ENGINEER

The Professional Bulletin of Army Engineers

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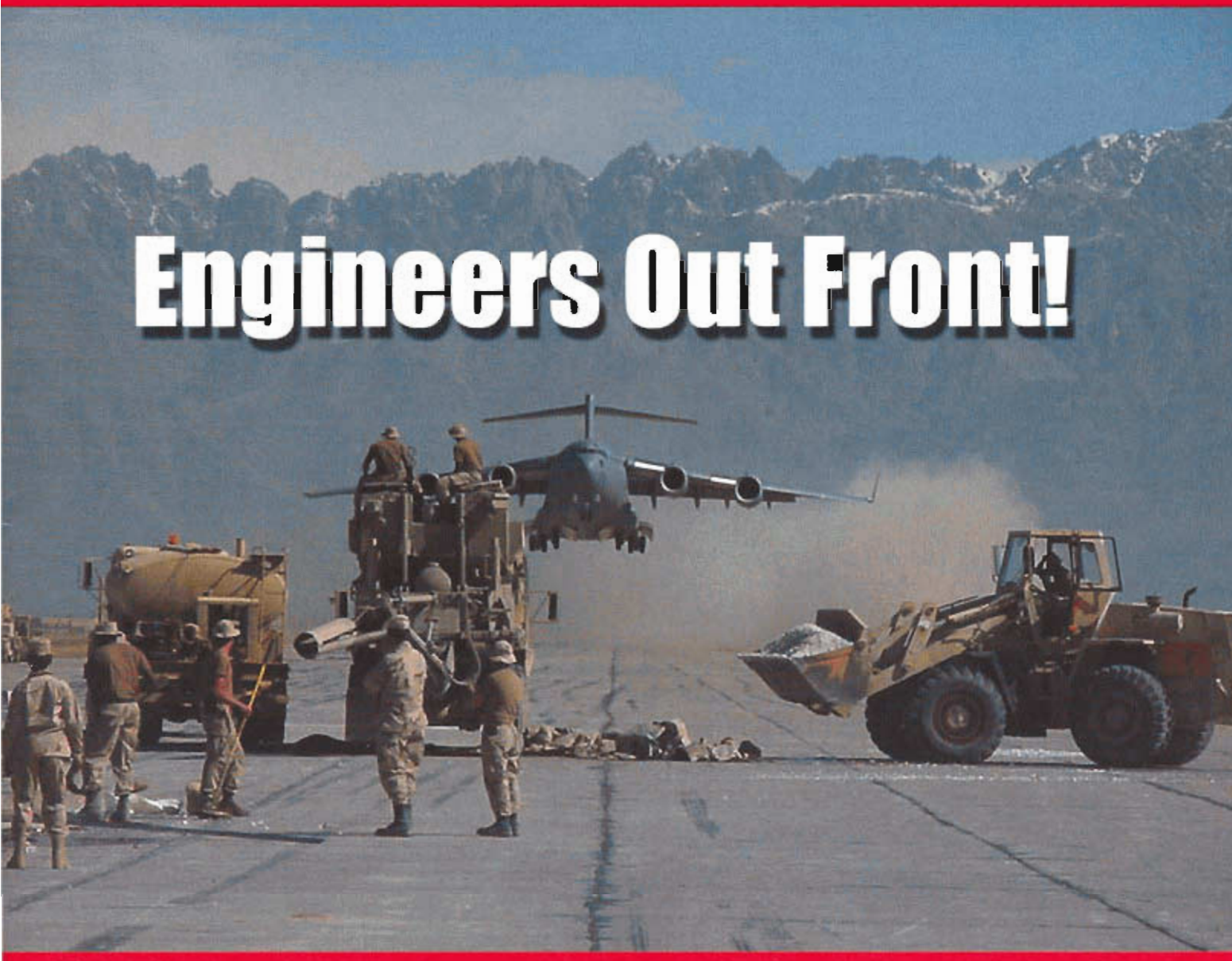

Engineers Out Front!

Operation Enduring Freedom From the Military Engineer Perspective

Repairing Runways and Clearing Mines in Afghanistan

Updating River-Crossing Doctrine: Who and When?

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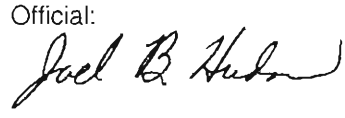

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Back Covers: *Engineer soldiers*

FEATURES

DEPARTMENTS

Clear The Way

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

ENFORCE 2002 was another professionally rewarding opportunity to get together with all our Engineer leaders from around our Regiment. While it is always wonderful chatting with old friends whom we haven't seen for years, ENFORCE also gives us super opportunities to roll up our sleeves and, collectively, get down to the nitty-gritty of our Regiment's most important and pressing issues. If you recall, the theme for the ENFORCE 2002 Conference was "*Full-Spectrum Engineers – Force for Change.*" These words were chosen carefully; these words have great meaning.

Full-Spectrum Engineers means that we are providing, and will continue to provide, the entire range of engineering to the Nation—from combat engineering to construction engineering to geospatial engineering to environmental engineering. *Force for Change* means that the Engineer Regiment will aggressively lead the Transformation to meet the needs of the Army and the Nation. The "*Full-Spectrum Engineers – Force for Change*" theme continues in this latest issue of *ENGINEER*. In this issue, you will find important and particularly relevant articles on our Sappers out front in Operation Enduring Freedom (OEF)—to include repairing runways, clearing mines, and performing rapid airfield upgrade. Those of you still wondering about Transformation will find Dr. Larry Roberts' article "The Evolution of the Engineer Force: Part II" especially poignant. Engineers have always been in the forefront of changing to meet the needs of our maneuver brethren and the Army. The Sapper warriors of today *and* tomorrow must continue this. And in LTC(R) Anderson's article "The Real Army," he reinforces the fact that the most important part of our Army is people.

While the positive vibrations of ENFORCE have not worn off, we have had little time to bask in that sunlight; we have been deeply engaged as the Army's Transformation continues in high gear. Our Regiment is deeply involved in the training and development of the Interim Force and the conceptual development and planning for the Objective Force. Recently, we have made important contributions to the role of maneuver support in the Objective Force. On 29 May 2002, the MANSCEN Commandants (Chemical, Engineer, and Military Police) briefed the CSA and the DA Requirements Review Council (RRC) on the Objective Force Maneuver Support Concept. Now, maneuver support is one of the three key integrating areas of the Objective Force operational framework. As you know, these are extremely important efforts that we Engineers must pursue.

In the future and today, countermine remains one of the leading issues for our Army. This is particularly compelling for our forces engaged in Operation Enduring Freedom. We continue to work to develop solutions for the mine and booby trap problems around the world. We will continue to provide subject-matter expertise and mobile training teams to prepare our Sappers going into harm's way. We will also continue to develop and brief, at DA level, requirements for materiel and training to keep our forces mobile and safe and ensure that the Objective Force's combined-arms maneuver Unit of Action (UA) will be able to overcome this threat in stride.

As our Army continues to change, and with the personnel transitions that summer always brings, our Engineer School continues to change as well. To name a few of the key changes: we bid farewell and thanks to LTC(P) Gary Johnston, Senior Engineer, Directorate of Combat Developments (DCD); LTC Bill Duddleston, Doctrine Chief; and LTC Tom Chapman, Engineer School Chief of Staff. We extend a hearty "welcome aboard" to the inbound talent, including LTC Pete Tabacchi, new Engineer DCD Chief (moving over from DCD Concepts); LTC Bryan Watson, Engineer DCD Concepts; LTC Tony Funkhouser, Doctrine Chief; and LTC Tom O'Donovan, Engineer School Chief of Staff. These are your new Schoolhouse warriors. Add them to your list of key contacts. Put them to work. Send them cards and letters. Support them and count on their support. They will do great things for you and the Regiment.

It has been a tremendous honor for me to have served as your Commandant for the past two years. I appreciate the great teamwork and warrior spirit that you, as Sapper leaders of the Regiment, have demonstrated. With the rapid pace of change, this has been an exciting ride. But the pace will not slow down soon, and the new leader has stepped in to ensure that the important beats are not missed. We all extend our heartiest welcome to MG Bob Van Antwerp, your new Commandant. Van is a great Sapper warrior and leader who, along with BG Randy Castro and the outstanding Engineer School team, will accomplish much as the leader of this Force for Change. Welcome aboard, Van, and Godspeed as Sapper 6!

Essayons!

Lead The Way

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

I want to begin by thanking all of you who supported this year's ENFORCE Conference and made it such a great success. It was good to see all of the Regiment's leaders again, back here at the home of the Engineers, engaged in the shaping of our future in support of our transforming Army.

I especially want to thank the Sergeant Major of the Army (SMA) for taking time out of his arduous schedule to be a part of the Council of Sergeants Major. His presence during our conference was historic, and the insights he has on what's important in our Army, its future, and the initiatives being worked were of great value to us all. Some might believe that the position of SMA is one of merely a figurehead that symbolically represents the enlisted force. SMA Tilley demonstrates to the entire Army that he is much more than that. He tirelessly works a multitude of issues that guide the future of our Army and impact quality of life, training, and standards in an extremely positive way. He is genuinely committed to our soldiers and this nation and is a great credit to our corps of noncommissioned officers.

One of the aspects of ENFORCE that is extremely important to the future of our Regiment is the interaction that results when we all come together on common ground. This year proved to be very beneficial because we were able to extract recommendations on important issues such as professional and personal development for all soldiers, assignment and training considerations, promotion considerations, and force structure and equipment modernization. One area in particular was the feedback we collected and incorporated into the proponent guidance handbooks that we prepare for every centralized board proceeding. With the recommendations we received from the Council of Sergeants Major, we were able to make some last-minute updates to the FY02 Sergeant First Class promotion board, which convened on 1 June 2002. Although we will continue to review trends that affect promotion opportunities within the Regiment, it is important that all leaders review the proponent guidance posted on the Engineer School Web page and offer feedback on change.

Last year, we performed a groundbreaking ceremony for the Sapper Memorial as part of our ENFORCE Conference. During this year's conference, we announced the new location of the memorial and presented details on its construction. I am happy to report that construction will begin soon, and the proposed completion date is 17 August 2002. In addition, the Army Engineer Association has begun contract negotiations for the Sapper statue that will be positioned at the entrance of the facility. The memorial will be used for Rites of Passage ceremonies, among other Regimental events, and will be a great addition to the installation.

As you all know, the Army and this nation lost a great American and Engineer with the passing of SMA(R) Leon L. Van Autreve in March of this year. Those of you who knew Van (as his friends called him) know that he loved this country; was committed to soldiers, their families, and their quality of life; and dedicated his life to making a difference. He was a very respected, articulate, profound man whose love of life was infectious and transcended all he did and was a part of. In his memory, I have proposed that we honor an outstanding Engineer soldier, the same way we do the Sturgis awardees, and present an annual award, named after SMA(R) Leon L. Van Autreve, to our Regiment's most outstanding Active and Reserve Component soldier (PVT thru SPC). The Army Engineer Association has gained sponsorship for the award, and we will work diligently to ensure that it is ready for unveiling by next year's ENFORCE Conference. I have communicated with Mrs. Rita Van Autreve, Van's widow, and she is very supportive and excited about our desire to do this. The award will be a great honor to those outstanding soldiers who truly represent our Regiment in everything they do across our Army.

In closing, I want to impress upon you the importance of all the hard work you, your units, and your soldiers do, and the hard work that goes on here at Fort Leonard Wood. How vital what we do collectively is to the future of our Regiment and the Army! Engineers are literally everywhere, and the influence we have as a Regiment is evident all over the world. I am proud to have been an Engineer and a Sapper for more than 30 years. And I'm grateful for the experiences that being an Engineer has brought to me and that I have shared with many of you.

ESSAYONS—Engineers Lead the Way!

Operation Enduring Freedom From the Military Engineer Perspective

By Colonel Jerry T. Mohr, Lieutenant Commander Frederick A. "Fritz" Mucke, and Lieutenant Commander Donald L. Maconi

On 11 September 2001, U.S. Central Command (CENTCOM) Engineer Division, and its equivalent staffs within component commands, began the daunting task of directing military engineer efforts for a war unlike any this nation has ever faced. Operation Enduring Freedom (OEF) required engineers to support a unique contingency operation that required extraordinary resourcefulness. Key OEF activities requiring engineer support included contingency planning, engineer unit deployment, airfield repair and upgrade, mine and unexploded ordnance (UXO) clearing, troop protection from environmental hazards, and base camp construction. An obstacle to meeting these challenges was the need for staff augmentation. This article discusses these engineer challenges and some of the lessons learned from them.

Contingency Planning

As the dust settled from the 9-11 terrorist attacks, engineers immediately engrossed themselves in contingency planning. They evaluated the condition of available infrastructure in the area of responsibility and compared this information with engineer assets and capabilities, including those of several units already deployed in the Middle East Gulf region. This helped CENTCOM planners select force bed-down locations. Using this information, they oversaw the deployment of engineers supporting OEF operations.

Soldiers perform runway repair work at Baghram airfield in Afghanistan.

Engineer Unit Deployment

The initial deployment of OEF special operations forces into the area of responsibility did not include supporting engineer units. This shortfall became obvious as the demand for engineers quickly escalated. Some engineer forces already in the area revised their deployments to support early OEF requirements. One such example was an Air Force RED HORSE unit that diverted from a programmed project in one country to a contingency tasking in another.

As OEF progressed past the initial special operations force stage, the flow of forces into the area increased significantly. To support this, Air Force RED HORSE and PRIME BEEF, Army engineer and prime power, and Navy Seabee units received deployment orders to OEF contingency installations to repair and upgrade airfields, construct base camps, and provide electrical power. Army engineer detachments relieved Air Force and Navy Seabee units to continue base construction, maintenance, and repair. Engineers from several coalition partner nations also deployed into the area and supported runway-repair, well-drilling, and mine-clearing projects.

OEF engineer deployments overcame many obstacles to mission accomplishment. For example, limited construction materials and equipment hampered engineer missions. And additional short-fused taskings further strained engineer deployments, such as the construction of short-term holding facilities for detainees.

Yet engineers persevered with innovation and determination, using unique materials and techniques to compensate for resource shortfalls. For example, Navy Seabees at Camp Rhino, lacking equipment to clear foreign object damage debris, brought back to life an old Russian street sweeper from a local junkyard and used it to clear debris from airfield runways and taxiways. Once again, the engineer "can-do" spirit proved indomitable!

Airfield Repair and Upgrade

To support OEF in Afghanistan, warfighters needed airfields in several Central Asian countries surrounding Afghanistan and

eventually within Afghanistan itself. These airfields would support fighter operations, logistical hubs, and force bed down. Because U.S. and Coalition forces had conducted only limited military operations in the region before 9-11, the only airfields and bases available quickly enough to support OEF were several fighter air bases of the former Soviet Union. The Soviets hastily constructed or expanded these airfields during their 1980s Afghanistan campaign. They used precast concrete slabs without rebar and emplaced them over graded ground without a subbase. Years of neglect and conflict, as well as OEF air strikes, had damaged and deteriorated the airfields and the supporting utilities and ground transportation infrastructure. Thus, engineers "operationalized" seven such former Soviet bases with significant infrastructure repairs and upgrades which established air operations for cargo (C-130 and C-17) and fighter aircraft.

A mine detection dog team proofs an area at the Baghram airfield.

Initially, rapid runway repair was the project du jour for engineers. They patched numerous bomb craters, repaired spalled pavement, and laid AM-2 matting to get airfields operational quickly. A more innovative technique was the Navy Seabees' use of "gorilla snot" palliative to suppress dust and stabilize soil for a desert dirt airstrip. But traditional concrete repair techniques necessitated closing sections of runways for days, while waiting for freshly placed concrete caps and patches to cure. Engineers discovered an alternative to conventional rapid runway repair that drastically reduced runway downtime—harvesting undamaged slabs from unused areas of airfields to replace damaged slabs. By replacing these slabs during several consecutive nights, airfields remained operational with minimal disruption while undergoing pavement repair.

The Air Force Civil Engineer Support Agency (AFCESA) performed pavement evaluation studies at each airfield. These studies provided analyses on airfield characteristics such as pavement strength and the number of passes a runway could endure before failing. The analyses also provided recommendations on runway, taxiway, and parking apron usage. Engineers used AFCESA studies to help determine the best use of limited engineering resources for airfield repair and maintenance.

Friendly forces are now using airfields used by our former adversary. Engineers have determined that in order to minimize the need to rework bomb crater repairs, future airfield strikes should avoid bombing the most critical sections of enemy runways—the landing touchdown and turnaround zones from either end of the runway for C-130 and C-17 aircraft.

Even after engineers made these airfields marginally operational, they contained preexisting environmental contamination, and the Afghanistan airfields remained laden with mines and UXO. So before the engineers could construct base camps by the airfields, they had to neutralize these hazards so the bases could support a significant population.

Mine and UXO Clearing

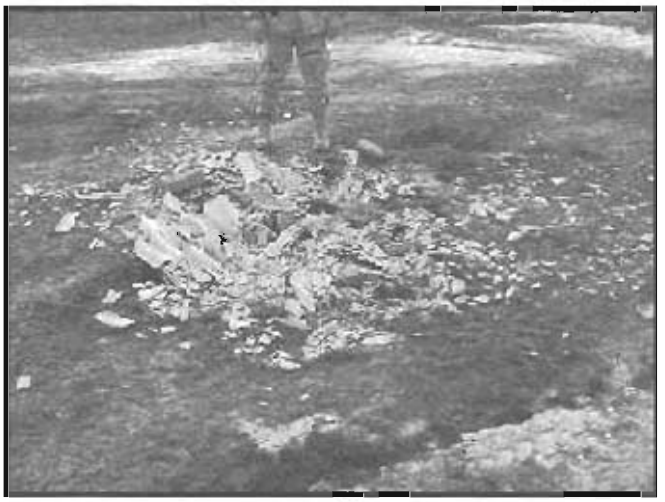
A common thread to every Afghan installation was the force protection requirement to "stay on the concrete" since mines and UXO littered each location. Although demining Afghanistan will be a separate long-term humanitarian-assistance initiative, OEF engineers had to immediately clear these hazards in areas where friendly forces were to live and work. In addition to the bed-down and operating areas, engineers cleared adjacent areas to achieve enough standoff distances for force protection.

Racing to stay ahead of arriving forces, U.S. military engineers initially deployed mine-clearing equipment and armor protection kits for bulldozers, along with operators and repair parts. Then several of our OEF Coalition partners stepped up to the plate, providing mine-clearing equipment, operators, and maintenance teams. As specialized equipment mechanically cleared these areas, contracted mine detection dog teams were used to proof the areas. The effectiveness of these mine-clearing assets allowed U.S. engineers to concentrate their efforts on tent city construction.

Environmental Engineering

During initial stages of OEF, planners faced time constraints and limited options regarding the selection of base locations, so operational planners were not always able to determine the extent of environmental hazards at an installation before deciding to deploy forces there. Ideally, environmental engineers perform baseline surveys within 60 days of deployment to operating bases to document preexisting conditions before U.S. forces arrive, but this was not always possible in OEF.

Engineers relied on the National Imagery and Mapping Agency (NIMA) to provide environmental assessments of potential operating bases, based on imagery analysis. NIMA assessments were sometimes the only source of environmental information available and were therefore invaluable to OEF planners.



Damaged asbestos roof tiles present an environmental hazard.

As U.S. forces flowed into these new OEF bases, some preexisting environmental hazards were discovered that could potentially impact ecological and human health:

- Petroleum-, oil-, and lubricant-contaminated soils—uncovered while constructing force protection berms.
- Exposed asbestos from damaged tiles and insulation—found while repairing and occupying existing structures.
- Low-level radioactive contamination—discovered in soil during earthwork.

Engineers used the U.S. Army Center for Health Protection and Preventive Medicine to help assess these hazards and develop mitigation actions.

Like any military operation, OEF generated significant quantities of hazardous waste (HAZWASTE), including used oil, dead batteries, and waste fuel. HAZWASTE-disposal contracts for the remote forward installations could not be awarded in time to eliminate the need to accumulate and store significant amounts of the waste at bases. It took 7 months to award a HAZWASTE-disposal contract to a qualified contractor and provide the required formal notification to countries receiving the waste.

Radioactive contamination was discovered during earthwork.

Base Camp Construction

As engineers made airfields operational and remediated mine/UXO and environmental hazards, their focus shifted to base camp construction to support the increasing flow of forces. They erected tent cities throughout the area of responsibility, using Harvest Eagle, Harvest Falcon, and Force Provider kits to support the ever-increasing force bed-down requirements.

CENTCOM engineers staffed and developed criteria for standardized guidance for planning and developing austere base camps and promulgated them in the "USCENTCOM Contingency and Long-Term Base Camp Facilities Standards." These standards will allow components to forecast resource requirements and provide tenant units with a common expectation for base camp construction.

CENTCOM Engineer Staff Augmentation

The CENTCOM engineering staff during peacetime is seven officers and one enlisted administrative specialist. With an OEF operational tempo of 24-hour days 7 days a week, the staff required augmentation from both mobilized Reservists and active-duty personnel on temporary duty.

Working through the J1 Directorate, the CENTCOM Engineer Division pursued staff augmentation. In addition to three assigned individual mobilization augmentee Reserve officers, CENTCOM executed its preexisting memorandums of understanding with service components for additional augmentees from both active and Reserve units. At the peak of OEF, the staff grew more than threefold. Work spaces became crowded, but the help was welcome.

Lessons Learned

During the first 9 months of OEF, the CENTCOM Engineer Division learned the following lessons on contingency engineering:

- Deploy more engineers earlier to support special operations forces and other operational units with equipment and skill sets to perform hasty construction. If such engineer assets could enter an area before the establishment of friendly operational airfields and without requiring helicopter support, they could quickly repair key airfields and establish air operations.
- Establish joint standardized guidance for planning and developing base camps, promulgated through a formal yet user-friendly document. It must be staffed and promulgated well before a contingency develops, so that components may quickly forecast resource requirements as a contingency kicks off.

A dozer operates in difficult Central Asian terrain.

- Engage environmental and preventive-medicine personnel early in planning and operations to assess the risks to ecological and human health and safety and mitigate them as much as possible.
- Initiate the HAZWASTE-disposal contracting process as soon as possible, so that these services are in place when needed to minimize operational constraints.

Summary

Engineers faced many challenges and learned many lessons from OEF. Some were typical of any contingency, while others were unique to OEF. Regardless, CENTCOM engineers successfully met the challenges and therefore contributed significantly to our successful and ongoing Global War on Terrorism.

Colonel Mohr served as chief of the U. S. Central Command J4-Engineer Division at the time this article was written. He previously commanded the 1AD Engineer Brigade. A graduate of the United States Military Academy, COL Mohr holds master's degrees in civil engineering from the University of Illinois and military arts and sciences from the Command and General Staff College.

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Lieutenant Commander Maconi, Civil Engineer Corps, U.S. Naval Reserve, has served in several Naval tours as both an active-duty and Reserve officer. He is currently recalled to active duty at USCENTCOM, Logistics Directorate, Engineer Division. LCDR Maconi holds a master's degree in public administration from Troy State University and is a registered professional engineer in Florida.

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Repairing Runways and Clearing Mines in Afghanistan

By Major Dennis J. McNulty

Engineer forces are accomplishing a wide variety of tasks in support of Operation Enduring Freedom. In Afghanistan, they have often been called on to perform missions that are outside of their normal mission-essential task lists. They have built latrines and enemy prisoner of war (EPW) holding areas, repaired runways, cleared large areas littered with mines, repaired water wells, and designed wastewater systems. Castle wearers, regardless of their unit affiliation or normal area of expertise, are considered subject-matter experts in all engineering tasks. And engineer leaders at all levels still need to be "jacks-of-all-trades" to be effective on the modern battlefield.

Engineer units are learning valuable lessons in Afghanistan that should be examined for potential incorporation into future engineer doctrine, organizations, and materiel developments to enhance our current capabilities. And our engineers also acquired valuable information on the tactics, techniques, and procedures (TTP) required for clearing large areas that are heavily littered with mines and unexploded ordnance (UXO). This article will review the observations in these two areas and highlight lessons that were learned during a recent combined-arms assessment trip to Afghanistan.

Engineer soldiers place concrete to repair a runway.

Runway Assessment, Tracking, Repair, and Equipment

Overall, U.S. Army engineer units could repair runways with their organic equipment, but they learned some valuable techniques. In addition, the U.S. Air Force RED HORSE units and their British equivalents introduced our engineers to some equipment that is optimal for rapid runway repair.

Because of a lack of robust ground lines of communications (LOCs) in the area of operation, maintaining air LOCs is a priority throughout the campaign in Afghanistan. A critical mission for engineer units is that of repairing, maintaining, and upgrading designated airfields. The two primary runways in Afghanistan are located at Kandahar and Baghram. Army engineer units were able to keep these runways operating, but they discovered that effective runway tracking techniques had to be established to effectively monitor the rapidly deteriorating runways. Our engineers also discovered that their organic equipment was not optimal for conducting repairs.

