school closed. However, the Regiment of Artillerists and Engineers was constituted as a military school and was reopened at the same location in 1794. For four years it constituted a school of application for new engineers and artillerists. Closing in 1798, due to a fire that destroyed many facilities, the engineers were without a school for three years.

In 1801, the War Department revived the school, and Major Jonathan Williams became its superintendent. Less than a year later, Congress authorized the Corps of Engineers and constituted it at West Point as a Military Academy. For the next 64 years, the Academy was under the supervision of the Corps. Although the curriculum was heavily laced with engineering subjects, the Academy commissioned officers into all branches of the service. Following the Civil War, supervision of the Academy passed to the War Department.

When the Engineer Battalion took station at Willetts Point, New York (see photo above), in 1866, engineer leaders saw the opportunity to develop a school oriented exclusively to engineers. From 1868 to 1885, an informal School of Application existed. Part of this effort involved the creation of the Essayons Club, an informal group that met during the winter months and presented professional engineer papers. In 1885, the School of Application received formal recognition by the War Department. In 1890, the name was changed to United States Engineer School.

In 1901, the school moved from Willetts Point (later called Fort Totten) to Washington Barracks in Washington, D.C., and was renamed the Engineer School of Application. Ironically, this name lasted only a few years. In 1904, the name was changed back to Engineer School. The school remained at Washington Barracks for the next 19 years, although it closed from time to time because of a shortage of officers or national emergencies.

In 1909, certain courses associated with the field army moved to Fort Leavenworth, and the Army Field Engineer School opened in 1910. That school, a part of the Army Service Schools, closed in 1916. The First World War forced a closing of the Engineer School because the instructors and students were needed to officer the expanding engineer force. The school resumed its instruction in 1920 but at a different location. Washington Barracks was transferred to the General Staff College, and the Engineer School moved to Camp A.A. Humphreys, south of Mount Vernon, Virginia. This was a World War I camp built on land acquired by the War Department in 1912. The original name for the tract was Belvoir.

For 68 years, Fort Belvoir was the home of the Engineer School. It produced thousands of officers, NCOs, and enlisted engineers who saw action in World War II, Korea, and Vietnam. Thousands more passed through the Engineer School during the peacetime years. In 1988, the Engineer School and Center moved to Fort Leonard Wood, Missouri. Here the traditions of engineering schooling, begun in the snows of Valley Forge, continue.

Dr. Roberts is the U.S. Army Engineer School historian at Fort Leonard Wood, Missouri.

Engineer School Commandants

Willetts Point, New York (Fort Totten)

MAJ James C. Duane..................................1865 - 1868
MAJ H. L. Abbot..................................1868 - 1886
MAJ C. B. Comstock..................................1886 - 1887
MAJ W. R. King..................................1887 - 1895
MAJ W. T. Rossell..................................1895 - 1895
MAJ J. G. D. Knight..................................1895 - 1901

Washington Barracks, D.C.

MAJ W. M. Black..................................1901 - 1903
MAJ Edward Burr..................................1903 - 1906
MAJ E. E. Winslow..................................1906 - 1907
MAJ W. C. Langfitt..................................1907 - 1910
MAJ W. J. Barden..................................1910 - 1913
MAJ Joseph E. Kuhn..................................1913 - 1914
MAJ William. P. Wooten.................................. 1914 - 1916
MAJ G. R. Lukesh..................................1916 - 1916
MG M. M. Patrick..................................1916 - 1917
COL W. W. Harts..................................1917 - 1917
BG Henrey Jervey..................................1917 - 1917
COL F. V. Abbot..................................1917 - 1918
COL Richard Park..................................1918 - 1918
BG Charles W. Kutz..................................1918 - 1918
COL Jay J. Morrow..................................1919 - 1919

Camp Humphreys, Virginia (redesignated Fort Belvoir in 1935)

MG C. A. F. Flagler..................................1919 - 1920
BG W. D. Connor..................................1920 - 1920
COL Meriweather L. Walker..................................1920 - 1921
MG Mason M. Patrick..................................1921 - 1921
COL J. A. Woodruff..................................1921 - 1924
COL H. Burgess..................................1924 - 1924
COL Sherwood A. Cheney.................................. 1924 - 1925
COL Edward M. Markham..................................1925 - 1929
COL Edward H. Schulz..................................1929 - 1933
COL George R. Spaulding..................................1933 - 1935
COL Laurence V. Frazier..................................1935 - 1936
COL Julian L. Schley..................................1936 - 1936
COL J. A. O'Connor..................................1937 - 1938
COL Thomas M. Robins..................................1938 - 1939
COL J. A. O'Connor..................................1939 - 1940
BG Roscoe C. Crawford..................................1940 - 1943
COL Xenephon H. Price..................................1943 - 1944
BG Gordon R. Young..................................1944 - 1944
BG Dwight F. Johns..................................1944 - 1945
BG Patrick Henry Timothy..................................1945 - 1946
COL Willis E. Teale..................................1946 - 1947
MG William M. Hoge..................................1947 - 1948
MG Douglas L. Weart..................................1948 - 1951
MG Stanley L. Scott..................................1951 - 1954
MG A. W. Pence..................................1954 - 1954
MG Louis W. Prentiss..................................1954 - 1956
MG David H. Tulley..................................1956 - 1958
MG Gerald E. Galloway..................................1958 - 1960
MG Walter K. Wilson..................................1960 - 1961
MG Stephen R. Hammer..................................1961 - 1962
MG Laurence L. Lincoln..................................1963 - 1965
MG Frederick J. Clarke..................................1965 - 1966
MG Robert F. Seedlock..................................1966 - 1967
MG Arthur W. Oberbeck..................................1968 - 1968
MG George H. Walker..................................1968 - 1969
MG William C. Gribble Jr. ....1969 - 1970
MG Robert R. Ploger..................................1970 - 1973
MG Harold R. Parfitt..................................1973 - 1975
MG James A. Johnson..................................1975 - 1977
MG James L. Kelley..................................1977 - 1980
MG Maxwell W. Noah..................................1980 - 1982
MG James N. Ellis..................................1982 - 1984
MG Robert S. Kem..................................1984 - 1987
MG William H. Reno..................................1987 - 1988

