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Meeting the Challenge

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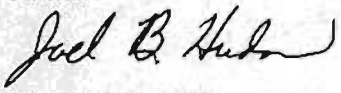
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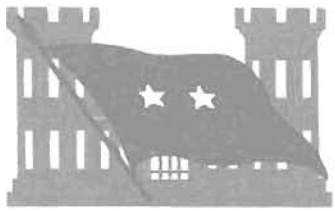
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Clear The Way

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





It is really great to be back in BDUs. Army life is full of changes and challenges, and each assignment has its own rewards. But I am so pleased to be back at Fort Leonard Wood and, more importantly, back with the Regiment. Thank you all for the warm welcome and your tremendous support during the transition.

I have been walking the grounds of Fort Leonard Wood since July, and I am impressed with what I've seen—sappers training in the basics of soldiering and combat engineering, seasoned drill sergeants, bright-eyed lieutenants, tough captains as small-group instructors, and the list goes on. The dedication and hard work of the civilians and soldiers of the Engineer School inspire me, as I see the Engineer Regiment transforming before my eyes. I would like to thank MG Andy Aadland for handing over the reigns to such a superb organization and fantastic team. And, Andy, keep those TIM dollars coming!

The hard work of the part of the Regiment here also includes work toward transformation. That work is important, and the reason is simple—the world in which we live is changing. The United States is now in a world of regional instability, rogue nations, international crime, land mines, and terrorism. For those reasons, we must transform. But our Commander-in-Chief, President Bush, has also told the military forces to be ready. Two missions at once is tough business, but engineers are used to it. We've always succeeded at multiple missions; we support the maneuver force and accomplish the engineer mission.

Change is something that we do not do easily. We have not had a major change in engineer force structure since ERI. That was almost 12 years ago during the Cold War era. We have made some changes in the margins, but fundamentally we are organized, equipped, and manned and usually function in exactly the same way that we did when the Wall fell. However, there is one area where things have changed significantly—engineer actions across the spectrum of operations. From Bosnia to Afghanistan to a multitude of smaller operations, we have seen what I think is a fundamental shift. I see smaller engineer forces carefully selected and trained to accomplish specific effects in support of maneuver.

Let's look at an example. In the past, we just put combat heavy battalions or companies on the TPFDD; deployed them lock, stock, and barrel; and accomplished the mission. It didn't matter if it was HIC (Desert Shield/Desert Storm), SASO (Honduras, Fuertes Caminos), Grafenwohr, or NTC. The rule was "if it is green and on your property book, then you need it, every time, every place," and you took it with you. In some ways, we no longer employ and deploy in this manner. Engineer employment is planned and prepared at a variety of levels to build task-organized units that are tailored to minimize lift, minimize logistical footprint, and maximize effects. We deploy what we need and whom we need. We train them to a high state of readiness in the special skills they will need. And they accomplish their missions magnificently.

A significant goal for the Interim and Objective Force Army is that same deployability, responsiveness, and sustainability—maximum effects, minimum lift, and minimum logistical footprint. Overall rapid, decisive, and successful operations require this tailorability. There are a variety of things that are allowing this to become part of how we do business: superior information flow, improved intelligence, better command and control, and smarter and tougher soldiers and leaders. It is an important shift and one of several that I think needs exploring. I need leaders at every level to keep brainstorming new ways we can fight the engineer fight of the future. If you are not engaged in the future, then you are part of the past.

While transformation is the direction of the future of the Army, the key to the continued success of the Army is people. You are the future of the Engineer Regiment. You are the reason we have the most dynamic engineer force in the world. You are the reason I am so confident in the future successes of the Corps of Engineers. And this is the reason that all leaders—from myself down to each squad leader—must take care of their people. I want each leader to ensure that he takes care of his people by achieving a healthy balance —a balance of spirituality, family, and work. The context of that balance certainly changes, but the fundamental approach applies everywhere—garrison, field, and battlefield.

Think about the future, take care of your people through balance, and we'll talk again in upcoming issues.

Essayons!

Lead The Way

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



As you read this article, there will be a new Regimental Command Sergeant Major at the helm of our Regiment. CSM Bill McDaniel has been selected to replace me and will undoubtedly do a great job as the Engineer School Regimental CSM. And, in addition to my replacement being named, our Corps of Engineers will have a new CSM in CSM Mike Balch. I realize this is old news, but I'm very excited about the future of our Regiment and what these two super NCOs will bring to it. Their selections represent a new generation of leaders, with fresh ideas and experiences that will shape the Regiment's future.

As I wind down the time I have left in this job and in the Army, I have reflected often on how much has changed in the last two years and over the course of my 30-plus years of service. In the last two years, we have seen the transition of several of our Regiment's best leaders. As I have said in earlier articles, transition of leaders in our business is commonplace. But what we have to realize is that with the passing of every great leader, our Regiment gets better.

We have seen our Army transform. Organizations, equipment, and doctrine are very different today in a lot of places in our Army than they were two years ago. Here at the Engineer School, we have won, then lost—and in some cases won back—key battles with regard to organizations, personnel, and doctrine. Although some of the faces have changed, and will continue to change, the mission here at Fort Leonard Wood will always be to ensure that our Regiment is relevant and integral to the Army's transformation.

I have visited most of our engineer soldiers throughout the world, and I'm always impressed with their enthusiasm and professionalism when they perform their duties. Our soldiers are the busiest in our Army and are the busiest they have ever been over the last 30 years. I can remember an Army that, in the mid to late 70s, did nothing in comparison to what our operational tempo has us doing today. In the 70s and early 80s, we occupied our time and our soldiers' time by maintaining equipment that never got used and training on tasks until we were numb. And alerts—when we did use our vehicles to get to the local deployment or marshalling areas—were one-day events.

I also remember an Army where the leadership was weak and uncaring and, therefore, soldiers were unmotivated, undisciplined, and unprepared for combat. I can remember reporting to my first unit overseas and being approached by a person in civilian clothes offering to sell me drugs, only to find out the next day that this person was an NCO in my unit. And I remember being housed in a room with a couple of specialists who smoked so much hashish that I refused to sleep in the room and moved my bunk and locker into the hallway. I also remember, as a platoon sergeant, relieving all four of my squad leaders whom I caught drinking wine at 0530 hours, when their squads and the rest of the platoon were preparing to move to the field.

I am not naïve enough to believe that we have completely removed this kind of misconduct in our Army, but I feel secure in saying that it doesn't happen very often. Our Army is much better today because of the people who join it and our superb NCO Corps. The leaders of our Regiment today are quality people who care for and prepare our soldiers superbly. They are all outstanding and are training their soldiers to carry on with the highest of standards and traditions. The greatness of our Army lies in all its components—Active, Guard, and Reserve—and the component we most often forget—our civilian workforce. That is why I can leave the Army content in knowing that the future of the Regiment is in good hands.

I began my life as an Army engineer at Fort Leonard Wood, and it's appropriate that I retire here. This has been my home for more than 12 years of my career, and this place has been good to me and my family. I reminisce often about my days on the trail, working out on the ranges, and the other positions I've held here. I think a lot about all the soldiers I trained and how many of them are Sergeants Major and First Sergeants today. And, as ironic as it may seem, I can remember avoiding guys like MG Jack Waggoner and CSMs Baxter, Butler, Haller, and Allen, but now I look forward to seeing them every day.

In closing, I want to thank all of the leaders of our Regiment for your support—Commanders, Command Sergeants Major, Officers, and NCOs. You have all made my time here as the Regimental CSM rewarding and have allowed me to experience a dream I have had since I became an NCO. I have been blessed throughout my career, serving with and for great commanders. I would name you all, but I know you know who you are. I want to say, simply, "Thank you."

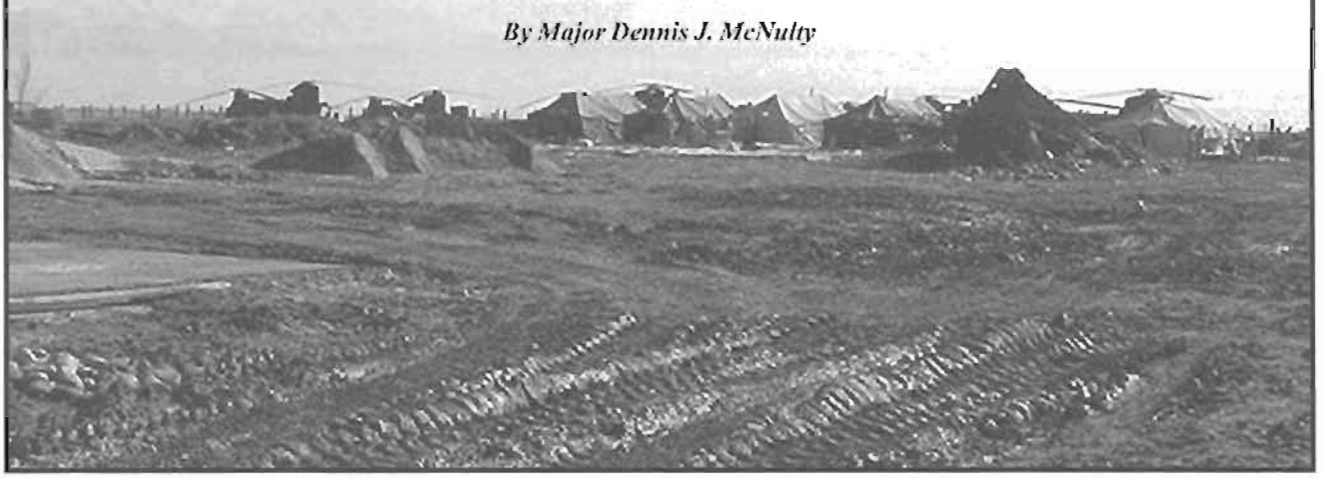
I would ask that you—and I know you will—give Bill McDaniel and Mike Balch the same level of support and faith in their abilities to do this work as you have me. Your trust and loyal support to them will make this arduous task fun. Essayons!

Engineers Lead the Way!

Sapper 7, OUT.

Base Camp Infrastructure Development and C2 in Afghanistan

By Major Dennis J. McNulty

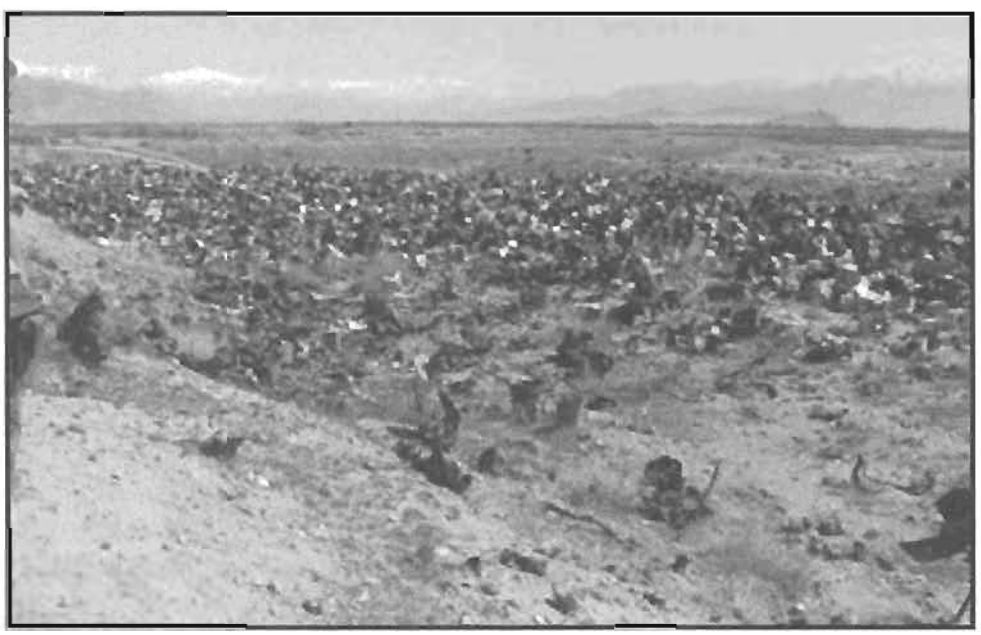


The rapid and unexpected population growth that occurred at the base camp at Baghram, Afghanistan, and the expansion of base camps in general, presents challenges for engineer and logistical planners concerned with developing base camp infrastructure in an efficient manner.

Before Operation Anaconda, the base at Baghram, located approximately 30 miles north of Kabul, was not expected to exceed more than 300 personnel. Accordingly, engineer and logistical planners did not expect, nor plan, extraordinary life support or base camp construction tasks. As the situation developed, however, the camp population began to expand rapidly, and by mid-January, the population was hovering at about 1,000. Thirty days later, it had nearly doubled, and two weeks after that, the population was up to almost 3,500. By mid-March, the population had peaked at about 4,000. This rapid growth presented several challenges for engineer planners who were concerned about developing basic base camp infrastructure. Challenges such as providing bed-down, latrine, and shower facilities; potable water; and adequate power distribution had to be overcome at Baghram, as well as at the base camp at Kandahar. Establishing a base camp master plan and a command and control (C2) organization in the midst of the rapid expansion also proved challenging.

Bed-Down Facilities

Initial bed-down facilities for the first units arriving at Baghram consisted of a mix of old Russian barracks; standard general-purpose, medium tents; and Force Provider tents. As the camp expanded, more Force Provider facilities were added, and several buildings were renovated for



A UXO-littered field in Afghanistan

use as offices and limited sleeping quarters. Planners faced a major challenge in establishing bed-down facilities at Baghram because the area was heavily mined. The method used to clear areas throughout Afghanistan was dependent on several factors, including the known or perceived threat, the purpose for clearing, the assets available, and the terrain on which the clearing was required. In Baghram—as in Kandahar—large, flat areas were available and designated for tent cities. In most cases, these areas were cleared with a mine-clearing armor-plated D7 dozer, or an Aardvark or a Hydrema flail, and then visually proofed. Mine-detection dogs were also used for additional proofing. (See article, "Repairing Runways and Clearing Mines in Afghanistan," *Engineer*, July 2002.)

Another issue faced by planners at Baghram was that initially, many conventional forces and some special operations units deployed to Baghram without tents. Consequently, several hundred tents had to be procured on short notice to provide adequate life support for these units.

Water Supply

Providing an adequate supply of potable water at Baghram was also challenging during its rapid expansion. Initially, bottled water was flown in, and this was sustainable when the camp consisted of fewer than 300 personnel. However, it soon became apparent that as the population expanded, bottled water would not be adequate to meet dining, laundry, and hygiene requirements.

During their occupation, the Soviets had built two wells at Baghram, but neither of the pumps was operational when U.S. forces secured the base. A British well-drilling team and U.S. engineers repaired or replaced the pumps. The British team tested the water from one well and confirmed that it was safe for drinking. However, reverse osmosis water purification units were brought in for both wells as added insurance of safe drinking water.

Repairing the well at Baghram required that engineers overcome a heavy lift problem. A crane was not available to lift the pipe from inside the well, so a helicopter secured the existing pipe and pulled it out. At Kandahar, wells also provided potable water. There, one of the pumps operated with three-phase electrical power. Very few people on the ground at the time had much experience with three-phase power. Fortunately, the engineer battalion S3, who had an electrical engineering degree, and a logistical assistance representative from the Tank-Automotive and Armaments Command were able to get the pump into operation. Had these people not been available, the pump would have had to be replaced with a pump that operated on more conventional single-phase power.

Latrine Facilities

The latrine facilities at Baghram went through several stages as the base camp expanded. The first latrine was a single privacy box constructed of four military metal pallets placed over an available sewage manhole cover



The first latrine constructed at Baghram

(see photo above). The camp quickly outgrew this facility, and latrine facilities progressed to slit trenches and urine tubes. As these facilities were improved to provide for privacy, more construction materials and engineer assets were flown in or purchased locally. In a theater where the primary—and often the only—means of logistical support is by air, getting heavy engineer equipment and large stocks of materials into Baghram was challenging. Early on, delays were common and often frustrated engineer planners on the ground.

Units were not accustomed to providing their own latrines. A general consensus of senior participants in the operation was that unit-level field sanitation tasks need more emphasis during home station training exercises.

Because the area around the Baghram airfield was heavily mined and littered with unexploded ordnance (UXO), continually relocating slit trenches was not practical. As the base camp continued to expand, slit-trench latrine facilities progressed to burn-out latrines. Once these facilities were constructed, personnel hired from the local area maintained them. In the Baghram area, planners were fortunate that there was plenty of unskilled labor available and willing to maintain burn-out latrines.