Initial Runway Assessments

A team from the Air Force Civil Engineer Support Agency (AFCESA) conducted initial assessments of the airfields at Kandahar and Baghram. The teams generally overestimated the capacity of the airfields. For example, assessment of the Kandahar airfield was that it could support 50,000 passes by C-17s and 50,000 C-130 passes after several craters were repaired and that the Baghram airfield could support 15,000 passes by C-17s and more than 50,000 C-130 passes. When they received these reports, engineer planners were relieved that the airfields could support this amount of heavy traffic. However, for various reasons, neither of these assessments has been accurate. Once the initial repairs were made, the runways have continued to deteriorate to the point that they require daily maintenance.

The premature failure of the Baghram airfield can be attributed in part to several passes made by Russian IL-76 and AN-124 aircraft—the first being about the size of a C-17 and the second being among the largest airframes in the world. There was no projection to use these large airframes on the airfields, but there was no way to limit the use of large aircraft until the airfield failed and the Kabul airfield opened. The failure to support the number of passes at the Kandahar airfield may be attributed to an errant estimate during the assessment that the base was up to 12 inches thick when actually the runway had very sparse base material under some areas.

Had the AFCESA reports been available to Army engineer units before they deployed, the information would have helped the units prepare for their repair and maintenance missions.

Engineers construct a head wall.

Runway Tracking Technique

The method used for surveying and assigning priorities for repair on a given runway was simple but effective. Repair teams divided the runway into sections or grids, systematically numbered these sections, and then assessed the condition of each. Teams were assigned numbers or color codes that indicated each section's current condition. Sections with a number one or a red color had failed or were in poor condition and required immediate replacement. Sections assigned a two or amber color were in better condition but needed to be monitored for eminent deterioration. Sections with a three or a green status were generally in good condition and were in no danger of failing in the near future. The runways were monitored and reassessed periodically as they deteriorated. The Baghram airfield was constructed of 10-foot by 20-foot concrete slabs, so each slab became a monitored section. At Kandahar, the runway was surfaced with asphalt and was tracked using station numbers.

Runway Repair Technique

The Air Force and British runway repair teams used a "slab-harvesting" technique at the Baghram airfield. Small patches of damaged runway were cut out, the subbase was replaced and compacted, and the area was capped with undamaged slabs cut from unused areas of the runway or taxi areas. This technique required a large concrete saw—which U.S. Army units did not have—so they used precast slabs or placed concrete directly into the prepared section.

The aggregate to replace the base, or to make concrete if necessary, was procured locally. It was difficult to obtain early on because of the austere infrastructure and limited suppliers available, but this situation gradually improved. Type I cement was the only kind available in Afghanistan, so all Type III cement (needed for proper repair of the runway) and all cold patch (needed to repair the asphalt at the Kandahar runway) had to be flown in. Keeping an adequate supply of these repair materials on hand was a constant challenge.

Runway Repair Equipment

Three pieces of repair equipment were particularly critical when conducting the slab-harvesting repair technique: a forklift (for lifting and moving the replacement slabs into place); a concrete saw; and a small, highly maneuverable compactor. Since the U.S. Army units did not have the concrete saws required to cut concrete patches, they purchased two of them from the Air Force units when they departed.

The Bobcat® excavator was a very versatile and easily transportable piece of equipment. Small enough to be transported by a CH-47 helicopter as either an internal or external load, it was critical when repairs were needed at the airfield near Mazar-e Sharif, where fixed-wing aircraft could not land because of craters. In addition, a commercial ditching machine was useful for trenching in lighting cabling to make the runway operational at night and for digging in other cabling and sewage lines. The combat heavy engineer battalion purchased these two pieces of equipment before it deployed.

The Army's repair capability was further enhanced when it purchased a small, portable concrete vibrator; a walk-behind vibratory compactor; and an adjustable concrete screed from the Air Force. The Army units had manual hand tampers but found that the plate compactor attachments on the Bobcat were easier to use and quite effective. In addition, the Bobcat's pavement-breaking attachment was more reliable than the breaker on the 250-cubic-feet-per-minute (cfm) trailer and the small emplacement excavators. The sweeping attachment of the Bobcat was useful for cleaning the runway after repairs were made. The Army has a nonadjustable 20-foot concrete screed, and soldiers conducted manual screeding of repairs over 20 feet wide. The pneumatic concrete vibrators purchased

from the Air Force provided more maneuverability and were more reliable than the ones for the 250-cfm compressor.

A larger issue with engineer equipment in Afghanistan was the number of aircraft sorties required to transport it into and within the theater of operations—nearly half of the sorties allotted to transport the entire brigade task force. It must be noted that the combat heavy battalion deployed with less than half of its assigned heavy-construction equipment. Had the airfields not been C-17 capable, moving the engineer equipment into Afghanistan would have been extremely difficult, if not impossible. As it was, several transloads were conducted, which resulted in separation of forces and equipment and delayed arrival of mission-critical pieces. Engineer equipment required 67 intertheater and 22 intratheater C-17 sorties to move into and around the theater.

Because of the complexities involved with air loading heavy engineer equipment, air-load planning is a must, even for units that do not traditionally move their equipment by air. Coincidently, the combat heavy battalion that deployed to Afghanistan had executed an air-load training event just before 11 September. In the exercise, the battalion loaded a dozer, a grader, a bucket loader, and a roller. Unit personnel became familiar with shoring and tie-down procedures for heavy equipment. The battalion was fortunate in that the theater airlift control element (TALCE), which was subsequently assigned to assist the battalion during the actual deployment, was the same team that had assisted the unit during the air-load training. This ensured the rapid and efficient deployment of the battalion because the TALCE unit was already familiar with the battalion's equipment.

Lessons Learned

- Leaders should carefully scrutinize airfield assessments as early as possible, especially when they are surprisingly optimistic.
- Army engineer units operating in areas that depend on air LOCs need to be highly trained and properly equipped to perform rapid runway repair techniques.
- Bobcats with appropriate attachments are highly effective for repairing runways.
- Concrete saws; small, maneuverable compactors; and a forklift are essential pieces of equipment for runway repairs requiring slab harvesting.
- Runway repair equipment should be small and easily transportable by helicopters or C-130s since the runway needing repair may not be open to large aircraft.
- Units should practice air loading their equipment, preferable with an available TALCE unit.
- Unit leaders need to ensure that their units have an adequate number of air-load planners and hazardous-material-qualified personnel for air loading their equipment.

Mine- and UXO-Clearance Operations

Engineer units were faced with the daunting task of clearing literally thousands of mines and UXO from thousands of square kilometers of ground to make the immediate areas safe for occupation and use by Coalition forces. The mine and UXO threat is extremely high in Afghanistan, particularly in the areas surrounding the Kandahar and Baghram airfields. An estimated 8 million-plus mines and UXO litter the countryside. The Soviets used antipersonnel (AP) minefields to protect the airfields and left them in place when they departed. These minefields were fenced and generally well-marked. Subsequently, however, the locals have lifted many of the mines and replanted them in areas outside of marked minefields. Both the Taliban and Northern Alliance forces are suspected of lifting mines and planting them in unmarked fields during their battles in and around the Baghram airfield.

Mines located in the vicinity include the PMN, PFM, POM-Z, TM-62, MON-50, MON100, TS-50, TC-6, and YM-1. UXO include AO-2.5 and PTAB-2.5KO, which are particularly prevalent, along with bombs with weights ranging from 200 to 500 kilograms. In addition, unexploded U.S. BLU-97s, which were dropped during early offensive operations, have been found. The U.S. forces that deployed were generally well-informed of the threat and the numbers and types of mines and UXO that they would encounter. At the time this article was written, there had been 10 mine and UXO incidents in Afghanistan, resulting in several deaths and severe injuries.

Coalition engineers and explosive ordnance disposal (EOD) units conducted clearance operations to make designated areas safe for use by Coalition forces. It is important to note that Title X, USC, prohibits U.S. soldiers from conducting humanitarian demining operations. Demining and area clearance differ in that area-clearance operations render an area reasonably safe for an operational use, while demining operations give a very high level of assurance that all mines and UXO have been removed from a designated area.

The procedures used to clear areas in Afghanistan were based on several factors, such as the estimated threat of encounters, the purpose of clearing, the type of terrain to be cleared, the type of clearing resources, and the time available. Generally, there were three methods of neutralizing mines in Afghanistan: manual, explosive, and mechanical.

Manual Clearing

The least preferred method, manual clearing involves manually moving or lifting mines or UXO out of the way. U.S. soldiers do not manually lift mines and, as this method involves the greatest amount of risk, it is not the preferred method of many Coalition force engineer units either. Lifting techniques are used to recover whole mines intact to use as training aides after they have been rendered safe. Mines that contain an explosive which remains stable over a long period, have a relatively stable activation mechanism, and are well-exposed are candidates for manual lifting. PMN mines were the most

common manually lifted mines. The Norwegian engineer unit rendered several PMNs and PMN-2s safe in Afghanistan.

Explosive Clearing

Clearing mines and UXO with explosives involves placing the explosives in close proximity to the mines or UXO without disturbing them and then blowing them in place. U.S. Army EOD units and the Norwegian engineer unit also used a technique called small-arms UXO disposal (SMUD). While not technically an explosive method, this technique involves shooting the mine or UXO at a precise location. The intent of this method is to separate the fuse from the explosive material before the fuse can be activated; however, the munition often explodes during this process.

An MCAP dozer clears an AP minefield.

The preferred rifles to use with the SMUD technique are the .50-caliber Barrett rifle, the 7.62-millimeter M23 MKS sniper rifle, or the 5.56-millimeter M16 equipped with a scope. The munition must be clearly identified and exposed, and the shooter must know the preferred point of attack for particular munitions. The shooter also must know the blast radius and the general fusing and activation technique for particular munitions. Combat engineers in the U.S. cannot use this method because they are not equipped with SMUD rifles, nor are they permitted to dispose of UXO. Norwegian engineers effectively used this technique with the .50-caliber and 7.62-millimeter rifles. In addition, they have a special .50-caliber weapons station on selected M113 armored personnel carriers, which allows a slightly modified .50-caliber machine gun to be accurately aimed and fired from inside the M113 by using a telescopic camera site. The Norwegian engineers also were equipped with manportable ballistic shields, which they use to provide limited cover while engaging UXO.

Mechanical Clearing

Mine-Clearing Armor-Protected (MCAP) D7 Dozer. Two MCAP dozers with mine-clearing rakes were used in Afghanistan. To maneuver in tighter areas where only AP mines were suspected, one of the dozer's mine rakes was replaced with a standard dozer blade. The dozers either set off mines or windrowed them into berms without detonating them. The MCAP dozers were effective at clearing mines to a depth of about 6 to 18 inches (15 to 45 centimeters), depending on the soil conditions. The soil was usually loose enough to allow the dozer to clear to at least 12 inches. The MCAP dozer could withstand blasts from AP mines with little or no damage. However, the enclosed cab intensified the blast effects from detonation, and if operators detonated several mines in rapid succession, they had to be relieved because of the percussion effects they experienced.

The mine-clearing rake configuration was the preferred configuration since it was more likely to unearth and windrow the mines off to the side. In one clearing operation, the MCAP dozer equipped with the mine rake unearthed four antitank (AT) mines, which were daisy-chained together, without detonating them. The system worked as intended and lifted and pushed them off to the side. Soldiers from the combat heavy engineer battalion operated both dozers. The battalion received the armor kits just before deploying and permanently installed them on their dozers (a somewhat arduous task) once they arrived in theater. In another clearing operation, the MCAP dozers unearthed 14 AP mines and detonated 5 of them.

The armor plating of the dozers severely restricts the operator's vision so, during clearing operations, a ground guide is stationed at a safe distance to guide the operator and observe the spoil for unearthed mines or UXO. A disadvantage of the MCAP dozer is that after clearing an area, not only is the recently cleared ground susceptible to becoming a quagmire, but a berm which may or may not contain mines remains to be cleared later. Another disadvantage is that when fully equipped, the MCAP dozer can only be transported on a C-17 or larger aircraft unless it is disassembled and transported as several separate C-130 loads.

Flails. Three types of flails were used in Afghanistan. The Norwegians used the Hydrema 910 mine-clearing vehicle, and the Jordanians and British used the Aardvark mine-clearing vehicle—both considered medium flails. The United States had three miniflails.

Hydrema 910. This flail, which is C-130 transportable in its standard configuration, was used with great success. It is mounted on an articulating, wheeled vehicle which has one engine that provides power to the flail and one that provides power to the vehicle's drive train.

The Hydrema was particularly well-suited for the terrain and soil conditions in Afghanistan. The terrain was generally flat and the soil was generally loose silt and sand with occasional areas of hard-packed caliche. This flail detonated numerous AP mines and received very little damage; it also detonated a TM-62 AT mine with minimal damage. The Norwegians reported that they had successfully tested the Hydrema on mines as large as the U.S. M15 AT mine.

The Norwegians had two Hydremas in Afghanistan. They had modified one by installing oversized tires, which gave the

A mine detection dog and his handler proof an area.

vehicle better traction, especially in wet conditions. Under normal conditions, the Hydrema is set to clear to 18 centimeters (7.2 inches) below the surface, but it can clear as low as 40 centimeters (16 inches) at a much slower rate. The Hydrema's normal clearing rate is about 1,800 square meters per hour. In Afghanistan, the Hydrema had a high operational readiness rate, and the Norwegians came with spare parts, mechanics, and support equipment.

In addition to its slower clearance rate (compared to the MCAP dozer), a big disadvantage of the Hydrema, as well as other flails, is that the ground is left in a condition that allows it to turn into a quagmire with only a small amount of rainfall. Another drawback of the Hydrema was that it generated a cloud of dust. The direction of clearing was often determined by the direction of the wind, since the operator could not see when the dust blew back on the vehicle.

Aardvark. The Jordanians and British used the Aardvark to clear mines in much the same way as the Hydrema was used. The partially tracked vehicle, which gives it better traction in rough or wet terrain, experienced a somewhat low operational readiness rating for two reasons: repair parts were not readily available, and U.S. mechanics, who were unfamiliar with the Aardvark, were the only mechanics available to maintain it. Therefore, it was hard to ascertain if the low operational-readiness rating was due to the equipment reliability or if it lacked the proper repair support.

Miniflail. The U.S. engineers had three remotely controlled miniflails, but they were not very effective in clearing mines, mainly because they were underpowered. In one instance, the miniflail encountered two PMN mines—one failed to detonate and the other detonated and rendered the miniflail completely inoperative, making it necessary to extract it from the area. The consensus of observers was that they would not feel comfortable walking into an area where the sole clearance method was the miniflail. However, the small size of the miniflail made it ideal for clearing in tight areas around buildings or along trails. Because it can be transported in a CH-47 or sling-loaded under a Blackhawk, the miniflail concept is ideal for extracting soldiers from minefields.

Detection Means

Clearance operations generally depend on the ability to detect mines or UXO before they are encountered. Conceptually, if you can first identify the location of each mine or UXO, the risk to clearers is significantly reduced. Because the ground around the Kandahar and Baghram airfields was littered with all types of metal clutter, standard metal mine detectors were almost useless. So the primary methods of detecting mines and UXO were visual and with mine detection dogs.

Visual Detection. Many of the UXO were surface-laid and were easy to see in the sparse ground cover of the area. Most of the AP and AT mines, however, were buried and very difficult to see. In lower-threat areas, several Norwegian soldiers carefully walked the area and located surface-laid UXO before they flailed the area with the Hydrema. For obvious reasons, visual detection is the least preferred method. When the Norwegian engineers entered high-threat areas, they wore pneumatic air boots, which significantly redistributed their weight and reduced the per-square-inch pressure on the ground.

Mine Detection Dogs. Eight teams of dogs and their handlers were brought in from Bosnia and used successfully. The dogs alerted their handlers whenever they smelled a mine or UXO. Once alerted, the handler pinpointed the mine by visual means or by probing and then either marked or manually neutralized it as appropriate. On one occasion, a dog even located a UXO buried several feet below the surface. The dogs were generally used to proof areas to be used for troop bed-down facilities, after the areas were flailed or plowed with the MCAP dozer.

A drawback of using dogs for mine detection is that the method is significantly slower than mechanical methods. Dogs are also affected by environmental conditions. For example, hot weather limits the amount of time the dogs can work. As of mid-March, the mine detection dogs at Kandahar worked about 4 hours in the early morning and then again for a short period in the late evening. As the summer progresses and temperatures rise, the number of hours that the dogs can work each day will be significantly reduced—perhaps even to the point that they will be ineffective for clearing large areas. The temperature effects may not be as drastic in Baghram, where the higher elevation will keep temperatures moderate for a longer period.

For obvious reasons, extreme levels of dust negatively affect a dog's ability to detect mines. Also, recent detonations in an area render it unsuitable for using dogs for several days because the explosive material scents the area. The amount of moisture on the ground also affects the dog's ability to detect mines and UXO. As the ground dries, vapors from the explosives rise and concentrate above the munitions. Because of this, an optimal time to work dogs is shortly after a moderate rain as the ground is beginning to dry out.

The table at right summarizes the author's opinions of the advantages and disadvantages of the mine neutralization and

*Advantages and Disadvantages of Neutralization and Detection Methods		
Neutralization Method	Advantages	Disadvantages
MCAP Dozer	- Has a rapid clearance rate - Clears AP mines - Clears subsurface, but has no depth control - Mechanically reliable - Clears rough terrain	- Leaves uncleared berms - Not C-130 transportable - Causes severe percussion if AT mine detonates - Makes ground susceptible to becoming a quagmire
Medium Flails Aardvark and Hydrema	- C-130 transportable - Offer depth control - Clear at a relatively rapid rate - Likely to withstand AT blasts	- Slower than the MCAP dozer - Cause a large dust cloud - Make ground susceptible to becoming a quagmire - Less effective in rough terrain
Miniflail	- Effective for mine extraction and MOUT areas - Highly transportable	- Allows minimal subsurface clearance - Has a slow clearance rate
Explosive	- Has a high probability of neutralization (if munition is seen) - Effective for point targets	- Not effective against buried munitions - Requires direct soldier exposure - Not effective for large areas
SMUD	- Requires no direct soldier exposure - Effective for point targets	- Requires special training - Requires special equipment - Requires pinpoint detection
Detection Method	Advantages	Disadvantages
Visual	- Easiest method - Can scan large areas	- Not effective for buried munitions - Only as good as the observer's visual acuity - Requires direct soldier exposure
Metal Detector	- Highly effective for high-metal mines and UXO	- Not effective with metal clutter or ferrous soil - Relatively slow - Requires direct soldier exposure
Mine Detection Dog	- Has a high success rate under ideal conditions	- Relatively slow - Affected by environmental conditions - Requires intensive training
* NOTE: The advantages and disadvantages shown above are based on the subjective opinion of the author and are intended to give the reader a comparative analysis of the various clearance methods used in Afghanistan. This is not intended to be a complete objective analysis.		

detection methods used in Afghanistan. The table is not intended to be a complete objective analysis of clearance methods.

Clearance Tactics, Techniques, and Procedures

In areas where it was unclear if mines or UXO were present, the preferred method for initially clearing was the MCAP dozer or the flail. The overall clearing TTP used to clear large areas was usually to combine at least two or three detection or neutralization methods to increase the probability that no munitions remained. One example already mentioned was using the MCAP dozer or the flail in bed-down areas and then proofing the area with dogs. This procedure became a problem when the flail or MCAP dozer detonated a mine. Then the dogs could not be effectively used for proofing because of the scent from the explosion. In these situations, if time permitted, the dogs returned a day or two later and reworked the area. When time was short, the MCAP dozer was used, followed by a visual inspection of the area by engineers. In low-threat areas, the Norwegians walked the area to conduct a visual inspection, used the flail, and then reinspected the area.

Area-Clearance Tracking and Control

The task forces at each camp in Afghanistan effectively track area-clearance operations, but as of this writing, they had not established robust military mine action centers. These centers are needed to act as the single point of contact to collect information on the mine/UXO threat in the surrounding areas, coordinate area-clearance activities, prioritize areas to be cleared, and keep a single updated map and database that contain all mine-clearing operations.

At each base camp, engineers were responsible for tracking clearance operations and reporting which areas had been cleared and where mines and UXO had been located. They have made contact with the local demining organizations and have maintained good communications with these organizations. However, in some circumstances, clearance procedures are not being tracked in enough detail to allow the areas to be turned over to a humanitarian demining center upon conclusion of operations. To continue their operations, the humanitarian deminers need an exact description of the procedures and markings used in each area so that they can determine what further actions are required to certify that the area is cleared to

Tier III United Nations demining standards. As soon as possible after the immediate operational areas are cleared, mine-clearing participants need to meet and establish a military mine action center and ensure that procedures are established for reporting the current status and assigning priorities. The mine action center is responsible for establishing a master plan for clearing areas and for establishing standards for how these areas are to be cleared. Representatives from each clearance unit need to attend regularly conducted area-clearance meetings to report the current status, update the group, and review the current priorities.

Role of EOD Personnel and Sappers

An observation made regarding the interaction of EOD personnel and engineer units in Afghanistan was that most of our Coalition partners embed their EOD personnel in their engineer forces. And, in my opinion, some of the Coalition force engineers seemed to be more knowledgeable on threat mines and UXO and their internal workings than their U.S. counterparts.

On the ground, U.S. EOD personnel and engineers communicated well with each other and worked well together. U.S. EOD units called the U.S. engineers whenever they encountered minefields, and engineers asked for EOD support when they encountered UXO. An EOD representative was usually in contact with the engineer staff on a daily basis and, at Baghram, an EOD staff representative worked directly inside the engineer staff cell.

In some situations, EOD personnel were preferred over engineers when it came to destroying weapons caches because of a fear that the caches would be booby-trapped. U.S. engineers (12Bs) currently do not receive booby trap training in basic or advanced individual training. Likewise, U.S. engineer officers receive no training on booby traps in the Officers Basic Course or Engineer Captain's Career Course. The Engineer School is working to alleviate this situation by initiating a new booby trap familiarization course at Fort Leonard Wood, Missouri. The course—which will train students in the rudimentary elements of booby trap recognition, detection, reporting, and clearance planning—will greatly enhance any previous training that soldiers may have had. It must be emphasized that the course will not make the students "experts" at booby trap clearance—nor is it intended to. Booby trap clearance operations are inherently dangerous and, as such, should always be conducted with the assistance of EOD technicians.

Lessons Learned

- The MCAP dozer was an effective tool for clearing large areas, especially when the dozer was equipped with a mine rake.
- Installing armor plating on a D7 dozer was an arduous task and limited the dozer's uses for other missions.
- The Norwegian Hydrema was highly effective in clearing large areas.
- Norwegian engineers are equipped to conduct SMUD operations and have pneumatic mine boots, which they claim are highly effective.
- Mine detection dogs were effective at detecting mines.
- Units need TTP for establishing military mine action centers.
- U.S. engineers need booby trap training, need to be more familiar with the characteristics of various mines and UXO, and need to be prepared to react to mines and UXO properly when they are encountered.

Conclusion

Engineers at both the individual and unit levels are accomplishing a wide variety of tasks and missions in Afghanistan, many of which are outside their designated specialty areas or traditional missions. For example, light engineers built EPW holding areas, latrines, and guard shacks, while combat heavy units cleared large areas, conducted security operations, and made water wells and wastewater systems operational.

One thing was clear: engineers—no matter what their unit affiliation or normal area of expertise—were looked on as subject-matter experts in all engineering tasks. And it was evident that engineer leaders at all levels still need to be jacks-of-all-trades to be effective on the modern battlefield.

Engineer soldiers build latrines.