Fort Leonard Wood, Missouri

MG Daniel R. Schroeder..................................1988 - 1991
MG Daniel W. Christman..................................1991 - 1993
MG Joe N. Ballard..................................1993 - 1995
MG Clair F. Gill..................................1995 - 1997
MG Robert B. Flowers..................................1997 - 2000
MG Anders B. Aadland..................................2000 - Present

PERSCOM Notes

Non-Branch-Qualified-Captain Assignments

By Captain Ronnie B. Griffin

The assignment of our non-branch-qualified (NBQ) captains is very critical to the future readiness of the Engineer Regiment. The objective in assigning NBQ captains is to ensure that each officer is exposed to the full spectrum of engineer assignments which will provide a broad range of experience in preparation for future responsibilities. Each officer must understand the process of an assignment action and the variables that influence the decision. I will focus on assigning officers from the Captain's Career Course (CCC) and discuss initiatives under consideration to improve the assignment process.

Our NBQ captains are assigned from the CCC to major Army commands (MACOMs) based on the unit readiness of subordinate units, the number of officers required by the Officer Distribution Plan (ODP), and when the officer can report to the command. The ODP is the personnel-management directive that determines the number of officers each MACOM receives based on the available population of officers in the Engineer Regiment.

Developing Assignments

Before we assign any officer from the CCC, we conduct a detailed analysis of each MACOM by reviewing the current number of officers on hand and the known and projected losses and actual gains that impact the command. Each officer in the MACOM is reviewed so that we have the most current information pertaining to his situation and how long he will be on station.

Once we complete this analysis, we determine the number of assignments to the MACOM by comparing the projected number of officers on hand versus the ODP for the time period that we are assigning officers from the CCC. The MACOMs that are projected to fall below the ODP are filled to the ODP first, by unit priority.

We allocate the total number of officers attending the CCC throughout the MACOMs based on the analysis and the preferences submitted. After preparing the assignment slate, we send it to the Officer Distribution Division (ODD), Personnel Command (PERSCOM), for approval. The ODD oversees the personnel accounts of the MACOMs and ensures that they are filled with the required number of officers based on the ODP. We work with the account managers to ensure that each MACOM is filled to the ODP. If it is not, we justify why and state when it will be filled.

Determining an Assignment

After slating is approved, we consider the variables that impact the assignments: personal preferences (potential duty locations and military schools), overseas tour equity, exceptional-family-member-program (EFMP) concerns, professional-development needs, joint domiciles (JD), and others. (Attending the University of Missouri's graduate-degree programs at Rolla or St Louis will not impact the assignment you receive.) During our time with the ODD account managers, we have usually worked out issues pertaining to EFMP and JD.

The first assignments we fill are those overseas because of unit readiness and tour equity. Korea is first, then Europe, Hawaii, Alaska, and other overseas areas. This ensures that all officers receive the same consideration for an overseas tour. Officers returning from an overseas tour to the CCC are not considered for a reassignment overseas unless they volunteer.

Next we fill the stateside locations by priority of fill with officers returning from short tours and all remaining officers in the CCC. Contributing factors that determine who is assigned where are current skills (primarily airborne and ranger), EFMPs, JDs, professional-development needs, and personal preferences. In each CCC class, about 65 percent of the officers request Fort Lewis, Washington; Fort Carson, Colorado; or Hawaii as their top three assignment choices. Obviously, there are more officers requesting these assignments than there are positions. The majority of officers assigned to those locations arrive there after a short tour and then request a sequential assignment to that location. So, if there is a particular location that you want, serve a short tour to Korea after the CCC and request a sequential assignment. This allows you to determine when to go overseas and complete a tour early enough when family issues may be less critical or a branch-qualifying assignment isn't critical to your career development.

The critical variable that impacts an assignment is professional-development needs. We want you to experience the full spectrum of engineer operations. Therefore, to broaden your professional development, we generally do not return officers to a duty station where they have already served. If you have a light engineer background, plan for your next assignment to be to a post that offers mechanized or combat-heavy engineer experiences. If you have mechanized experience, your next assignment (if qualified) could be to a post that offers light or combat-heavy engineer experiences. Having officers with diverse backgrounds ensures that the Regiment will have a qualified pool of officers available to meet the demands of tomorrow's Army.

Personnel Management Initiatives

We are studying several initiatives that will better inform officers of assignments, provide a wider array of career opportunities, reduce personnel turnover, and provide stability for our officers and their families. We are reviewing the possibility of assigning officers to the CCC a year in advance upon release of the captain's promotion list. This will allow the leaders in the field to manage their personnel better. Consequently, we can ensure that the MACOMs will have the required number of officers on hand at all times. We will assign the older year groups to the CCC before assigning officers from the promotion list. Officers will still be required to accept or decline the CCC within 30 days of a request for orders being published according

Operational Career Components

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

First and Second Lieutenants	Functional-Area Designation / Captain / Career-Field Designation	Major	Lieutenant Colonel	Colonel

Officer Basic Course	Troops	Engineer Captain's Career Course / Combined-Arms and Services Staff School / Company Command	Company-Grade Branch-Qualification Requirements	Command Staff College	Major Branch-Qualification Requirements	Battalion-Level Field-Grade Branch-Qualification Requirements	Senior Service College	Brigade-Level Command Utilization

Professional Development

Engineer Officer Basic Course/ Engineer Captain's Career Course/ Combined-Arms and Services Staff School	1
Lieutenant Time	3
Company Branch Qualification	2
Command Staff College	1
Field-Grade Branch Qualification	2
Battalion Command	2
Senior Service College	1
Brigade Command	2
Total years	14

= Primary-Zone Promotion Board

This chart is based on information in Figure 16-1, DA Pam 600-3.