At the end of February, porta-potties became available and started to replace the burn-out latrines. At Baghram, local contractors maintained the porta-potties, but finding competent contractors turned out to be somewhat challenging for engineer planners. The long-term goal of the camp at Baghram is to tap into existing sewage lines. However, the problems involved with locating and clearing existing lines may make it more feasible to construct a completely new sewage system.

At Kandahar, the latrines progressed in a similar manner. Porta-potties there were serviced by a Canadian team with the appropriate equipment. Waste was hauled to a local leach bed within the camp perimeter. It is noteworthy that burn-out latrines, as opposed to porta-potties, are generally considered the best interim solution since using contractors or coalition partners for waste disposal will not always be a readily available



An Aardvark flail used to clear the base camp area

option. As of this writing, a utilities detachment was installing a sewage main at Kandahar that will allow gray water to be drained directly to the leach bed and will allow some existing facilities to be brought into service. Fortunately, the engineer battalion commander purchased a commercial ditching machine for each of his companies before deploying. This equipment has proved very useful for installing cable, sewage lines, and underground power lines.

Shower Facilities

Shower facilities were quickly sought at Baghram as well as at Kandahar. A few permanent facilities were located and put into operation by the combat heavy engineers, but they were always overcrowded and were not nearly adequate for the number of soldiers at the camp. Many units did not deploy with kits or materials to make field-expedient showers, so they were dependent on the logistical system to provide them. Some of our coalition partners, however, came with field shower equipment and were able to provide service to their units. As of the writing of this article, showers were still in high demand at both base camps.

Power Distribution

Power generation went through similar development at both Kandahar and Baghram. Initially, units depended on their organic tactical generators for their power needs. At Kandahar, personnel from prime power units arrived and quickly designed power grids. The existing power distribution systems at both camps were deemed too unsafe or unreliable, so the utility detachment and other engineer personnel began installing underground power lines. The biggest constraint in getting the power grid into operation at both camps was the transport and availability of the prime power unit's large 750-kilowatt (kW) generators. Once these generators were on the ground, the prime power units—with the assistance of the utility detachments—installed a power grid in relatively short order.

The mission of the prime power units is to design the power grid and provide low-voltage (120/208 – 60 hertz) power to the user. Their normal tasks do not include running long exterior low-voltage lines to end users. Military occupational specialty 51R electricians assigned to the combat heavy engineer units were very competent at interior wiring tasks, but most of them had little experience with running long exterior low-voltage lines. Fortunately, soldiers from the prime power detachments were able to assist the combat heavy units' electricians, who installed low-voltage power lines for other units as required.

It was noted that the generation of technology used by the prime power detachments is based on aging technology. Prime power personnel are required to manually balance the loads placed on the power grid. In modern power grids, this task is automatically accomplished by semiconducting resistance circuit boards. In addition, the step-down transformers that they use can only be obtained through the Army supply system and are unlike the ones readily available off the shelf. This is potentially problematic, since the required transformers can only be procured from limited sources.

The initial assessment was that the power requirement at Kandahar was 2.2 megawatts. This required the base camp to use three 750-kW generators and one backup 750-kW generator. However, during the summer months, many units subsequently added environmental control units to provide air conditioning. These requirements were not initially accounted for, and they easily doubled the requirement for 750-kW generators from four to eight.

This situation points to a larger issue. The Army has not clearly defined the standards for base camps. Established standards or goals are needed so that future base camp infrastructure plans can be completed early on and ample lead time is available for necessary logistical support coordination. Without established planning standards, planners have nothing on which to base plans. To solve this problem, the Coalition Forces Land Component Command (CFLCC) C7 and Central Command (CENTCOM) staffs drafted—and received approval for—a set of standards that are available for future operations. These standards are called the *Sand Book*.

Base Camp C2 and Master Planning

During early stages of base camp development, planners sometimes found it difficult to expand the camp in an organized, synchronized manner. This was especially true at Baghram, and one of the ways this problem manifested itself was when planners discovered that a recently renovated building could not be used as a dining facility because of force protection concerns. This situation was partially attributed to the rapid and unpredictable growth of the base camp but can also be attributed to the rapidly changing C2 structures and

missions of the forces at Baghram. A brief history of Baghram will illustrate how the base camp C2 structure evolved.

On 19 November 2001, CFLCC issued operations order (OPORD) 02-005, which directed CFLCC forces, in coordination with coalition forces, to operate and maintain Baghram airfield to support humanitarian assistance and set the conditions for follow-on operations. Task Force Baghram was officially activated on 29 November 2001. The initial staff consisted of 18 personnel. The task force's mission was to protect the force, conduct airfield and detainee operations, provide base support to seven coalition tenet units, and provide C2 to the approximately 600 coalition and joint forces operating in the Baghram Valley area. Key tasks also included enabling infrastructure development within Afghanistan.

On 9 December 2001, CFLCC published fragmentary order (FRAGO) 02 to CFLCC OPORD 02-005, which directed the movement of a colonel from CFLCC C3 (Rear) to assume command of Task Force Baghram. Over the next three months, the task force headquarters grew to nearly five times its initial staff strength, and tenant units grew to more than 4,000. As the number of tenant units and their corresponding life support requirements quickly increased, problems such as the one described in a preceding paragraph began to surface, and it became apparent that closer attention had to be given to base camp development.

A base camp planning board was established on 27 January 2002, based on the recommendation of a member of the CFLCC C7 staff who was sent to Baghram to assist in the orderly expansion of the camp. This colonel, the chief of construction and facilities section of the CFLCC C7, became the de facto mayor of Baghram and held this unofficial position for about seven weeks. The concept of the planning board and base camp mayor was taken from the C2 structures recommended by the *Redbook*, a planning guide for base camp development used in Europe. The planning board, which consisted of representatives from most of the major tenant units and staff elements, met weekly. The meetings provided a forum for representatives to voice requirements and issues. In addition, an officer who specialized in master planning deployed to Baghram on a temporary basis to help develop the overall infrastructure plan. The board developed a robust plan and successfully housed an additional 1,000 personnel during the last five days in February.

About this time, a seven-person facilities engineer team (FET), consisting of engineers with a variety of engineering disciplines, was deployed to Baghram. The team's mission was to assist the base camp planning board (which later became the Base Operations Center) in developing technical scopes of work and designs for future base camp infrastructure upgrades. The FET found that the Theater Construction Management System (TCMS) was useful for obtaining basic designs and drawings, even though some of the drawings were outdated. In addition, it found that the software was not user-friendly unless the user was thoroughly familiar with the program.

The *Redbook* was used in space allocation planning for services such as postal, base camp C2, laundry, and bathing. The FET found that having team members with basic surveying skills was useful for making field surveys of various sites. In addition, the team found that it would have been beneficial to have a power distribution engineer on the team. The team also coordinated with CFLCC C7 staff and the U.S. Army Corps of Engineers liaison officer to coordinate scope of work for projected military construction and Logistics Civil Augmentation Program projects.

The FET was given a general planning horizon and number of personnel to plan for when it began work in Baghram. Until that time, a clearly defined end state for the base camp was difficult to ascertain, which made it rather hard for engineer planners to commit the right resources to base camp planning and development. Understandably, security concerns over future operations to be staged out of Baghram were likely the reason why few on the ground knew how rapidly the camp would expand and how permanent the expansion would be.

Task Force Baghram commenced drawdown and transition activities on 21 February 2002, and on 6 March 2002 it officially transferred staff functions and responsibilities for garrison C2 responsibilities to the commander of the resident supply and service battalion.



A ditching machine used to install cable and sewage and power lines

Lessons Learned

Engineers and logistical planners learned the following lessons regarding base camp infrastructure development and C2 in Afghanistan:

Bed-Down Facilities

- Clearing areas of mines and UXO for tent space may limit the pace at which a base camp can expand in areas where the mine/UXO threat is high.
- Units should come prepared with enough tents to accommodate their personnel or should let their higher headquarters know their requirements early on.

Water Supply

- In austere theaters that are dependent on logistical support by air, using bottled water as the only source of potable water may not be sustainable.
- Combat heavy engineer units should know how to service wells and pumps, to include pulling and replacing pipes. They also should know the basics of three-phase power.
- Drilling new wells may be necessary if existing wells are not satisfactory or are not available.
- Units must be ingenious and use all available assets to accomplish their missions in austere environments.

Latrine Facilities

- Battalion-sized and smaller units should be prepared to provide for their own field latrines until more permanent facilities are constructed.
- Units may not be getting the necessary training on basic field sanitation tasks because of the dependence on portable latrines in most training areas and the relatively short duration and low density of troops during training events.
- Units that are not prepared to construct basic latrines place additional and unnecessary requirements on scarce engineer resources.
- Units must mark slit trenches and urine pits when they are filled in so that future base camp expansion can be planned without jeopardizing the health of the inhabitants.
- Porta-potties cannot always be expected to replace slit trenches since they are dependent on the availability of maintenance equipment in theater.
- A ditching machine allows utility detachments and engineers to rapidly install cable, sewage lines, and underground power lines.

Shower Facilities

- Units should deploy with materials to construct field showers and be prepared to use them until more permanent facilities are in place.

Power Distribution

- Availability and transport of 750-kW generators can be a limiting factor in the rapid establishment of a power distribution system. Off-loading the generators from the aircraft is difficult since each generator weighs more than 39,000 pounds and requires a special loader to off-load it. This special loader itself requires heavy lift assets to off-load from the aircraft. Although clearly stated in FM 5-422, *Engineer Prime Power Operations*, the logistical coordination required to transport these large generators into austere areas of operation should not be overlooked.
- Units should train on how to run low-voltage power lines to main access points provided by prime power units.
- Ditching machines greatly enhance the rate at which power lines can be installed.
- The technology used by prime power units should be upgraded to keep up with common industry standards.

Base Camp C2 and Master Planning

- It is difficult to plan for base camp facilities when the population rapidly and unexpectedly expands and the internal C2 organization rapidly changes.
- A Base Camp Planning Board should be established as soon as possible to assist with the organized development of the infrastructure of the base camp.
- The FET enhances the infrastructure planning for base camps.
- Allowing the FET to tailor itself to the specific mission enables the right capabilities to be deployed.
- Clearly defining the end state for a base camp is the single most important thing that can be done to ensure that proper planning for life support can be accomplished.
- The TCMS is generally useful but needs to be updated and made more user-friendly.
- The *Redbook* is generally useful but should be updated to include base camp living standards or goals for varying lengths of expected occupation in austere environments such as those encountered in Afghanistan. Some of these standards are addressed in the *Sand Book*. However, every commander should have his own standard.

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Operation Bulldog Barrier

By First Lieutenant John Mooney

The wake of the 11 September 2001 attacks left much of the Army—including the forces stationed in Hawaii—scrambling to implement antiterrorism and force protection measures. Though measures such as identification card checks and vehicle searches were implemented immediately, there was still the threat of a brute-force attack, either via charging through the gates in a vehicle or by car bombing. United States Army Hawaii (USARHAW) has plastic water-fillable barriers to cover this threat. But, unfortunately, these barriers are limited in number, are intended to be temporary, and offer less protection than a solid concrete barrier.

At most posts, such a problem could be solved easily. Concrete highway or "New Jersey" barriers are common and would simply need to be purchased and moved into place at installation gates and mission-essential vulnerable areas (MEVAs). On the island of Oahu, finding concrete barriers is a little more difficult, and to ship such barriers from the mainland United States would be extremely expensive and slow. Bids from local civilian contractors were equally impractical, since they could produce only three to five barriers per day at an exorbitant cost. Recognizing the criticality of this need, the USARHAW commander turned to the 84th Engineer Battalion (Combat) (Heavy) at Schofield Barracks.



Photo courtesy of 2/25 Aviation

An aerial view of the jobsite

Mission

On 20 September, the 84th received the mission to construct at least 25 concrete barriers per day—for an indefinite period of time—with the following specifications:

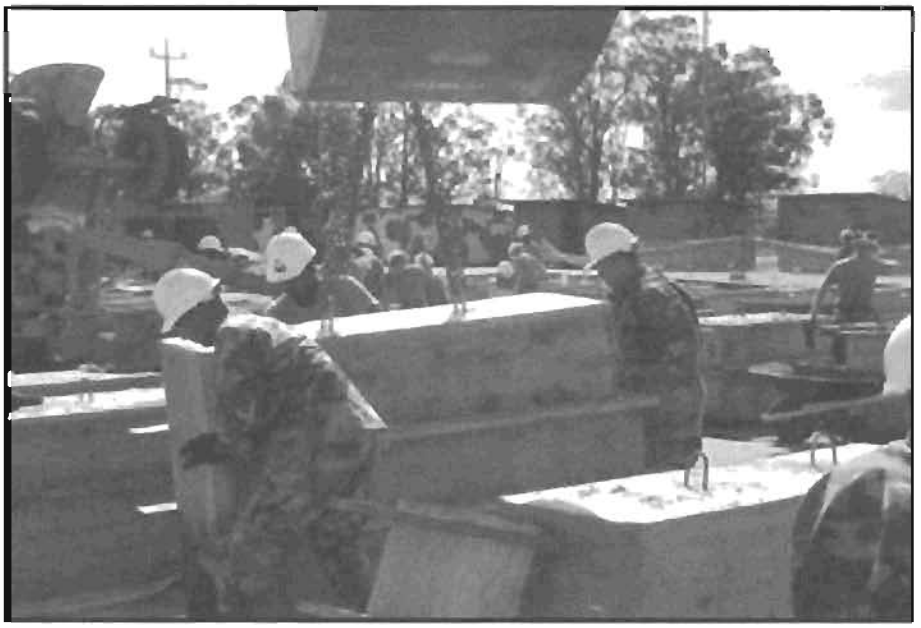
- Must stop a vehicle traveling at 55 miles per hour
- Must be movable by a forklift and crane
- Must measure approximately 3' x 2' x 6'
- Can be painted yellow or beige, depending on use

Project Planning

The civil engineer section (S3C) began to develop a design for the barriers, and Bravo Company started planning the project, using FM 5-412, *Project Management*, as a guide. Because there was such a critical need for the barriers, we could not afford to delay the start of production. In this case, a 50 percent solution right away was better than a 90 percent solution too late. The indefinite nature of the project was the most significant factor in the planning process. Estimates for the total number of barriers needed ranged from 100 to 3,000. This meant that maximizing efficiency was paramount and that the plan could not ignore normal day-to-day activities such as physical training, maintenance, and personnel actions.

We determined that the most efficient method would be to develop an assembly line. By breaking down individual tasks to the most fundamental levels, soldiers could focus on a single task continuously, which would cut down on mistakes and increase production. The use of jigs or templates for these tasks would virtually eliminate mistakes. In addition, any soldier could learn any single operation on the assembly line very quickly, allowing supervisors to allocate any soldier to any task based on changing needs and opening the possibility of using other military occupational specialties to augment the Career Management Field 51 (general engineering) soldiers.

The battalion motor pool was selected as the site for the construction, due to its abundant



Soldiers remove a new barrier from its form.

space, vehicle access, existing electrical and plumbing utilities, and proximity to the rest of the battalion. Moreover, the platoons could work out of their motor pool storage sheds, and the tools and equipment would remain in a secure area throughout the project. This proved to be one of the wisest decisions made during this project.

Building the Barriers

In working out the details of the project, the process of building the barriers was separated into six major operations. Each of those tasks was further broken down using flow diagrams as outlined in FM 5-412, Chapter 4.

Fabricate cages. The design for the reinforcing steel (rebar) cages called for #4 (1/2-inch diameter) rebar to be cut, bent, and tied together into cages. There were four different types of pieces for the cage: two 5'4" x 1'8" braces, three 5'3" x 2'4" long stirrups, five 2'3" x 1'7" short stirrups, and two 4' lifting hooks. The processes to build each piece were broken down into the most basic steps: cut to length, bend, assemble, and tie. We determined that it would be more efficient to cut and bend the braces in two pieces, then weld them together. We also determined that for the sake of strength, the lifting hooks should be welded to the cage. Once the cages were completed, they were moved to a location where they could be conveniently placed in the concrete forms.