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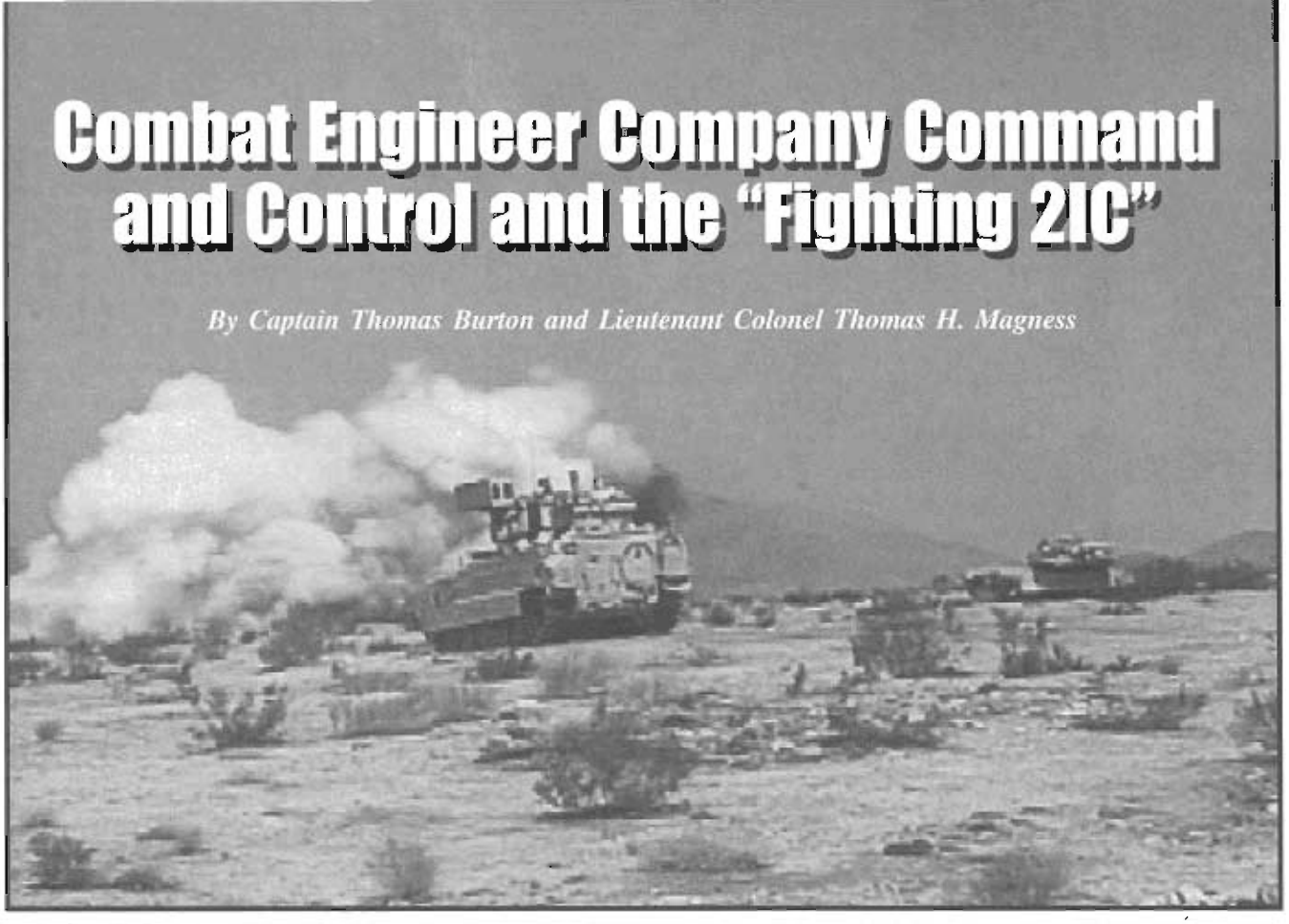
Combat Engineer Company Command and Control and the "Fighting 2IC"

By Captain Thomas Burton and Lieutenant Colonel Thomas H. Magness



Field Manual (FM) 71-1, *Tank and Mechanized Infantry Company Team*, provides the following definition of the responsibilities of the maneuver company second in command (2IC):

- Assist the commander with command and control (C2).
- Ensure that accurate, timely tactical reports are sent to higher headquarters.
- Conduct tactical coordination with higher, adjacent, and supporting units.
- Assist the commander in company troop-leading procedures.
- Prepare to assume command if necessary.

All of these roles are critical and are designed to do one thing—help the maneuver commander command his company. Without the assistance of the 2IC (typically the executive officer [XO]), the requirements and burdens of command in a warfighting scenario can be overwhelming. The 2IC is the commander's right-hand man—his wingman—with a similar fighting platform (tank or Bradley) to fight forward and help command.

Who fills this role in the combat engineer company? Rotation after rotation, battle after battle at the National Training Center, Fort Irwin, California, the answer continues to be the same—*no one*. Yet combat engineer companies are executing more combat missions as a warfighting headquarters—not simply as force providers and task-force-level staff integrators. We see engineer companies as the breach force in task-force-level breaching operations, engineer companies in direct support to the task force during defense-in-sector preparations, and an economy-of-force element to conduct shaping operations during movements to contact. With increasing frequency, engineer commanders are commanding their companies—but they are doing so without the assistance that their maneuver peers could not possibly fight without. The results, typified by the scenario in Figure 1, page 16, and amplified in the subsequent sections, include—

- Breakdown of C2 at the critical point of the fight—often the breach.
- Span of control issues—one leader working across the full width and depth of the task force's battlespace, orchestrating the combat operations for a variety of subordinate units with a variety of critical tasks.
- Minimal assistance provided to the commander during the planning, preparation, and preexecution phases of the mission.
- Reporting requirement—overload. One leader cannot be expected to manage at least three nets (typically engineer company command, maneuver task force command, engineer battalion command) simultaneously.
- Combat service support (CSS) issues—especially maintenance—often take "center stage" and become the commander's close fight.
- Succession of command—no one is prepared to take over the company should the commander be unable to continue.

> ***"In circumstances where experience provides few answers, commanders combine their experience, intuition, and judgment with the recommendations of the staff and subordinates to create new strategies."***
>
> ***FM 3-0, Operations***

The Dilemma

The National Training Center continues to highlight the following observations and trends with respect to engineer company C2:

Engineer Company/Teams

With increasing frequency, we are seeing a transition from engineer commanders functioning as task force mobility/survivability (M/S) Battlefield Operating System (BOS) integrators (dividing out resources and advising task force commanders) to warfighting company commanders in leaner (three maneuver companies under the Force XXI design) task forces.

In offensive operations, task force commanders are increasingly likely to leverage the capabilities and leadership of the engineer commander as a breaching or shaping force or a mobility reserve. During defensive operations, companies consistently fight pure, typically in direct support to maneuver units. Engineer transition into Bradley engineer fighting vehicles (BEFVs) will add combat power and capabilities to the task force that will make these arrangements even more likely.

During offensive operations, the engineer commander is more likely to serve as the breach force commander. As such, he is typically responsible for creating and marking lanes through or around obstacles, securing the nearside and farside of the obstacle, defeating forces that can place immediate direct fires on the reduction area, and reporting lane statuses/locations. The reverse breach planning process, outlined in FM 3-34.2, *Combined-Arms Breaching Operations*, often results in a breach force (the engineer company/team) with six or more platoons, each with unique capabilities. Figure 2 depicts one possible organization for actions at the most critical point

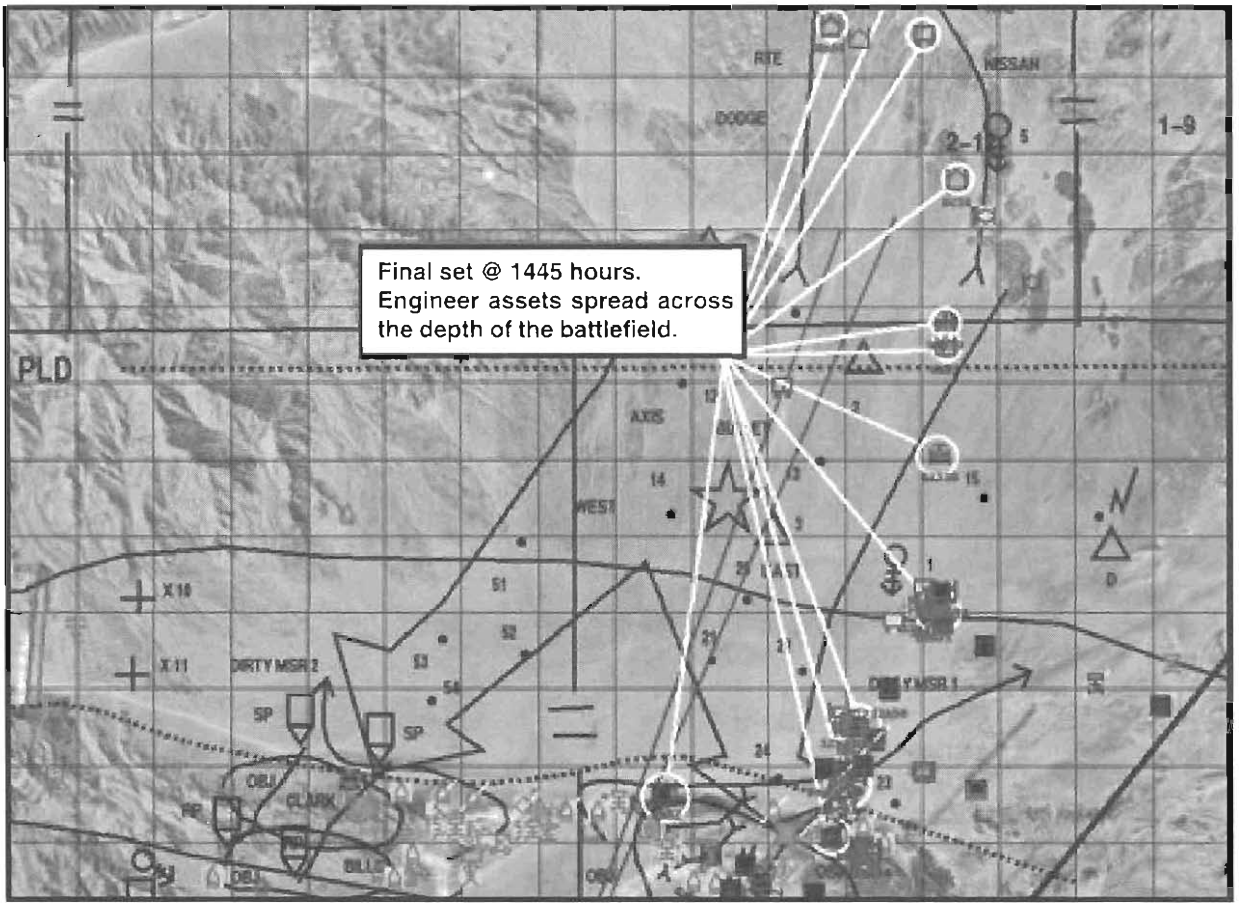


Figure 1. Breach force C2 at the breach

on the battlefield for an attacking task force—the breach. The engineer commander may have a tank or Bradley platoon to secure the point of breach, a mechanical smoke platoon to screen movement into and actions at the point of breach, two to three sapper platoons with attachments to reduce two lanes (with redundancy), and perhaps even a military police platoon to facilitate traffic flow around or through obstacles. The engineer company/team may also include an assault and obstacle (A&O) platoon tasked with mobility or countermobility missions, to include mine-clearing line charge (MICLIC) reload operations, lane improvement, Volcano emplacement, and other countermobility and survivability tasks associated with flank security or hasty defense.

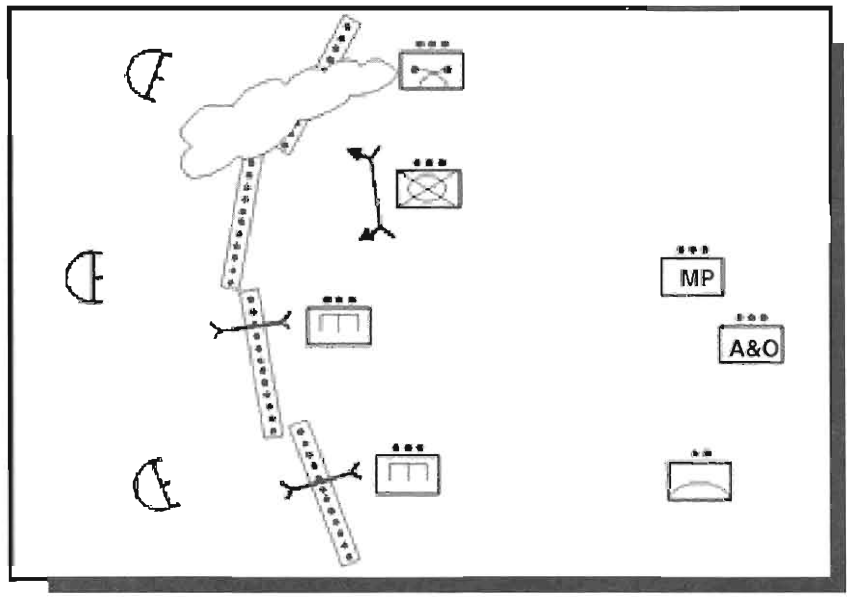


Figure 2. Breach force at the point of the breach

Is it any wonder that we continue to list breaching operations as the most complicated mission we ask our units to execute? By some measures, we have created a completely horizontal engineer company C2 structure that, in many cases, contributes to the complexities at the breach. Add to these the requirements to synchronize indirect and direct fires (attached maneuver or organic BEFV systems) at this critical phase of the attack, and the friction approaches chaos! In most scenarios, the commander must execute all of this without his own unique, appropriately positioned command post (his command post is tied into the task force tactical operations center [TOC] along with his company XO, wherever that may be) and no wingman!

Communications Overload

While the engineer commander fights his company, the task force and engineer battalion commanders are fighting their respective units and need continuous, accurate reports to be able to make decisions and keep their own higher headquarters informed. Typically this results in the requirement for the engineer company commander to monitor three FM nets (company command, task force command, and engineer battalion command) using only two radios. It cannot be done! Unfortunately, no one is forward with the commander to relieve him of some of these reporting requirements so that he can focus on his primary responsibility—fighting his company.

CSS Challenges

As engineer companies fight, they expend resources like any other unit—and things break. Whether accounting for the unique requirements of organic and attached units (M1 fuel, fog oil resupply, MICLIC reload operations, or even Stinger missiles), or keeping a firm hand on the readiness of aging engineer equipment, CSS is not a "change-of-mission" event. Unfortunately, the leader who is the primary CSS planner and maintenance integrator in most combat engineer companies in garrison (the company XO) is typically not available to help orchestrate these critical tasks during combat operations. Whether by design or by default, the engineer company XO is "locked" inside the task force TOC, leaving only the company first sergeant and the company commander to plan, prepare, and execute the critical "Paragraph 4" tasks. *WHERE IS THE HELP?*

Succession of Command

Who is the 2IC? Who has the situational awareness to take command should the commander be unable to continue? Who is positioned on the battlefield to be able to do this without losing momentum? Who has the fighting platform, the communications capabilities, the requisite leadership skills, and an adequate understanding of the plan to be able to "step up" if required? Answer—*no one*.

A Fighting 2IC

There are at least two possible courses of action (COAs), neither of which is easy nor perfect. Each has advantages and disadvantages and may require some "outside-of-the-box" thinking. Hopefully, the issues identified above are enough to make us all do so. Both COAs take into account that someone must fill the role of dedicated BOS integrator within the task force TOC—and someone *must* fill the role of 2IC.

COA 1

Use the XO as the fighting 2IC while moving the A&O platoon leader into the task force TOC to serve as the assistant task force engineer (A/TFE)/task force staff officer. The XO is the most senior and experienced lieutenant in the company, typically having served as a platoon leader and as a staff officer. The XO is already the company's chief CSS and maintenance planner and coordinator. He is the actual 2IC, already handles many of these 2IC duties when not deployed with the task force, and is arguably the leader most capable of assuming command when necessary. Observations at the National Training Center are that the A&O platoon leader is considerably

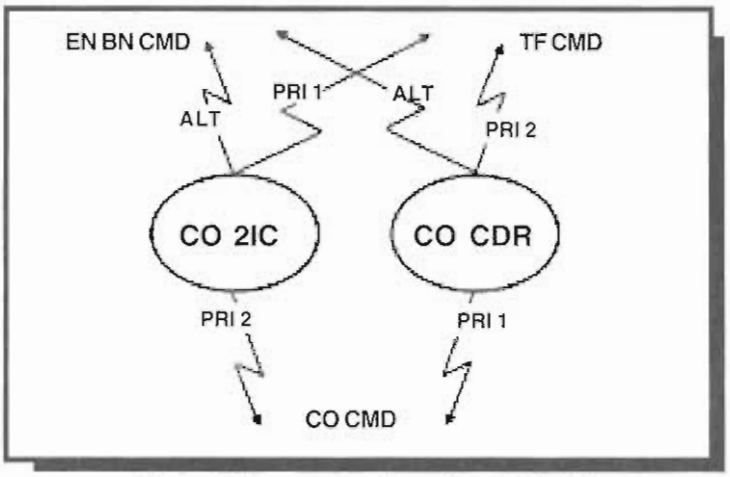


Figure 3. Commo configuration "A Way"

underutilized. His assets—M9 armored combat earthmovers (ACEs), armored vehicle-launched bridges (AVLBs), armored vehicle-launched MICLICs (AVLMs), and Volcanoes—are generally not working for him but are task-organized with one of the line platoons. What remains could be led by the platoon sergeant. We submit that the task forces will not, or do not, care who shows up as the A/TFE—as long as that person is a dedicated, competent engineer staff officer. The A&O platoon leader generally has an adequate understanding of his company's capabilities and should be able to work with the task force staff to integrate engineers and the M/S BOS into the task force scheme of maneuver. This is a paradigm shift, but a manageable one. (We said this would not be easy!)

COA 2

The A&O platoon leader serves as the fighting 2IC, and the XO stays in the TOC. This COA is clearly the easiest to implement. The XO continues to serve as most currently do, integrating the BOS at the task force level, while the A&O platoon leader, currently underutilized, is empowered to help the commander command. With respect to CSS, most maintenance issues within the engineer company are related to the A&O platoon, so its leader is already familiar with a large percentage of the critical logistics issues. However, the A&O platoon leader is not as experienced as the XO and is not the actual 2IC.

Discussion

The division of labor between the commander, fighting 2IC, and engineer BOS integrator (A/TFE) does not vary between either COA. While the commander still has overall responsibility for commanding the company and being a task force staff officer (task force engineer), he has a dedicated lieutenant to assist in each capacity. The commander gives the A/TFE guidance and direction for the integration of the M/S BOS into the task force scheme of maneuver. The 2IC has a primary focus of helping the commander command, assisting with leadership, discipline, employment, training, and sustainment of the company.

The engineer BOS integrator fights from the task force TOC. He assists the commander with the initial development of the engineer battlefield assessment, works with the task force S2 in developing the task force's situation template, and participates in the military decision-making process with the task force staff to help the commander integrate engineers into the task force's scheme of maneuver. He further assists with the preparation of the task force engineer annex, company operations order, and engineer logistics planning in the task force sector. He monitors engineer preparation and execution status as an integral part of the task force TOC.

The fighting 2IC is responsible for ensuring that accurate and timely tactical reports are sent to both the supported task force and engineer battalion. He conducts tactical coordination with higher, adjacent, and supporting units; conducts additional missions as required; assists the commander with troop-leading procedures; and, in conjunction with the first sergeant, plans and supervises the company CSS effort. During the fight, he assists with C2 and ensures that tactical reports are sent to both higher commands (task force and engineer battalion) (see Figure 3).

In both COAs, the A&O platoon sergeant must be prepared to take over the duties of the platoon leader in the field. The platoon leader serves either in the task force TOC (COA 1) or as the commander's wingman (COA 2). Most likely the senior and most capable of the available platoon sergeants in the company, the A&O platoon sergeant's role is primarily that of force/asset provider and CSS executor.

Benefits of the 2IC

A fighting 2IC provides value to more than just the engineer company commander. Reducing the number of tasks the engineer company commander must *personally* accomplish allows him to focus on the critical aspects of the company fight without sacrificing tasks critical to higher and adjacent units. While the commander may focus on critical planning/preparation issues such as company orders, precombat checks and inspections, and rehearsals, the 2IC may be tracking unit statuses, planning and coordinating company CSS efforts, and assisting in troop-leading procedures. Since the 2IC is familiar with the company scheme of maneuver that he helped the commander develop, he may be available to attend the brigade-combat-team (BCT)-level M/S rehearsal, freeing the commander to complete his company and task force combined-arms rehearsals—definitely a win-win scenario! During the execution phase, the commander can focus on the critical aspects of fighting his company. The 2IC pushes combat reports (yes, this is another paradigm shift—engineer companies pushing information!) to the task force and engineer battalion and coordinates supporting efforts such as mechanized smoke, air defense, or CSS, again allowing the commander to fight his company.

Similar to tank and mechanized infantry company 2ICs, our 2IC primarily focuses on integration with higher and adjacent units. Therefore, the task force and engineer battalion

commanders get firsthand spot reports as the situation develops, regardless of how involved the commander is in the close fight. The improved situational awareness at task-force and engineer-battalion levels improves the abilities of both commanders to make decisions. The task force commander is better prepared to shift focus of supporting forces and commitment of assault forces. Even more time critical is the engineer battalion commander's ability to shift engineer assets across the BCT to take advantage of successes or react to a lack of success. Both higher commands can now make better and more timely recommendations to the BCT commander.

This delineation of duties frees the company first sergeant to focus on soldier preparedness. While the 2IC focuses on CSS planning and synchronization, the first sergeant is able to supervise the execution of CSS operations. He may also find more time to help the commander by supervising the company's execution of precombat checks and subordinate-unit rehearsals, in turn ensuring that the company is more prepared for the commander's inspections and higher-level rehearsals. Again, it is a win-win situation.

Conclusion

A fighting 2IC is a force multiplier for the engineer company, maneuver task force, and engineer battalion. He frees up the company commander to focus on the decisive point of the company fight. He provides firsthand tactical reports to higher headquarters regardless of how busy the commander is. And the fighting 2IC has the situational awareness to assume the fight if it becomes necessary.

To fully develop duties and responsibilities for the 2IC, we can start by looking at how tank and mechanized infantry companies utilize their XO. Thus, FM 71-1 is a point of entry for this analysis. For duties and responsibilities of the engineer BOS integrator (A/TFE in the task force TOC), the description in FM 5-71-2, *Armored Task Force Engineer Combat Operations*, remains an excellent guide. These duties and responsibilities could be refined and trained during officer professional development and company lane exercises, then confirmed during integrated combined-arms training exercises.

Each COA has relative strengths and weaknesses and is likely unit- and personality-dependent. We have not recommended a particular COA—just that you pick one. Hopefully, this discussion has convinced (or reminded) you that the C2 of combat engineer companies requires that someone fill the 2IC role. Decide who this person is; determine appropriate employment tactics, techniques, and procedures; and start practicing. The potential benefit to the company's warfighting capabilities and its integration within the task force and engineer battalion are too great not to move forward.

Train the Force!

Captain Burton is an instructor at the Infantry School, Fort Benning, Georgia. He previously served as an engineer company and task force M/S BOS trainer at the National Training Center and commanded Alpha Company, 317th Engineer Battalion. CPT Burton is a graduate of the University of Nevada and holds a master's degree in civil engineering from the University of Missouri.

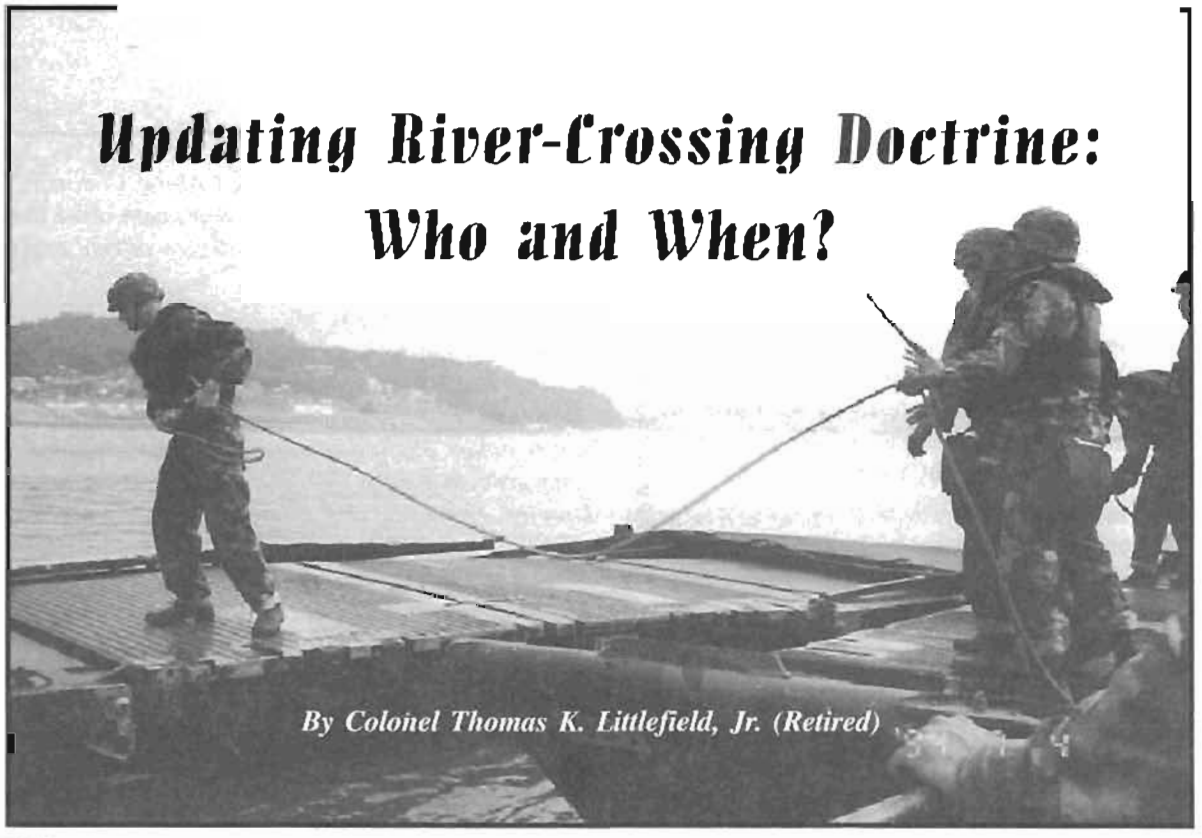
Lieutenant Colonel Magness is the Detroit District Commander for the U.S. Army Corps of Engineers. Previous assignments include engineer battalion S3 trainer on the Sidewinder Team at the National Training Center; brigade and battalion S3, 4th Infantry Division, Fort Hood, Texas; company commander, 16th Engineer Battalion, 1st Armored Division, Germany; and platoon leader and battalion staff officer, 17th Engineer Battalion, 2d Armored Division. LTC Magness is a graduate of the United States Military Academy and the Command and General Staff College and holds a master's degree from the University of Texas.