Branch-Qualified Requirements

Active Component/Reserve Component
U.S. Military Academy
Army Staff
U.S. Army Recruiting Command
Joint
Advanced Civil School
Reserve Officer Training Corps
Observer/Controller
Department of Public Works
Functional Area
U.S. Army Corps of Engineers
Small-Group Instruction
Branch Immaterial

to Army Regulation (AR) 350-100, *Officer Active Duty Service Obligations*; AR 635-100, *Officer Personnel*; or AR 635-120, *Officer Resignations and Discharges*.

We work to ensure that officers assigned to Korea receive their station of choice upon return, but are reviewing the option of providing station of choice assignments for NBQ CPTs who volunteer for the 12-month tour to Korea before attending the CCC. Once officers are first lieutenant promotable, they will be able to request the one-year tour to Korea, serve the tour, attend the CCC, and proceed to their station of choice. This would be an opportunity to complete an overseas tour, gain valuable engineer experience, and get a station of choice.

We have started scheduling permanent-change-of-station (PCS) moves for the summer months, where possible, which allows families to plan around the school year. The CCC follow-on assignments are exempt from this initiative.

The personnel community is studying the impact of leaving officers on station for the duration of their tours instead of PCSing them immediately after completing their branch-qualifying position. Also being discussed is making Korea a 24-month accompanied tour.

Stay tuned for more information!

Your Obligations

For your benefit, ensure that your contact information (home and duty phone numbers and e-mail and home addresses) is up to date with your assignment officer. Ensure that you have a current photo on file at PERSCOM. Various senior leaders review your file for a variety of reasons (consideration for aide-de-camp, branch selection boards, and other nominative assignments). Many officers have lost an opportunity to make a favorable impression by not having an updated photo in their file.

Contact your assignment officer from time to time. Inform us when you arrive at a duty location and, most importantly, let us know when you take company command. After 6 months of command, give us a call and we can begin to address—with you and your chain of command—follow-on branch-qualified captain assignments. For officers considering advanced civil schooling options, it is best to take your graduate record examination before taking company command. You may not have time during command.

Familiarize yourself with Department of the Army Pamphlet (DA Pam) 600-3, *Commissioned Officer Development and Career Management*. It's your bible to career success. It contains information on leader development, career timeline, education, functional areas, and career-field designation. We receive numerous inquiries concerning these subjects.

Our NBQ captains are critical to the success of engineer units today, and all leaders must ensure that these officers are trained and ready to lead our Regiment tomorrow. We are committed to giving every consideration to assigning the right officer, with the right skills, to the right unit, at the right time.

Captain Griffin is the branch-qualified-captain assignments officer, Engineer Branch, Personnel Command (PERSCOM). Previous assignments include future-readiness officer, Engineer Branch, PERSCOM; observer-controller trainer, 2d Training Support Battalion (Engineer), 15th Support Brigade; company commander, 58th Transportation Battalion, 1st Engineer Brigade; S3 and assistant S3, 46th Engineer Battalion, Warrior Brigade; company executive officer, 84th Engineer Company, 2d Armored Cavalry Regiment; platoon leader, 102d Engineer Company, 199th Separate Infantry Brigade. CPT Griffin is a graduate of the U.S. Army Officer Candidate School and is pursuing a graduate degree from Webster University.

CTC Notes

Battle Command Training Program (BCTP)

2000 BCTP Perceptions for Mobility/Survivability

By Lieutenant Colonel Scott Bickell

Each year, the BCTP consolidates significant lessons learned as a result of Warfighter exercises. Developed for each Battlefield Operating System (BOS), these lessons learned become *BCTP Perceptions*. Two of three BCTP Perceptions for 2000 for the mobility/survivability (M/S) BOS—**Commanders and staffs do not take adequate actions to counteract enemy countermobility efforts** and **Commanders do not maximize countermobility capabilities or effects**—are carryovers from the 1999 BCTP Perceptions (see the November 1999 issue of *Engineer*). The third BCTP Perception focuses on deliberate river-crossing operations. In several Warfighter exercises, commanders and staffs have struggled with planning and executing deliberate river-crossing operations. It is apparent that these operations have become a lost art. The following perceptions address the problems that we have identified during Warfighter exercises and lists some tactics, techniques, and procedures (TTP).

Perception: Commanders and staffs do not plan or synchronize river-crossing operations.