Construct forms. The woodworking processes were split into a dimensional lumber-cutting operation, a plywood-cutting operation, and a forms-assembly operation. The plywood was cut to be sheathing for the sides and bottom of the forms. Yokes were cut from 2" x 6" lumber, and 2" x 10" lumber was cut to leave holes for forklift tines. The precut lumber would be partially assembled at the woodworking station and moved out to the concrete placing area for final assembly. Once the forms were complete, high chairs would be attached to the rebar cages with zip ties and the cages placed in the forms.

Place concrete. The plan was to place the forms in long rows, leaving a lane between rows wide enough for a ready-mix concrete truck. Each row would correspond to one day of work. On any given day, we used one row for form assembly and the next for placing concrete. The third row would contain previously poured concrete that was curing, and the fourth row would contain forms that were ready for disassembly. The last row would be for painting the barriers. Finally, we anticipated that we should have at least two extra storage rows to allow the unit that picked up and delivered the barriers some flexibility in scheduling. To actually place the concrete, we planned to roll the trucks down the line of forms, filling each form. The screed, float, and finish crews would follow right behind the truck.

Remove forms. Following placement of the concrete, we planned for the barriers to cure at least 36 hours before removing the forms. During initial planning, we did not have a definite place to remove the forms. We anticipated that the best way to find the most efficient method was to allow the crew leaders to use the trial-and-error method. We anticipated that the plywood forms would be durable enough to use for four to five concrete placements, and we realized that to reuse the forms, we would have to carefully remove them. The forms would then be moved to another line to be reassembled and readied for another concrete placement.

Apply paint. As with form removal, we were unsure during initial planning about how to most efficiently paint the barriers. We did note, however, that paint sprayers would be much more efficient than rollers or brushes and that environmental compliance would be a concern.

Deliver barriers. Delivery of the barriers was also left unplanned, because we had received the mission to construct the barriers but had received no requirement or guidance to deliver them.

Assecessing the Risk

The company safety officer and NCO conducted a risk assessment for each operation and created a safety plan. Most of the safety measures were fairly standard, such as using ground guides to move vehicles around the jobsite and assigning a dedicated safety NCO. One of the most important outcomes of the risk assessment was the identification of necessary safety equipment that was not on hand. For example, although safety goggles are included with most of our organic sets, kits, and outfits, we did not have enough for every soldier in the company. Also, we anticipated a lot of wear and tear on

the safety equipment on hand and planned to order additional stock of those items.

Jobsite Setup

Four days after receiving the mission, Bravo Company began setting up the jobsite. During this short phase of the project, the barrier construction plan continued to evolve. Though the company had done a good deal of planning, many issues had gone unresolved due to the urgent need to begin the project.

The rebar station came together as planned. The station crew built metal-cutting tables with stops to ensure that rebar cuts were made exactly. They also built tables with makeshift rebar benders and stations for crews to tie cages together. The company maintenance section set up a welding station with our welding trailer and contact truck surrounded by welding screens. The makeshift bending tables were an excellent improvisation but produced large-radius bends, making it difficult to assemble the rebar cages within tolerance. Fortunately, before setup was complete, the command provided funds to buy specialized, nonorganic tools, including dedicated rebar benders.

The woodworking stations and concrete lines came together quickly. The initial rows held 25 forms—the anticipated daily output. Based on estimates by the first sergeant and the commander, the row of forms would expand to 35, then to 50 before the first batch of barriers was completed. Also during the setup phase, we solved the painting problem. We bought paint sprayers using our tool fund and built a mobile paint booth from two M920 tractors with M870 trailers, plywood, and nylon matting.

On the last day before the start of production, the first sergeant and the platoon sergeants conducted a leaders' validation course for the NCOs to ensure that crew leaders knew how to supervise almost any station and to gain a rough production estimate. By 1 October, the first batch of barriers was ready for delivery.

Execution

Operation Bulldog Barrier, as it came to be known, went as planned for the most part. Over the 10-week period of construction, soldiers and NCOs on-site devised many improvements in efficiency. Without these innovations, Bravo Company might have been building barriers through January 2002. However, many problems surfaced during construction that significantly impacted production. Though many were out of our control, some occurred because of planning shortfalls.

The rebar operation turned out to be very manpower-intensive, requiring a minimum of 16 soldiers to run. Early in the project, before the process was streamlined, it took up to 30 personnel to maintain normal daily production. This was even more difficult when resources became a problem later on.

The woodworking operation was fairly simple once an initial batch of 150 forms was made. Since the forms were used four to five times before disposal, the next batch could be built over the course of several days, and we stockpiled extra form sections to replace those that broke or wore out early. The operation started slowly, although the purchase of a large table saw and a panel saw sped the process. Also, scrap plywood was used to build form inserts in the shape of—among other things—the 25th Infantry Division (Light) insignia.

The concrete placement crews consistently improved in efficiency. In the beginning, it took them seven to eight hours to place 50 barriers. By the end of the project, they could place 55 barriers in only four and one-half hours. Changes to the initial plan included running two ready-mix concrete trucks simultaneously and adding a fourth yoke to the forms, since about three forms would experience blowout failure each day. In addition, the customers began to request barriers that could hold soil for potted plants to make the barriers more aesthetically pleasing. These flowerpot barriers were much more difficult to construct.

It soon became apparent that form removal and reconstruction were critical to the project. In the first three to four weeks, the company worked 12 to 14 hours a day, and rebuilding forms was always the last to be completed. Initially, soldiers unscrewed the form completely and pried the sides off. Then, a forklift raised the barrier, and the bottom sheathing was removed. Lastly, soldiers used sledgehammers to remove the blocks that formed the forklift holes. This process was manpower-intensive and time-consuming, caused at least a dozen sledgehammers to break, removed the forklift from service elsewhere, and exhausted the soldiers.

One NCO came up with the idea to use the hydraulic excavator and a roller to lift the barrier and remove the forms. Also, the forms removal crew became proficient enough to remove only one side of the sheathing and then lift the barrier out of the form. With this system, the soldiers could remove and reconstruct 55 forms in seven to eight hours. Something



A soldier guides the vibratory roller forward. The slots underneath the barrier enable a forklift to carry it.



Two soldiers paint barriers in their M870-mounted mobile paint booth.

else that speeded up the process was that we discovered—by trial and error—that the forms could be removed as soon as 30 hours after placing the concrete.

By far, the most crucial aspect of the project was resources: when resources were delayed, we were delayed. Twice, we ran out of rebar because the contractor did not deliver the next batch on schedule. The same thing happened with tie wire, high chairs, plywood, and dimensional lumber. In addition, our cordless drills—which were critical to forms removal—burned out at a rate of about one or two each day, causing delays if they could not be replaced immediately.

The barriers were loaded and transported to their destinations around Oahu by the 325th Forward Support Battalion and the 25th Transportation Company (Medium Truck). The 65th Engineer Battalion and the 25th Infantry Division (Light) divisional engineer battalion directed the placement of each barrier.

By 14 December, Bravo Company had built 2,033 barriers at an approximate cost of $1.5 million. (Concrete costs about $170 per cubic yard on Oahu, and each barrier requires 1.4 cubic yards. Plywood is $34 per sheet.) The soldiers gained a lot of pride and an unprecedented level of esprit de corps. In addition, the efforts of the 84th Engineer Battalion saved USARHAW an estimated $5 million.

Lessons Learned

Resources drive the train. If any aspect of the project needs to be perfect, it is resources. A project should not be started unless you are confident that resources, especially materials, will be available when they are needed. In any project, resource needs should be projected well into the future.

Planning is an investment, and it does not stop when a project starts. In this project, we needed to begin as soon as possible. We conducted the minimum amount of planning necessary to start, then became focused on day-to-day operations. Foresight could have prevented the following problems:

- We neglected to plan a project tracking method, making it difficult now to estimate the project cost, equipment hours, and man-hours. We should have required platoon leaders to turn in daily or weekly reports on equipment, manpower, and material usage.
- Our safety staff deployed to Bosnia midway through the project. Because of the meticulous attention of first-line supervisors, we sustained only one reportable accident; however, the safety system on a project of this magnitude should be centralized.
- Tool control became difficult because there were so many tools on-site, and there was no plan to account for them on a daily basis. We should have established platoon-level toolroom procedures.
- We did not plan for waste disposal. We did not contract for trash bins until after scraps from the forms began to pile up on the jobsite. The waste generated by cleaning out the concrete trucks became a problem as well, and we had to improvise a solution to prevent a buildup of slag.

Fortunately, none of these problems were fatal, but planning ahead would have saved much time and effort, even after the project started.

The right tool is necessary for the right job. This project proved to Bravo Company that cordless tools are very valuable. Specialized tools that are not organic to a construction company are probably worth the cost. The savings of time and improvement in quality more than paid for our rebar benders and panel saw.

External resources maximize engineer effort. The 325th Forward Support Battalion loaded the barriers and moved them to gates and MEVAs, which relieved Bravo Company of that task. As a result, engineer soldiers could focus on the engineer mission, while transportation soldiers took care of the transportation duties.

Construction management doctrine should be trusted. FM 5-412 was extremely useful for this project. Many smaller projects allow the officer or NCO in charge to get away with minimal planning, but it is still a good idea to exercise critical-path-method planning and site layout/flow process analyses. The practice will reap huge benefits when trying to plan more substantial projects.

Conclusion

Overall, Operation Bulldog Barrier was a success. Barriers are now placed in dozens of areas around the island of Oahu, providing vital force protection to USARHAW. In addition, Bravo Company soldiers gained an immense amount of training benefit and unit pride, while at the same time saving USARHAW about $5 million.

First Lieutenant Mooney, now executive officer for Bravo Company, 84th Engineer Battalion (Combat) (Heavy), was previously platoon leader for 1st Platoon, Bravo Company. He holds a bachelor's in mechanical engineering from the United States Military Academy.

Leveraging the Power of the Regiment

By Lieutenant Colonel Christopher J. Toomey

Any valid description of the current and future operational environments demonstrates the continued relevance of engineers. We fully expect our forces to operate for extended periods in austere environments characterized by poor infrastructure and often saturated with mines. Consider recent operations in such diverse places as Haiti, Bosnia, Kosovo, and Afghanistan. Our forces operate amongst poor roads and immature and inadequate airfields, with little to no supporting utilities.

Add to this the potential for an elusive and asymmetric enemy that will necessitate extensive force protection measures—as well as the removal of varied, often undocumented minefields—and it is clear that engineers will be extremely busy. The record of recent operations bears this out. Regardless of the theater, whether removing mines along the Tuzla-to-Brcko rail line or preparing joint logistics-over-the-shore sites in Haiti, our engineers are key members of any combined-arms teams and are called on to execute varied missions that stretch our capabilities and challenge our leaders.

Yet, though we know the characteristics of any future environment literally cry out for engineers, force structure demands in the Stryker Brigade Combat Teams (SBCT) and the proposed Initial Division (IDIV) diminish the density of organic engineers. Figure 1 shows the SBCT Engineer Company. Optimized for the immediate tactical mobility of the SBCT, it is challenged to provide significant countermobility, survivability, or general engineering within its doctrinal 50- by 50-kilometer area of operations. Certainly, the embedded digital battle command will provide increased situational understanding that will help get the right engineer force to the right place at the right time, but an analysis of engineer capabilities versus potential requirements indicates that we are accepting considerable risk. Providing oversight over the engineer company and orchestrating maneuver support within the SBCT is the brigade engineer section, shown in Figure 2, page 14. The organic digital terrain team can provide terrain visualization down to brigade level.[1] Yet, the brigade engineer section is limited

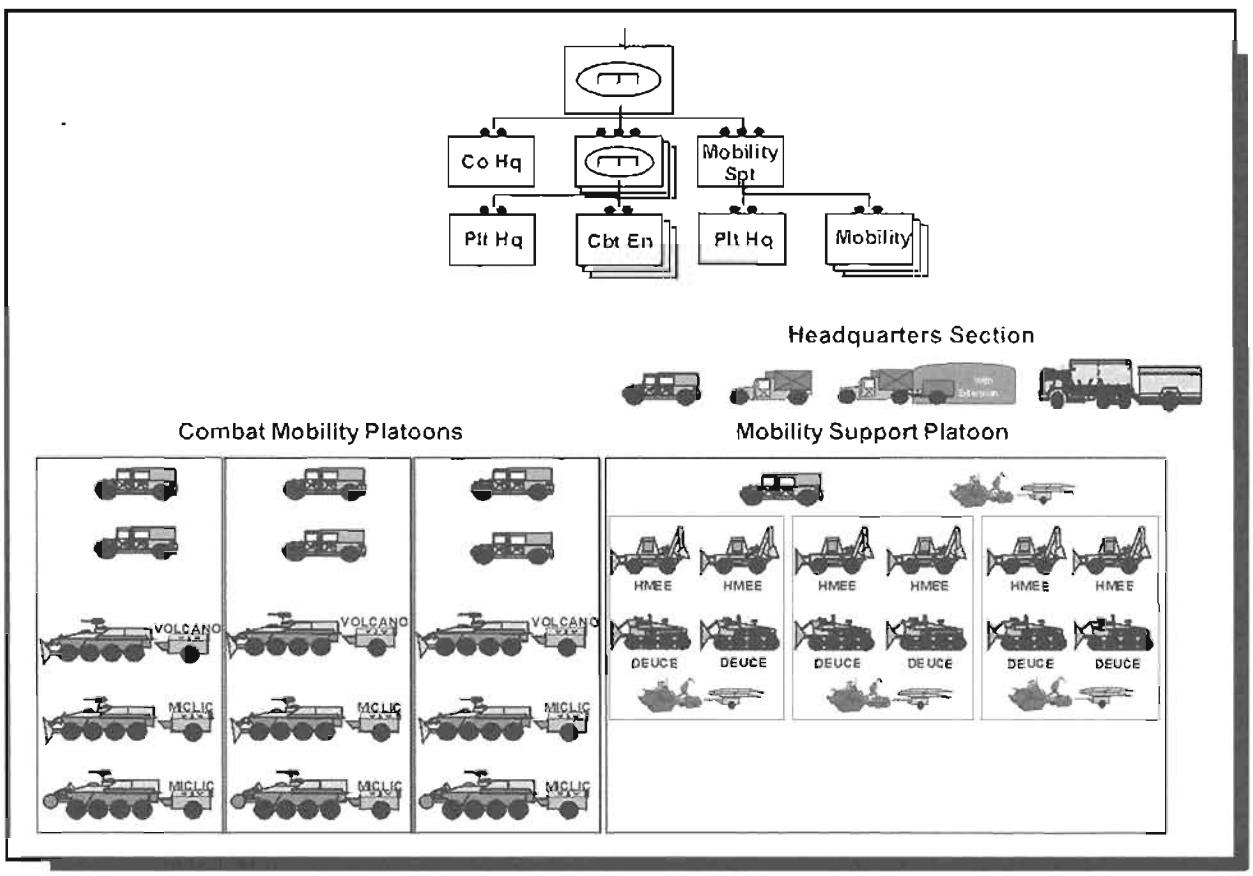


Figure 1. Organization of the SBCT Engineer Company

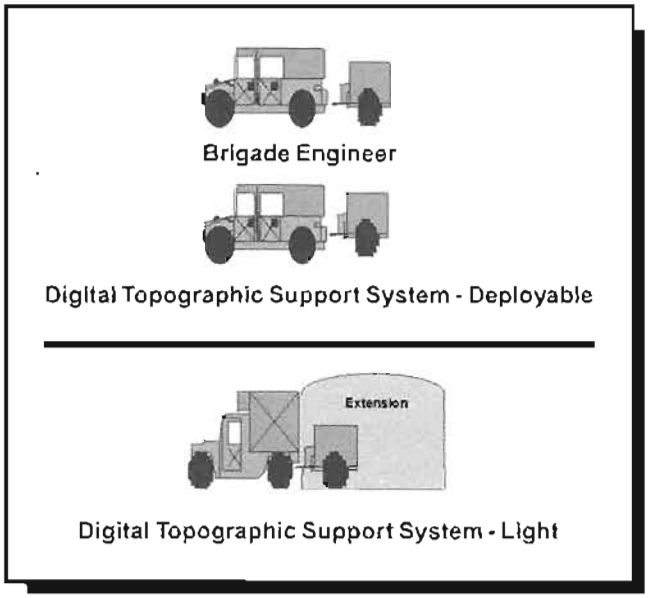


Figure 2. The SBCT Brigade Engineer Section

in its connectivity and will have to fight for high-demand and scarce bandwidth. Additionally, it faces challenges when integrating analog-based legacy engineers into the fight.