Parting Shots

As indicated in this article, no COA for how we implement this is easy—or perfect. It is worth concluding with some "unconstrained" tactics, techniques, and procedures for how we might implement this technique to maximize its potential:

- √ Identify the requirement for a dedicated engineer staff officer at the task-force level (like the S2 or the fire-support officer) and assign him to the maneuver headquarters for which he will work. Include the division cavalry squadron with this staffing requirement. M/S integration and terrain analysis are too critical to be available within the maneuver staff only as a function of task organization. We need to create the conditions where the commander is not forced to choose between BOS integration and command of his company. Both are important—and should be fully resourced.
- √ Adjust lieutenant career progression models to account for the critical assignment of M/S BOS integration. Currently, engineer officers spend almost no warfighting time between platoon leader and company command—if you accept the argument that A&O platoon leader (force provider), company XO (task force staff officer), and engineer battalion staff are not "trigger pullers." This is not unlike the artillery model—where lieutenants serve as fire-support integrators (company fire-support team) before moving to gun platoons. This gives lieutenants at least two warfighting assignments—platoon leader and company XO.
- √ Resource the 2IC with an M113 (and ultimately a BEFV). This obviously has huge implications. Is the appropriate number of Bradleys in an engineer company 9—or is it 10? We believe it is the latter—just as it is for tank (M1) and mechanized infantry (M2) units.

Updating River-Crossing Doctrine: Who and When?



By Colonel Thomas K. Littlefield, Jr. (Retired)

When I reviewed the first draft of Field Manual (FM) 3-93, *Decisive Force: The Army in Theater Operations*, one line early in the manual caught my attention: "As a doctrine-based organization, the foundations of the Army's doctrine for full-spectrum operations are found in FM 3-0 (formerly 100-5), *Operations*."[1] This made me think of three things:

- FM 100-5 was the capstone document for doctrine throughout my career. Its importance to winning the Cold War and many other hot conflicts, especially Desert Storm, cannot be underestimated. This quote about "doctrine-based organizations" and FM 100-5 reminded me just how important doctrine is. We are truly a doctrine-based organization and are only as good as our written foundation.
- Headlines in the *Army Times* stated, "Rock Bottom—Training Centers Report They Can't Meet the Mission"[2] and "Training Command the Hardest Hit in Manning Plan."[3] Our doctrine is written at the training centers. If they aren't supported, our doctrinal base will not be updated. We will be stuck on a single step in the never-ending staircase of military evolution. My concerns were confirmed when I called the Engineer School and learned that its doctrine cell consisted of three people and was being reduced to two in the near future.
- I encountered a doctrine problem in the 2d Infantry Division concerning river-crossing operations. The essence of this problem was rafts versus bridges.

Rafts versus Bridges

During my last assignment as the engineer brigade commander for the 2d Infantry Division, I was very fortunate to have a bridge company as part of the brigade. My previous engineer assignments were with the 25th Infantry Division and the 101st Airborne Division. In these light organizations, river crossing wasn't on our mission-essential task list, so we simply didn't train on it. The last time I planned and participated in major river-crossing operations was as a company commander in the 1st Armored Division during Reforger 79. During my four-plus years with this division, we conducted numerous river crossings. The primary lesson we learned with mobile assault bridges (MABs) and the "new" ribbon bridge was that you bridge as soon as possible. We rafted only when we couldn't get a bridge in quickly enough to support the maneuver commander's plan. There was some risk, but it was offset by the much greater buildup of combat power afforded by bridges. During Reforger 79, we went straight to bridging. Our combat power built up and quickly overwhelmed the opposing force—1st Tank seized and maintained the initiative until the end of the exercise.

At the 2d Infantry Division, I ran into the doctrinal problem of rafts versus bridges. During a planning session, I commented that as a general rule I recommended rafting only when there were not enough assets to build a bridge. The response was, "This isn't our doctrine; we raft to build initial combat power and then transition to bridges." We discussed that the decision to bridge immediately was a situational decision based on the calculus of combat-power buildup and the level of risk the commander was willing to accept. Even so, my audience still believed that rafting operations are a necessary part of doctrinal river-crossing operations. They provided direct quotes from FM 90-13, *River-Crossing Operations*, to support their argument.

In reviewing FM 90-13, I discovered that there were very few references to immediate bridge construction. They were limited to the following:

"Commanders may consider immediate construction of a bridge during this phase (Phase II - Assault Across the River)

without ever conducting rafting operations. The advantage is that the combat power can be massed on the far shore at a much faster rate. The risk that the commander takes in making this decision is that a larger amount of bridging assets is exposed to enemy fire before the elimination of enemy indirect fires on the crossing area."[4]

"Since vehicles cross rivers much faster on bridges than on rafts, early bridge assembly is desirable but must be weighed against the risk that the enemy can still bring indirect fires down on an immobile bridge."[5]

References on the need for rafting were much more numerous and included the following:

"Bridges replace or supplement rafts once enemy-observed indirect fire is eliminated."[6]

"The urgent need to get tanks across the river means the rafting stage often begins before terrain on the far shore is secure to the planned (release line) *RL."*[7]

"Heavy rafts are prepared to transport tanks and infantry fighting vehicles to the far shore for reinforcing the dismounted infantry."[8]

"Enemy indirect fire into the crossing area will probably continue; however, each crossing site within the crossing area must be isolated from direct fire to enable the construction and operation of rafts. These rafts will then be used to transport armored vehicles for rapid reinforcement of the dismounted infantry task force."[9]

"Rafts are usually the initial means for crossing non-swimming vehicles—particularly tanks—on wide, unfordable rivers. It may be possible to bridge immediately after the assault across the river; however, rafting is normally first because rafts—

- *Are less vulnerable to enemy air and indirect fire due to their size and maneuverability.*
- *Are quicker to assemble.*
- *Offer more flexibility in operation, particularly in site selection and subsequent movement between sites.*
- *Can use existing road networks and banks where access and exit routes are not aligned opposite of each other."*[10]

Consider the following—

" A river crossing is a race between the crossing force and the enemy to mass combat power on the far shore. The longer the force takes to cross, the less likely it will succeed as the enemy will defeat, in detail, the elements split by the river. Speed is so important to crossing success that extraordinary measures are justified to maintain it. The commander must allow no interference with the flow of vehicles and units once the crossing has started."[11]

The calculus of force buildup is greatly enhanced by immediate construction of bridges if the situation allows. To close a 150-meter gap on the Imjin River, where we routinely trained, with one construction site took about 90 minutes. At this point, we could begin crossing vehicles at the rate of 200 an hour. If we initially built the two rafts that can be accommodated with a single centerline on a 150-meter gap, we could cross 14 M1 tanks in 95 minutes.

Five minutes after the bridge went into operation, it began to exceed the crossing capability of the rafts. It could cross 33 vehicles every 10 minutes versus the two vehicles crossed by the rafts. This is a significant payoff that must be considered and not ignored due to the wording and structure of our doctrine. (See the table on page 22 for the vehicle-crossing timelines.)

Members of the 50th Engineer Company "Bridge the Gap!"

Number of Vehicles Crossed											
Minutes	25	35	45	55	65	75	85	95	105	115	125
Two Rafts	1	2	4	6	8	10	12	14	16	18	20
Bridge	0	0	0	0	0	0	0	16	49	82	115

Why doesn't our doctrine explain how to compare bridges to rafts and definitely say that going immediately to bridges is a serious option? My initial thoughts were that we were still using doctrine based on old time-intensive bridge systems. As a platoon leader, I had experience in building Class 60 and M4T6 rafts. For trained troops, building a Class 60 raft capable of carrying an M60 tank took 50 minutes if the pontoons were preinflated and combat-loaded and 90 minutes otherwise. For the equivalent M4T6 raft, it took 100 minutes.[12] For both types of bridging, it took 3 to 5 hours to build the 150-meter bridge required for the Imjin River example.[13] I believed that since it took so long for bridge construction, these bridge systems forced us to initially build rafts. This suspicion led me to the Military History Institute, where I reviewed all available river-crossing publications beginning with one dated 31 January 1941 to the present one dated 26 January 1998.

As I reviewed the various manuals, I was surprised—especially by the post-World War II publications. The manuals of the 1940s depended heavily on various rafts with the standard rafting operations followed by bridging operations. The first field manual I found that was totally dedicated to river crossing was FM 31-60, *River-Crossing Operations*, dated August 1952. Based on the date, I assumed that it incorporated lessons from World War II and the initial lessons from the Korean War. Following are some of the more interesting quotes:

"While it is desirable to delay [bridge] construction until the construction site is relatively safe from observed artillery fire, the responsible commander must evaluate the effect of delaying erection on his mission against losses of trained personnel and equipment."[14]

"The following factors must be considered before heavy-bridge construction is ordered:

(1) The mission.

(2) The tactical and logistical support required by forces on the far side of the river.

(3) The amount of available and reserve bridging.

(4) The accuracy and intensity of enemy air attacks and artillery fire on the bridge site.

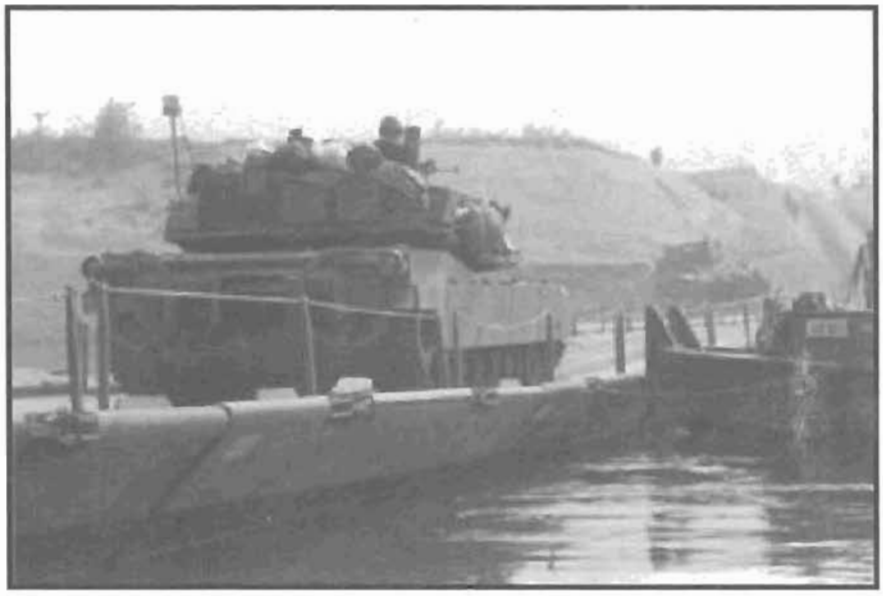
(5) The probable danger of loss of the bridgehead if sufficient armor cannot be crossed until the bridge is in.

(6) When additional bridging material is unavailable, the effect on the operation if the bridge were destroyed by the enemy.

(7) Availability and use of smoke-generating equipment."[15]

"Rafts are an excellent means of putting the high-priority essential vehicles into the bridgehead during the interval between the assault crossing and the completion of bridges. Employing men and equipment on raft construction and use, however, may retard the building of bridges. It takes almost as long to build a raft and to put it into operation as it does to build a bridge to span a stream which is 150 feet or less in width."[16]

"Bridges are constructed after the second objective (a position that eliminates the enemy's observed fires) is taken or earlier if enemy artillery fire proves to be ineffective, has been rendered so, or has been neutralized."[17]



1st Brigade, 2d Infantry Division, crosses the Imjin.

Manuals up into the 1970s continued to reflect this more aggressive use of bridges, to include the 1972 version of FM 31-60 that I used with the 1st Armored Division. It included the following information:

"Failure to construct bridges early in the operation may result in delaying

Tanks of the 1st Brigade continue to pour across the Imjin to exploit success.

the advance beyond the river. This may allow the enemy time to reinforce with sufficient strength to delay or prevent securing the bridgehead."[18]

"The initial advantage of speed in commencing operation of rafts may be more than offset by the greater efficiency of bridges that can be placed in operation in a short time. Construction of bridges begins as early as possible."[19]

"If sufficient MAB equipment is available, consideration must be given to employing it as a bridge early in the operation. Assembly times are shorter when compared to other types of float bridges. In addition, if enemy fires should increase to a level endangering the bridge, the MAB units can rapidly disengage from one another and be reconfigured as rafts until the fires subside.[20]

I find it interesting that the older manuals address constructing bridges as soon as possible and go into more detail than our current manual does on considerations for omitting rafting. Going immediately to bridging should not be ruled out just because it is only addressed by four sentences in our doctrine. We need to emphasize the importance of rapidly building combat power and consider going straight to bridges. Immediate bridging operations should be a serious course of action for all river-crossing operations. The experiences gained during World War II, the Korean War, and the Cold War should not be forgotten by current doctrine. They must be overtly reflected in our current doctrine for planning considerations. We cannot raise a new generation of sapper warriors who don't seriously consider all options. This is especially important since American large-scale river-crossing experience is rapidly shrinking. With only a handful of active duty bridge units, we have largely lost our "hands-on experience." This makes doctrine even more important. Future generations of engineers will depend on it.

Summary

In the narrow scheme of things concerning river-crossing doctrine, we need to capture our experiences and include the considerations for going straight to bridging. We must make it a possible course of action and check the calculus to see if the benefits are worth the risk for the maneuver commander. Don't just ignore this option due to a doctrinal deficiency. As a doctrine-based organization, we must update our doctrine as our systems change, to provide more flexibility. Decision makers need to be empowered and not shackled with a doctrine that no longer fits the bill. Let's start the dialogue to help the Engineer School update our doctrine.

Who . . . and when? Us . . . and NOW!

Colonel Littlefield (now retired) was assigned to the U.S. Army War College's Department of Military Strategy, Planning, and Operations when he wrote this article. He previously commanded the 2d Infantry Division's Engineer Brigade. A graduate of the United States Military Academy, COL Littlefield holds a master's degree in operations research/systems analysis from the Naval Postgraduate School. He was a joint specialty officer and is a registered professional engineer in the state of Virginia.

Endnotes

[1] FM 3-93 (100-7), *Decisive Force: The Army in Theater Operations*, First Draft, July 2000, pp. 1-14.

[2] Sean D. Naylor, "Rock Bottom," *Army Times*, 11 September 2000, p. 8.

[3] Sean D. Naylor, "Training Command the Hardest Hit in Manning Plan", *Army Times*, 4 September 2000, p. 10.

[4] FM 90-13, *River-Crossing Operations*, 26 January 1998, p. 5-8.

[5] Ibid, pp. 7-14.

[6] Ibid, pp. 7-13.

[7] Ibid, pp. 3-11.

[8] Ibid, pp. 5-6.

[9] Ibid, pp. 5-8.

[10] Ibid, pp. 7-9.

[11] Ibid, pp. 1-6.

[12] FM 31-60, *River-Crossing Operations*, 27 March 1972, p. 60.

[13] Ibid, p. 67.

[14] FM 31-60, *River-Crossing Operations*. August 1952, para. 45.

[15] Ibid, para 45.

[16] Ibid, para. 62.

[17] Ibid, para. 63.

[18] FM 31-60, *River-Crossing Operations*, 27 March 1972, pp. 3-19.

[19] Ibid, pp. 3-28.

[20] Ibid, pp. 3-28.

Rapid Airfield Upgrade at Castle Assault Landing Zone

By First Lieutenant Nicholas Melin

22 August 2003

The president orders the XXVIII Airborne Corps and 82d Airborne Division to conduct a noncombatant evacuation operation in one country, while simultaneously providing support to an ongoing United Nations stability operation. The 82d notifies the 307th Engineer Battalion and its attached light equipment company, the 618th Engineer Company, during the mission analysis portion of the military decision-making process. The division operations officer and the division engineer estimate that at least eight airfields are required to successfully deploy the division's follow-on forces in theater, with one Interim Brigade Combat Team to arrive within 96 hours. Further analysis shows that the host nation has only four operational airfields in the area of operation and the Army must construct the rest. To meet the deployment timetable and handle the increased throughput of supplies, these airfields must be operational in 10 days.

Joint Rapid Airfield Construction Program

Unfortunately, it typically takes more than 30 days to complete an airfield construction project of this nature. Herein lies the issue confronting the Joint Rapid Airfield Construction (JRAC) program and the reason the 618th Engineer Company deployed to Fort Pickett, Virginia, from August to September 2001.

To meet the Chief of Staff of the Army's vision of deploying a combat-capable (medium) brigade anywhere in the world in 96 hours, a division in 120 hours, and five divisions in theater in 30 days, the U.S. Army Corps of Engineers, along with its Air Force counterparts, formed the JRAC program to look into the rapid construction and upgrade of airfields.[1] The three primary objectives of the program are to optimize airfield site selection, enhance airfield construction productivity, and incorporate advances in rapid soil stabilization.[2] Since the C-17 Globemaster III aircraft was designed to carry oversize loads (such as the M1A1 Abrams tank) and land on forward, semiprepared (such as dirt) airfields, the team is specifically interested in constructing and upgrading C-17-capable airfields.[3] As the only light equipment airborne engineer company in the Army, the 618th received the mission to upgrade Castle (formerly Wonju) assault landing zone (ALZ) at Fort Pickett from C-130 to C-17 specifications. Since there is such a limited number of C-17-capable, nonstabilized ALZs in the world, the company faced a considerable challenge. The 618th tested the feasibility of new, rapid airfield construction technology to be used in future construction operations. The lessons learned from this project may be useful to other construction units in the Corps of Engineers.

A soldier supervises operations on the field landing strip.

Computer-Aided Earthmoving System

Throughout the project, the 618th used a Computer-Aided Earthmoving System (CAES) marketed by Caterpillar®. Developed originally for the mining industry, it has been available commercially since June 1997.[4] CAES integrates site-planning and -design operations with construction to reduce costs and increase job-site efficiency. The system consists of onboard computers, Global Positioning System (GPS) receivers, data radios, a GPS reference station, and a radio network. The project designer and surveyors enter the design schematics into the command computer and map

the design elevations for the site. Then they use a portable GPS to chart existing elevations. A comparison of the elevations reveals the cut and fill requirements for the project site.

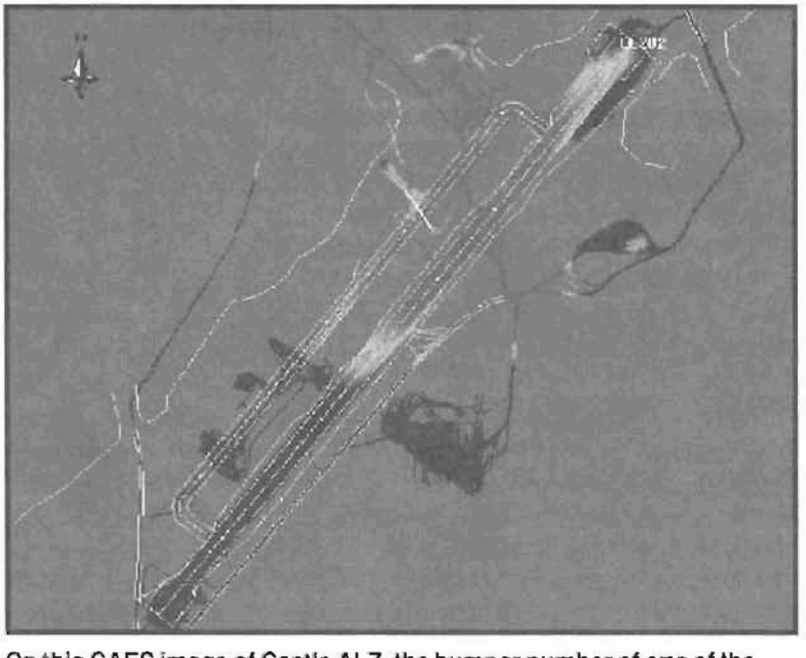
Although not the case during the deployment of the 618th, each piece of engineer equipment on the site should have a GPS and a computer terminal that transmits real-time updates of the site elevations. This allows project managers to track equipment activity and productivity daily. The GPS terminal mounted on the equipment shows the operator the site boundaries and the cut or fill required at any position. These features greatly decrease the requirements placed on surveyors during airfield construction. Normally, surveyors must stake out project boundaries and earthmoving requirements for the entire project. Using the CAES, equipment operators know their position on the site at all times and can move and shape earth to meet project requirements.

For the Castle ALZ project, engineers from Caterpillar installed the CAES terminals on two 613B scrapers and two deployable universal combat earthmovers (DEUCEs). Along with the radio network and reference station, the total cost of this system with training and installation would normally be $350,000. The JRAC program, along with Caterpillar, used the Castle deployment to examine the applications of the GPS in rapidly upgrading an ALZ.

Soldiers from 1st Platoon use a hand tamper to compact soil on top of dual 18-inch plastic corrugated culverts.

Planning and Preparation

Before the deployment to Fort Pickett, the 618th surveyors were already developing the airfield design. First, they conducted a topographic survey to map the existing ALZ. Surveyors also took soil samples from the ALZ and the two borrow sites and sent them to be tested at the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, Mississippi. These tests identified the properties of the soil and its suitability for airfield construction. These tests must be conducted as early as possible since the quality of the soil is a primary factor in determining the earthwork required for the project. The results of the soil tests also established the optimum moisture content and the maximum dry density required to satisfy compaction criteria established by Engineer Technical Letter (ETL) 97-9. Another advantage of relying on ERDC to conduct the soil analyses was that ERDC could archive the data for future use, as well as coordinate for possible soil analysis training with the unit's surveyors and design team.



On this CAES image of Castle ALZ, the bumper number of one of the CAES-equipped DEUCEs, LE202, is shown at the north end of the runway.

After determining the dimensions and elevations, the surveyors designed the ALZ. Using information in ETL 98-5, they determined the requirements for a maximum aircraft on ground (MOG) 2, C-17-capable ALZ (see table, page 26). The major changes required were to add turnarounds at each end of the runway, move the taxiway to allow for C-17 wingtip clearance, and increase compaction. The surveyors then entered the design into the Terramodel™ software. This design program allowed the head surveyor and ALZ designer to download the elevations gathered during the survey and make the necessary alterations to the existing ALZ. The finished design provided the required elevations at each point along the runway and taxiway.

Integrating the CAES into the 618th required training for both operators and surveyors. The surveyors spent a week working with

Critical Dimensions for a C-17 ALZ[5]

Runway:

- Length – minimum 3,500 feet
- Overruns – 300 feet on each end of the runway to the same standards
- Turnarounds – 165 feet wide by 180 feet long (may be included in overruns)
- Width – 90 feet
- Shoulder width – 10 feet
- Width of graded area – 35 feet on each side of runway beyond shoulders
- Width of transitional area – 70 feet on each side beyond graded area
- Longitudinal runway grade change – 1.5% maximum per 200 feet
- Transverse grade of runway shoulders – 1.5% minimum, 5% maximum

Taxiway:

- Length – 3,500 feet with turnarounds or the entire length of the runway
- Turning radii – 90 feet
- Shoulder width – 10 feet
- Longitudinal grade – 3%, with a maximum change of 2% per 100 feet
- Runway clearance – 280 feet from centerline of runway to inside shoulder of taxiway
- Taxiway clear area width – 70 feet
- Infield area – must be clear of obstructions

representatives from Caterpillar to learn the setup and maintenance of the CAES. Then, the 618th conducted a field-training exercise where surveyors set up the GPS equipment and instructed equipment operators on using the computer displays in the equipment. With operators and surveyors well-trained, the company was ready to deploy to Fort Pickett and build an airfield.

Main Effort: The Runway

To upgrade the ALZ to C-17 specifications, the 618th made numerous alterations to the existing C-130 ALZ. The main effort, which was assigned to 2d Platoon, was to upgrade the 4,100-foot runway. This included reshaping and compacting it and adding 165- by 180-foot turnarounds at both ends. But before this work began, it was necessary to repair the existing C-130 ALZ.

The runway was overgrown with grass and had at least 6 inches of organic material that needed to be grubbed. Additionally, to expand the clear and transitional areas on either side of the runway to meet C-17 requirements meant clearing and grubbing a considerable area, to include trees. The CAES was useful for this task. The equipment operators did not have to wait for surveyors to stake in the boundaries of the runway. Using the display terminal, operators followed the design boundaries and marked the area that needed clearing.

After they completed the clearing and grubbing, the 618th established borrow and waste pits from which fill material could be moved to the runway and waste material stockpiled. Then, to reach the design grade, 2d Platoon cut and filled the runway. (Many places required fill in excess of 2 feet.) Since the CAES has a horizontal accuracy of plus or minus 3 inches associated with earthmoving, it was possible to complete a large portion of the cut without grade stakes. However, to get the runway to standard, it was then necessary to shape and compact it to meet density and moisture requirements and allow for proper drainage. Because of the error margin associated with the CAES, it was not useful for the precision grading required to ensure that the runway met slope requirements.