Discussion: Commanders and staffs at the corps and division levels struggle with planning and executing deliberate river-crossing operations. This perception has three components:

- Staffs do not identify, and units do not set, the conditions to conduct river-crossing operations. There is no single doctrinal source that clearly articulates all conditions units must meet to conduct a river crossing. Typically, staffs will state the conditions that must be met, but they do not conduct a cross-BOS analysis of these conditions and do not develop plans that allow the necessary conditions to be met. Also, staffs do not clearly identify GO/NO-GO criteria for the river crossing based on meeting the conditions, nor do they develop contingencies that address the failure to set the conditions. Typically, a division will identify a set of conditions that must be met to conduct a successful river crossing. Often, subordinate brigades will identify a set of conditions to be met for the crossing, but these conditions are not linked to the division's conditions. Seldom is the status of these conditions briefed at battle-update briefs (BUBs).
- Commanders and primary staff officers tend to view river crossings as an engineer operation instead of a complex combined-arms operation. Units seldom plan a river-crossing operation as a combined-arms operation using all of the available staff expertise. Past Warfighter exercises have shown that engineers will have the "rose pinned on them" for developing the corps or division river-crossing plan. The staff engineer produces the written river-crossing plan and includes it as an appendix to the engineer annex. Cross-BOS analysis is seldom conducted, and details of the river crossing are not nested in the base order. Also, brigade-level staffs fail to conduct detailed river-crossing planning based on the division's plan and fail to adjust these plans based on current enemy and friendly situations.
- Units assign river-crossing operations to subordinate units and do not provide the required support. Corps and divisions typically task subordinate units to conduct river-crossing operations without giving them sufficient resources and support. Corps must allocate sufficient resources to crossing divisions. (Not every division needs to conduct an opposed river crossing; therefore, not every division needs river-crossing assets.) Divisions, like corps, must allocate sufficient resources and support to crossing brigades. Typically, divisions will allocate assets down to the crossing brigades. What is supposed to be a division deliberate crossing turns into separate brigade crossings that are not synchronized with the division's plan. Corps and divisions have a planning and resourcing responsibility for river-crossing operations. For instance, corps will develop the deception plan and resource this plan for a division's deliberate river crossing. Corps and divisions must also assist in setting the conditions for subordinate units' river-crossing operations. An example of this would be the corps providing additional artillery and aviation assets to conduct deep attacks against enemy artillery which could influence the crossing sites.

TTP:

- Units conducting a deliberate river-crossing operation must conduct a cross-BOS analysis of conditions to be met and must clearly identify GO/NO-GO criteria for the operation based on those conditions. The stated conditions should be nested in the corps/division base operations order, and the status of these conditions should be briefed at BUBs.
- Units must develop and execute detailed, synchronized plans that allow the necessary conditions to be met and develop contingencies that address the failure to set those conditions. Also, conditions set by subordinate units must be nested with those set by the higher headquarters.
- River crossings are complex combined-arms operations. Engineers provide the means and support to corps and division river crossings, but they should not develop the entire river-crossing plan. BOS integration and synchronization are key to planning and executing successful river-crossing operations. Units must plan river-

crossing operations as a combined-arms operation. Maneuver planners at the division level must take the lead on developing the deliberate river-crossing plan.

- A river-crossing operation should be included as part of the combined-arms rehearsal. Units that conduct detailed river-crossing rehearsals are generally more successful than units that do not.

In addition to these TTP, the following are recommendations for training in deliberate river-crossing operations:

- Conduct combined-arms battle-staff training at brigade and division levels which focuses on planning and executing a deliberate river-crossing operation. Include the use of simulations, such as Joint Army/Navy Uniform Simulation (JANUS) or Corps Battle Simulation (CBS), during this training.
- Plan and conduct a deliberate river-crossing operation at the home station if a waterway and assets are available. If an assault float-bridge company or multirole bridge company is not located at your post, coordinate with the Reserve Component. Over 70 percent of our bridge assets are in the Army National Guard or U.S. Army Reserve, and they would be more than willing to participate in an active division's deliberate river-crossing operation.
- From a BCTP standpoint, include river-crossing operations in the trend-reversal process and include focused rotation on river-crossing operations in future Warfighter exercises.

Conclusion

Planning and executing deliberate river-crossing operations have become a lost art. Few units have the opportunity to conduct a deliberate river-crossing operation as part of their home-station training. This is due in part to the loss of the divisional assault float-bridge companies. The engineer community must impress upon maneuver commanders that a deliberate river crossing is a complex combined-arms operation; it takes the entire combined-arms team to plan and execute a successful river-crossing operation. The Infantry and Armor Centers should act as the lead in deliberate river-crossing operations, while the Engineer, Artillery, and Chemical Schools should assist in future doctrine development.

LTC Bickell is the mobility/survivability BOS chief for BCTP Operations Group Bravo at Fort Leavenworth, Kansas. Before this assignment, he served as the assistant division engineer (ADE), 4th Infantry Division, and S3, 588th Engineer Battalion, 4th Infantry Division. LTC Bickell has also served in various command and staff positions in divisional and corps combat-engineer battalions.

Attention Units!

Many post offices will not deliver mail without a street address. Please contact us to update your mailing address if the one we are using for you does not include a street address. Include the old address and your telephone number, as well as the corrected address, and e-mail to *morganj@wood.army.mil*.

(Sappers, continued from page 63)

Junior leaders, do not sit on your ideas. Do not become cynical of procedures or embittered by slow progress. Take the words of the MANSCEN Commander Major General Anders B. Aadland, to heart: "Think through problems and let me know what you would do it YOU were the CG. DON'T COMPLAIN."[9] Use your senior leaders to convey your thoughts. Win their support by being detailed, thorough, and constructive in your analysis, and they will make your cause their own. Army time is a valuable commodity, and finding time to work issues outside of our daily jobs seems all but impossible. I believe, however, that developing the future of the Engineer Regiment should and must be a part of our daily routine, regardless of where we work. The Engineer Regiment, through the Engineer School, is transforming the way engineers will do business in the years ahead, and it is doing this admirably. We must also do our part because our thoughts and ideas will help give substance and shape to the somewhat nebulous future.