In any operation, the SBCT engineers will require augmentation. As a Regiment, are we ready to provide that augmentation? Additionally, engineers "in the box" will want to leverage the full intellectual power of our Regiment to expand the combat power of our committed engineer forces. Are we ready to do this? I will explore both of these concepts in this article and provide some thoughts to add to an already active discussion on engineers within Transformation.

Building Effective Augmentation

Augmentation of organic engineers is expected. It is needed for anything but the most rudimentary missions, and the Regiment's ability to provide rapid and effective augmentation to the SBCT or IDIV will be a solid gauge of our effectiveness to the combined-arms team. As seen during Force XXI and with the SBCTs, augmentation of digital forces presents some unique challenges for analog legacy units. Since it is expected that the majority of nondivisional engineer units will be in the Legacy Force for some time, we need to examine the nuances of our Legacy Forces working with SBCTs and, eventually, IDIVs. Some of the obstacles are digital integration/awareness, establishing digital-analog integration procedures, and the challenges with austere logistics.

Digital Awareness

Engineer forces joining the SBCT are expected to be digitally aware and understand the full power of the Army Battle Command System (ABCS)[2]. A key component of the Interim Force is that it can deploy quickly. Rapidly augmenting engineers cannot expect a long train-up period to get soldiers and leaders ready to operate in the digital environment and must be prepared to operate either without the benefit of digital enablers or with digital equipment—and with luck some attached operators—loaned from the gaining unit. It is expected that they will know how to employ the equipment with minimal refresher training. This is especially true of leader understanding of digital battle command capabilities. At Fort Lewis, Washington, some units are finding that operators can normally be trained to use ABCS and digital command and control systems rather quickly—often, a few weeks is enough to learn how to push the buttons. Leader digital battle command employment training takes longer.

Familiarizing leaders, both NCOs and officers, is a training problem that can be addressed both at the institutional and unit levels. At the institutional level, we need to weigh adding digital training to already heavily committed training schedules. TRADOC recognizes the need for an Armywide digital training program, but it is currently not funded. The Regiment needs to carefully examine the overarching benefits of "leaping forward" to include digital training and awareness in its officer and NCO training.[3]

Fortunately, unit leaders do not need to wait to get started on familiarizing their subordinates with digital battle command and can consider incorporating ABCS familiarization into unit professional-development programs. Just because the system is not in the unit does not mean it cannot be trained. Those units fortunate enough to have access to actual systems via collocation with digital units must work to share some systems and develop digitally cognizant, if not enabled, leaders. Additionally, leaders should take advantage of the numerous digital distance learning tools that the Army is developing to support training digital staffs.[4]

Procedures

Leaders in both digital and supporting analog units must look to establishing the procedures and protocols for integrating an analog unit into a digital unit. Working within the digital environment will require some accommodations by analog units. They will need to understand what the digital units "see" and the workings of the digital units' information management methods—both inherent in the digital SOPs—to ensure that they have current information to achieve at least a measure of situational awareness.

A critical element is that nondigitized units will not "show up" on the digitized units' battlefield unless their locations are rigorously tracked and manually put into the system. Digital unit locations are routinely updated via the tactical internet. This will NOT happen with units that are not digitally enhanced with a blue feed tracking device. In a nonlinear battlefield, this can quickly result in fratricide and accountability problems as units operate and try to clear fires and effects in an environment with no front line. Thus, both supporting analog units and receiving digital units must have clear procedures to ensure that unit locations are known and disseminated.[5]

Austere Logistics

The mantra of "just-in-time logistics" within the Interim Force means bare-bones logistical infrastructure. With an anticipatory-based logistics concept that seeks to minimize on-hand inventory, Interim Forces will have a hard time absorbing resource-intensive augmentees, such as engineer units.[6] The anticipatory logistics concept is targeted at minimizing inventory, limiting the amount of on-hand supplies. This makes even more acute the continual problems associated with supporting echelons-above-division engineers within divisional and brigade areas, particularly during the early part of an operation.

One particularly challenging area is with maintenance. A look at the SBCT Engineer Company organization shows no dedicated engineer maintenance. In fact, the maintenance concept is focused around combat repair teams dedicated to the maneuver battalions and field artillery. There are only six military occupational specialty 62B construction equipment repairers in the entire SBCT, with four assigned to actual repair duties, one supervisor, and one technical inspector. There are serious challenges with even supporting the SBCT Engineer Company, never mind any augmenting forces.

Engineers must anticipate providing—or negotiating from supporting logistics units—a combat service support "slice" to provide for their immediate needs and establish the procedures—via either digital or analog means—for providing logistical reports.

Reaching Back

One way that Interim Forces are expected to enhance combat power is to use reach (also known as "reach back" or "reach operations") to leverage assets not under their immediate control. Though possessing a physical quality in terms of calling for additional assets and logistics, reach also has an arguably more powerful information-oriented quality (see Figure 3).

Engineer Reach

Engineers are already experienced with "reaching" to enhance the informational combat power of deployed forces. Indeed, such initiatives as field force engineering that are currently employed to support forces with U. S. Army Corps of Engineers-provided information are already making great strides in ensuring that engineer forces can tap into the intellectual power of the Regiment. Notwithstanding recent accomplish-ments, the Regiment needs to consider how to maximize its reach potential and continue to look for opportunities to both exercise and practice reach operations.

At an extreme fidelity, reach involves creating the conditions for "brilliant push," where the right information is pushed to the user at the right time and in the right format, vice "smart pull," which is someone answering a carefully worded question. One is proactive, while the other is reactive. One removes the burden of "asking the right question," while the other relies heavily on committed forces doing the asking.

The Regiment is already moving toward a smart pull. Using a wide range of mediums to include cell phones, deployed engineers are in contact with the Regiment, asking questions and getting answers. But is this enough? Are there missed opportunities because we are not formulating a brilliant push?

In establishing a push-oriented reach capability, the Regiment will have to commit to establishing some protocols on how to conduct business and manage information. Additionally, engineer forces in the field—at all echelons—need to establish the conditions to provide opportunities to train reach operations. Only rigorous training will expose problems with procedures, architectures, and connectivity.

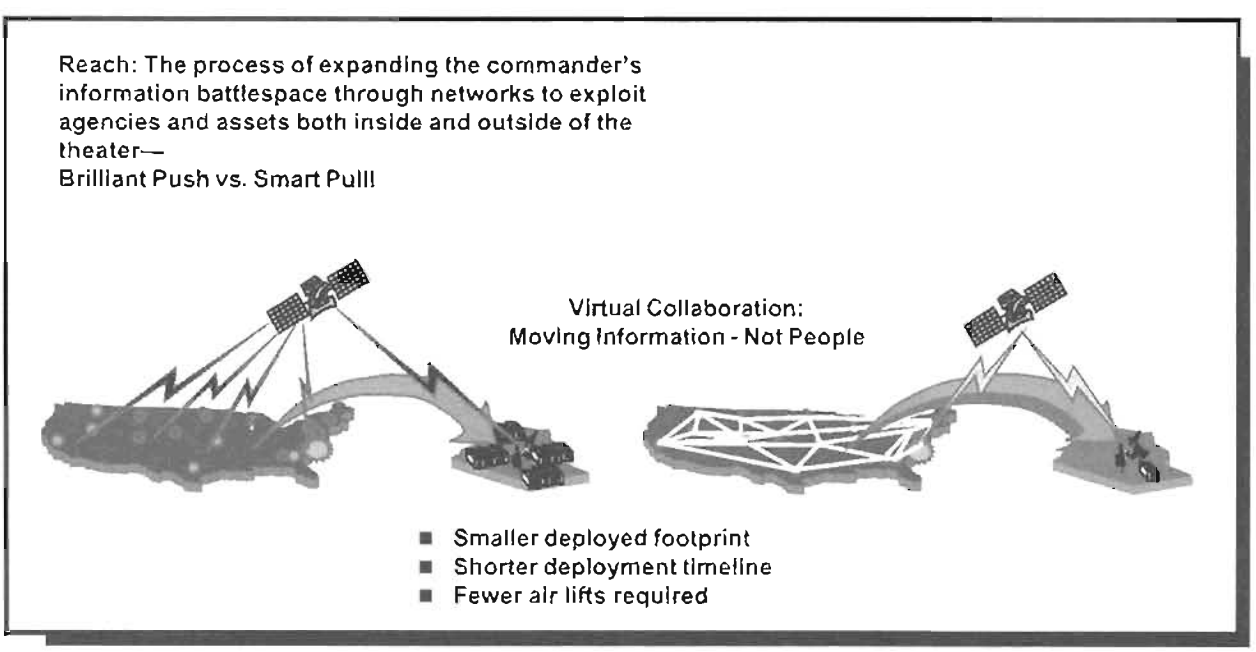


Figure 3. Moving toward a definition of reach

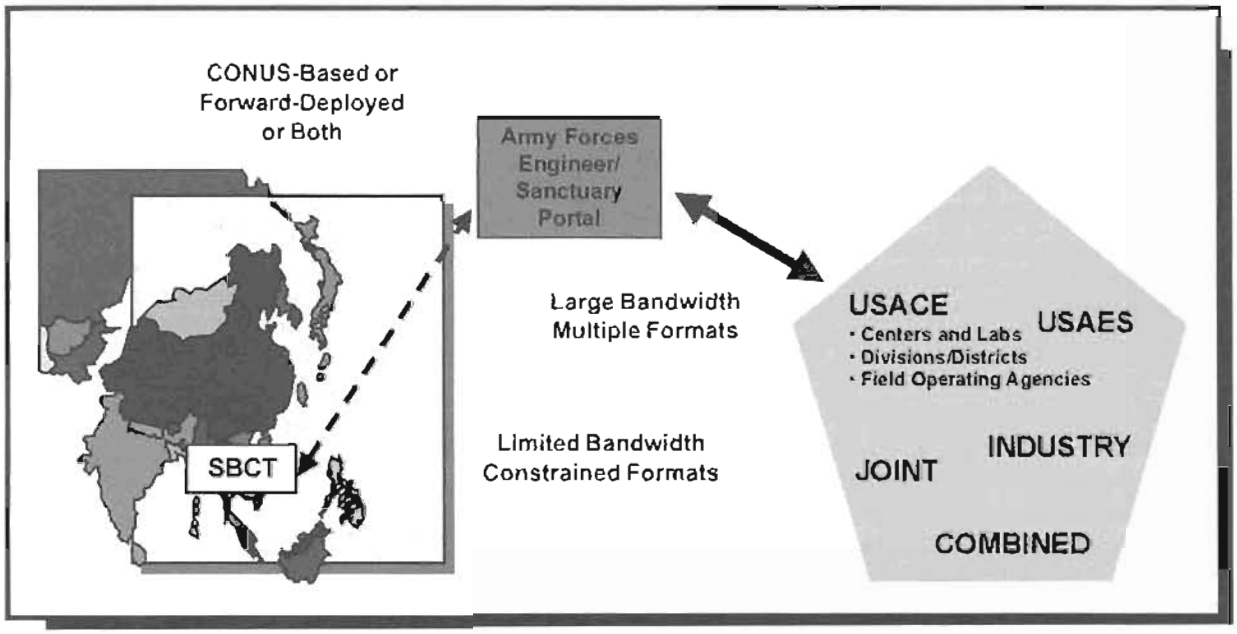


Figure 4. A notional example of engineer reach

Developing a knowledge agent, an organization that represents the informational interests of the committed engineer force, is a step in the right direction. A knowledge agent can serve several functions. First, it serves as a single, 24/7 information portal for the committed force. No more surfing around Web sites or hunting around agencies. Next, the knowledge agent is virtually linked to the committed forces and, with a clear understanding of the commander's intent and conditions in the field, is able to anticipate requirements and push the right information to the committed force at the right time. Third, the knowledge agent, because it is connected to the larger global information network, is able to continuously mine the community for information that may escape members of the committed force who are operating under "less-than-office-environment" conditions. It is expected that the knowledge agent connectivity is normally less constrained than that found in the committed force, particularly during the early stages when bandwidth constraints over satellite communications will be acute. Finally, the knowledge agent can ensure that information is phased in at the right time and in the right format to ensure it is usable. The knowledge agent is an information manager for the committed force (see Figure 4).

Conclusion

Army Transformation and the emergence of the Interim Force present unique challenges for our Regiment. Without question, we want to ensure that we are engaged at every level to solidify the relevance and role of Army engineers in making our Army successful. All units should look for opportunities to further develop their ability to serve alongside digital forces while the Regiment needs to address developing ways to optimize engineer-related information needed by committed engineer forces. Overcoming the challenges ahead will be exciting!

Lieutenant Colonel Toomey, currently attending the Naval War College, was recently chief, Battle Command and C4ISR, at the Fort Lewis Brigade Coordination Cell, Army Transformation Task Force. The former commander of the 14th Combat Engineer Battalion, LTC Toomey is a graduate of the United States Military Academy and the Massachusetts Institute of Technology.

Endnotes

[1] Major Anthony Wright, "Concept and Organization of the IBCT Engineer Company," *Engineer*, May 2001.

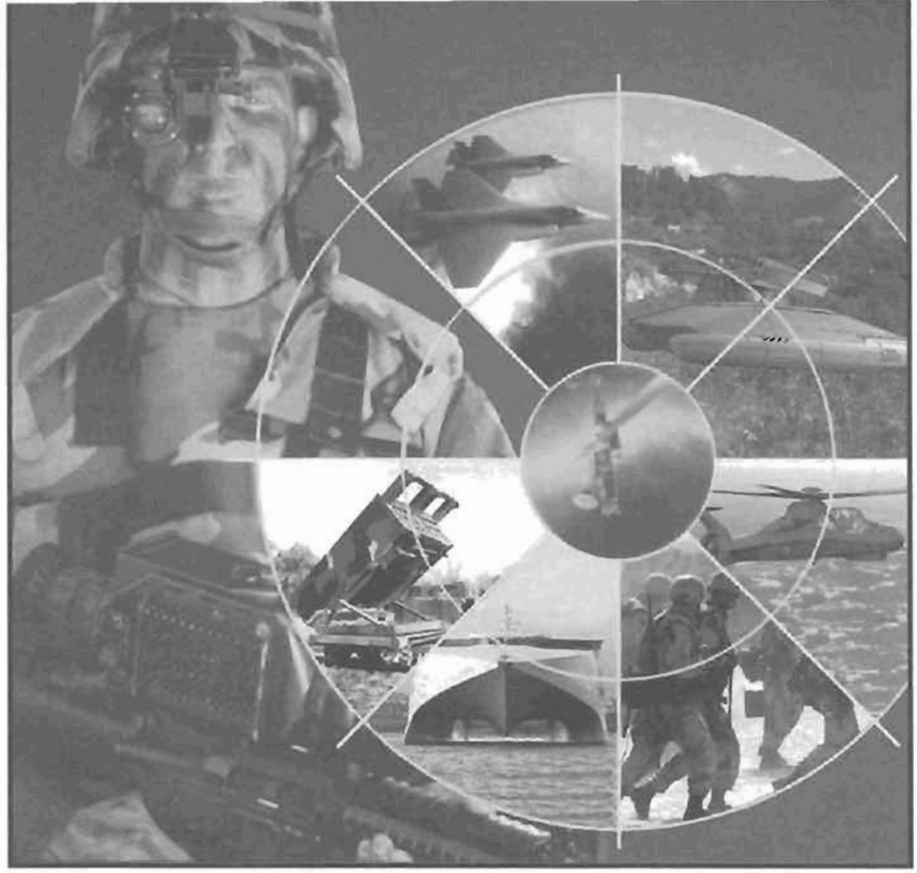
[2] An overview of the ABCS system-of-systems is at the TRADOC Program Integration Office-ABCS Web site: *http://www.leavenworth.army.mil/tpioabcs/overview/ABCSoverview.exe*

[3] Discussions at ENFORCE 2002 indicate that the U.S. Army Engineer School is already moving to incorporate digital training into the Officer Education System and Noncommissioned Officer Education System.

[4] Warrior-T has numerous products to assist with training digital staffs. Try *Training the Brigade Battlestaff* at *http://fioasat.hood.army.mil/docdetail.asp?docid=239*.

[5] Warrior-T has assembled tactics, techniques, and procedures (TTP) to assist in integrating digital and analog units. See *Mixed TTP Manual* at *http://fioasat.hood.army.mil/products.sp?view=type&type=2*.

[6] This problem of supporting echelons-above-brigade/echelons-above-division engineer units is not new. Several methods are discussed in "Supporting Nondivisional Engineer Forces" by Major Christopher Toomey, *Army Logistician*, March-April 1996.