As 2d Platoon moved down the runway, the surveyors verified that the completed work met compaction requirements. Using a nuclear densometer, they measured the density and moisture, and with a dynamic cone penetrometer, they confirmed California bearing ratio requirements. Where these measurements failed to meet the required standard, the soil had to be scarified (disked) and recompacted.

The final step was to grade the runway to ensure that it had a proper crown and drainage. Although the CAES was not useful during this phase of construction, the system's advantages allowed 2d Platoon to finish its portion of the project a week ahead of schedule.

Supporting Effort: The Taxiway

Perhaps the most difficult assignment went to 1st Platoon to move the taxiway 40 feet to the west to allow wingtip clearance for the C-17 aircraft. This required installation of three 18-inch double culverts and a large amount of earthwork on the shoulders and clear area.

The CAES dramatically reduced the amount of time it took to locate the culverts. Instead of having to stake and restake them to ensure that they were straight and at the proper slope, the platoon used the CAES with the culvert design loaded into the system. The display terminal in the cab of the DEUCE showed the operator how much to cut within 3 inches. The surveyors then placed grade stakes and string lines to achieve the final grade and desired slope. By using the CAES, the experienced crew saved one day of work on each culvert.

Another timesaving measure was that the platoon used corrugated plastic culverts rather than the standard concrete or corrugated metal pipes. They were light enough so that two people could carry a 20-foot section and could also easily attach multiple sections using connectable lips. A drawback of plastic culverts was that the slope had to be carefully checked because the plastic had a tendency to bend and distort.

Clearing and grubbing the taxiway occurred concurrently with culvert installation. By using nonorganic D7 bulldozers

Surveyors determine the earthwork required for the project.

and 621B scrapers, it was fairly easy to clear the necessary area to move the taxiway. The fill requirements, however, were significant.

The natural slope of the areas around the taxiway required lifts of more than 5 feet in some areas. Moving enough earth to reach grade effectively eliminated any gains made from the quick installation of the culverts. After completing the earthmoving, the platoon established drainage into and out of the culverts by shaping the infield (the area between the runway and taxiway) and the shoulders of the taxiway. The taxiway was shaped and compacted in the same manner as the runway. The CAES made it possible to finish construction five days ahead of schedule.

Supporting Effort: The Tank Test Track and Road Extension

The 3d Platoon was detached from the ALZ project to construct a 1.5-mile-long tank test track, a 0.25-mile emergency road extension, and a helipad for Fort Pickett. Although not involved with the ALZ construction, these projects were considered by the installation's chain of command as the main effort for the deployment.

The site chosen for the test track was next to Blackstone Army Airfield. When constructing the airfield, the location of the tank test track was used as the waste pit for the project. All the organic materials were heaped in this area. When 3d Platoon started working on the test track, it was overgrown and looked like a patch of woodland.

Not until the platoon cleared and grubbed the track did it become apparent that there would be a problem with the amount of organic material in the soil. In addition, the soil had insufficient strength to meet the requirements of the road. It was of such poor quality that it had to be cut out to a depth of 3 feet and replaced with clay from the borrow site at the ALZ. This necessitated hauling 2,000 cubic yards of soil over a 12-mile route. Once the dirt was hauled in, the platoon was able to compact the subgrade for the road and begin hauling the 3,500 cubic yards of gravel needed for the surface of the track.

The emergency road extension also provided some unexpected challenges. To obtain proper drainage for the road, five 20-foot-long culverts were added to the test track and road extension. With no CAES assets on site, and a constantly evolving design concept, the platoon had to construct the road using the tedious staking method. This operation took 5 days and verified the advantage of using GPS technology with culvert emplacement.

Lessons Learned

The Castle ALZ construction project demonstrated both advantages and shortcomings of the CAES for use in rapid airfield construction:

Advantages

- As an enhanced surveying tool, the system worked well. It allowed operators and supervisors to "see" project boundaries, even during hours of limited visibility, and accurately map them using engineer equipment. It cut down on the direct surveyor support required at the beginning of the project, thereby allowing the engineer unit to mass them at the main effort.
- The system was very useful when conducting shift-change briefs. The outgoing construction foreman could easily show the construction officer and incoming construction foreman the progress made during the day. Similarly, the construction officer could easily delineate the scope of work for the incoming construction foreman and equipment operators. It was also helpful in giving an overview of the status of the project.
- The system was easy for operators to use, and it was not difficult to establish command and control from a centralized location. However, line of sight was required.
- The system was a valuable asset when placing culverts. It allowed for accurate excavation without use of grade stakes until nearing the final excavated grade.

A scraper performs cut and fill operations.

- The system was valuable for large cuts and fills in earthmoving operations. If in excess of 1 foot, the CAES allowed operators to move earth without grade stakes. And the display in the cab provided a visual indication of progress.
- Tracking the equipment across the entire job site made it possible to determine the overall progress of the project (volume of earthwork moved). However, since the system was only installed on four pieces of engineer equipment, it was difficult to evaluate the utility of the CAES in tracking individual equipment productivity.

Shortcomings

- The utility of the system is only as good as the inputted design. In one case, the design placement of a culvert was incorrect. The error was not discovered until after the culvert was partially installed, which required additional labor to correct. Although this was a man-made error and not a product design, it reinforced the importance of quality control on a job site. It should also be noted that the CAES allowed the 618th to rapidly correct the deficiency.
- The system was not useful in the final grading of the runway or taxiway. The error margin in the system was too great for the precision work required to successfully complete the project.
- It would be difficult—if not impossible—to use this technology (as currently designed and implemented) during initial-entry operations in an immature theater of operations. However, it could be a valuable asset in a scenario where the initial airfield was capable of receiving air-land personnel and equipment, the lodgment had been secured, or the airhead had been expanded and had the infrastructure to support the use of laptop computers (from a tactical operations center or similar location). Automation support is about the only external requirement to make this system operational since the GPS reference station and radio receivers/transmitters are solar-powered, while the equipment-mounted systems are battery-powered.

Conclusion

Using the CAES in the Castle ALZ upgrade provided a glimpse into the future of airfield construction. The use of GPS technology to increase information available to operators had a definite effect on construction efficiency. Despite the fact that the 618th used only four mounted systems, the overall construction time on the ALZ decreased by five to seven days when compared to the forecasted duration of the project. Moreover, it was so essential in the construction process that maintenance and repair of vehicles with CAES equipment became a top priority. Although the technology itself does not solve all the challenges of JRAC, the CAES certainly decreases the time necessary to upgrade an ALZ. As shown during the project, the effect of terrain and weather on construction time is significant. The use of GPS for site selection could improve these areas. Soil stabilization of the dirt in ALZs will also decrease airfield maintenance throughout the duration of operations. In the future, the Castle ALZ at Fort Pickett could become a useful test location for JRAC.

First Lieutenant Melin is working on a master's degree in civil engineering at Oxford University in England. He previously led 2d Platoon, 618th Engineer Company (Light Equipment) (Airborne), in support of the 325th Airborne Infantry Regiment. 1LT Melin is a graduate of the United States Military Academy and holds a bachelor's degree in civil engineering.

Endnotes

[1] Jeb S. Tingle, E.I., Research Civil Engineer, U.S. Army Corps of Engineers, Engineer Research and Development (ERDC), Geotechnical and Structures Laboratory, Vicksburg, Mississippi.

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[3] Travis A. Mann, *Joint Rapid Airfield Construction (JRAC) Enhanced Earthmoving Capability (EEC) Technology Demonstration*, ERDC Trip Report, 4 May 2001.

[4] Caterpillar Promotional Pamphlet, *CAT Computer-Aided Earthmoving System*, 2000.

[5] Engineer Technical Letter 98-5, *C-130 and C-17 Contingency and Training Airfield Dimensional Criteria*, June 2002.

Book Reviews

The Army, Brigadier General Harold W. Nelson, Editor in Chief. The Army Historical Foundation/Hugh Lauter Levin Associates, Inc; Arlington, Virginia, 2001, 352 pages, 600 illustrations.

The Army is a richly illustrated historical overview of the United States Army prepared by the Army Historical Foundation. Its authors are largely retired senior military officers, many with a background in published military history. The volume covers such topics as the role of the Army in nation-building, the history of the Medal of Honor and other military decorations, the Army Schools, and the role of the Reserve Components in the wars of the nation. As such, *The Army*, is not an illustrated history of the Army, but a historical overview of some aspects of the Army and its more than 200 years of service to the United States.

The volume has an introductory article by serving Army Chief of Staff, General Eric K. Shinseki, and a concluding article by Lieutenant Colonel Clayton R. Newell, U.S. Army, Retired. The former article deals with the Army Vision and its association with both the Army of yesterday and the Army of the future. The latter article documents some of the emerging technology that the Army is seeking to bring to the battlefield. These bookend articles place the historical material into the context of the Army today and the future of the service in the years ahead.

One of the outstanding features of *The Army* is the inclusion of 600 photographs, reproductions of military art, and other illustrations. The art is by such established military artists as Mort Kunstler, Don Troiani, Don Stivers, and Dale Gallon. The artwork by these and other artists adds a colorful and dramatic aspect to the more common black and white photographs of the nineteenth and twentieth century Army that many readers are familiar with. The reproductions of this military art are almost worth the price of the book alone.

Although *The Army* is written by those with the requisite historical training to produce an authoritative work, the book does suffer from an occasional error in accuracy. However, the errors in the text do not detract from the visual value of the volume and the overall story the authors and editors convey. *The Army* would make an excellent addition to the bookshelves of the general reader or history buff. Those wanting more depth to the areas covered in this volume can start with the professional reading materials noted in the *Suggested Reading* portion.

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

Note From the Publisher: Purchasing *The Army* not only will be of interest to readers but also will directly benefit the Army Historical Foundation, which receives a royalty on each book sold. The Foundation is a nonprofit organization dedicated to the preservation and promotion of Army history and traditions. It directly supports the historical programs of the Army and is an integral part in the building of a national Army museum.

The Army can be ordered directly from the Army Historical Foundation (703-522-7901 or *http://www.armyhistoryfnd.org/*). It is also available through warehouse clubs, local bookstores, and online. Visit the Foundation's Web site for more information *(http://www.hlla.com)*.

The Soviet-Afghan War: How a Superpower Fought and Lost by Russian General Staff (Editor), Lester W. Grau (Translator), Michael A. Gress (Translator), Foreword by Theodore C. Mataxis.

The War in Afghanistan (1979-1989) has been called "the Soviet Union's Vietnam War," a conflict that pitted Soviet regulars against a relentless, elusive, and ultimately unbeatable Afghan guerrilla force (the mujahideen). The hit-and-run bloodletting across the war's decade tallied more than 25,000 dead Soviet soldiers, plus a great many more casualties, and further demoralized a USSR on the verge of disintegration.

In *The Soviet-Afghan War*, the Russian general staff takes a close critical look at the Soviet military's disappointing performance in that war in an effort to better understand what happened and why and what lessons should be taken from it. Lester Grau and Michael Gress's expert English translation of the general staff's study offers the very first publication in any language of this important and illuminating work.

Surprisingly, this was a study the general staff never intended to write, initially viewing the war in Afghanistan as a dismal aberration in Russian military history. The history of the 1990s has, of course, completely demolished that belief, as evidenced by the Russian army's subsequent engagements with guerrilla forces in Chechnya, Azerbaijan, Tadjikistan, Turkmenistan, and elsewhere. As a result, Russian officers decided to take a much closer look at the Red army's experiences in the Afghan War.

The study presents the Russian view of how the war started, how it progressed, and how it ended; shows how a modern mechanized army organized and conducted a counterguerrilla war; chronicles the major battles and operations; and provides valuable insights into Soviet tactics, strategy, doctrine, and organization across a wide array of military branches. The editors' incisive preface and commentary help contextualize the Russian view and alert the reader to blind spots in the general staff's thinking about the war.

This one-of-a-kind document provides a powerful case study on how yet another modern mechanized army imprudently relied upon the false promise of technology to defeat a determined guerrilla foe. The Red army had fought its war to a military draw, but that was not enough to stave off political defeat at home.

This book is part of the *Modern War Studies* series.

About the Translator/Editors:

Lester W. Grau, a Vietnam War veteran and retired U.S. Army lieutenant colonel, is an analyst for the Foreign Military Studies Office at the Army's Combined Arms Center at Fort Leavenworth, Kansas. He is also the editor and translator of *The Bear Went Over the Mountain: Soviet Combat Tactics in Afghanistan* and *The Other Side of the Mountain: Mujahideen Tactics in the Soviet-Afghan War*.

Michael A. Gress is a native of Siberia and a former soldier in the motorized rifle forces of the Soviet army.

Partnership Training

By Captain Daniel J. Meyers

The U.S. Army's 1st Infantry Division Engineer Brigade, Headquarters and Headquarters Company (HHC), and Germany's *Stabskompanie, Pionierlehrbrigade 60*, have a unique partnership. Our focus is on building trust, camaraderie, and mutual respect at all levels—from the newest private to the brigade commander. Through a variety of activities, ranging from combined-arms training to social events, we achieve a greater understanding of each other's capabilities—an understanding that is beneficial and rewarding to both the soldiers and the organizations. Combining training opportunities causes an increase in *esprit de corps* and interoperability. The events over the past decade in Europe confirm a strong need to understand each other's armies as we perform operations as multinational forces. Our partnership training has directly improved our readiness posture.

A soldier fires the MG-1.

For three consecutive years, Engineer Brigade's HHC has earned the title "Best Continuing Partnership" within the 1st Infantry Division. The competition is fierce, but quality and quantity of training make all the difference. The result of cohesive activities is displayed through awards, language skills and, most important of all, a better understanding of customs and traditions of the two countries.

One of the primary points of emphasis in the partnership is the training and development of junior enlisted soldiers in both units. Our planning continually strives to provide them with opportunities to learn. We believe that training as partners strengthens the soldiers' desire to stay in the service and enhances their careers.

Both German *Unteroffiziers* and American NCOs are provided the unique challenge of instructing soldiers from a foreign army. The language barrier is just one hurdle that must be negotiated. Other difficulties include cultural differences and a lack of familiarity with foreign weapon systems.

Exchanging marksmanship techniques is one ingredient toward a successful partnership because it enhances interoperability. To earn the coveted *Schuetzenshnur*—in either bronze, silver, or gold—is a goal of each soldier. The German weapons qualification consists of three weapons, and soldiers must qualify on all three to earn the *Schuetzenshnur*. Firing the pistol (P1) is an easy task, but the other two weapons—the G3 (equivalent to the M16) and MG-1 machine gun—are tougher because their high caliber causes a powerful kick.

A combined crossing of a water hazard

Another area of concentration with our partnership unit is physical fitness. For U.S. soldiers, the goal is to "max" the Army Physical Fitness Test. While all do their best, not everyone can qualify for the badge. The same holds true for the *Leistungsabzeichen* (German sports badge). Passing both tests is an indicator of excellent physical fitness.

This year, not only did we train on both German and American weapons, but we also survived the rigors of a white-water river exercise, marched over several mountain peaks, and competed in a variety of sporting events. The NCOs

and officers, up to and including the brigade commanders and command sergeants major, led their soldiers with skill and decisiveness. They planned and executed training, met for equipment demonstrations, and led their soldiers in the celebrations that marked another successful year.

For the past two years, our units have hosted an event called "Project Teamwork." The concept is to provide soldiers of both nationalities an opportunity to train, challenge, and compete against other teams, using cooperation and collaboration. Comprised of both German and American soldiers, the teams are presented with a series of obstacles or tasks, such as weapons assembly/disassembly; first aid procedures; nuclear, biological, and chemical agents; a grenade toss; and a water hazard. Each scenario forces the soldiers to think as a unit and conquer the obstacle or complete the task through teamwork. These events foster the foundation of our partnership. They are the mechanisms that support our title "Best Continuing Partnership" in the division.

Ceremonies provide a good avenue to share traditions and customs. The *Gelobnis* (graduation) ceremony is a good example. We are invited to attend the ceremony whereby German soldiers are officially indoctrinated into the *Bundeswehr*, and our partnership unit is invited to our change-of-command ceremonies.

In addition to the soldier tasks of weapons familiarization, physical fitness evaluation, and ceremonial activities, we share experiences, leadership development, award recognition, and cultural enlightenment. The friendships that ensue are a byproduct of the continuous training opportunities.

During the holiday season, we participate in each other's festivities. The somber gatherings have given way to more upbeat parties. Perhaps the best example is the white elephant gift exchange. Our partnership unit finds this to be a very intriguing event. So this past holiday season, each German soldier brought a gift so that he could participate.

The 1st Infantry Division Engineer Brigade's HHC has a common bond with *Stabskompanie, Pionierlehrbrigade 60*, and we look forward to broadening our partnership in the future. Statistics prove that we have a powerful foundation. Solidarity is our core asset and will continue to provide stability and strength for years to come.

Captain Meyers is the battalion maintenance officer, 1st Infantry Division Engineer Brigade, HHC, and also serves as the brigade S3. He holds a bachelor's degree in urban planning from the University of New York at Albany. His next duty assignment is the Captain's Career Course at Fort Leonard Wood, Missouri.

The Engineer Writer's Guide

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

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

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

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

Include a statement with your article 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. (*Engineer* is available for sale through the Superintendent of Documents.)

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

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

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

THE EURO NATO TRAINING ENGINEER CENTRE:

YOUR INTERNATIONAL ENGINEER SCHOOL

By Major Frank Akins and Sergeant First Class Benjamin Addison

Since 1977, the Euro NATO Training Engineer Centre (ENTEC) in Munich, Germany, has provided engineer interoperability training to increase efficiency between military engineers of NATO and its partner nations during peacetime and war. The current focus is primarily engineering interoperability challenges within peace support operations from squad to division level.

ENTEC is organized into four cells (see figure), which are powered by 14 primary instructors, ranging from sergeants first class to lieutenant colonels:

- Tactics and Doctrine Branch—provides instruction pertaining to tactics and doctrine, including input for development of Standardization Agreements (STANAGs).
- Mine/Countermine and Demolitions Branch—focuses on training related to mine/countermine equipment, mine and booby trap threat, and demolition equipment used and encountered by ENTEC member nations.
- General Engineering Branch—concentrates on military bridging, combat engineer and construction equipment, reconnaissance, and base camp construction.
- Military Engineer Consultancy—collects and catalogs current engineer lessons learned and provides them, upon request, to NATO nations. This cell is also an excellent source of information concerning national engineer force structures and organizations.

Levels of Instruction

ENTEC conducts four levels of course instruction per year: Instructor's Course, Platoon Leader's Course, Company Commander's Course, and Battalion Commander's Course. ENTEC also provides mobile training teams to units upon request.

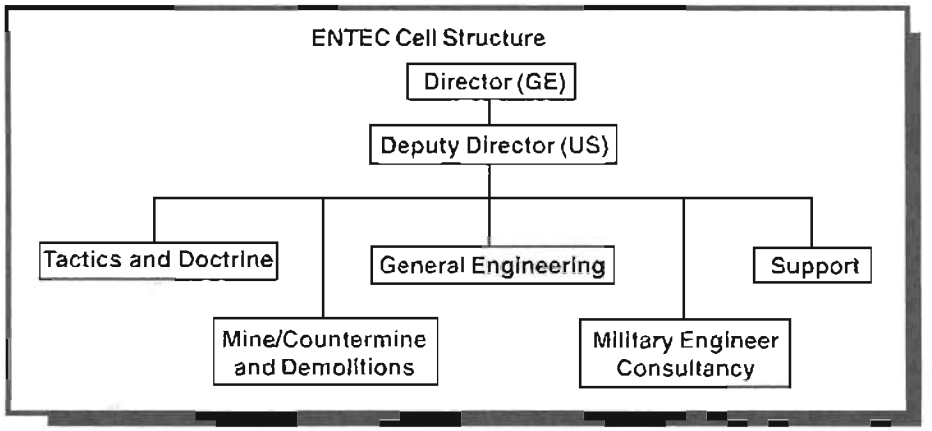
Instructor's Course

This 2-week course is designed to promote and improve engineer interoperability at squad leader through platoon leader levels. It is the "bread-and-butter" course, encompassing a maximum amount of hands-on training with classroom instruction. When engineers complete this course, they can teach soldiers mine awareness, international explosives use, demolition target folder preparation, demolition mission handover/takeover, barrier control and execution, international engineer lessons learned, and how to obtain international military engineer assistance on a moment's notice.

Platoon Leader's Course

This week-long course promotes and improves engineer interoperability at platoon and company levels by introducing officers and noncommissioned officers to engineer operational

Hands-on booby trap training facility



and tactical interoperability challenges and how to overcome them. Through a combination of classroom and team instruction, map exercises, and hands-on training, students gain an understanding of the characteristics and capabilities of each ENTEC nation in demolition, bridging, combat engineering, and construction equipment. Students become familiar with mine/countermine equipment employed across NATO and gain an understanding of correct policy and procedures for training on and employment of antitank and antipersonnel mines. This course is more tactically oriented and less technically focused than the Instructor's Course.

Company Commander's Course

This course promotes and improves interoperability at company to battalion levels by introducing officers to the engineer operational and tactical procedures of all participating nations. Instructors provide orientation to several force-projection missions and discuss international lessons learned. Guest speakers from several ENTEC nations discuss experiences in combat and peacekeeping operations. The focal point of this course is an in-depth map exercise that facilitates planning for a multinational, out-of-sector mission, encouraging officers to solve complex problems in an international working-group environment. Students are introduced to common interoperability challenges and how to overcome them. They receive a brief orientation on demolitions, bridging, combat engineer, and construction equipment from each ENTEC nation and the important characteristics and capabilities of each. Various social functions during the course encourage students to interact with their multinational colleagues.

Battalion Commander's Course

This course promotes and improves engineer interoperability at battalion and brigade levels by introducing officers to the engineer operational and tactical procedures of all participating nations. Guest speakers discuss recent experiences in combat and peace-support operations and provide lessons learned. An in-depth map exercise on out-of-area contingency operations is the main vehicle of learning. The ENTEC staff introduces officers to common interoperability problems and how to overcome them. A guided tour of Munich, museum visits, and a semiformal dinner increase interaction among officers from the various nations. There is also a VIP Day during the course that provides an opportunity to meet with many national engineer school officials and see some of the latest engineer equipment available on the worldwide market.

Training Aids

A series of training aids increases multinational interoperability effectiveness: a 10-language Combat Engineer Dictionary CD, bilingual handbooks, a one-stop source for international engineer lessons learned, an Engineer Platoon Leader's Handbook, and more. Instructors participate in NATO standardization working groups pertaining to combat engineering interoperability issues, as well as other activities to promote engineering interoperability.

Other Activities

The ENTEC staff supports NATO exercises around Europe. And ENTEC is the perfect off-site location for exercises and conferences. On request, ENTEC supports individual units or headquarters with mobile training teams, which are usually scheduled and approved a year in advance but can react to short-notice requests in crisis situations. ENTEC's Web site at *http://www.entecmunich.de* provides more information.