As Lieutenant General Ballard said at ENFORCE 2000, with regard to the future of the Engineer Regiment, "We must act collectively . . . become more adaptable. . . and become more flexible."[10] Let us work the issues as our Army transforms into this lightweight, technologically superior, and lethal powerhouse. Let us tell our soldiers that we care about their welfare and want to increase their survivability on this increasingly complex battlefield of the future so they can return home safely to their families. Let us question our TTP: assess our training aids, devices, simulators, and simulations (TADSS); and evaluate our equipment to see if they suit our future operating needs. Let us implement the means and the ways to train our engineers, making them better experts so we can win! If we can't, then at least "Let us try!" Essayons!

Captain Taphorn is a platoon trainer for the Engineer Officer Basic Course, B Company, 554th Engineer Battalion, Fort Leonard Wood, Missouri. Former assignments include platoon leader, C Company, 326th Engineer Battalion, and executive officer, HHT, 2-17th Cavalry Squadron, Fort Campbell, Kentucky.

Endnotes:

[1] ENFORCE 2000 Conference notes, May 2000.

[2] Ibid.

[3] Ibid.

[4] Ibid.

[5] Ibid.

[6] Brigadier General (Retired) Huba Wass de Czege and Major Jacob D. Biever, "Six Compelling Ideas on the Road to a Future Army," *ARMY*, Vol. 51, No.2, February 2001, pp. 43-46.

[7] TRADOC Pamphlet 525-5, *Force XXI Operations*, (part of front material, no page number).

[8] Lieutenant General Joe N. Ballard, "One Regiment, One Fight," *Engineer*, Vol. 29, April 1999, pp. 9-11.

[9] MANSCEN CG Philosophy.

[10] ENFORCE 2000 notes.

Commercial numbers are (573) 596-0131, ext. xxxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Directorate of Training (DOT)

MC-1 Tester. Several months ago, an e-mail message was sent to units that may have a horizontal construction mission requiring the use of the MC-1 Tester (NSN 6635-01-030-6896). The message contained important safety/legal information regarding the MC-1. If your unit has such a mission and did not receive the message, please contact this office.

POC is SFC Brian J. Nering, 37593; DSN -7593; or e-mail *neringb@wood.army.mil.*

WANTED! Warrant Officer Applicants. We need qualified MOS 81Ts, E5 or above, with 4 to 12 years of service time, to apply for the MOS 215D Terrain Analysis Technician Warrant Officer Program. The duty description is in Department of the Army Pamphlet 611-21, *Military Occupation Classification and Structure*. For information on how to become a warrant officer, go to the Warrant Officer Career Center's home page at *http://leav-www.army.mil/wocc/.*

POC is CW4 Frederick Kerber, 34088; DSN -4088; or e-mail *kerberf@wood.army.mil.*

Increased Enlistment Contract for MOS 51M Firefighter. Initial term retention for this MOS is well below the Army average, leaving this MOS with a reduced E5 population. Effective FY02, the 51M enlistment contract will be 5 years.

POC is SFC Jorge Rios, 37311; DSN -7311; or e-mail *riosj@wood.army.mil.*

Engineer Manuals and Mission Training Plans (MTPs) on the General Dennis J. Reimer Library. Not all engineer materials have been posted to the Reimer Library. If the publication you need has not been posted, contact this office. For a list of engineer manuals on the General Dennis J. Reimer Library, go to *www.adtdl.army.mil/atdls.htm* and click on "Enter the Library." Select "Field Manuals" on the left drop-down menu and "Engineer" on the right drop-down menu. Click "Submit." For a list of MTPs, go to the same Web site and enter the library but select "Mission Training Plans" and then the desired MTP.

POC is Mr. Reggie Snodgrass, 37762; DSN -7762; or e-mail *snodgrar@wood.army.mil.*

Engineer Lessons Learned. We are getting a trickle of articles and have one SOP from field units. These new items can be found on the Center for Engineer Lessons Learned page of the Engineer School Web site. Please continue to forward any engineer lessons learned from exercises and operations; others may well benefit from your experiences.

POC is Mr. Reggie Snodgrass, 37762; DSN -7762; or e-mail *snodgrar@wood.army.mil.*

Professional Engineer (PE) License. The Engineering Division of the Department of Instruction continues to serve as the Engineer School POC for soldiers who are seeking information about obtaining their PE license. To assist anyone interested in this subject, we maintain a Web page (*www.wood.army.mil/ENGR/register.htm*) that provides general information about registering military personnel and Department of Defense civilian employees as PEs.

POC is Mr. Kenny Light, 35655; DSN -5655; or e-mail *lightk@wood.army.mil.*

Terrain Visualization II CD-ROM. The Terrain Visualization II CD-ROM is now complete. Copies were mailed to the combat training centers; active, Reserve, and National Guard battalions; selected higher headquarters; other branch schools; and various agencies.

POC is MAJ Chris Kramer, 37060; DSN -7060; or e-mail *kramerc@wood.army.mil*

Situational Obstacle Training Support Plan (TSP). For some time, the combat training centers (CTCs) have reported situational-obstacle planning as a negative trend. To help reverse that trend, we have developed a Situational Obstacle TSP. In addition to augmenting instruction for the Engineer Officer Basic Course and the Engineer Captain's Career Course, we anticipate that this TSP will help reinforce planning at the unit level. The TSP was sent to the CTCs, engineer brigades, divisional engineer sections, and engineer groups.