Vigilant Warriors 2002
Army Transformation War Game

By Mr. James L. Allen, Mr. Edd Pyatt, and Lieutenant Colonel Mark H. Potter

The ongoing Army Transformation is arguably the single largest effort to change itself that the Army has ever undertaken. As such, it represents a tremendous investment of every type of resource. The goals of transformation are generally well understood across the Army. Less well understood, however, is the ongoing development work to support transformation planning. The Army Transformation War Game (ATWG) is a part of that development. This year's ATWG, called Vigilant Warriors 2002, was held at Carlisle Barracks, Pennsylvania. The exercise involved a significant portion of the Army's senior leaders, including the TRADOC commander and the Army Chief of Staff. Vigilant Warriors 2002 is a good example of how the Army is trying to think about the future defense of our nation.

Back to the Future

The year is 2020 and we are at war. The United States is preparing to go into battle with an enemy unlike any it has faced before. Inferior to U.S. forces in many ways, the enemy plans to use technological sophistication it possesses in certain areas to create vulnerabilities in perceived U.S. strengths. The enemy's approach is to use the Objective Force's heavy reliance on sensors as a way to disrupt U.S. operations. From unmanned aerial vehicles (such as the "Global Hawk") and space-based sensors to unmanned and manned ground sensors, the enemy has determined that these sensors can be used against us if they are fed disinformation or are overwhelmed with information.

Simultaneously, the enemy will try to win small but highly publicized victories as our forces are deploying. Designed to turn the U.S. population against continued fighting, these enemy actions are not so much to gain victory over the overwhelmingly superior power of the United States as they are to prevent defeat of its own forces until the United States loses public support and withdraws. It's a sound strategy, one that has worked before—for General George Washington in the Revolutionary War.

Within the contemporary operating environment just described, the ATWG was fought against a backdrop of tremendous and chaotic conflict. U.S. peacekeeping forces deployed to the fictitious Southeast Asia country of Sumesia, only to find the operational environment changing to a

counterinsurgency operation against well-organized separatist extremists. In the Caspian Sea area, a major regional fight developed between the U.S. ally Azerbaijan and the fictitious aggressor nation of Anfar, assisted by Iran, over access to the region's large oil and natural gas reserves. Other potential trouble spots included Colombia, a newly unified Korea, and the Balkans. Overlaid upon this world scenario were terrorist bombings and cyber attacks aimed at disrupting U.S. transportation and financial institutions.

Vigilant Warriors 2002

Such was the world of Vigilant Warriors 2002. With approximately 500 military leaders from across the services participating—as well as civilians, former ambassadors, and retired military personnel—the purpose was to assess the capabilities of the Objective Force in a 2020 operating environment. Fought using a seminar format, a live Red Force, and a multitude of scenarios, the exercise included a significant focus on homeland security operations, with maneuver support forces (engineer, chemical, and military police) playing a critical role.

The area of homeland security—with its significant possibilities of successful attack against domestic targets of high political or national importance, military power projection airports and seaports of embarkation, or other lucrative targets—drew the focus of the maneuver support community. The threat of chemical, biological, radiological, nuclear, and high-yield explosives; cruise and ballistic missiles; and nuclear and/or chemical "dirty" bombs on U.S. soil—combined with the conduct of disinformation and misinformation/cyber attacks against U.S. financial, industrial, government, and business interests to disrupt capital flow and impact world energy markets—produced conditions requiring engineer, chemical, and military police support. These homeland security incidents were a critical aspect of the war game, stressing Army resources to their limits and identifying insights for Army leadership into transformation issues created by simultaneously fighting terrorism overseas and at home. The key headquarters for fighting the homeland security battle was the newly created (in 2002) Northern Command (NORTHCOM), with missions including the following:

- Provide chemical response units to civil authorities (chemical).
- Provide explosive ordnance disposal assets.
- Provide medical support assets.
- Provide force protection (engineer, chemical, and military police).
- Provide air defense assets.
- Provide general-purpose forces for physical security of designated ports (military police).
- Provide crisis management, consequence management, and deliberate planning to support civil authorities upon request (engineer, chemical, and military police).
- Conduct command and control with civil authorities and subordinate forces (engineer, chemical, and military police).
- Provide liaison officers to civil authorities (engineer, chemical, and military police).

Since this range of missions is very similar to that of the real NORTHCOM, it provided an excellent opportunity to exercise those missions against a backdrop of global conflict.

That global conflict came to a head as the deployed force in Sumesia (an Objective Force division, a Stryker Brigade Combat Team, and minimal maneuver support and maneuver sustainment forces) became embroiled in a revolution while performing a U.N.-mandated peace enforcement mission between government forces and those of the National Independence Movement (NIM). With the NIM forces in control of the majority of the population, terrain, and forces on the island of Sumatra, they were able to put U.S. forces in the quandary of having sufficient combat power to defeat the NIM forces but lacking key mobility enablers needed to rapidly and efficiently maneuver small combat formations throughout the width and breadth of the island. For example, without the joint transport rotorcraft or significant mobility assets, U.S. forces found themselves constrained by the limited road networks and hostile terrain comprised of mountains, jungle, and flood plains. Having information and intelligence dominance and the ability to capitalize on the information by aggressively pursuing and destroying massed NIM forces using non-line-of-site and other standoff technologies was compromised by a Red Force that truly understood the key concept of the Objective Force—to survive by rapidly maneuvering in a nonlinear, noncontiguous environment. This dilemma produced the opportunity for the war game participants to explore, in detail, aspects of the Objective Force as part of determining the best possible avenues for force and combat developments.

Similarly, major theater war erupted in the Caspian. The U.S. and allied forces quickly squelched an Iranian incursion, and the Iranian army was driven behind its borders. The Anfarians proved to be no match for the superior intelligence, combat power, and resolve of the friendly forces, and in a matter of days, it was all over. Engineer, military police, and other post-conflict forces were left to reconstruct a nation and handle the thousands of prisoners and displaced civilians.

The give and take of the war game in these missions produced the following key insights:

- There is a need to develop actionable intelligence for the homeland security mission area.
- Sensor technology can contribute significantly to homeland security.
- Liaison officers are needed among NORTHCOM, the 29 Federal Response Plan-led federal agencies, Canada, Mexico, and U.S. territories to maximize operational interconnectivity.
- Critical infrastructure protection requires an Army/civil authority partnership.

(continued on page 21)

Supporting Army Recruiting and Retention

By Ms. Zandra Smith, Captain Kristen Youngman, and Lieutenant Colonel Ronald N. Light

"Because recruiting is so critical to readiness, it is #1 on my mission-essential task list."
General Eric K. Shinseki, Chief of Staff of the Army
(Manning Message, 8 November 1999)

The United States Army makes no secret that recruiting and retention of quality soldiers and officers are vitally important to its continued preeminence. The Honolulu District supports both of these crucial missions through its real estate services and intern programs. It is one of 18 U.S. Army Corps of Engineers districts (out of a total of 41) that supports the recruiting efforts of the Army and the other armed services. Throughout the Department of Defense, the Corps of Engineers supports nearly 6,800 recruiting and support facilities: Army (2,022), Navy (1,725), Air Force (1,587), and Marines (1,465).

The Honolulu District is engaged throughout the Pacific Region in support of the Honolulu Company of the U.S. Army's Portland, Oregon, Recruiting Battalion. Geographically, the District's area of responsibility is the largest in the Corps. Its support begins in the Hawaiian Islands, then moves 2,400 miles south to the territory of American Samoa, west 3,800 miles to the territory of Guam and the commonwealth of the Northern Marianna Islands, and on to Japan and Korea, nearly 5,000 miles from Hawaii.

In the Honolulu District's area of operations, there are 13 Army and 21 Navy, Air Force, Marine Corps, and Army National Guard recruiting stations. For all these offices, the District executes all office space leases, building upgrades, telecommunications support, furniture purchases, and emergency repairs.

The Honolulu Recruiting Company was recently honored as the top producer of recruits in the western United States. The NCO in charge of the Kapiolani, Honolulu, station attributes part of the company's success to the support he gets from the District. He noted that in today's competitive job market, a professional-looking recruiting facility sets the right tone for prospective recruits. The office there is large, clean, and well-lit and meets the mission requirements. If there is a problem with lighting, building fixtures, or janitorial service, he calls the Corps, and it provides excellent, timely service.

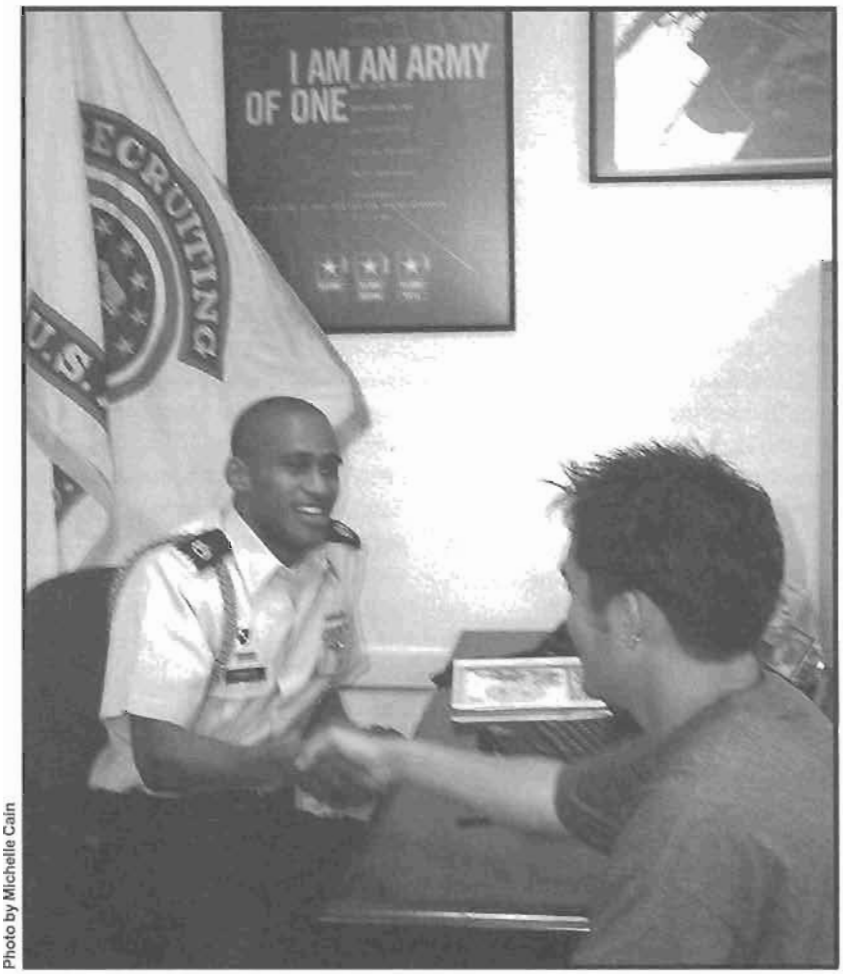


Photo by Michelle Cain

The Honolulu District assists recruiters for the Army and other services across the Pacific region through leases, building upgrades, telecommunications, furniture purchases, and emergency repair support.

In FY01, the Army recruited nearly 1,600 Pacific Islanders into the U.S. Army or Army Reserve. Recruits came not only from Hawaii, Guam, the Northern Marianna Islands, and American Samoa but also from the Federated States of Micronesia, the Republic of the Marshall Islands, and the Republic of Palau. Residents of Micronesia, Palau, and the Marshall Islands are able to volunteer for



Photo by Doug MacKitten

A recent Honolulu District intern checks work on the Palau Compact Road project with the District's Palau Resident Office project engineer. The District is overseeing construction of the U.S. Department of the Interior's 53-mile road project.

service in the armed forces of the United States through an agreement called the Compact of Free Association, signed in January 1986.

While the Honolulu District executes a relatively small portion of the Army's $172 million recruiting facility program for FY02, its support to Army recruiting efforts is important. First, it provides access to the military services for Pacific Islanders. This helps to ensure diversity of the force from this vital part of the world. Second, the District's service supports the United States' strategic engagement of the region, providing a link to the Department of Defense's growing reliance on the Pacific area.

Recruiting quality soldiers and officers is important and retaining them is a must. In recent years, the Army faced a particular problem regarding the loss of company grade officers. Accordingly, throughout the Army, emphasis was on studying the problem and finding ways to solve it. Analysis determined that young officers would be more likely to continue serving if they were more aware of the variety of career options the Army offered. In response, Corps districts—including Honolulu, Alaska, Charleston, Far East, Fort Worth, Mobile, Portland, Savannah, Seattle, and Walla Walla—implemented officer intern programs. (See article, "The Junior Officer District Intern Program," *Engineer*, October 2000.)

The Honolulu District's intern program began in August 2000 through memoranda of agreement with tactical engineer units located in Hawaii. The intent of the program is to expose Army officers and cadets to the Corps of Engineers from the perspective of a field district, alerting them to the many opportunities to serve in the "nontactical" side of the Corps. The program invests in junior officers, relying on the mentoring, coaching, and teaching of Department of the Army civilians in the District.

The typical internship lasts three weeks and enables company grade officers and cadets to learn about work the District performs at any one of four resident offices throughout the Pacific. This includes the Palau Compact Road Resident Office, Republic of Palau; Kwajalein Resident Office, Kwajalein Atoll, Republic of the Marshall Islands; and the Schofield Barracks and Fort Shafter Resident Offices, located on the island of Oahu, Hawaii.

This professional development opportunity encourages officers and cadets to appreciate the diversity and opportunities to serve in the Corps. Participants gain a greater understanding of the functions and roles of the Corps, the support provided to major commands and installations, the complexities of construction management in the field, and the opportunities to serve within the Corps.

One of the first participants in the Honolulu District's intern program said that previously she saw the Corps of Engineers as a federal government organization that invested in the local community through its civil works construction projects. But the intern program helped her realize that the Corps's mission is much greater, especially in the area of impacting soldiers' lives on a daily basis. The new barracks and family housing construction in Hawaii, workplace renovations, and other facility construction demonstrated to her how the Corps serves the Army and soldiers as part of the "One Team" concept.

An important facet of the District's program is the opportunity for officers and cadets to interact and learn from Department of the Army civilians. According to the chief of the construction branch—a former Army engineer officer—participants learn the life cycle process of a construction

project from its inception, through design, and into construction. The officers and cadets work closely with seasoned professionals, who share their knowledge, life experience, and lessons learned over the years. The insights and techniques that the officers and cadets take away from the program apply to both tactical and nontactical situations. In addition, participating in the program establishes relationships and lines of communication to solicit counsel and advice in the future.

Investigating design difficulties, inspecting quality control, and scoping project requirements are a few of the tasks visiting officers tackle during their internships, which are structured to their interests. The officers are exposed to all the details of delivering a project, including project management, contracting, and safety. The intent is to get the officers out into the field, working with contractors, construction representatives, and field engineers. It's a hands-on program. Exposure to the civilian side of the Army and the Corps can be invaluable. Interns are surrounded by the projects these people construct and manage, and they bring a lot of management and construction expertise to the Army.

Since the program began, the 84th Engineer Battalion at Schofield Barracks has sent five officers to the Honolulu District for the three-week internship, one per month on average. Upon completion of the internship, every officer shares lessons learned and personal observations, and it has had a positive impact on junior officer retention in the 84th. To date, not one officer within the entire unit has resigned from active duty, and many are asking how they can get into a Corps district following successful completion of company command.

Every officer intern leaves with a much greater understanding of the Corps and the dedication of Department of the Army civilians who support the Army and the nation. Moreover, they leave excited and eager to be part of the Army in the future.

Ms. Smith is a Department of the Army civilian real estate specialist for the Honolulu District.

Captain Youngman completed an internship with the District while she commanded the 70th Engineer Company, 29th Engineer Battalion (Topo). She is currently training for an assignment in the 96th Civil Affairs Battalion, Fort Bragg, North Carolina.

Lieutenant Colonel Light was commander and district engineer of the Honolulu District at the time this article was written.

("Vigilant Warriors 2002" continued from page 18)

- Mobilization adversely impacts civilian first responder capability, because a disproportionately large number of first responders are also members of the National Guard and Army Reserve.
- There is a need for prioritized mission requirements to facilitate preparation by the U.S. military for homeland security roles and responsibilities.
- While the true ramifications of employing the Sumesian forces in a traditional combat role—as opposed to the nonlinear, noncontiguous role it was designed for—were never evaluated, it was apparent that this force must have all the enablers (such as command,control,communications, computers, intelligence, surveillance, and reconnaissance [C4ISR] and joint tactical radios [JTRs]) the design calls for, or there is serious risk associated with a conventional employment.