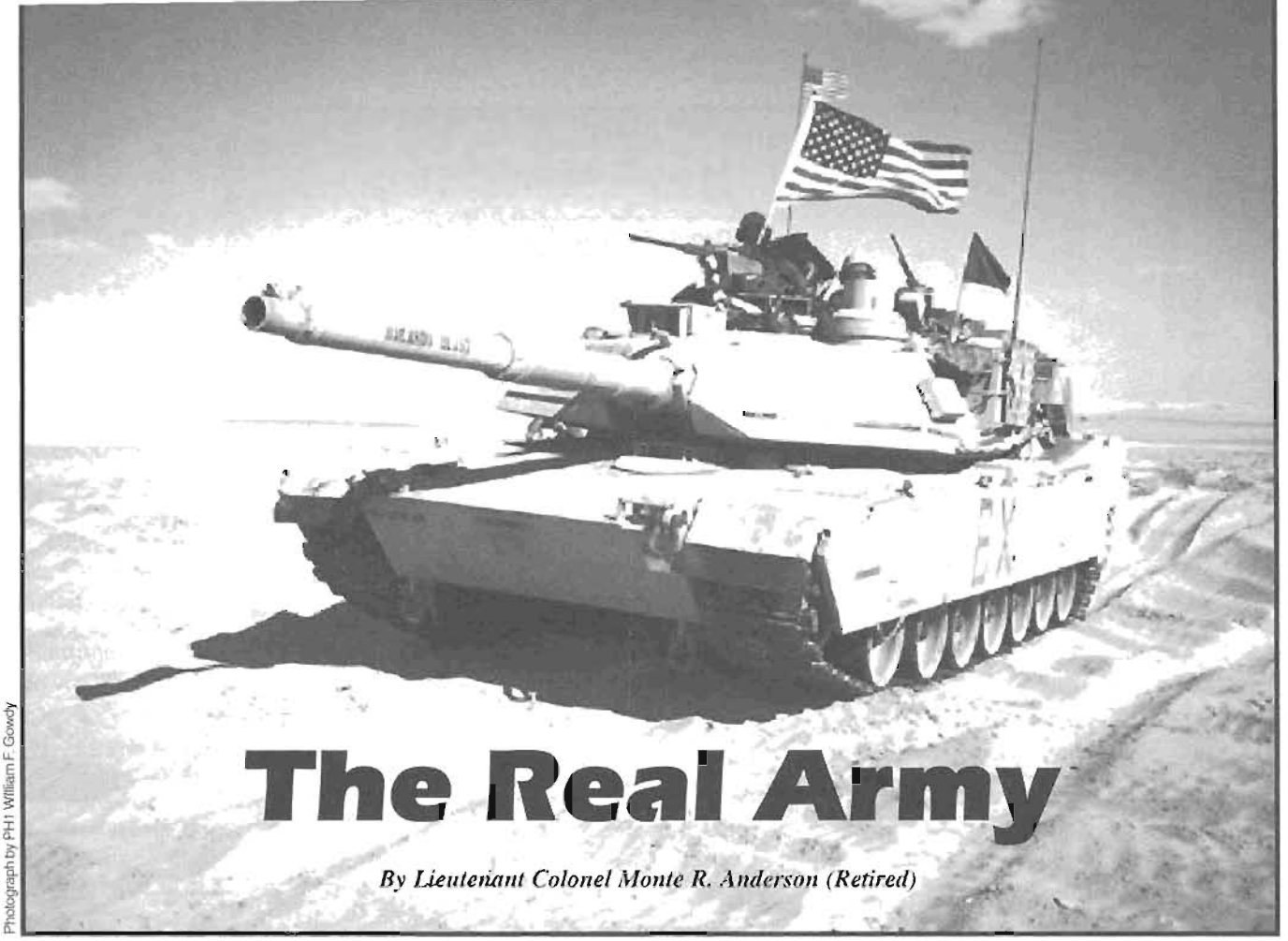
Conclusion

ENTEC offers a unique opportunity to learn about international engineer interoperability and to make contacts and friends in the international community. All TDY and course fees are reimbursed for U.S. soldiers stationed in Europe. Course tuition fees are covered for U.S. soldiers stationed within the United States. The ENTEC staff members invite you to visit the training center and join them in future classes and activities.

Contact MAJ Akins at *frank.akins@catc.7atc.army.mil* or call 011-49-89-95959482.

Major Akins is the deputy director of the Euro NATO Training Engineer Centre. He is a graduate of the Command and General Staff Course and holds a master's degree in geology/civil engineering.

Sergeant First Class Addison is the senior U.S. instructor at the Euro NATO Training Engineer Centre. He has attended the Basic and Advanced Noncommissioned Officers Courses, Primary Leader Development Course, Air Assault and Airborne Courses, and the Sapper Leader's Course.



Photograph by PH1 William F. Gowdy

The Real Army

By Lieutenant Colonel Monte R. Anderson (Retired)

Everyone talks about the "Real Army," but no one knows where it is. *Not really.* I retired in 1990—after 22 years in the Infantry Corps—and I think I spent my entire career looking for the Real Army, that mythical Holy Grail of professionalism. I never did find the Real Army, but somewhere on my quest, I learned a thing or two about professionalism.

I started my career as a cadet at West Point. I was taught by some of the sharpest and brightest young captains of the military, many of them combat veterans of Vietnam. They were the cadre I looked up to and who set the example for me to follow. I was reminded on numerous occasions that when I graduated and pinned on that butter bar, I would join the ranks of the Real Army. Those veterans, who surely knew of such things, assured me, in no uncertain terms, that the Real Army would be more demanding and less forgiving of my ignorance and errors. My decisions would mean life or death for members of my platoon. It was, therefore, with some anticipation that I looked forward to joining the Real Army.

After graduation, I went through a series of military schools—airborne, jump master, ranger, and the Infantry Officers Basic Course—all designed to finely hone my skills and instill in me the fighting spirit that I would need in the Real Army. Much to my disappointment, I was informed that these schools were not the Real Army. For that, I would have to wait. I was told this by some of the best NCOs in the Army. The cadre at West Point had told me that such men existed, and here they were in the flesh. These were men with many years of experience in leading and training soldiers, real soldiers from the Real Army. Nearly all were combat veterans, and most certainly knew the difference between the Real Army and the school environment. I studied hard to prepare myself, but I was becoming impatient to find the Real Army. I longed to be in a unit where every soldier was highly motivated and each man knew his duty—a place where the title "soldier" meant being proud, standing tall, combat ready, lean and mean. That's what I wanted and, by God, I meant to have it.

All too soon my military schooling ended, and I joined the 82d Airborne Division. But that was not the Real Army, I was told by senior officers who must be privy to such knowledge. It was the late '60s. Drugs were a major problem, and we were coddling drug users and trying to rehabilitate them. Combat veterans who had only a few months left to serve were "short-timers" with bad attitudes. New recruits were green and hardly knew basic soldier skills. The division was understrength and short on equipment. Even with my inexperienced eyes, I could see that, indeed, this could not be the Real Army.

Soon I was a first lieutenant en route to the 101st Airmobile Division in Vietnam. I thought my search would soon be over. When I took over my new platoon, I discovered that it, too, was not the Real Army. It was a group of scared young men just trying to keep from getting killed. They looked to me not to lead them to victory but to keep them alive long enough to take that long flight back home. They did everything I asked them to do, but they were not eager to reenlist.

Morale was low and got even lower. The young men didn't hate the Vietcong or the North Vietnamese and actually hoped they would not see one. They lived in fear, drank whenever they could, and smoked a joint now and then when I wasn't around. But together we survived. We learned how to bring superior firepower to bear without exposing ourselves to enemy fire. We learned to conceal ourselves so well in an ambush that the enemy could not see us until it was too late. We learned not to bunch up on the trail, to move without any noise, and to keep our equipment operational. We looked out for each other. We all cried when one of us got a "Dear John" letter. We all cheered when one of us heard he was now a father. We celebrated when someone got his orders to go home. We shared our dreams and aspirations. My dream was to find the Real Army. We all made it back to the States.

I returned to the 82d Airborne for two more years. Then I went to the Armor Officers Advanced Course at Fort Knox, Kentucky; on to graduate school; and back to West Point as an instructor. I was now part of the elite cadre—and yet I had never seen the Real Army. I almost gave up my search. All the other instructors talked about it, but no one had actually seen it. One armor officer said that he almost saw it in Germany, but it apparently had departed before he got there and never returned. We pretty much agreed that it was either in Germany somewhere or maybe in Korea, but it certainly was not stateside. So Germany was the next stop on my quest. I would surely find the Real Army in Germany.

Germany was totally different than I had imagined. I was assigned to an infantry unit at Wildflecken. The Cold War was still going strong in the late '70s. My battalion had a wartime mission to be the covering force for the brigade. We expected high numbers of casualties. Wildflecken was within artillery range of the East German border, and we fully expected to be under fire from our billeting area all the way to our deployment positions. Our only hope would be early warning. We took our mission seriously. We trained in the field for weeks on end, once for 6 weeks straight. Every day in the field meant 3 days in the motor pool, maintaining our equipment. I thought, "If this isn't the Real Army, we are in trouble." But things were not as they should have been. We still had drugs. The equipment was old. I was positive that I had an M113 with Patton's initials on it. There were also personnel shortages. It was part of the "Hollow Army"—too many missions and not enough men and equipment. I began to suspect that this was not part of the Real Army.

My worst fears were confirmed. Senior NCOs who, of course, know of such things, told me that this was not the Real Army. Not any more! Some had spent many years in Germany. All had been to Vietnam and in stateside units. One NCO had been around the world three times and to a world's fair, two circuses, and a county fair. He knew everything, and he informed me that the Real Army no longer existed. It had died, unannounced, sometime between World War II and the Korean War. However, he had not actually been to Korea and, perhaps, a small remnant of the Real Army remained there. There was still hope.

The Army in Germany was in a metamorphosis. We concentrated on combating the drugs and made major headway. The Army moved to an all-volunteer Army, combined with frequent and random drug testing and easier ways to get rid of drug users. The new recruits arrived drug-free and with a positive attitude. They were well-trained in basic soldier skills. We began to develop teamwork and a sense of unit pride. We went from mastering platoon operations to company—and then to battalion and task force—tactics. Soon we became proficient at brigade and division maneuvers. It was as if we were beginning to create the Real Army ourselves.

I went from Germany to the Command and General Staff College at Fort Leavenworth, Kansas. After graduation, I stayed on as a tactics instructor for 3 years. It was not, of course, the Real Army. We invented an imaginary army that could do anything—attack, defend, envelop, withdraw, cross rivers, and perform airmobile operations and urban fighting. You name it, this army could do it. Of course, the students had to plan for this dream army. It was always at 100 percent strength, sometimes 110 percent. It had the latest equipment, some of which had not really been fielded. There was no end to the supplies and logistics, as long as it was planned for and coordinated. It was the perfect army—on paper. We were in the middle of developing the AirLand Battle doctrine and supporting tactics.

In 1984, I went from Fort Leavenworth to be the Inspector General of the 2d Infantry Division in Korea. It was my sincere hope to finally find the Real Army. I was in a position to do a proper search. I inspected every unit in the division and was impressed by what I found. The soldiers were highly motivated, well-trained, and well-led. While the Cold War was coming to a close in Europe, that was not the case in Korea. The 2d Division stood toe-to-toe with the North Korean army, and every soldier understood his mission clearly. The division was up to strength and well-equipped, with new equipment arriving every day. This was not the Army of the '60s or the '70s. Every soldier had volunteered to be there. Drug use was way down. I thought that at long last I had finally found the Real Army, but it was not to be. Nearly one-third of the division's soldiers were Korean Augmentees—excellent Korean soldiers who spoke English. Most had been drafted and given a choice of serving with the Korean or the U.S. Army. That made the 2d Division unique, because no other unit was made up of allied soldiers. No doubt, in the event of war with North Korea, these soldiers would be invaluable assets to the division. However, as configured, the 2d Division could not deploy to any other theater of operations. It was a stand-alone, one-of-a-kind unit. It was not the Real Army.

In 1985, I was reassigned to the Pentagon, and I despaired of ever finding the Real Army. There, we tried to forecast what the Real Army of the future should be, based on our own concept of what that might be. This was made more difficult by the ending of the Cold War, the collapse of the Soviet empire, and the growing threat in the Middle East. New equipment was

(continued on page 39)

Modernized Demolition Initiator Update

By Sergeant First Class Jeffrey Venus (Retired)

The Army is fielding the newest components to the Modernized Demolition Initiator (MDI) family—the M151 and M152 booster assemblies. These components are the materiel solutions for the restrictions placed on the MDI in 1998, which limited the operational uses of the M11 and M16 MDI shock tubes. The M11 and M16 will be phased out as they are replaced by the M151 and M152. The new MDI components will give our soldiers the most modern pieces of equipment in the demolition inventory and ensure that they have the competitive edge required on the battlefield.

Background

The MDI was initially fielded in 1996. But testing indicated, and field commanders confirmed, that there were serious shortcomings. The problems center on a simultaneity issue and the sensitivity of the high-strength blasting caps. In addition, field commanders raised issues concerning burying high-strength blasting caps and prepriming charges for transport to mission sites. Due to these shortcomings, on 3 December 1998, the Engineer School issued a Letter of Instruction that restricted the use of the M11 and M16 MDI components until these issues were resolved.

Description

The MDI is used for standard military demolition missions. When first type-classified in 1996, the MDI had a safety limitation that prohibited the priming of underground charges with devices containing sensitive primary explosives. The M151 and M152 booster assemblies overcome this limitation and the operational employment restrictions. The M151 and M152 consist of a booster, which contains only insensitive secondary explosives, and a length of low-powered detonating cord (5 grains/foot versus 50 grains/foot for high strength) with a high-strength booster in lengths of 10 feet and 30 feet respectively. As such, the low-powered detonating cord will not cut itself or other detonating cords if crossed.

The boosters at the end of the M151 and M152 assemblies look like blasting caps, but they are not blasting caps because they contain no primary explosives. Although the boosters have the same strength as #12 commercial caps, they can be treated like detonating cord because they contain only secondary explosives. The booster end piece (the part that looks like a cap) is added to the low-strength detonating cord to fit the system into standard military cap wells.

These new components provide the same functionality as the M11 and M16 blasting cap assemblies, but with expanded capabilities. The M151 and M152 have been fully tested in all primary missions, but there are no safety restrictions as there are on the M11 and M16. Also, when using the M151 and M152, it is safe to preprime and carry the demolitions.

New Equipment Training

The Maneuver Support Center (MANSCEN) Directorate of Training Development will ensure that all combat engineers receive new equipment training (NET), to include training on all MDI components and the M151 and M152 systems. Questions about NET should be directed to—

- Staff Sergeant Bob Watson, (573) 596-0131, extension 36299, *watsonb@wood.army.mil*
- Sergeant First Class Jeffrey Venus (Retired), (573) 596-0131, extension 37994, *venusj@wood.army.mil*

Future Demolition Modernization

Progress does not stop; therefore, the Engineer School continues striving to reduce the weight and volume of demolition systems to transition the Engineer Regiment to the Interim and Objective Forces. Future articles will describe the Demolition Modernization Plan for long-term Army requirements, which was presented in the Demolition White Paper sent to TRADOC and DA for approval. In the short term, improvements to the MDI will include versions of a new "minitube" system. The new components of the MDI will soon undergo developmental and operational testing. The target date for initial fielding of a new lightweight, low-volume minitube MDI system is the end of FY02.

The point of contact for information on demolition issues or to relay concerns from the field is Sergeant First Class Jeffrey Venus (Retired), U.S. Army MANSCEN, Directorate of Combat Developments, 320 MANSCEN Loop, Suite 141, Fort Leonard Wood, Missouri 65473-8929; commercial (573) 596-0131, extension 37994; DSN 676-7994, e-mail *venusj@wood.army.mil.*

Sergeant First Class Venus was a combat developer for demolition items at MANSCEN when he wrote this article.

Improving the Technical Skills of the Combat Heavies

By Sergeant First Class Carl L. Lindsay II

What do we expect of our combat heavy engineers in today's force? That question would have as many different answers as people asked. Combat heavies have been used extensively in humanitarian roles and in the Gulf War where they performed numerous tasks. In this article, I address the technical expertise that is expected of these units and what I believe is the true level of expertise.

Combat heavy units have carpentry, masonry, plumbing, and electrical specialists, as well as light and heavy equipment operators and construction supervisors. Looking at the make-up of construction units, you basically see a construction company. The problem we face is that soldiers have very little technical proficiency to perform the skills to the level necessary. Most of the experience in these units comes from the soldiers' background—for example, from a vocational school. While this is a good resource, it should not be the crux of the technical expertise.

With the specialties that are in these units, the personnel should be able to accomplish any construction mission. While at their home base, the units could take on several troop construction projects if the technical skills were developed. With the cutbacks that the directorates of public works have faced, these units could be valuable assets to the installations.

Seeing the problem is easy; improving an existing asset to solve the problem is the challenge. I would not want to present this solution as an overnight fix to this challenge but rather as an opportunity to use the asset that could prove to be invaluable. Some of the actions we could take to improve the technical proficiency of the combat heavies follow.

The U.S. Army Corps of Engineers (USACE) offers several courses that would help improve the technical proficiency of the combat heavy soldiers and instructors, to include carpentry, masonry, plumbing, electrical, and earthwork. In addition, an instructor certification course would help us teach the materials during advanced individual training. USACE also offers advanced training that could be used to improve and enhance higher-grade skills at the basic and advanced noncommissioned officer's course levels.

We should try to implement a more vocational style of training for soldiers. This would require a longer training period and possibly some civilian support. However, the technical expertise gained would be a huge benefit. Also, the time has come to upgrade our sets, kits, and outfits to reflect what industry today uses when constructing. The benefits of this improvement would far outweigh the cost involved.

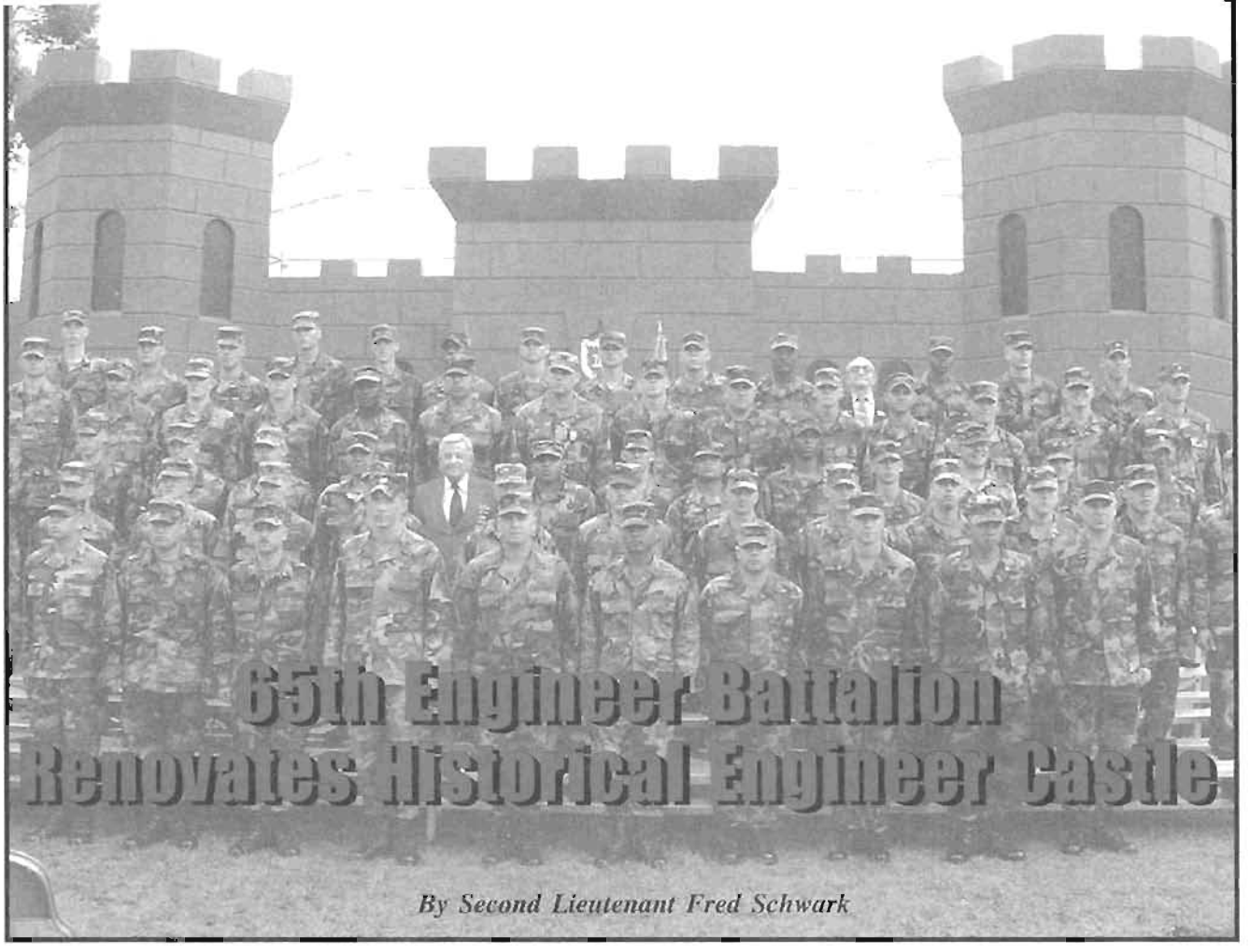
We also must better equip our battalion construction inspectors so they can perform their mission. As a construction inspector for USACE in Korea, I ensured that the quality of work met the standards of the specifications and blueprints for USACE projects such as constructing barracks, company operation facilities, and battalion and brigade headquarters. As an inspector, I had a wide range of tools available, to include the technical expertise of USACE. Battalion construction inspectors should have the same tools at their disposal; in most cases, they could get these through a local USACE office. Our inspectors could also attend advanced courses for certification, which would give us a better inspection process. It would increase the quality of work produced and give credibility to the work that a troop construction unit could perform.

We could use the USACE guide to develop specifications and testing procedures for troop construction projects. If these steps were taken, we could show the quality of work that is being performed and increase our value to the installation and the Army. And we should adopt the USACE safety manual—EM 385-1-1—as our safety and health requirements manual to establish safety standards that are the same throughout our units and consistent with USACE standards.

The biggest challenge that we face would also yield the greatest reward—engineers becoming a total team. Through the team-building process, units become more technically proficient, which will prove to be an asset for USACE also. Occasionally, USACE has had trouble filling positions quickly. In Bosnia, for example, the NCOs who were USACE inspectors were taken from Korea and Japan to fill the positions until civilian inspectors could arrive. When USACE is shorthanded at a location, we would be able to provide temporary inspectors. This would be excellent on-the-job training for the troop construction units and valuable assistance until the positions are filled. Another benefit from this training is that USACE would be training future employees to help fill the ranks of construction inspectors and project engineers.

We should not lose our focus; our mission in the combat heavies is to perform combat-engineering tasks, as well as the heavy construction missions required in a theater of operations. I believe that at the same time we can become a more technically proficient unit and a greater asset to the Army. I also believe that improving technical skills encompasses the synergy that the Chief of Engineers is seeking—for when we look at these improvements, it is truly a win-win situation.

Sergeant First Class Lindsay was a quality assurance representative in the Far East district, USACE, Camp Humphreys, Korea, when he wrote this article. He is now a platoon sergeant in the 46th Engineer Battalion, Fort Polk, Louisiana. He holds an associate in general studies from Cameron University and is working toward a bachelor's degree in business management.



65th Engineer Battalion Renovates Historical Engineer Castle

By Second Lieutenant Fred Schwark

Sixty-seven years ago, members of the 3d Engineer Combat Regiment, Schofield Barracks, Hawaii, began construction of an engineer castle to be part of a stadium on Ralston Field. The structure served as a grandstand as well as a symbol of the Corps. Years of weathering and neglect left the castle in dire need of attention.

In October 2001, veterans of the 25th Infantry Division (Light) met for their 60th anniversary reunion at Schofield Barracks. It was during this reunion that the 65th Engineer Battalion ran a rifle range for the veterans, who met and reminisced about their days at Schofield Barracks and the mighty castle on Ralston Field. While on the range, two of the veterans donated a few pictures of the 65th Engineer Battalion from 1941, standing tall in front of the castle. This sparked interest in renovating the castle.

Members of Second Platoon, B Company, 65th Engineer Battalion, 25th Infantry Division (Light), volunteered to renovate this symbol of pride and began work on 28 December 2001. First, they used scrapers and basic paint tools to remove the old paint, and then they used a pressure washer to get the rest of the paint off. Two weeks and almost 10 gallons of Engineer Red paint later, the castle had been brought back to life. The end product brilliantly reflects their hard work, and the finished castle remains a testament to the soldiers who built it 67 years ago.

Soldiers paint the castle on Ralston Field.

In a special ceremony on 13 February 2002, three veterans of the 65th Engineer Battalion from 1941 returned to Schofield Barracks to participate in the rededication of the castle. The veterans were in the 65th during one of the most turbulent times in American history. Months before the infamous day of 7 December, they stood tall with their companies in front of the engineer castle. Not knowing what the future held for them, they trained for their eventual deployment to the Philippines.

The veterans' stories of duty, honor, and country rang a chord within the soldiers of today. Maurice Storck came to the 3d Engineer Regiment by way of the Maine National Guard, which he

joined in April of 1937, just shy of his 15th birthday. In 1940, he was transferred to the regular Army and assigned to B Company, 3d Engineer Regiment. Camellus Cappelluzzo, or "Cappy" to his comrades, joined the Army in July 1940 at the age of 17. In November 1940, he was assigned to the 3d Engineer Regiment. Bing Kow was drafted in March 1941 in the second peacetime draft. After basic training, he also went to the 3d Engineer Regiment as part of a group of men who replaced those who had already been sent to the Philippines. In the fall of 1941, the Old Hawaiian Division was formed into the 24th and 25th Infantry Divisions. Likewise, the 3d Engineer Regiment was reorganized into the 3d Engineer Battalion, which supported the 24th Infantry Division, and the 65th Engineer Battalion, which supported the 25th Infantry Division. All three of these veterans became part of the newly formed 65th Engineer Battalion.

This castle serves as a link between these warriors of the past and the soldiers of today. In October of 1941, the newly formed 65th Engineer Battalion had company pictures taken in front of the Ralston Field castle. Sixty years later, the 65th Engineers once again came to take company pictures at this castle. Although the original picture has faded with age, the same engineer spirit and determination are evident in both pictures. Essayons!

The Engineer Castle History

Strength, pride, heraldry, prestige, and honor. The castle remains the premier symbol of the U.S. Army Corps of Engineers. The medieval castle is inseparably connected with fortifications and architecture. In heraldry, the castle and the tower are often used on coats of arms. In this country, the term "castle" has been applied to the strongest of our early fortifications, such as Castle Pickney in Charleston, South Carolina, and Castles Williams and Clinton in New York Harbor. The castle is a highly stylized form without decoration or embellishment.