POC is CPT Dan Smith, 35582; DSN -5582; or e-mail *smithda@wood.army.mil.*

Lesson Plans; Tactics, Techniques, and Procedures; and Other Products. The Tactics Web page is continually growing. We currently have a number of products available, including the Situational Obstacle TSP, planning aid for combat engineers, obstacle planning calculators, and an assistant brigade engineer battlebook. Also, links to the Terrain Visualization Center and the new Terrain Visualization II Multimedia Tutorial are on the Web site. These are located at *http://www.wood.army.mil/Tact/products.htm*. A slide show on the Engineer Captain's Career Course can be downloaded and used for officer professional development/NCO development program classes from *http://www-lab.wood.army.mil/student_handout/Engr/EOAC/MOD%20D-Engineer%20Tactics.*

POC is MAJ Michael Kinard or Mr. Ed Zielonka, 35592/37061; DSN -5592/7061; or e-mail *kinardm@wood.army.mil or zielonke@wood.army.mil.*

Mobile Training Teams (MTTs). Two mine-awareness MTT courses are available: one is for all arms and the other is engineer-specific. We recommend mine-awareness training within 3 months of deployment. Since our calendar is filling up, please contact us as soon as possible so we can schedule the training. Units are required to pay associated costs.

POC is Major Mark Griffin, 34134; DSN -4134; or e-mail *griffinma@wood.army.mil.*

Training Aids. We can help you procure mine-identification boards and individual plastic mines for your unit mine-awareness training. We have some of these items on hand and can connect you with suppliers.

POC is Mr. Mike White, 35578; DSN -5578; or e-mail *whitemi@wood.army.mil.*

Training Circular (TC) 3-34.489, *The Soldier and the Environment.* This publication is scheduled for release 3QFY01. It provides information on personal and professional responsibilities for protecting the environment. Information in the TC will help soldiers make responsible decisions about the environment. It is the companion to FM 3-100.4, *Environmental Considerations in Military Operations* (June 2000).

POC is MAJ John Whitfield, 35647; DSN -5647; or e-mail *whitfiej@wood.army.mil.*

Environmental Web Sites. The Office of the Director of Environmental Programs' home page *(www.hqda.army.mil/acsimweb/env)* is an excellent site for "communication and information between major Army commands." The site is also an unclassified information source for all parties interested in the Army's Compliance Program. The U.S. Army Environmental Center (USAEC) home page *(http://aec.army.mil)* is another excellent site for critical information pertaining to environmental compliance. The USAEC provides technical services to HQDA, major Army commands, and commanders and also integrates, coordinates, and oversees implementation of the Army's environmental programs for Army staff.

POC is MAJ John Whitfield, 35647; DSN -5647; or e-mail *whitfiej@wood.army.mil.*

Engineer-Focused Battle Staff Training System (EFBSTS). In late CY00, the Engineer School's self-paced, Internet-based, constructive training program for engineer staff officers and NCOs was approved as an Army Correspondence Course Program course. Four of the courses have been added to the Reimer Digital Library, with the remainder to be added during the next few months. The completed courses, including the new final exam, are available at *http://www.adtdl.army.mil/atdls.htm.* The remaining courses are still available through Mr. Skinner.

POC is Mr. Bobby Skinner, 36243; DSN -6243; or e-mail *skinnerb@wood.army.mil.*

Volcano Trainers. A reloadable Volcano training canister is being developed by the program manager and will be fielded to support CTCs and home-station training. This canister will reduce the overall cost of training on the ground- and air-delivered Volcanos. It will be able to deploy the new mine-effect simulator (VMES), which is being developed to replace the current mine-effect simulator for use at the CTCs, or a single "dog-bone" slug. The VMES will provide the means to deploy a realistic Volcano minefield. It is currently in Phase I, which is scheduled for completion at the end of September 01. Fielding dates and reload costs are not known at this time. The VMES, with its improvements, will—

- Function with the CTC instrumentation system.
- Fire one time only until reset.
- Contain replaceable batteries (2 AA).
- Have a locator buzzer activated by the controller "gun" to aid in recovery.
- Be deployed by Volcano using the reloadable canister or emplaced by hand.
- Be tested for a minimum of 50 deployments.

POC is Mr. Joe Decker, 34146; DSN -4146; or e-mail *deckerj@wood.army.mil.*

Directorate of Training Development (DOTD)

Field Manual Update. The following field manuals (FMs) have recently been sent to ATSC for printing and distribution. Look for them on the Reimer Digital Library at *http://155.217.58.58/atdls.htm.*

- Change 2 to FM 3-34.2, *Combined-Arms Breaching Operations.* This 3-page change corrects a figure depicting the fragmentation zone for firing the mine-clearing line charge (MICLIC). (The forward and rearward dimensions were reversed.)
- Change 1 to FM 5-34, *Engineer Field Data.* This change corrects some misinformation on bridging, mines, and obstacle symbols.

- Change 1 to FM 5-125, *Rigging Techniques, Procedures, and Applications*. This change institutes several technical revisions to bring the manual within American National Standards Institute standards. It technically outlines the wear conditions at which wire rope must be discarded as unserviceable. The changes deal with normal wear, birdcages, kinks, popped cores, and electrical damage. Drum-wire operations are addressed, as well as new figures for rope lay, wedge socket, basket-socket end fittings, and attaching basket sockets by pouring.