Conclusion

The ATWG was just one small part of the overall effort to determine the best possible implementation of Army Transformation. But even so, it represented a lot of hard work by a lot of leaders trying to see into the future. Their efforts to see as clearly as possible will have a long-term impact on how the engineer, chemical, and military police forces within our Army develop.

Mr. Allen is the lead analyst and science advisor for the Concepts Branch, Engineer Division, Maneuver Support Center (MANSCEN) Directorate of Combat Developments (DCD), Fort Leonard Wood, Missouri. He retired from the U.S. Army Reserve as a lieutenant colonel and has 34 years of active, reserve, and civilian military duty. Mr. Allen served in the 4th Infantry Division in Vietnam and the 1st Infantry Division in Germany.

Mr. Pyatt is a military research analyst with the MANSCEN DCD, Military Police Division. He retired from active military service as an aviation lieutenant colonel and has been involved in military police transformation since the move of the Military Police School to Fort Leonard Wood.

Lieutenant Colonel Potter is the total force integrator (AR) for the Engineer Division, MANSCEN DCD. During the three years in this position, he has been deeply involved in Army Transformation. Before his assignment to DCD, LTC Potter served as the plans chief and operations officer at both the 412th and 416th ENCOMs and 3d U.S. Army/U.S. Army Central Command.



V Corps Terrain Analysis Supports a Warfighter Exercise

By Lieutenant Colonel David R. Goddard

Effective terrain analysis pays big dividends to the warfighter. And during V Corps's warfighter exercise, Urgent Victory 2002, effective integration of terrain analysis in the military decision-making process contributed significantly to the success of the entire exercise. With the support of the 1st Armored Division and 35th Infantry Division, V Corps conducted Urgent Victory 2002 from 27 March through 2 April at Grafenwoehr Training Area, Germany. United States Army Europe (USAREUR) and 7th Army provided an exercise response cell to simulate the higher command headquarters. In each of these commands, the topographic units provided significant support to their respective higher headquarters.

The 320th Engineer Company (Topographic) provides V Corps's organic terrain analysis support. The 320th maintains a 22-person terrain analysis section, collocated with V Corps headquarters, on Campbell Barracks in Heidelberg, Germany. The remainder of the company is stationed at Grossauheim, Germany.

Important Early Decision

To ensure that the Corps Battle Simulation (CBS) gaming process was transparent and that the Corps gained the maximum training value from the exercise, the V Corps commander directed that the battle staff base its planning focus only on the *real-world terrain*. Commands can choose to fight only the simulated CBS terrain. (See article titled "BCTP Terrain Analysis: Unlocking the Mystery," *Engineer*, August 2001.) The commander's commitment to training the "right way" drove the military decision-making process and reinforced the vital role of the Corps's organic terrain analysis/topographic personnel.

Getting the Terrain Data

In preparation for the exercise, the terrain analysis technician began developing a terrain database for the exercise in November 2001. The National Imagery and Mapping Agency (NIMA) provided foundation data (FD), interim terrain data (ITD), vector interim terrain data (VITD), vector maps (VMAPs), and digital feature analysis data (DFAD) for the exercise area. NIMA generally produces FD to support planning products produced at a scale of 1:250,000. The Corps headquarters required planning products at a scale of 1:50,000, so the terrain platoon added more detail to NIMA's FD and other vector data.

With the assistance and cooperation of the Corps's G2 collection management section, the terrain platoon obtained imagery of the area from national sources. This imagery was analyzed and used to develop additional information about the area of operations. Features such as road networks, bridges, and airfields were added to the FD to create a Tactical Geospatial Data Set (TGDS) for the exercise. By the time the Battle Command Training Program (BCTP) seminar arrived, the terrain platoon was able to come up with about a 70 percent complete TGDS.

The TGDS was sufficient to facilitate the military decision-making process during the BCTP seminar. The seminar was held in Heidelberg, so as specific areas of interest and operations were refined, the terrain platoon could focus its production efforts on these areas. The platoon developed specific data for the road network leading to the river-crossing site, the crossing site itself, and the road network leading to follow-on objectives. Other products included—

- An elevation study used by the signal unit to locate line-of-sight communication assets.
- Vertical obstruction maps used by aviation units during flight planning.
- Determinations as to whether or not existing airfields could support military requirements.

Following the seminar and leading up to the train-up exercise, called Victory Focus 2002, the terrain analysis platoon

continued to refine the TGDS and fill the information gaps that existed. Again, the Corps's collection management section worked closely with the terrain platoon to secure full-frame national imagery, which was used to develop Controlled Imagery Base–1 Meter (CIB01).

During the train-up exercise, mobility of the force was a key issue in enabling the Corps to move quickly to the river-crossing area and then continue the movement to follow-on objectives. The terrain platoon's efforts contributed significantly to the Corps's ability to maintain freedom of movement and enjoy great success. Within the exercise, the contribution of the divisional terrain teams was particularly evident during the river-crossing operation.

The 1st Armored Division terrain team developed the detailed terrain analysis products required to support the Corps's crossing of the river. The divisional team added another layer of detail and accuracy to the TGDS provided by the Corps's terrain team. This layer of detail facilitated the planning of river-crossing operations at the battalion level within the division. As the data was created, the divisional terrain team passed this data back to the Corps's terrain platoon as well, which allowed the platoon to update the Corps's master database and share the data with subordinate elements.

The Corps and division staffs continued to develop contingency plans, branches, and sequels throughout the exercise, which drove abbreviated military decision-making processes within the train-up exercise itself. Often, this involved developing terrain data for specific areas that had not been analyzed by the terrain platoon or teams. The terrain data developed in conjunction with this effort was also added to the master database and then disseminated to other subordinate elements.

A vital aspect of the support the terrain platoon provided to the Corps was identifying locations where the long-range surveillance teams could make the maximum contribution to the Corps's operations. The terrain platoon performed line-of-sight analysis to determine the best observation locations and helped identify suitable insertion and extraction locations. Again, this information was added to the Corps's master database.

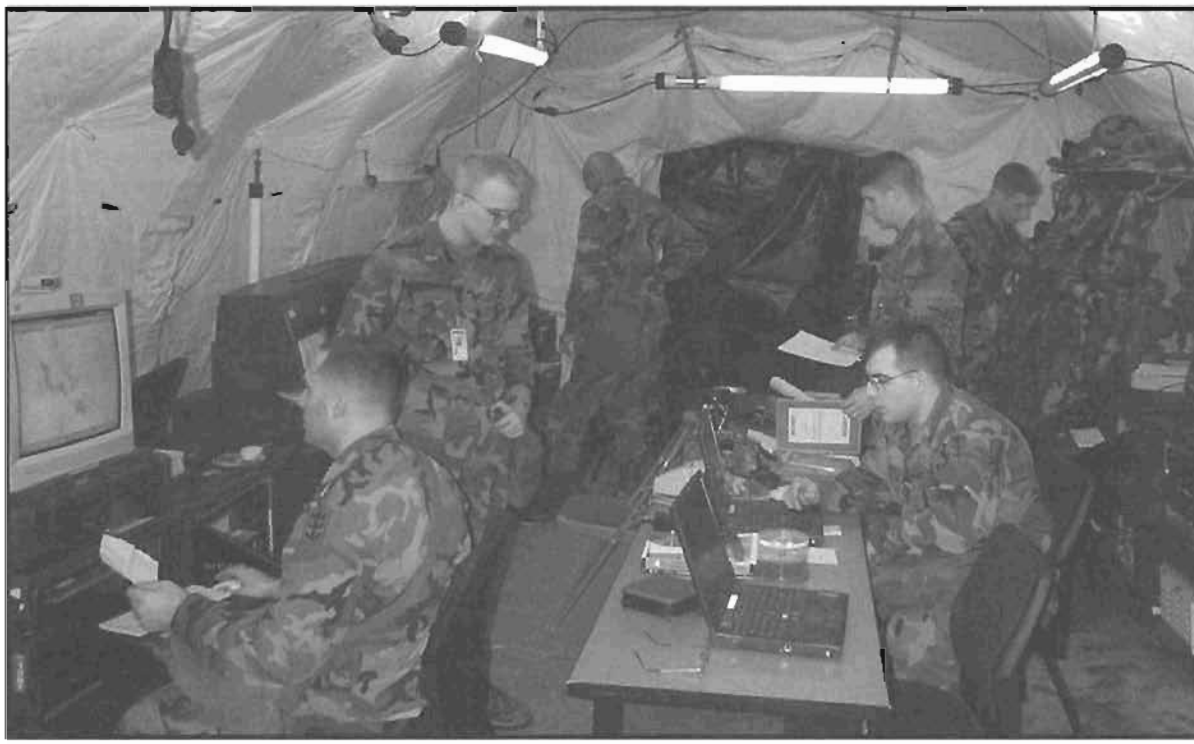
By the end of the exercise, the Corps had significantly improved the quality of its master terrain database. The terrain platoon leader estimated that the database was about 90 percent complete and was nearing a 100 percent solution.

Significant Results

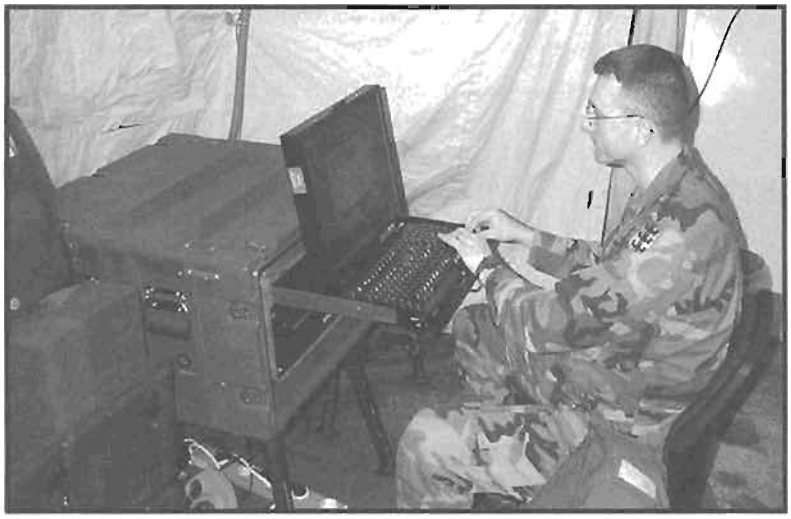
Several after-action issues were identified during the train-up exercise, including Strike tactical operations center (TOC) staffing, use of SkyMedia systems, function/role of the geospatial information and services (GIS) officer during the exercise, and dissemination of products.

New TOC Configuration

At the start of the train-up exercise, a full-blown Corps TOC was established. In this configuration, three of four squads of the terrain platoon, 320th Engineer Company, collocated with the Corps Main to provide the required topographic support. During the course of the exercise, the Corps tested a TOC configuration (called the Strike TOC), with a much smaller footprint. In this configuration, the terrain analysis platoon



The V Corps terrain team analyzes terrain data.



A soldier updates the terrain database during V Corps's warfighter exercise.

collocated with the 320th Engineer Company, leaving only three terrain analysts behind to support the Corps. However, these three personnel were insufficient to provide the required level of support and responsiveness to the Corps headquarters. During Urgent Victory 2002, the Strike TOC was staffed with about eight personnel on each shift. This allowed the terrain platoon to provide superior service to the Corps staff, while minimizing its footprint. This result confirmed that the minimum size of a terrain team should be about eight (squad size).

Satellite Connectivity

The Corps has two SkyMedia systems; however, both systems are nondeployable, and they provide little additional value to the Corps's forward-deployed topographic effort. In garrison, there are easier and more dependable alternatives for downloading commercial imagery and other geospatial intelligence, whereas in the field, the alternatives are limited. Since the terrain platoon doesn't have a deployable SkyMedia system, it is forced to rely primarily on the intelligence backbone to download data from outside the command. Due to the sheer size of commercial imagery and geospatial data files, an independent, deployable means of data transfer within the Corps's topographic company is required in the organization capabilities.

Dedicated GIS Officer

The Corps's GIS officer was dual-hatted as a targeting officer during the train-up. Since the targeting officer duties consumed a significant portion of his time during the train-up, he couldn't dedicate much time to his GIS duties. As a result, there was no one actively seeking out GIS requirements from other staff sections and subordinate units. During Urgent Victory 2002, the GIS officer was able to dedicate only slightly more time to his geospatial responsibilities, with the majority of his time being consumed by targeting. The role of the GIS officer is important. It should not be diluted with additional duties or dual-hatting. Corps and division engineers must insist on properly supporting this mission.

Geospatial Information Sharing

The bandwidth to provide digital availability of all the different topographic and terrain analysis maps does not exist within the Corps today. To ensure that the widest number of the Corps's subordinate elements benefit from the work of the terrain analysts, the 320th Engineer Company uses high-volume plotters to make hard copies of the various products and disseminates them to supported units. These copies are produced in the company's garrison facilities. During Urgent Victory 2002, the 320th was able to not only sustain this capability but also improve its responsiveness by deploying the high-volume printers to the field. This greatly improved the company's ability to provide support, especially to major units subordinate to the Corps. Mine maps and other products were produced and distributed to soldiers in the field. This capability was vital to supporting muddy-boot soldiers during the exercise.

Commander's Guide

Between the train-up and Urgent Victory 2002, the 320th Engineer Company published the *Commander's Guide to Topographic Operations*. The guide highlighted the products that the topographic company could produce and how these products could be used by various units to support the decision-making process. The guides, which were disseminated before and during the exercise, helped educate commanders on the capabilities of the topographic company and increased the demand for various products the company produced.

Command and Control Systems

An important observation made in both the train-up exercise and Urgent Victory 2002 was the limited ability to share digital terrain data with the digital command and control (C2) systems. There are several problems related to this issue including the use of different C2 systems within USAREUR and V Corps, the use of commercial off-the-shelf terrain analysis software, and the multitude of file formats.

C2 From Corps to Higher

The Global Command and Control System – Army (GCCS-A) only allows raster graphic backgrounds. These formats don't lend themselves to provide even the most basic of analysis capability or flexibility in displaying data. Most commanders demand more sophisticated products than this system is able to provide, so the staff is driven to use alternative software products to track the battle and provide a common operating picture (COP). GCCS-A functionality must be expanded to account for this more sophisticated need.

Experimental Freebies

The USAREUR staff relies heavily on FalconView™ as its primary utility for displaying the COP. V Corps, on the other hand, uses a Command and Control Personal Computer (C2PC)

to display the COP and report the disposition of the force to USAREUR. Both the USAREUR and V Corps headquarters staffs prepare operations graphics with their respective C2 systems. However, the graphics can't be shared between the systems without manually converting them since the file formats for FalconView and C2PC are incompatible—as are the file formats being used by our terrain analysts. Corps and division headquarters should use the same C2 system or at least use compatible file formats.

Digital Topographic Support System

Our terrain analysts use Army standard commercial off-the-shelf software programs like Environmental Systems Research Institute (ESRI™), ArcGIS™, and Earth Resources Data Analysis System (ERDAS®) IMAGINE to analyze, develop, and improve the level of detail found on national-level products. These programs have more capabilities than C2PC or FalconView and allow the production of more sophisticated terrain products. Unfortunately, neither ESRI, ArcGIS, nor ERDAS will store information in a file format that can be read by C2PC or FalconView.

Labor-Intensive Work Around

During the final preparation for Urgent Victory 2002, the 60th Engineer Detachment commander manually converted V Corps maneuver graphics to ERDAS IMAGINE formats so he could georeference them. Then he manually converted this georeferenced information to FalconView formats. Through a rather inefficient process, he was able to ensure that both USAREUR and V Corps shared at least one aspect of the COP. During the exercise, the 54th Engineer Battalion employed a rather interesting work around for this problem. First, graphics from one program were projected onto a white board. Using a white-board marker, the graphics were traced onto the board itself. The map graphics from the other system were then projected over the graphics on the white board. Finally, the graphics were redrawn using the mouse to trace over the white board. But the difficulty in sharing databases is not limited to player units; it extends to the simulation cell as well.