The Army unofficially adopted the castle to appear on the Corps of Engineers epaulets and belt plate in 1840. Soon afterward, the cadets at West Point—all of whom were part of the Corps of Engineers until the Military Academy left the charge of the Chief of Engineers and came under the charge of the Army at Large in 1866—also wore the castle on their cap beginning in 1841. Subsequently, the castle appeared on the shoulder knot, on the saddle cloth, as a collar device, and on the buttons. Finally, in 1902 the castle was formally adopted by the Army as the insignia of the Corps of Engineers. Although its design has changed many times since its inception, the castle has remained the distinctive symbol of the Corps of Engineers.

Second Lieutenant Schwark is the Adjutant of the 65th Engineer Battalion, Schofield Barracks, Hawaii.

(The Real Army, continued from page 35)

developed to support the AirLand Battle tactics. New organizations were designed to handle the new equipment and tactics. But I never actually saw these units come into being. After 3 years, I gave up on ever finding the Real Army and was transferred to a Reserve Officer Training Corps assignment.

As the Professor of Military Science at a university, it was hard to describe to my students what the Real Army was like, having never seen it myself. My only hope was that one of my young students would take up my torch, search for the Real Army, and one day find it. Although I retired without ever fulfilling my quest, I now had time to reflect and put things into perspective, which is what retirees do I am told. And I have reached these conclusions:

- There is no perfect army. Not really. Never was, never will be. That theoretical Real Army—at 100 percent strength, with 100 percent operational new equipment, and that is well-trained—doesn't exist except in military classrooms.
- The Real Army is an ideal, a goal. It is what could be. You don't seek it, you create it. It means being "All You Can Be, An Army of One"—doing your best, going the extra mile, and doing the extra push-ups. Okay, so your unit is not the best. Why not? What are you doing about it? Will it be a better unit because of you? It had better be!
- It is all the Real Army, every bit of it. There is only one Army, and you are in it. It may be like the five blind men feeling different parts of an elephant for the first time, but it is all one Army. It doesn't matter whether you are in Europe, Korea, Alaska, or stateside. It is not important whether you are airborne, ranger, mechanized, light infantry, armor, or aviation. It is the same Army doing the same mission. You are just seeing a different part of the Real Army. It is all too real.
- The Real Army is the people in the Army. It is as true today as it was at Valley Forge. It is made up of real people, fighting men and women. They are the greatest people on earth. Everywhere I served, I found real people doing a real job serving their country. I may have run out of fuel or bullets, or wished for better equipment, or thought the training and skills were lacking, but the people never once let me down. Not once! It was the soldiers who got the job done in spite of any hardships.

I am convinced that the best-equipped, best-supplied, and best-trained army will fall to pieces in a conflict if it doesn't have the best people. I spent my whole career looking for the Real Army—only to discover that it was always there, just outside my tent. I rest easy in the knowledge that it will always be so.

Lieutenant Colonel Anderson was assigned to the 82d Airborne Division, 101st Airmobile Division, 15th Infantry Battalion Mechanized/3d Infantry Division, 2d Infantry Division, and the Pentagon (DCSOPS). He is a graduate of the United States Military Academy, the Armor Officers Advanced Course, and the Command and General Staff Course and holds a master's degree from Indiana University.

The Evolution of the Engineer Force: Part II

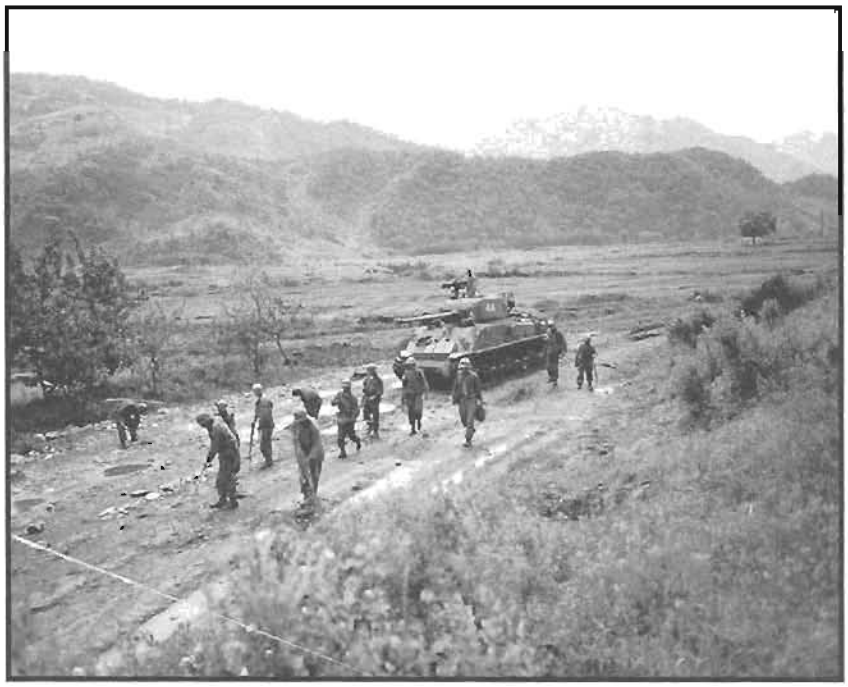
By Dr. Larry Roberts

This is the second of a two-part article. Part I (Engineer, April 2002, page 44) covered force structure during World War I, the interwar period from 1919-1941, World War II, and the period from 1946-1950. Part II begins with force structure during the Korean War and continues through the 20th century, to include Vietnam, Desert Storm, and the Engineer Restructure Initiative (ERI).

Korea

The outbreak of hostilities in Korea in June 1950 tested the new engineer structure. However, it was a flawed test. The first engineer units, especially the first units deploying to Korea from Japan, were severely undermanned and inadequately equipped. The postwar demobilization of the Army had cut deeply into the manpower of divisional and nondivisional organizations. It was not until 1951 that engineer units in Korea had anything close to their authorized strength. Equipment available in the Far East was largely left over from World War II and in poor repair, if not totally worn out. New equipment from the United States had to compete with other items for space in the storage holds of naval transports. Korea was in every respect a "come-as-you-are" war. The American Army, and the Corps of Engineers, was not prepared for the conflict.

There was one other aspect of the war in Korea that tended to blur any determination of the viability of the engineer force structure at that time. Korea was not seen as the most strategically important area in the contest between the democracies and communism. Senior military commanders and the National Command Authority continued to see Europe as the most critical strategic area. Indeed, a number of Army units, to include engineers, were sent to Europe during the period of hostilities in Korea to reinforce the North Atlantic Treaty Organization and deter any Russian move to the west. This overtaxed the armed forces and forced a partial mobilization of Reserve Component units.



Engineers sweep for mines in advance of armor in Korea.

It is possible, however, to glean some basic facts concerning engineer force structure from operations in Korea. First, the divisional engineer battalion, even with its post-World War II augmentation, was still not capable of handling the engineer work in the division. Numerous commanders in Korea noted the need to continue applying an additional combat engineer battalion asset to the support of the division. In some instances, this was for a specific operation, such as a river crossing. In most instances, it was to handle the massive amount of roadwork required. Unfortunately, the slow rate of deployments to Korea in the first 6 months of the war meant that there were often no additional battalions to call on. Those that did exist were often consumed by line-of-communication work. The 36th Engineer Combat Group spent its first 6 months in Korea performing the work of a construction or depot group at Pusan.

The second fact was that the distinction between combat and construction units blurred or even dissolved due to the demands of the time. As has been noted, the 36th initially performed the duties of a construction group. Conversely, the 84th Engineer Construction Battalion built defensive positions in the Pusan Perimeter during its initial days in Korea. Five of the

construction battalions ultimately sent to Korea performed road- and bridgework in support of the three corps, a task more appropriate to a combat battalion-army or a specialized company, such as a light equipment or bridge company.

In spite of these facts, the lessons and experiences of the conflict in Korea, the general engineer force structure, and the doctrine for employing engineer units changed little in the early 1950s. The next major shift in force structure would be occasioned by a perceived need to shift the Army to a force capable of fighting on an atomic battlefield.

From Pentomic to ROAD

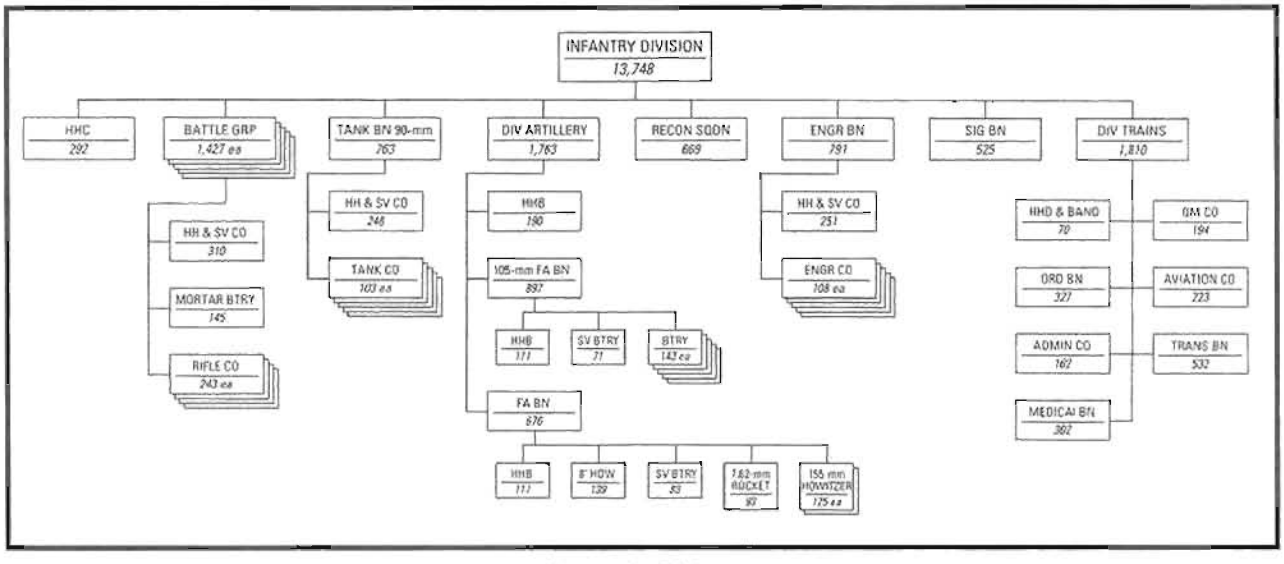
In 1954, Army Chief of Staff General Matthew Ridgway directed a review of the Army's organizational structure with recommendations on the organization of the Army from 1960-1970. He wanted a mobile force, capable of fighting on both atomic and nonatomic battlefields, that took advantage of new technology. A United States Army War College study recommended a total departure from the triangular division. In its place, the study recommended a small division of approximately 8,600 men organized into five small, self-sufficient battle groups—a pentomic division. The division would be completely air transportable. In spite of vigorous opposition, Ridgway's successor, General Maxwell Taylor, approved the study in 1956. When the Continental Army Command completed final work on the pentomic division, it had grown to more than 13,000 officers and men. However, it retained the focus on the five self-sufficient battle groups.

The divisional engineer battalion was restructured into an organization with five lettered companies, each having two platoons. The battalion retained the bridge platoon but lost the assault platoon from the 1948 organization. In addition, each of the battle groups had an engineer platoon in the headquarters and service company of the battle group. This platoon was to furnish the pioneer engineer support (hasty repair of roads, trails, fords, and culverts), limited field fortifications and obstacle breaching, and demolitions support. The platoon had no heavy equipment. Bulldozers, cranes, graders, and other similar equipment were in the divisional engineer battalion. Although the divisional engineer battalions contained five companies, one per battle group, doctrine maintained that some of these companies had to remain under the control of the division engineer for general work in the division area.

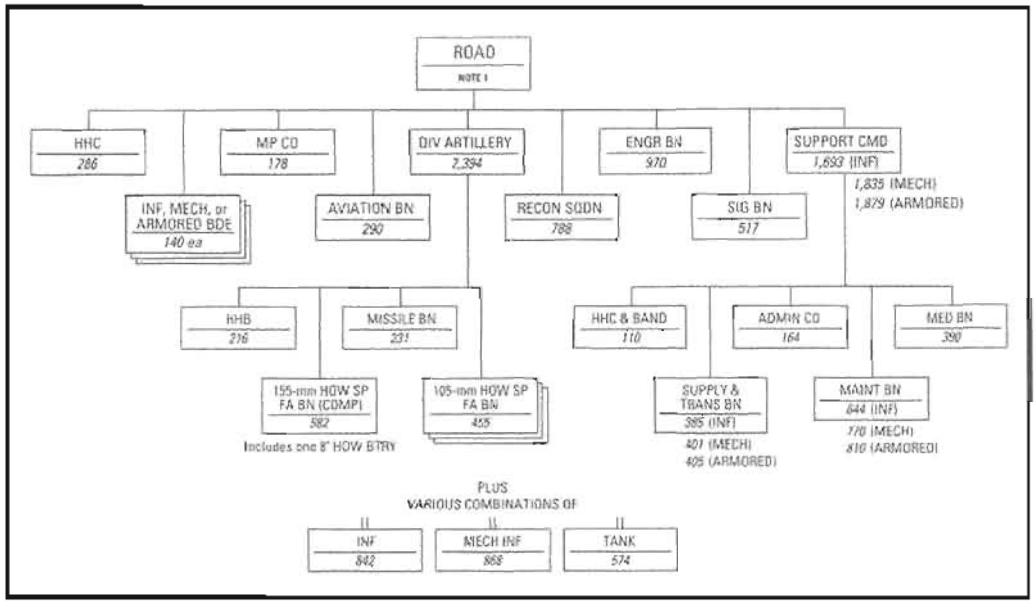
The projected force structure for a corps increased by a combat engineer group and three associated battalions, totaling three and nine respectively. The corps also added a panel bridge company, a float bridge company, and a light equipment company. There was a corresponding increase at field army level. The Department of the Army added a three-battalion engineer construction group and additional construction support—dump truck units. The field army's camouflage company became a camouflage battalion. The field army also retained its three-battalion combat groups.

The increase in the nondivisional engineer force reflected the orientation toward operations on a potentially atomic battlefield. The destruction of facilities and transportation possible in this type of environment required a robust engineer force. Doctrine still projected the reinforcement of divisional engineers by combat engineer assets at the corps. Construction engineering remained tied to the field army.

By 1960, the Army had reorganized most of its divisions according to the pentomic concept. However, opposition to the concept remained strong. Some believed that the divisional structure had to be sufficiently flexible to be tailored to certain tactical and geographical environments. A study entitled "Reorganization Objective Army Divisions (ROAD) (1961-1965)" was completed, even while the Army was completing its transformation to the pentomic structure. This approach, termed the ROAD concept,



Pentomic Divison



Divisional Base—ROAD Concept

reflected a thought process much like that which prompted the creation of the "group" versus the regiment. All divisions would have a common base of units, such as signal, transportation, and reconnaissance. However, the division's fighting elements—battalions and brigades—would be added or deleted as the tactical or geographical situation demanded. The ROAD concept was approved in late 1961. After delays occasioned by the Berlin Crisis and the Cuban Missile Crisis, the Army began reorganizing its divisions.

While the ROAD concept accepted the mixing of combat arms battalions according to tactical or situational needs, the generally accepted structure of a ROAD division had three combat arms brigades. In a sense, this returned the Army to the triangular division. For the engineers, the ROAD division was remarkably like the 1948 division. The basic difference was that the ROAD divisional engineer battalion had three letter companies and a bridge company in addition to the headquarters and headquarters company (HHC). The advent of the combat engineer vehicle negated the need for an assault platoon in the HHC. The tremendous increase in the number and weight of divisional vehicles increased the need for bridging, hence the strengthening of the battalion's bridging capabilities. Those units equipped with the mobile floating assault bridge had slightly fewer personnel than those using either the M4T6 or the Class 60 divisional bridge.

Under the ROAD concept, most of the Army's divisions were either armor or

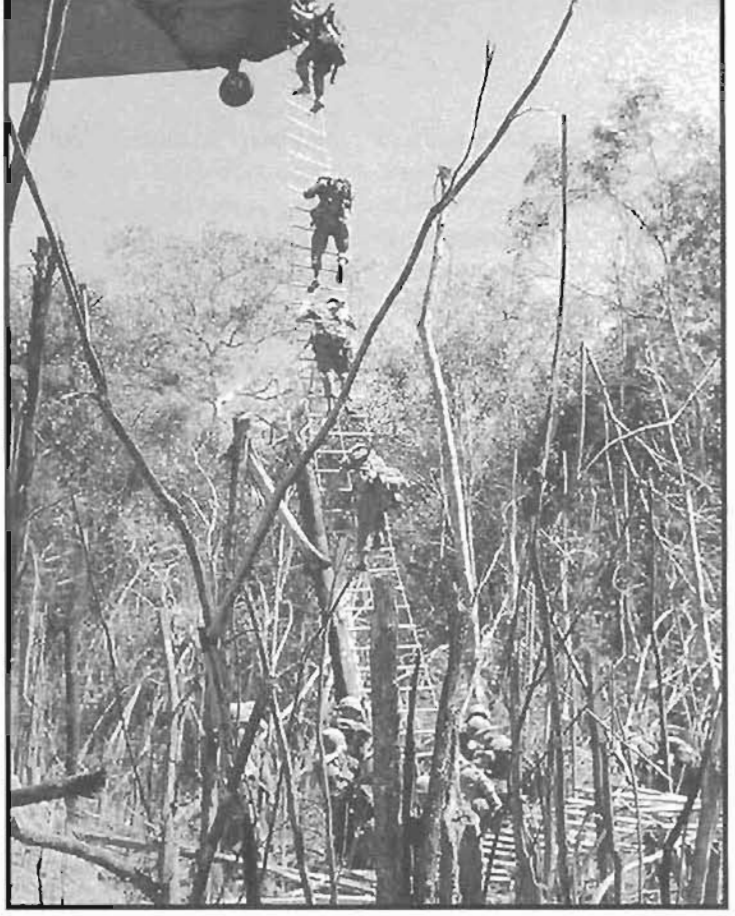
A 3d Armored Division tank prepares to cross the Rhine River on a 12th Engineer Battalion raft (1959).

mechanized infantry. The airborne division was the only organization at this echelon that was specialized. The airborne division engineer structure went through all of the various restructurings from 1948-1962. Following World War II, the airborne divisional engineer battalion had three companies, each with three platoons of three squads. The headquarters company, in addition to normal signal and logistical personnel, had an equipment platoon and a bridge platoon. The aggregate strength of the unit was 753 officers and men. In the restructuring associated with the pentomic concept, the battalion trimmed down to two companies with four platoons each. It lost its bridge platoon and 280 personnel slots. Unlike the infantry battle groups, the airborne battle groups did not have engineer platoons embedded in the group's headquarters company. With the ROAD reorganization, the battalion gained almost 100 personnel, with most of the gain going to battalion headquarters. The three line companies had three platoons with three squads each. There was no appreciable change in basic equipment.

There were some changes in key nondivisional units. The engineer combat battalion-army (doctrine manuals now included corps) picked up a fourth company. In addition, the combat groups in the corps and field army contained four battalions instead of the three in previous force structures. While the number of groups per corps and field army declined to two and three respectively, the total number of combat companies at these levels actually increased. In addition, an engineer combat brigade headquarters was authorized at both corps and field army levels. Construction had a minor increase in personnel with no change in either their structure or mission. Construction battalions and groups remained focused on the communications zone. Doctrinally, none were found in the corps or field armies.

Vietnam

The nation's involvement in Southeast Asia marked a test, of sorts, of the ROAD concept.



Engineers descend from a Chinook helicopter in Vietnam.

Generally, the three-brigade division was seen as sufficiently flexible to adapt to the requirements of unconventional warfare. Attachment of supporting organizations, especially aviation units, was well within the spirit of the ROAD idea. However, the divisions that did deploy to Vietnam were largely mechanized or light infantry divisions. No armored divisions went to Southeast Asia, although smaller armored units did serve in the theater. The 1st Cavalry Division, reorganized as an airmobile organization, was the only nonstandard unit of that size in the country.

Vietnam cannot be seen as a total affirmation of the ROAD concept. This was due to the fact that the Army, especially the engineers, did not fight according to doctrine—even the emerging unconventional warfare doctrine of the time. The major reason for this was the limitations on the numbers and types of engineer units that could be deployed to Southeast Asia. Major General Robert Ploger, the senior engineer in Vietnam and first commander of U.S. Army Engineer Command-Vietnam, noted:

"Early planning for the buildup and operations in Vietnam had little more to go on than tentative indications of the number of maneuver battalions that might be deployed. There was no generally accepted tactical concept, campaign plan, or scheme of logistical support upon which effective engineer planning could be based."

When senior Army leaders did begin to appreciate the magnitude of the engineer requirement, political decisions forced the Army to make nondoctrinal adjustments. At that time, 50 percent of the Army's engineers and engineer equipment was in the Reserve Components. However, the nation's leaders decided against a selective call-up of Army Reserve or National Guard personnel. This, coupled with the continuing demand for forces in Europe to deter the Warsaw Pact, meant that senior engineer officers had to send CONUS units to Vietnam in spite of their organizational type. Consequently, the engineer force in Vietnam, at its peak, had two brigade headquarters, six group headquarters—of which only one was a combat group headquarters—and 28

nondivisional battalions. Thirteen of these battalions were combat battalions; the remaining 15 were construction battalions. This engineer force was in addition to the organic engineers of the seven divisions and seven separate brigades deployed to Vietnam.

The nature of operations in Vietnam tended to negate established engineer doctrine and its associated force structure. The need for both combat and construction engineer support meant that both combat and construction units did both tasks. The traditional practice of placing a combat engineer battalion in support of a division was also modified. In the first place, the supporting battalion might be a construction battalion and not a combat battalion. Second, the tactical situation and the mobility offered by the helicopter could result in different battalions providing support at different times.

MG Ploger noted that maneuver units using helicopters were far more mobile than their engineers. Consequently, operational support came from whatever engineer unit was closest to the area of operations. Ploger went so far as to subdivide South Vietnam into operational areas for his groups. These groups, and their battalions, supported whoever entered their area. This was in addition to tasks directed by higher headquarters, such as improvements in the lines of communications and airfield construction.

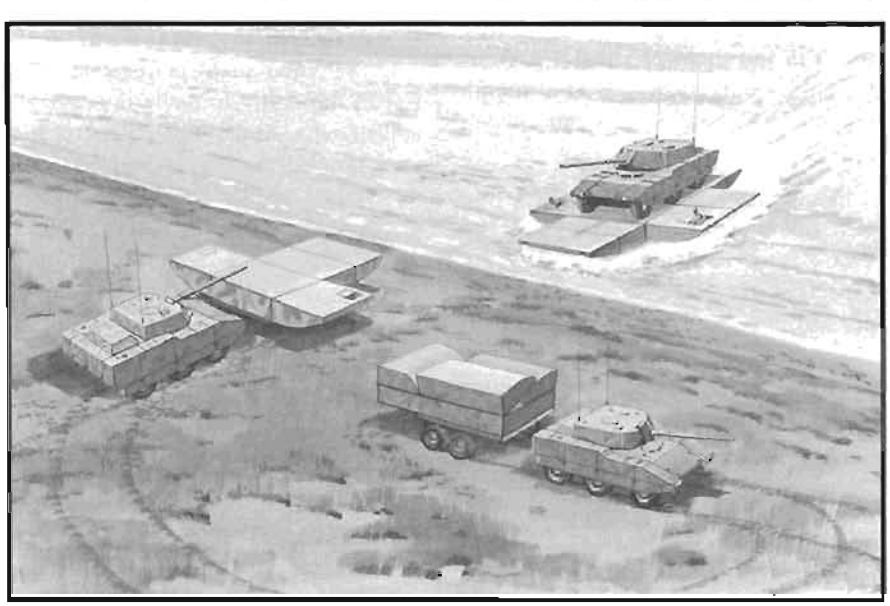
Airmobile operations were the major tactical innovations associated with the Vietnam War. The 1st Cavalry Division was the Army's first division structured around the airmobile concept. From an engineer standpoint, this division was analogous to the airborne division. Neither had the ability to move heavy equipment. Therefore, these engineers relied on light dozers and engineer equipment. The airmobile division engineer battalion was larger than its airborne counterpart by 150 men. The difference was found in a fourth letter company and an additional equipment platoon in the headquarters company.

1975-1990

Although the 1st Cavalry Division had validated the airmobile concept and ensured its place in future force structures, the Army turned its attention back to Europe and heavy forces in the years following Vietnam. The continuing perception that confrontation with the Soviet Union remained the greatest challenge explained part of this orientation. A second factor was the Yom Kippur War. In the midst of the American Army's efforts to create lighter and more mobile forces, such as the 1st Cavalry, the Middle East erupted in a conventional war characterized by armored and mechanized war on a level not seen since World War II.