POC is Sandra Gibson, 37651; DSN -7651; or e-mail *gibsons@wood.army.mil.*

Directorate of Combat Developments (DCD)

M172A1 Series 25-Ton Semitrailer. We need to know the condition of all M172A1 semitrailers in engineer units. The M172A1s were manufactured between 1973 and 1975 and have a useful life expectancy of 30 years. Currently, the Army has 879 excess M172A1s, so programming funds to replace the M172A1s until the excess trailers are disposed of may be difficult. We recommend that units that have local direct-support maintenance activities or a Directorate of Logistics conduct a 100 percent technical inspection (TI) and complete a cost repair sheet (ECOD) for each M172A1. If a trailer exceeds the military-expenditure limit, code it out so excess trailers can be distributed. Send copies of your TIs to: MANSCEN DCD, Engineer Division, ATTN: SFC Pezzuti, 320 MANSCEN Loop, Suite 141, Fort Leonard Wood, MO 65473-8929. We will forward these results to the Combined Arms Support Command (CASCOM) DCD for appropriate action.

POC is SFC Scott Pezzuti, 37357; DSN -7357; or e-mail *pezzutis@wood.army.mil.*

Mine-Awareness /Mine-Detection Equipment. There is a technology upgrade available for the AN/PSS-12 mine detectors that will improve soldier survivability and detection effectiveness, especially in metallic and/or mineralized soils. The upgrade is available as a modification work order (MWO). We are working to get funding from the Army Materiel Command (AMC) for the MWO application, which would then be done at the local installation level. We request that unit commanders who have the AN/PSS-12 in their mission-essential task list provide a statement of concern/statement of need to us immediately, identifying the requirement for better capabilities in mine-detection equipment because of the high risk to soldiers in difficult detection situations. These statements will be forwarded to AMC to justify funds to upgrade the AN/PSS-12.

POC is Mr. Glenn Boxley, 37337; DSN -7337; or e-mail *boxleyg@wood.army.mil.*

TRADOC Program Integration Office-Terrain Data (TPIO-TD)

TerraBase II 5.0. The 5.0 version provides access to new data types and significant new capabilities for TerraBase II users. The following are some of the new features:

- Users can display and query the National Imagery and Mapping Agency (NIMA) vector-product-format (VPF) data such as foundation feature data (FFD), Mission-Specific Data Sets (MSDS), vector maps (VMAP) and vector interim terrain data (VITD).
- Users can display VPF data with the prototype GeoSym 4.0 CGM map symbology.

NOTE: The GeoSym 4.0 Prototype is not complete. GeoSym CGM scripts will only work on Windows NT and Windows 2000 systems. Symbol functionality is product-specific; not all symbols will display on all products. MicroDEM will display only those symbols which have complete CGM scripts that function correctly with Windows API calls; most line symbols do not meet this requirement. GeoSym is not a final working product. Implementing a fully functional CGM map-symbol overlay depends on the changes that are made to the future GeoSym 5.0 and future releases of MicroDEM.

- NIMA digital terrain-elevation data (DTED), controlled-image base (CIB), and compressed arc digitized raster graphics (CADRG) data can now be loaded to the hard drive and accessed concurrently using the new NIMA database function.
- Users can create their own ESRI shape files and database attribute tables while performing heads-up digitizing on screen.
- New military-icon and map-icon functions allow placement of scaled, Military Standard 2525B symbols and nonscaled, user-selected graphics on map overlays.
- The OpenGL 3-D View allows real-time control and display of map and imagery data draped over elevation data.
- The new route-observation "Ambush" movies allow clear and concise views of potential friendly/enemy gun positions along a route.

- Users can create true 3-D map and perspective views of terrain using stereo-anaglyph functions. Viewing requires red-blue filter glasses.
- The built-in Pipeline Automated Planning Aid (PAPA) allows logistics planners to define a route for installation of a pipeline. PAPA will then calculate the profile; pressure heads; pump placement; and number of sets, kits, and outfits required for the project.
- CastleNET users can graphically display and query the obstacle database.
- The United States Geological Survey's (USGS's) digital-elevation-model data can now be exported in NIMA DTED format.
- New dual universal-transverse-mercator (UTM) grid displays, dual Military Grid Reference System (MGRS) and latitude/longitude coordinate displays, and roaming of pointer position on all displays simplify the instruction; understanding; and use of datums, grids, and coordinates for new and experienced users.
- Products created in version 5.0 can now be exported directly to PowerPoint presentations with a single mouse click.

TerraBase II version 3.0, 4.0, and 5.0 software and training materials can be downloaded free from the Terrain Visualization Center Web site at *http://www.wood.army.mil/TVC/.*

POC is LTC Steve Tupper, 34077; DSN -4077; or e-mail *tuppers@wood.army.mil.*

News and Notes

National Engineers Week's *Future City* Competition. To increase public awareness and appreciation of the engineering profession and to help students better understand the practical applications of mathematical and scientific principles, the National Engineers Week Committee sponsors an annual competition. The Engineering Society sponsored the Michigan regional competition at the Spirit of Ford building in Dearborn, Michigan, on 30 January 2001. Twenty-six teams from schools throughout Michigan participated. The theme centered around future communications. Students designed their future city, plotted a map, built a scale model with a moving part, wrote an essay, and made oral presentations to panels of judges. Ideas for communications ranged from neural implants, to wrist communicators and holographic eyeglasses, to DNA implants. Each school can sponsor one team, consisting of three students, a teacher, and a mentor. St. John Lutheran School from Rochester won the regional event and an award from Ford Motor Company for "Best Transportation." The team went to the National Competition in Washington, D.C., during Engineers Week, 18 through 24 February, and received an award from the American Society of Civil Engineers for "Best Aesthetic Design in Structural Engineering" and an award from the Society of Manufacturing Engineers for "Best Manufacturing Zone." The national champion, St. Barnabas Catholic School from Chicago, Illinois, received a trip to the U.S. Space Camp in Huntsville, Alabama. Next year's materials will be available in mid-August. For more information on *Future City,* go to *http://www.futurecity.org.* For more information on Engineers Week, go to *http://www.eweek.org.*