Back to the Early Decision

The terrain database in CBS does not take advantage of the detailed terrain analysis performed by our units. The database it uses is rather rudimentary by comparison. It can be altered to more realistically reflect real-world conditions, but it would be better if our CBS database used the very detailed database prepared by the terrain teams. This would be especially true if the system were used for war gaming variations of a tactical plan. Sharing a common geospatial database between the various systems would improve the accuracy and validity of the conflict modeling process (war gaming) and the COP—used to manage conflict. The V Corps commander's commitment to train right pays off because the staff is well-trained, issues such as bandwidth and C2 compatibility are uncovered, and the following significant conclusions are generated.

Unify Terrain Data

An effort should be made to synchronize the development of tactical terrain analysis systems, tactical C2 systems, and simulation systems. This effort would eventually lead to a convergence of the geospatial databases supporting each of these systems.

Fix the USAREUR C2 Tangle

In the meantime, both USAREUR and V Corps should possess comparable and interoperable C2 capabilities. Compatible systems will improve the ability to transport, portray, and manipulate information that provides real-time visualization, collaborative planning, and decision tools in current and future network-centric operations. The file formats supported by commercial off-the-shelf terrain analysis programs used by the terrain teams must also support the C2 systems used within the command.

During Urgent Victory 2002, the V Corps terrain platoon was again reminded of the need for precision when making requests for information. The analysis and control element generally provides what you request. If you don't request the right product, it causes delays and additional work. An approach recommended by personnel at the U.S. Army Engineer School is to staff the analysis and control element with an engineer officer on a full-time basis. This would be of great value to the terrain analysis effort and the broader engineer effort as well.

Terrain Teams Worth Their Weight

The Corps's terrain team performed well during Urgent Victory 2002. The TGDS produced by the Corps and divisional terrain teams contributed decisively to the decision-making process during every phase of the operation—from the BCTP seminar through the exercise. In addition, the printed products produced by the 320th Engineer Company demonstrated its ability to provide timely, relevant, and useful products to support actual combat operations on the ground. The topographic soldiers, noncommissioned officers, and officers truly fulfilled their commander's charge by training the right way.

Lieutenant Colonel Goddard was chief of the GI&S Division, Deputy Chief of Staff for Engineers, USAREUR, at the time this article was written. He is currently serving as deputy resource manager, V Corps. Previous assignments include deputy district commander, Honolulu Engineer District; S3, 65th Engineer Battalion, Schofield Barracks, Hawaii; area commander, Honduras and El Salvador Mobile Engineer District; engineer team chief, Readiness Group Salt Lake; commander, 50th Engineer Company, Korea; commander, B Company, 4th Engineer Battalion, Fort Carson, Colorado; company executive officer and platoon leader, 54th Engineer Battalion, Germany.

Engineer Branch Accident Analysis

By Mr. Fred Fanning and Ms. Vicki Hall

Each year, Army personnel are involved in accidents, many of which could have been prevented. The key to preventing these accidents is for everyone to understand where they occur and learn how to prevent them or lessen their effect on us. The U.S. Army Safety Center at Fort Rucker, Alabama, maintains a database of Army accidents. Each time an accident occurs, a report is submitted through the installation's safety office to the U.S. Army Safety Center and then into its database, which any soldier or civilian employee can access by going to *http://www.rmis.army.mil.* In this article, we provide a quick analysis of accident statistics for the Engineer Branch over a three-year period—fiscal year (FY) 99, FY00, and FY01—in five accident categories.

Background

The nature of engineering tasks makes them among the most hazardous in the Army. Specialized heavy equipment use, quarry and blasting operations, construction, high-voltage-line maintenance, demolitions, diving, fire fighting, and earthmoving each has its hazards.

There are many types of accidents (see Army Regulation 385-40, *Accident Reporting and Records*), but the five most common types for engineer units are Army motor vehicle, Army combat vehicle, other Army motor vehicle (O-AMV), privately owned vehicle (POV), and personal injury-other. Army accidents are also classified by their severity—designated as classes A through E. An accident falls into a particular class if it has any or all of the criteria. Our discussion focuses on classes A through C (see Table 1).

Class A—Property damage is $1,000,000 or more; an injury or occupational illness results in a fatality or permanent total disability.

Class B—Property damage is $200,000 or more but less than $1,000,000; an injury or occupational illness results in permanent partial disability; five or more personnel are hospitalized as inpatients as a result of a single accident.

Class C—Property damage is $10,000 or more but less than $200,000; a nonfatal injury causes lost time from work, other than on the shift on which the accident occurred; a nonfatal occupational illness causes lost time from work or disability at any time.

Table 1. Army accident classes

Accident Analysis

Army Engineer Branch accidents have cost more than $14 million since FY99. About $12 million of that was for personnel injury and fatality costs. During that period, 40 engineer soldiers lost their lives and more than 400 were injured. Some of those injured received permanent disabling injuries that will involve treatment costs for many years.

Army motor-vehicle accidents involve tactical Army wheeled vehicles. The number of this type of accident has remained fairly constant from FY99 through FY01 (see Table 2). The causes are inattention, inexperience, excessive speed, and failure to take appropriate actions for environmental conditions. The average age of drivers involved in these accidents was 18 to 25. This indicates that perhaps the required level of operator experience should be raised to a higher standard.

Army combat-vehicle accidents involve vehicles such as armored personnel carriers. These accidents have also remained constant over the last three years (see Table 2). Causes point to improper or inadequate training for operators and improper maintenance, mainly during the preventive maintenance checks and services (PMCS) process. One area of concern is that improper maintenance on the track on the M113 has led to the tracks breaking and causing rollovers. Many of these rollovers have resulted in the death of the track commander.

O-AMV accidents involve operating an Army vehicle other than Army motor vehicles or combat vehicles, such as bulldozers, forklifts, road graders, rollers, and most other construction equipment. A major cause of accidents is that drivers lose sight of other vehicles or personnel because of

Accident Type A-C	FY99	FY00	FY01	Total
Army motor vehicles	18	13	15	46
Army combat vehicles	8	7	7	22
Other Army motor vehicles	11	12	10	33
Privately-owned vehicles	35	34	27	96
Personal injury—other	94	69	82	245
- Explosives	2	1	3	6
- Fire	2	1	1	4
Total accidents	166	135	141	442

Table 2. Three-year accident-type comparison for A-C accident classes

sudden or unexpected changes in the terrain. Maneuvering in the safe zone—that area in which the driver can see objects or other vehicles—is not specifically addressed during initial training but is only learned while operating the vehicle. It is important for engineer equipment operators to recognize that equipment and vehicles come with their own peculiar restrictions, and they must consider those restrictions before conducting a mission. Nothing should be assumed when it comes to operator capability. Supervisiors should perform periodic tests to ensure that proficiency is being maintained and standards are adhered to. We must never allow deviations from the standard to become the standard.

Are soldiers being properly prepared for driving and performing other aspects of engineering? No amount of classroom instruction, reference materials, or lecturing can replace the hands-on training needed to adequately understand a vehicle's abilities and limitations. For example, we have determined that blind spots on the M9 ACE are in excess of 75 feet. Yet, until recently, this fact was barely addressed in training materials. Now, lesson plans have been changed, and the issue is being taught to all new drivers.

POV accidents involve an individual operating a personal vehicle in an unofficial capacity. These accidents claim more lives of engineer soldiers than any other type of accident. Even though POV accidents in FY01 were down 21 percent from FY00 (see Table 2), 27 accidents is still a high amount. Investigations show that driver fatigue, inattention, distracted driving, failure to maintain control of the vehicle, and excessive speed are the top reasons for these accidents—the same reasons as for Army motor-vehicle accidents. Another parallel between these two types of accidents is the age of the operators, 18 to 25 years, indicating that the level of experience and maturity are contributing factors.

Personal injury–other accidents are those that involve injury to Army personnel not covered by any other accident type. These accidents include slips, trips, and falls; sports injuries; being struck by an object other than a vehicle; or injury by a tool. These accidents are common and can result in a wide range of injuries, from lost time to death. The causes of these accidents are normally failure to follow procedures, using the wrong tool, using a tool improperly, housekeeping hazards such as tripping, and improper use of pyrotechnics and explosives. It is critical that supervisors know the proper procedures and that all personnel are following them. In addition, field-expedient methods should be reviewed and confirmed as appropriate. Many field-expedient methods once commonly used are not allowed now, but unless the review is conducted, soldiers may not know.

Leaders' Responsibilities

Analyzing motor-vehicle accidents raises the issue of whether or not training or the lack of it may have been contributing factors. There are lesson plans and training circulars that units or organizations should use to train their operators properly. In addition, hands-on training can supplement the training program and assist instructors in teaching all the hazards that exist in driving. Leaders of units using the M113 should ensure that their preventive maintenance program for the tracks is working properly. In addition, the seat bar for the track commander's seat should have any paint removed so the seat can fall when the release is pulled. The operation of this seat should be checked periodically. Leaders should also ensure that track commanders do not stand or sit out of the vehicle hatch more than the height of the name tag on their uniform from the ridge on the hatch. Conducting PMCS is another important practice for leaders. Properly training drivers and enforcing standards can reduce the number of mechanical problems that lead to accidents. Once shortcuts become routine, accidents will occur more frequently and with more severity.

Personnel must be reminded to take measures to ensure their own safety, such as being defensive drivers. Being in the "right" is no longer enough. They must also learn to anticipate other driver's actions and be prepared to take evasive actions. In vehicle convoys, field operations, or other exercises, keeping a watchful eye on other vehicles will go far in preventing accidents. If an operator is unsure of correct procedures or is not performing to standard, leaders must take the time to correct the problem. We still see POV accidents involving personnel who have consumed alcohol and/or were not wearing seat belts. Leaders must continue to emphasize the importance of not drinking and driving and of using seat belts.

Summary

As this analysis shows, POV accidents cause more deaths to engineer personnel than any other type of accident. This more than justifies the time commanders take to present holiday briefings and counsel soldiers who have received traffic tickets for moving violations. The analysis also shows that accident numbers are constant in most areas with a definite reduction in POV accidents and an increase in personnel injury–other. There is much more that can be learned about accidents; this article has only touched the surface. Each unit and organization should analyze its accident data and then take positive steps to reduce or eliminate hazards. The entire Engineer Branch will benefit from an across-the-board reduction in accidents.

For additional assistance in accident prevention measures, please visit the Maneuver Support Center Safety Web page at *http://www.wood.army.mil/safety/*.

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Crossing the River "Regen": Regenerating Combat Power at NTC

By Lieutenant Colonel James A. Knowlton and Lieutenant Colonel Michael J. Teague

A rotation at the National Training Center (NTC) is one of the toughest training events a battalion will undertake. Fighting the World-Class Opposing Forces (OPFOR)—on their own turf—makes for an intense training event that challenges each and every member of a combat engineer battalion. But this is more than a big field training exercise; it truly is a campaign. Just deploying to a "hostile country" is a challenge. Drawing pre-positioned vehicles and equipment along with all classes of supplies—in a compressed time schedule—requires planning and organization to get into the maneuver box, ready to fight.

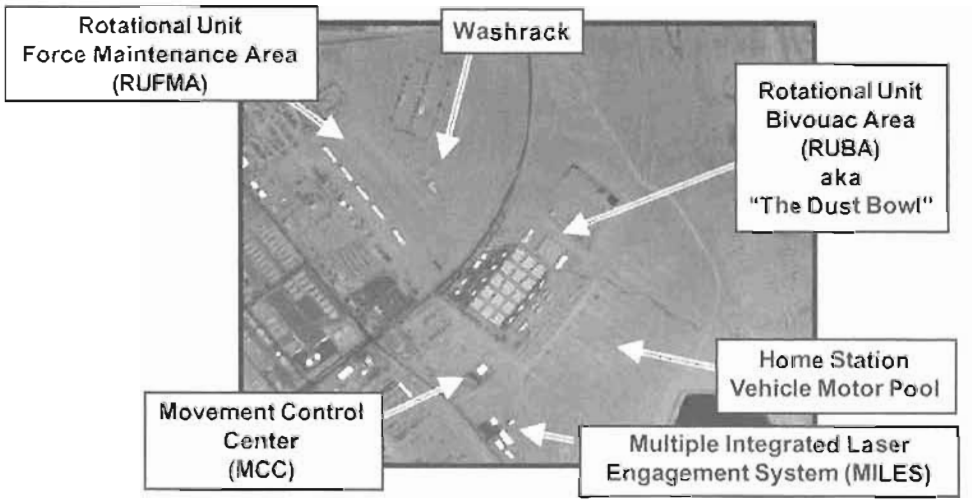
Unfortunately, once a battalion finishes battling the OPFOR, it is ready to sit back and bask in the glory that comes from working hard and successfully throttling the enemy, but this is when the "real fight" starts. The next phase of the campaign is turning all drawn equipment back to ITT, the contractor that owns and maintains the pre-positioned fleet at NTC. *This is the turbulent River "Regen" that your unit must cross in order to get everyone home!* Regeneration—or regen—is extremely difficult and can bring a unit to its knees if it has not properly prepared for this fight. Recently, the 4th Engineer Battalion, Fort Carson, Colorado, completed two rotations to NTC within seven months. During the second rotation, we were able to apply valuable lessons learned during our previous rotation. We returned to home station knowing that not only had we successfully battled the OPFOR, but we also had successfully "won" the regeneration fight!

The following system worked well for the 4th Engineer Battalion. In addition to being a compilation of our lessons learned, it also contains lessons from the experiences of other units. We are sure the system can be improved, but it is a great baseline to start with as a unit prepares for a rotation to NTC.

Regeneration Is a Mission

Like any other mission, regeneration requires thorough planning; an order; rehearsals; and solid command, control, and communications. It is a training event that should have its own after-action review (AAR). (That's where we captured the lessons learned from the first rotation.) As engineers, regeneration seems very similar to a river crossing. There is literally a hardball road between the "shores" of the turn-in yards, and the key to success is to get equipment to the far shore (ITT's side) and keep it there.

Since we knew there would be a "crossing" during this campaign, we started our planning before we left home station. We did a sand table of Irwin Military City and conducted rehearsals for reception, staging, onward movement, and integration (RSOI) and regeneration so that all of our leaders understood the terrain. The staff gathered tools that would be



critical during regeneration, and the units identified key leaders and operators for the process. We developed tracking charts for the draw grid that included every piece of equipment we would draw and had the tracking charts enlarged and laminated. We designed the charts as spreadsheets and used them as part of our nightly status report throughout both RSOI and regeneration.

We found it important to identify all vehicles by both their home station bumper numbers and the NTC admin numbers. ITT and the NTC Theater Support Command talk solely using NTC numbers, and by the end of regeneration, most soldiers and leaders are more comfortable with the NTC numbers than those of the home station.

As part of our unit's preparation, we brought office supplies specifically for regeneration, including accordion files for each company and job order folders for each vehicle and trailer. These folders became the key management tools to ensure that files were complete and allowed us to maintain positive control over all of the paperwork for each piece of equipment. This helped avoid the frustration of getting a vehicle ready for the final quality check and discovering that the air filter slip was missing.

Planning Is Critical

We wrote a separate operations order (OPORD) for the regeneration operation that covered the end of live fire through the turn-in of equipment and redeployment to home station. The OPORD covered moving out of and clearing the maneuver box and occupying the RUFMA. An OPORD shell was completed before deploying to NTC, and the staff planning was completed during the live-fire transition. We did not conduct a full rehearsal in the field, but each commander and primary staff officer back-briefed the battalion commander on his plan before departing the box.

A battalion can prepare in many ways for success during regeneration, but the most important step is for operators and supervisors to be ruthless about completing DA Forms 5988E, *Equipment Maintenance Worksheet*, and processing them through the maintenance system each day the unit is in the maneuver box. This is easier said than done when the OPFOR is pressing from all sides, you can't find the mine-clearing line charge (MICLIC) tags, and the observer/controller wants an AAR. But if you don't get low-density engineer parts on order early, your unit will spend additional days in the RUBA—also known as the "Dust Bowl"—waiting for parts instead of heading home.