In 1975, the Department of the Army directed the Training and Doctrine Command (TRADOC) to analyze the heavy division. The basic premise was that technology had been applied as "add-ons" rather than doctrinally incorporated into the structure and warfighting doctrine of the division. The advent of the "active defense" concept reinforced the need to reexamine the role and organization of the heavy division. The objective was to apply new technology, primarily in the form of new weapons and support systems, to achieve greater mobility, firepower, and maneuverability. The resulting Division Restructuring Study recommended several changes in the composition of the division. One of the recommendations was to remove the bridge company from the engineer battalion and move it to the corps. This suggestion was somewhat puzzling. An increase in the weights of divisional equipment—especially armored vehicles—and the need for greater maneuverability logically argued strongly for the retention of the bridge company. In addition, the survivability of divisional forces, an obvious facet of the reality of fighting "outnumbered," should have called for additional engineer assets.

Parallel to this reevaluation of the heavy division was the Army's attempt to respond to the congressionally mandated requirement to alter the "tooth-to-tail" ration. A number of analysts and congressmen believed that the support forces in the Army had grown out of proportion to the combat forces. This reinforced the desire of General Creighton Abrams, the Army Chief of Staff in the early 1970s, to eliminate everything in the active Army that did not contribute directly to the fighting force. The Corps of Engineers responded in two ways. First, it changed the designation of its construction battalions to "combat heavy battalions." Second, it shifted a number of corps and echelon-above-corps support functions to the Reserve Components.



Light Assault Raft

The fruits of the Division Restructuring Study were short-lived. In 1979, General Don Starry took command of TRADOC. He rejected the idea of "active defense" in favor of a reorientation on offensive operations. This ultimately led to the advent of "AirLand Battle." With a new doctrinal philosophy, TRADOC reexamined the heavy division in an effort known as Division 86. At the same time, TRADOC took on a directed task to standardize infantry, airborne, and airmobile divisions. The issue here was to field a force capable of rapid deployment, but with sufficient firepower and resources to sustain itself in combat. As was the case in the Division Restructuring Study, planners looked to technology to add new capabilities to the combat force.

Although the Army adopted a "final form" for the heavy division in 1982, the actual conversion of armored divisions was deferred until the mid-1990s. Reductions in personnel made it difficult, if not impossible, to fill the 18,000 to 20,000 personnel slots in the various forms of the division. In addition, the new division incorporated more than 40 new weapons or pieces of equipment, some of which were still in the developmental stage. The solution was to adopt interim organizations until such time as the materiel was available. The divisional engineer battalion reflected this approach. The structure called for an organization of four letter companies, a bridge company, and a headquarters company. The line companies were authorized the M9 armored combat earthmover (ACE). Unfortunately, the M9 had not been fielded. This, plus personnel constraints, meant that interim organizations with reduced manpower (to include the absence of the bridge company) and substitute (often obsolete) equipment would be the norm for the foreseeable future.

There was no final form for the "light" divisions. General Starry set a cap on the size of the unit at 14,000 personnel. In addition, the new division would not have organic tank or mechanized infantry units. More importantly, he specified that the unit had to be deployable in C-141 transports. In this latter case, Starry departed from one of the basic design principles that had guided Army planners for most of the 20th century. Force structure had always had as its guiding principle the ability of the organization to perform its function in combat. Starry added, or conceivably substituted, the ability of the unit to get to the area of operation. In this respect, Starry's action was remarkably similar to Army leaders of the post-World War I period who sought to trim the division based on the road space it occupied or the number of ships needed to get it overseas. In this sense, mobility was not the same as maneuverability; mobility was in fact deployability.

This idea carried over into the next phase of force design that came to be known as the Army of Excellence. The new Chief of Staff, General John A. Wickham, wanted light divisions to be deployable three times faster than existing infantry divisions. He also wanted the light division to be totally transportable in fewer than 550 C-141 sorties. Based on this criteria, planners designed a division of slightly more than 10,000 men. The divisional engineer battalion had 314 officers and men, organized into a headquarters company and three line companies. At full strength, each of the letter companies had 63 officers and men. The headquarters company had an assault and barrier platoon with small emplacement excavators and M9 ACEs. Indeed, all of the unit's earthmoving equipment was consolidated in the headquarters company.

General Wickham's desire to reduce the size of the light division carried over to the airborne, airmobile, and motorized divisions. The engineer battalion was reduced to approximately 400 officers and men for the airborne and airmobile battalion. The motorized division engineers numbered 490. The engineer structure for the motorized division represented a significant departure from traditional designs. The battalion had three light and one heavy company. The light companies had three, two-squad platoons and a mine/countermine section. The heavy company had one standard platoon of two squads, a mobility platoon with ACEs and light assault bridges, and a countermobility platoon oriented to mines and antitank ditches.

Ironically, all of the effort at designing a motorized division that reflected the latest technological innovations came to naught. The division's structure, and to a degree its method of operation, depended on the acquisition of the new equipment, such as assault guns and fast attack vehicles. However, the money for the acquisition of those systems never materialized. Consequently, the Army had developed a specific type of division that it ultimately could not field because it could not purchase the equipment unique to that organization.

Desert Storm and the ERI

In late 1990 and early 1991, the Army deployed a significant part of its force structure to the Persian Gulf in response to the invasion of Kuwait by Iraq. The forces included armor, mechanized infantry, airborne, and airmobile organizations. These units brought with them a variety of organizational structures implemented under the Division Restructure Study, Division 86, and Army of Excellence programs. Most of these had been established to deal with a principal threat of conflict in Europe against the Soviet Union. However, the demise of the Soviet Union cast large questions about the proper structure and composition of Army units.

The engineer force that operated in Southwest Asia was not one approved in the conventional force structure process. Since the mid-1980s, the engineers had advocated a fundamental change to the 50-year rule of limiting divisional engineer assets to a battalion. The Engineer School commandant recognized the need for an engineer brigade in the armored and mechanized infantry divisions. This was initially called E-Force and would ultimately become ERI. This concept called for three divisional battalions under the command and control of a divisional engineer brigade commander. Although the concept had

M9 Armored Combat Earthmover

been approved at several levels and had been tested in various exercises, it had not been formally adopted by the Army. The Central Command commander approved the formation of ERI "brigades" in four of the five divisions deployed to the Persian Gulf. Engineer brigade commanders and staffs were formed as ad hoc organizations with personnel drawn from a number of sources. In one case, the supporting engineer group commander assumed command authority over the three battalions in the division (the original divisional engineer battalion and two corps assets). For the most part, the new divisional battalions were corps units. While the ERI concept was successful, some engineers suggested that an operational environment was not the place to test new organizational concepts and that the hastily assembled divisional brigade command and control elements could have encountered significant problems. The shortness of Operation Desert Storm meant that many of the potential problems of the ERI did not have time to surface.

In March 1991, the Army Chief of Staff approved the ERI for implementation across the Army. This constituted a rather unique situation where the Corps had developed an organizational structure and "sold" it to the Army. Historically, engineer planners have been part of a larger group of individuals examining organizational structures and arriving at integrated recommendations.

However, the ERI would suffer from the same circumstances that negated adoption of the two-battalion regiment in the days following World War II. A continuing move to reduce the manpower strength of the Army and the application of scarce resources to other programs, such as modernization, prompted a continuing number of inactivations. In addition, the reorientation of the Army from a forward-deployed force to a CONUS-based force placed an unusually high premium on the ability to deploy to a distant region in a reasonable amount of time. As had happened in the past, the ability to meet certain deployment criteria became, in some instances, a factor more important than the ability to perform required missions or tasks once in the area of operations.

Conclusion

For most of the 20th century, engineers have tried to develop force structures that enable them to meet their mission responsibilities. Those responsibilities have remained relatively constant through time. While planners and developers from the 1920s, 1950s, 1970s, and 1990s have used different terms or phrases to define mission requirements, the challenge of the engineers has consistently been to facilitate the movement of the combined arms, impede the movement of the enemy force, and construct those works which allow for the physical and logistical support of the field force. Technology has changed the physical characteristics and capabilities of the equipment the engineers use, but it has not altered the purpose of engineer work.

The evolution of engineer forces in the last 80 years has shown certain recurring trends. First, the division has been the central focus for Army planners throughout the 20th century. For engineers, the capabilities and limitations of divisional engineers have significantly affected the composition and structure of corps engineer units. Lack of sufficient organic engineers in the division has forced planners to push corps engineer units into the divisional area to accomplish needed work. This has, in turn, forced the forward displacement of engineer units in echelons above corps to the corps area to cover requirements. This constituted a "work-around" approach that actually became codified in engineer doctrinal publications. The second fact is that while maneuver commanders have generally clamored for more engineers during combat operations, this need has often been forgotten when postconflict demobilizations and reduced budgets required manpower caps on divisional and nondivisional units. Finally, engineer planners have generally based their organization structures on the nature and quantity of work to be done in a given area. However, Army planners have often been influenced by the dictates of deployability and unique operational requirements. The pentomic division, and its focus on an atomic battlefield, was an illustration of the latter.

The challenge for engineer force planners in the future will be to educate the senior Army leadership on the nature and scope of engineer work across the operational spectrum. These same planners must then craft an engineer force with whatever manpower and equipment resources the Army is willing to provide.

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

CTC Notes

Combat Maneuver Training Center

Editor's Note: The article below describes well-refined tactics, techniques, and procedures for using an engineer reconnaissance team (ERT) while fighting in compartmented terrain at the Combat Maneuver Training Center (CMTC). Many engineer commanders in the field use a similar ERT concept to improve the quality of engineer reconnaissance information and more fully integrate mobility/countermobility/sustainability priority intelligence requirements into the supported unit's reconnaissance and surveillance (R&S) plan. Readers should understand that ERTs are not resourced in unit modified tables of organization and equipment and that the use of ERTs is not taught at the U.S. Army Engineer School as a doctrinal approach. Certainly, real innovation comes from the field and often turns into doctrine. But we need to be disciplined in our approach so these innovations complement and do not undermine existing tactics. As always, we encourage our readers to continue submitting articles as such and share ideas that build upon our warfighting skills.

Engineer Recon Teams

By Captain Gerald Dull and Sergeant First Class Danny J. Petersen

Engineer battalions deploy to the CMTC with the intent of using ERTs to gather engineer-specific intelligence on the battlefield. An ERT is an excellent asset when used appropriately.

It is important to understand the concept of an ERT, given that the current engineer force structure does not provide personnel dedicated for reconnaissance purposes. Although a battalion may choose to use more assets for reconnaissance, the ERT is the base engineer recon element. Its arrival method may vary from dismounted (air insertion or ground) to mounted (wheeled or tracked). An ERT can vary from three to five people, depending on whether they will be mounted or dismounted. A mounted recon consists of five people. An assistant recon team leader and a vehicle operator remain with the vehicle and the other three conduct the recon dismounted. The recon team leader typically moves with the dismounted element. The mounted element's primary mission is to maintain communication with the dismounts and the supported unit. Its secondary mission is to be prepared to go forward and conduct a recon if the dismounted element is unsuccessful. The dismounted element's mission is to report all information required by the supported commander, according to the R&S plan. It reports directly to the supported unit's headquarters or, if part of a mounted recon, it can relay information to the supporting mounted element. Generally, ERTs are tasked to locate and recon obstacles and restrictions along a route or an axis. This article examines the steps necessary for obstacle reconnaissance.

An ERT's purpose is to determine the best method to overcome the effects of obstacles, either through bypass or reduction. The ERT and engineer battalion must understand the five steps to a successful engineer recon mission:

- Detection. An ERT must help locate and evaluate obstacles and restrictions, and this begins during the brigade and/or task force intelligence preparation of the battlefield process. This process focuses the ERT on a particular named area of interest (NAI) or obstacle to recon. The ERT combines this effort with the work conducted during its troop-leading procedures (usually a map recon) to identify all possible obstacles and restrictions within its area of operation. It then uses this information to plan and conduct its mission.
- Area Security and Recon. Once the ERT detects an obstacle, it establishes an overwatch position and confirms the enemy situation from the nearside. Once the enemy situation is confirmed, the ERT establishes an observation post on the farside to provide 360 degrees of security around the obstacle.
- Obstacle Recon. Once security is established, the ERT determines obstacle location and orientation; type of mine or obstacle; obstacle length and width; existence of enemy coverage, including enemy strength, equipment, and fire power; and equipment necessary to reduce the obstacle.
- Course of Action (COA) Selection. The ERT has four basic COA options: bypass (preferred), reduce the obstacle (least preferred as it significantly degrades its abilities), support a breaching operation, or continue the mission. Initial guidance for COA options is generally found in paragraph three of the base operations order (OPORD) or in the R&S plan. After collecting the facts, the ERT leader analyzes the COA and mission, enemy, terrain, troops, time available, and civilian consideration factors to select the best COA.
- COA Recommendation/Execution. After selecting a COA, the ERT leader either makes a recommendation to higher headquarters or executes the COA. Many times he will execute a COA based on prior guidance from the OPORD.

To accomplish these tasks, the ERT can be employed using one of three methods. The first method is to integrate the team as part of the brigade intelligence-collection effort. This employment concept may be used when engineer scouts are not expected to work closely with task force scouts or there are advantages (such as observing enemy obstacle emplacement) to moving the ERT across the line of departure before the task

force scouts. Typically this is how the engineer battalions employ their ERTs at CMTC as they task-organize an ERT with a brigade recon troop (BRT). It requires the most involvement by the engineer battalion; it is also where units generally fail. Because the engineer battalion is not very involved, the BRT uses the ERT as observation posts or radio/telephone operators, since the BRT commander, without clear guidance, uses the ERT to best support his mission. To avoid this problem, the engineer battalion must ensure that the ERT is included in the brigade intelligence-collection plan by stating tasks in the R&S section of the brigade OPORD. It must also actively track the ERT's logistics status, position, and no-fire areas and ensure that intelligence gathered by the ERT is disseminated.

The second method is to assign the ERT brigade's NAIs in a task force area of operation. The ERT then receives its objectives through the engineer battalion via the brigade OPORD. It is imperative that the ERT team leader links up with the task force scout platoon leader and gets integrated into the task force plan. He should attend all task force scout OPORD briefings and rehearsals.

The third method is for the ERT to work under a task force's control. This requires the least amount of coordination and planning for the engineer battalion. The activities of the ERT fall on the task force engineer, who is now responsible for using the ERT and integrating it into the R&S plan. He is also responsible for the ERT's logistics status, tracking its position on the battlefield, establishing no-fire areas, and disseminating the ERT's reports from the engineer tactical operations center to the engineer battalion.

No matter which employment method is chosen for the ERT, selecting the proper personnel and equipment is critical to the success of the ERT. When making these selections, the engineer battalion must be aware of the trade-offs in using assets in a recon role as opposed to a maneuver-support role. The loss of personnel and equipment can degrade the battalion's capabilities. A primary consideration in selecting personnel rests with the training required to make them successful at their task. A large amount of time must be devoted to training, and the battalion staff and ERT members should be trained in the six fundamentals of tactical recon operations:

- Use maximum recon forces forward; do not keep them in reserve.
- Orient on a recon objective. All personnel should understand the purpose of a recon mission, which is found in priority intelligence requirements, the R&S plan, and the commander's intent.
- Report all information rapidly and accurately. The ERT needs to report what it sees on the ground and not what it thinks the higher commander wants to hear. Information that an obstacle is not in a templated location is just as valuable as information on where an enemy or obstacle is actually located.
- Retain freedom of maneuver. The ERT must be able to maneuver on the battlefield.
- Gain and maintain enemy contact. Once contact is made, the ERT must maintain it using all means available.
- Develop the situation rapidly. Time is a precious commodity; soldiers must be able to accomplish their tasks with a minimum of guidance from higher headquarters.

Besides executing the fundamentals, it is vital that the ERT is able to effectively operate with brigade assets and task force scouts in a habitual relationship. Trust and familiarity must be developed at the home station before a rotation. In many instances, a CMTC rotation is the first time the ERT has trained with the BRT or task force scouts. The soldiers must also become proficient in basic soldier tasks, including reporting, calling for fire, first aid, noise, light, and litter discipline. Finally, the members of the ERT must conduct rigorous physical training to ensure that they have the endurance to complete the dismounted missions.

Training is only part of the equation for a successful ERT. The soldiers must also have adequate resources to ensure success. First, if they are to insert by ground, they must have a vehicle—which can be either a high-mobility, multipurpose wheeled vehicle (HMMWV) or an M113A3. At the CMTC, the HMMWV is the preferred mode of transportation as it offers greater stealth, is less maintenance intensive, and can travel in restricted terrain. Using an M113A3 is more desirable if the requirements call for more personnel and equipment or the need for survivability is a higher priority.

Outfitting the vehicles and personnel with proper communications equipment is vital to the ERT's success. The mounted element should have a minimum of two radios per vehicle. This allows them to act as a retrans or extend the range of the dismounted element's radio systems. The ERT should also have a manpack for the dismounted soldiers. Weapon systems should include an MK19 or M2 mounted on the vehicle; dismounted soldiers should have an M203 and a SAW/M60. Other recommended equipment includes night-vision devices, a global positioning system, a laser range finder, and a digital camera.

The ERT is an excellent asset if a unit can afford to resource it and understands how to use it. The ERT must be integrated into the R&S plan and home-station training with the BRT or task force scouts. If the ERT is equipped and properly used, it can be a combat multiplier through the intelligence it gathers. The OPFOR at CMTC uses the ERT effectively against the training units during every rotation, and we can do the same.

Captain Dull is the assistant brigade engineer observer/controller at CMTC. Previous assignments include commander, C/299th Engineer Battalion, and training officer, Engineer Brigade, 4th Infantry Division.

Sergeant First Class Petersen is the engineer battlestaff NCO observer/controller at CMTC. Previous assignments include combat engineer vehicle commander, 82d Engineer Battalion, and A&O platoon sergeant, 58th Engineer Company (OPFOR).

ENGINEER UPDATE

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

Directorate of Training (DOT)

Counter-Booby Trap Course. On 28 May 2002, 18 Engineer Officer Basic Course students from Class 3-02, along with two first lieutenants from the 1st Engineer Brigade, Fort Leonard Wood, Missouri, participated in a pilot Counter-Booby Trap Course.

The purpose of the 2-week course was to train personnel to recognize, detect, report, and plan the clearance of booby traps. Students were introduced to a wide range of counter-booby trap topics, including uses and principles; switches; recording, marking, and reporting; and recon. They participated in various practical exercises that incorporated classroom training into real-life scenarios, while providing an opportunity to plan various booby trap clearance operations and conduct clearance exercises. Students used trip wire feelers; titanium probes; AN/PSS-12 mine detectors; DA Forms 1355, *Minefield Record*; and rolls of engineer tape for marking safe pathways. The intent of the course was not to turn lieutenants into subject-matter experts but to expose them to the many aspects of booby traps and enhance previous training.

The students were reminded regularly that all clearance missions should be conducted with the support of explosive ordnance disposal (EOD)-qualified soldiers. Trained experts on post, including instructors from the Department of Instruction at the Maneuver Support Center and the Sapper Leader Course, enhanced the quality of the course while offering students the opportunity to learn about real-life experiences. The course was capped off by a visit from EOD personnel from Fort Polk, Louisiana, who offered search advice and fielded questions.

Officials from the Directorate of Training Development are currently deciding on the course's future, making any necessary adjustments, and deciding at what level of leadership the course will be taught.

POC is CPT John Clarke, 35582; DSN –5582; or e-mail *clarkej@wood.army.mil*.

News and Notes

United States Military Academy (USMA) and United States Military Academy Preparatory School (USMAPS) Appointments. USMA at West Point, New York, is the world's premier institute of leader development. Graduates not only receive a bachelor of science degree but also a commission as a second lieutenant in the U.S. Army. They also gain practical leadership experience that is virtually unmatched in any other profession.

Each year, USMA or USMAPS at Fort Monmouth, New Jersey, offers admission to approximately 250 soldiers (Active, Reserve Component, and National Guard) and more than 100 military dependents. USMAPS prepares soldiers for success at USMA through an intensive curriculum focused on English and mathematics.

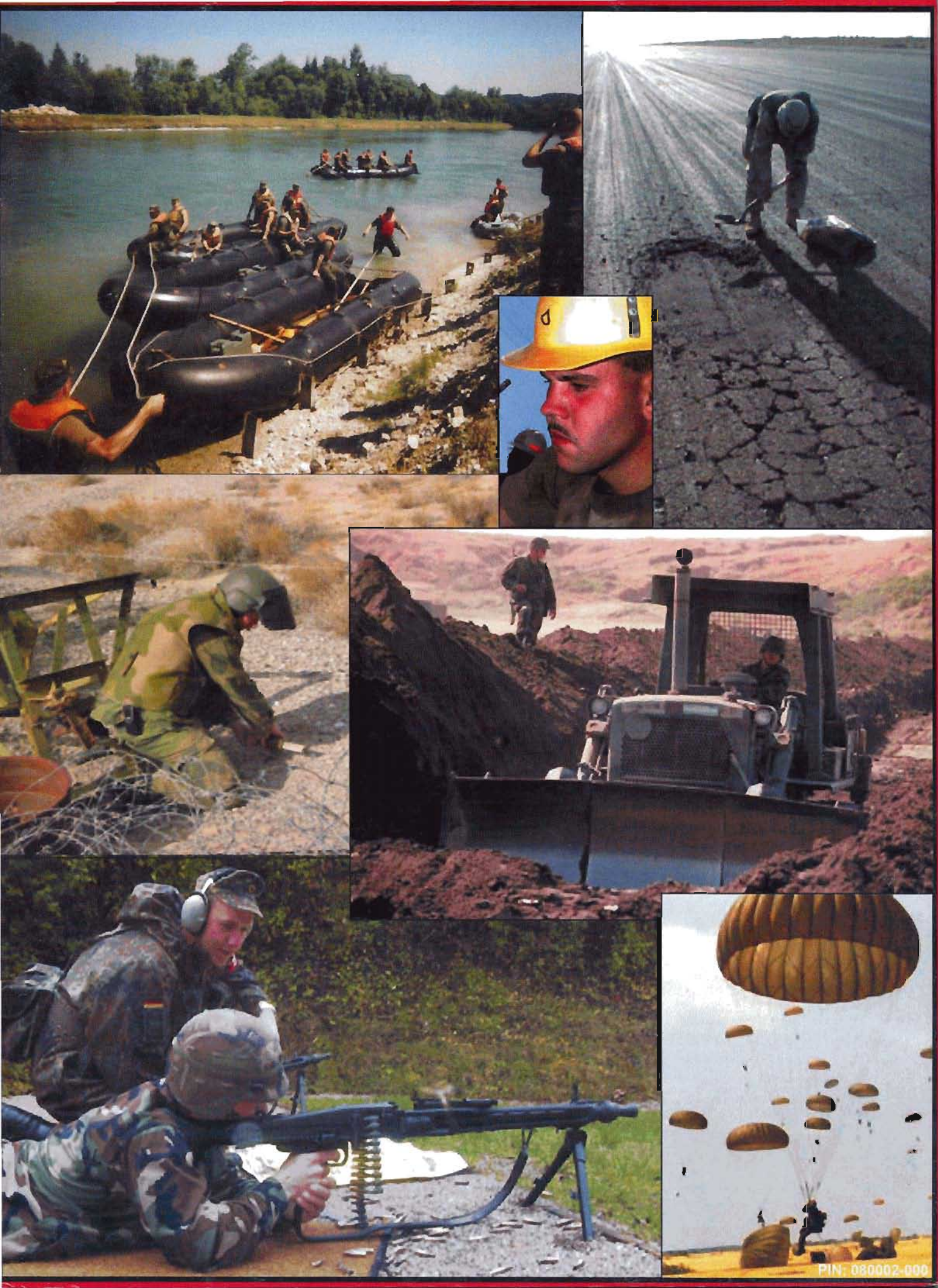
To be eligible, a dependent must be the son or daughter of a military member in one of the following categories. First are career family members. These are members of an armed force (Army, Navy, Air Force, Marines, or Coast Guard) who are on active duty (other than for training) and who have served continuously on active duty for at least 8 years or who died while they were retired with pay or granted retired or retainer pay. Second are service members currently serving in the Reserve Component who are credited with at least 8 continuous years of service computed under Section 12733 of Title 10, United States Code (for example, at least 2,880 points). Third are Reservists who are entitled to retirement pay when they reach age 60, including those who have died. Applicants must be—

- U.S. citizens.
- Unmarried with no legal obligation to support dependents.
- High school graduates.
- Under 23 years of age before July 1 of the year entering USMA (under 22 years of age before July 1 of the year entering USMAPS).
- Of high moral character.

Most importantly, the applicant must have a sincere interest in attending USMA and becoming an Army officer.

Soldiers and dependents who meet the basic eligibility requirements, have achieved SAT scores greater than 1,000 or an ACT composite score of 20 or higher, and have earned good grades in a college preparatory high school curriculum are especially encouraged to apply. All application requirements must be submitted by 1 April 2003 to be considered for appointment to USMA or USMAPS in July 2003.

POC is Captain Cliff Hodges at (DSN) 688-5780 or (845) 938-5780, e-mail: *tc2324@usma.edu*, or fill out the request form at *http://forms.admissions.usma.edu/cb*.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