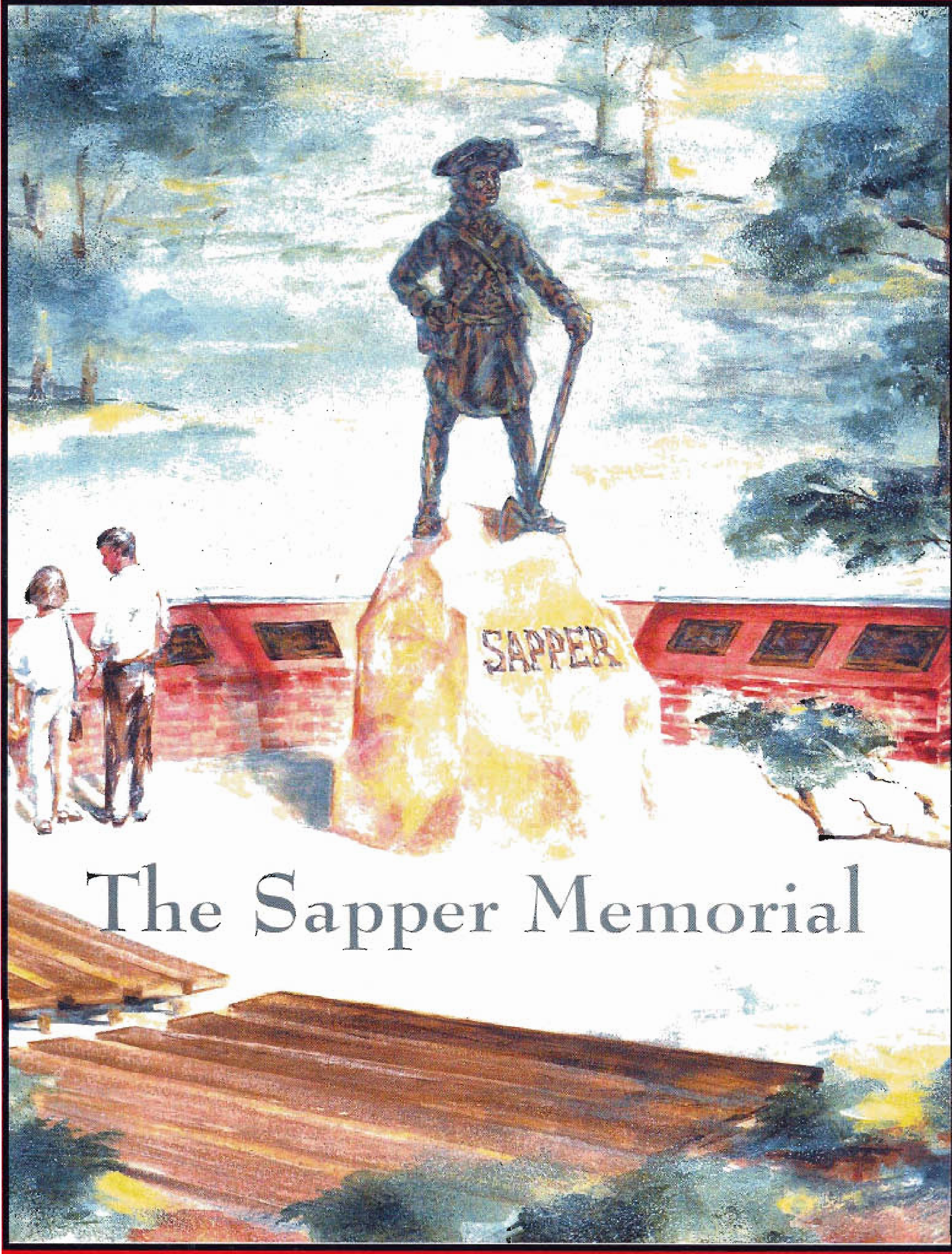
POC is Patrick T. Klever, (616) 842-5510, or e-mail *Patrick.T.Klever@lre02.usace.army.mil.*

Balkans Special Collection. The History Department at the United States Military Academy is collecting materials for a Balkans Special Collection that will be maintained in the West Point Archives. The intent for this collection is to consolidate materials that will be helpful to those interested in the soldier's experience in the Balkans. The collection would make future research on service in the Balkans easier and prevent the loss of a wealth of soldier experience and insight as time passes and individuals discard invaluable materials. The collection will include any electronic or hard-copy information that soldiers have maintained concerning their experiences while serving in the Balkans during the last several years. These materials can either be correspondence kept from the period of deployment (letters home, to friends, or the home unit; journal entries; and e-mails) or recollections of time spent in the Balkans (including personal reminisces and formal after-action reviews). If you have any materials you think will interest the Academy's History Department or if you wish to contact the department, use the information below:

Mr. Alan C. Aimone, Senior Special Collections Librarian, U.S. Military Academy Library, West Point, N.Y. 10996-1799
Phone: (845) 938-2954, fax: (845) 938-3753, or e-mail: *ua3925@exmail.usma.mil*

POC is CPT Jeffrey French, (845) 938-4410, or e-mail *kj6911@trotter.usma.edu.*

BACK COVER:
An artist's rendering by Joan Ozment shows the Engineer Memorial Grove, which will commemorate the history and lineage of the Sapper Engineer. The statue portrays a Sapper from the Revolutionary War. During ENFORCE 2001, a groundbreaking ceremony will be held for the park, which will be located adjacent to the Engineer Museum.



The Sapper Memorial

PIN: 788821-000