In addition to working the Army maintenance system as designed, there are several other systems that you can implement within your unit to improve the probability of success. It was absolutely critical for us to designate one NCO to be in charge of locally purchased repair parts. The Theater Support Command maintenance tech is a wealth of information about local sources, but one NCO—who had a commercial vehicle and a government credit card and could run for parts—was a linchpin throughout the entire rotation. (Your installation resource manager will want you to keep track of the purchases for NTC versus home station vehicles.) You also need to understand the turn-in standard. Although the rumor mill told us that ITT would change the standards between drawing equipment and turning it in, we found that the ITT team was extremely fair. The team used an NTC Overprint 2404, *Equipment Inspection and Maintenance Worksheet*, for each vehicle rather than a 10/20 standard out of a technical manual. The same standard form is used at draw and turn-in time. In addition to daily DA Forms 5988E, our operators completed an NTC Overprint 2404 during live-fire transition to identify problems early and get parts on order before departing the maneuver box.

Finally, you must complete the Army Oil Analysis Program (AOAP) samples while the unit is in the maneuver box. This is easy to do, but it requires an NCO in the unit maintenance collection point (UMCP) to track each vehicle and ensure that each sample is collected and turned in and the results returned. ITT will not accept a vehicle without the proper AOAP paperwork.

Keys to Success

1. Purchase locally.
2. Use NTC Overprint 2404s.
3. Complete AOAP samples.

Start on the Right Foot

Once the final battle is over, the tendency is for units to sit back and relax for a day or two. After all, they have fought an intense campaign against the Krasnovian hordes over the previous 14 days and now deserve a break. This is the worst thing a unit can do because it puts it two days behind on recovery and turn-in. This is when leaders must be ready to execute an already-developed plan and execute it violently! Soldiers must understand that each day wasted up front is an extra day in the Dust Bowl. Once the unit finishes initial battlefield recovery in the maneuver box and begins redeployment to the Dust Bowl, everyone's focus must turn to regeneration.

The first part of the regeneration mission is redeploying from the maneuver box. Successfully accomplished, this postures the unit for the regeneration fight. We set up a drive-through station that was run by the engineer battalion Headquarters and Headquarters Company (HHC), which gathered all Class I, IV, and V supplies and trash from each of our units before it left the live-fire area. Our brigade combat team (BCT) conducted a four-corners (referring to the intersection of the two main range roads) drill that accomplished the same requirements outside the cantonment area, but most of the battalion's vehicles were able to drive straight through and into the RUFMA because they were already downloaded. When planning, don't forget the engineer piece of clearing training areas. You will have to fill in all the major holes, and there is no reason to race blade assets back to the RUFMA just to send them out again.

The quartering party for the battalion was the UMCP. The battalion maintenance technician (BMT) and battalion motor sergeant (BMS) set up shop in the trailer provided and were ready for the companies to arrive. They had marked vehicle lines by fleet, rather than by company, and the mechanics were ready for the vehicles. We consolidated all mechanics and reorganized by fleet: tracked, wheeled, and engineer. This aligns the unit's assets with ITT's crew organization.

Since most vehicles did not have to stop at four corners, the drawn vehicles immediately got into line for the washrack. This is the first step, and the line gets long. This is where great NCOs take over as they use the "down" time in line to remove the Multiple Integrated Laser Equipment System (MILES), download personal gear, and move home station equipment and sets, kits, and outfits to the MILVANs. This is also where home station vehicles separate from drawn vehicles. Home station equipment does not go through the washrack but goes right to the MILES warehouse. Drawn vehicles that were not mission-capable bypassed the washrack and went straight to the maintenance area. These vehicles were very specifically tracked, knowing that the ITT inspectors could not conduct the joint technical inspection (TI) until the operator washed the vehicle.

Vehicle Turn-In Process

Once we pushed drawn vehicles through the washrack, downloaded the MILES, and turned in items such as communications equipment and weapons, we parked them on line in the Dust Bowl. Once there, the vehicles did not move until ITT inspectors conducted the initial joint TI. This is the inspection that identifies the deficiencies operators will ultimately work off before they can turn in the vehicle. Units must be careful about pulling vehicles out of the RUFMA for a detail. During our first rotation, we had to pull an M916 truck and a loader out of the RUFMA—after ITT had already conducted the joint TI—to clear part of the training area. The operator had already worked off a great deal of the vehicle deficiencies, but he had to start over once he cleared the training area, a morale buster at best!

Steps for Vehicle Turn-In

1. Download.
2. Go through washrack.
3. Replace air filter and complete AOAP samples.
4. Perform joint TI with ITT.
5. Work off all deficiencies.
6. Obtain pass from line boss.
7. Go to final QA line.
8. Turn in or return to Step 5.

(Most vehicles will return to Step 5 several times before final turn-in.)

Each operator must replace the air filter on his vehicle as part of the regeneration process. This can be done before the joint TI, and the shop gives him a slip verifying that the filter has been replaced. Leaders must ensure that the slip gets into the vehicle's packet in the job order folder because no one can turn in a vehicle without one. This is where the folders become so important.

There is a line boss from ITT for each unit, and working with him as a teammate will make life much easier. Inspectors do not work for your line boss so you will have to coordinate for them to inspect your vehicles. *Get this done as soon as possible!* You can't order the right parts or work the right deficiencies until you have an NTC Overprint 2404 from the joint TI. Our BMT was the primary person who worked with the line boss, and the BMS worked with the inspectors. Everything was centralized through battalion maintenance with the BMT, BMS, and maintenance battle captain. This last part of the team was one of the tactical operations center (TOC) battle captains who ran all communications and reported from the trailer in the RUFMA to the rest of the leaders on the ground. Operators, squad leaders, platoon sergeants, and platoon leaders were not allowed to coordinate with the line boss. During both rotations, we saw operators lose their tempers because of frustration with a system they did not understand. Working with ITT—not against them—is the key to going home.

All of the maintenance clerks were inside the trailer under the control of the BMT and BMS. Their role is very important since no one wants to wait for parts that are the wrong ones! They must also remove all home station vehicles from the Unit-Level Logistics System (ULLS) box and turn in all of the recoverable parts. You will not leave NTC unless all recoverables are turned in or your unit pays double for the part or assembly. The AOAP monitor is also in the trailer making sure that the AOAP documents are correct and in each folder.

The battle captain controlled the folders for each vehicle and trailer and the draw grid spreadsheet. Unless a mechanic was working on the vehicle or it was in the final quality assurance (QA) line, the folder stayed in the trailer. The battle captain or BMT coordinated with the line boss to get the pass required to get into the final QA line.

Vehicle Packets

1. Air filter pass.
2. AOAP printout.
3. Joint TI 2404 with all deficiencies worked off.
4. Pass from line boss.
5. Clean DA Form 5988E.

Command, Control, and Communication

Once operators work off deficiencies, the next phase of the fight begins. At this point, it is important to get leaders at key locations to control vehicle flow and

track the location of all unit vehicles. A lot of time is wasted if a vehicle fails a final inspection for a minor problem and the operator gets out of line when he could have gone to the quick-fix line and been finished in a matter of minutes. As with a river crossing, leadership on the ground was our solution to this problem.

We did not allow a vehicle to go to the final QA line without an NCO. After a while, we identified certain NCOs who were successful at turning in vehicles. That NCO is not always a mechanic; in our unit, our best guy was a motivated cook! We placed key leaders at critical points on the battlefield. The battle captain ran the maintenance trailer and tracked where every vehicle was in the turn-in process. The Alpha Company commander went to the final QA line, and the HHC commander went to a staging area located a few hundred yards before the final QA line. When the QA line got too long, ITT tightly controlled the vehicles that got in, regardless of whether they had a pass or not. We staged vehicles close to the QA line under the control of a commander and treated that location much like the engineer regulating point (ERP) before a crossing site. The Charlie Company commander was at the MILES warehouse, the S1 was in the MCC, and the S4 was turning in secondary loads and basic issue items. The battalion commander, executive officer, and command sergeant major moved among all of the sites. Since all leaders had communications equipment, it was easy to get one of the top three to a critical point on the regeneration battlefield when needed. Units without a senior leader in the RUFMA spent considerably more time before crossing the River Regen.

The RUFMA and the Dust Bowl did not seem very spacious, but by the second day, we had walked miles. Each leader must have communications equipment to provide status reports to the trailer as vehicles move in many directions throughout the RUFMA. AN/PRC-127 radios are the method of choice, but Motorola® and other handheld radios also work well. You cannot count on your vehicle radios since you will be turning them in or packing them for home station.

Each day after ITT shutdown, we conducted daily operations meetings to review the current status and establish priorities for that night and the next day. For us, it was a 24-hour-a-day operation, just like the training in the maneuver box, and we even executed a sleep plan to ensure that mechanics and operators were getting at least four hours of sleep each day.

The ITT line boss can be a tremendous asset. For vehicles requiring maintenance work above the capabilities of the BCT (depot level), the ITT line boss recommends arbitration. Then he coordinates and puts his recommendation on the arbitration process, and the unit turns the vehicle in with the required paperwork to go to the next maintenance level. We had several vehicles that went through arbitration. Establishing a good relationship with the line boss made this a less contentious process. He can also help with parts because he knows where most of the parts are throughout Fort Irwin and can point you in the right direction.

Almost Done, but Don't Stop Yet

Once you get down to the last 10 vehicles, ensure that you keep a sufficient number of key leaders and soldiers to complete the turn-in. The tendency is to try to get as many people home as you can (taking care of soldiers), and you end up short. Our forecasting rule for transportation was for a soldier to head home a full day *after* his vehicle was turned in. Since we worked 24 hours a day in the RUFMA, this gave everyone a chance to sleep, do laundry, and then start the manifest process. The standard was published in the regeneration OPORD, so everyone knew the rules up front.

We also kept several home station vehicles until the very end. All contact trucks, the wrecker, the Batmobile, and the tool truck stayed until the last day. If you don't have access to a commercial truck, you should also keep a cargo HMMWV to pick up parts and turn in recoverables. We contracted for three air compressors with impact wrenches to help in changing tracks and were able to return them when the last of the tracked vehicles were turned in. As the engineer battalion, you will probably be responsible for the environmental team of the White Cell, which means that you will be responsible for cleaning any spills in the RUFMA. We found it best to arrange for contracted equipment so drawn equipment can be turned in and home station equipment can be rail-loaded while still accomplishing the White Cell mission. You cannot use the same equipment you are turning in.

Conclusion

Every unit that goes to NTC learns a great deal from the experience. They get better with every fight and normally leave the maneuver box extremely proud of their combat readiness. One of the challenges that can bring a good unit to its knees is the regeneration process. The battle that awaits a unit when it comes out of the box is as tough as any fight it will experience at NTC. With proper preparation—both at home station and during the rotation—this final battle can be another streamer on the battalion colors. It's a great feeling to be the first battalion in the BCT to cross the River Regen and send soldiers home. This truly is the best way to end a successful campaign against the Krasnovian World-Class OPFOR!

Lieutenant Colonel Knowlton is the European Command exercise planner in J37, U.S. Space Command. At the time this article was written, he commanded the 4th Engineer Battalion, 4th Infantry Division, Fort Carson, Colorado. Previous assignments include the S3 and Assistant Division Engineer of the 307th Engineer Battalion, 82d Airborne Division, and company commander of units in Aschaffenburg and Berlin, Germany.

Lieutenant Colonel Teague is chief of training for the U.S. Army Space Command and was the battalion XO of the 4th Engineer Battalion, 4th Infantry Division, when this article was written. He previously served with the 10th and 19th Engineer Battalions and commanded the 13th Engineer Company (Construction Support).

Enlisted PERSCOM Notes

By Lieutenant Colonel Jack F. Smith

On behalf of the great staff here in Alexandria, Virginia, greetings from the Engineer Enlisted Branch. Having just arrived as the new branch chief, I am glad to have this opportunity to update you on the current health of the enlisted engineer force.

Health of the Regiment

The overall Engineer Regiment is very healthy. Today our Regiment is manned with 15 of 21 military occupational specialties (MOSs) at or above 100 percent with three more at 99 percent (see table).

Our biggest challenge is in the 12B MOS, particularly at skill level one. We underassessed this MOS during fiscal year (FY) 01 to correct a significant overstrength. The result of this and other corrective action is that the majority of units in the field are currently being manned below 95 percent at skill-level-one positions. Starting in October, we will bring in additional soldiers to increase our strength in this critical combat specialty.

Several actions taken over the past fiscal year have dramatically improved our low-density MOSs—00B, 52E, and airborne 62E/J. These should be healthy by the end of FY03. These MOSs offer very attractive reclassification bonuses under the Bonus Extension and Retraining Program. Call this office if you are interested in reclassifying into these specialties.

The shortage in noncommissioned officers (NCOs) continues to be problematic worldwide. While there are many reasons for the shortage, there really is only one solution. Soldiers in the field need to get scheduled for promotion boards. If you are eligible, ask your chain of command when you can go before the next promotion board.

Recruiting and retention have been well above historical averages across the Army and in the Engineer Regiment. All of our training seats were filled for FY02, and all the required seats for the first quarter FY03 have already been contracted. On the reenlistment side, all but one of our 21 specialties are well above the five-year historical trend. We expect this to continue, partly due to reenlistment bonuses, but most likely due to our ongoing campaign against terrorism.

The long-term projections for the Regiment are very good. We can expect our shortage MOSs (12B10, 00B, 52E) to improve dramatically in the next 12 months. Meanwhile, other specialties (51B, 51M, 51R, 51T) will experience decreases in overall strength to bring them in line with authorized manning levels.

The Assignment Process

The assignment process for enlisted soldiers is complicated, yet relatively simple. The complicated part is getting 15,000 soldiers properly aligned with so many priorities throughout the world for high-quality, trained, and ready soldiers. The simple part is that each soldier can have a direct impact on his or her assignment process.

There are many variables that go into the assignment process: exceptional family member program, married soldiers program , drill sergeant/recruiting nomination process, AC/RC, schooling, needs of the Army, deployment stabilization, and the all-important readiness of our field units. However, there is one thing that is not a variable, the soldier's preference. What has amazed me in my short time on the job is the number of both junior enlisted and NCOs who have not bothered to let Branch know their preferences. There are three methods to make this happen: You can submit a DA Form 4187, *Personnel*

Personnel Action		
MOS	Authorized Strength	Strength (percent)
12B	8,161	99
12C	659	105
12Z	229	96
00B	138	99
51B	881	121
51H	434	104
51K	115	106
51M	241	99
51R	128	155
51T	116	99
51Z	116	103
52E	185	85
62E	1,342	105
62F	279	100
62H	99	98
62J	686	100
62N	459	104
81L	245	113
81T	460	101
81Z	19	105
82D	110	114
Total	15,243	98.5

Engineer Enlisted Operational Strengths (as of 4 September 2002)

Action, listing your assignment preferences; you can go online through Army Knowledge Online and use the Assignment Satisfaction Key (ASK); or you can call your assignment manager and tell him your preference. If you do the latter, you will be asked to follow up with a DA Form 4187 to document your preferences. ASK is the preferred method because that process eliminates the middleman. Your preferences are automatically posted to your record as soon as you hit the enter key. While we cannot guarantee that we can meet your preference in every assignment, I can guarantee that when we do have a valid requisition for a soldier, the first thing we look for is those who have listed that location on their preference.

When should you talk to your assignment manager? Often! We do work assignments for E-4s through E-6s six to eight months out from their report date. So if you've been at one location for over 36 months, your manager is already deciding where you will PCS to next. For those on short tours, about the time you arrive in country, you need to update your preferences.

For senior NCOs (E-7s and above), we are attempting to work your assignments so we can provide 12 months notification of a PCS. We have been improving, but we will never get to a 100 percent solution on this due to soldiers coming off levy, school scheduling, and the like. Here at Engineer Branch, we intend to start posting on our Web page critical assignments that we need to fill for selected senior NCO key billets with AC/RC and other jobs that are seldom easy to fill. Assignments can range from North Dakota to Hawaii, Egypt to Australia, and I think it will be a good opportunity to match up soldiers who want a deal of a lifetime to go to select locations.

I know there are soldiers reading this who are thinking, "What is this guy talking about? I got my orders exactly 32 days before the truck showed up at the house." There are a lot of reasons for this happening. Sometimes, but not often, the needs of the Army demand that we do a short-notice PCS, and we do everything in our power to avoid this. Another reason can be that some headquarters, for whatever reason, has not done its job of downloading assignment instructions and then publishing orders. If it has been more than 30 days since DA has informed you that you have been placed on assignment instructions, you need to go to your installation personnel office and find out what is holding up your orders. Here's a little secret: We post assignment instructions worldwide every Tuesday morning. Once posted, they are available for your installation personnel office to act on immediately. The key words here are "assignment instructions." Just because an assignment manager has told you that you have been nominated for an assignment does not mean assignment instructions have been published. The nomination process can take several months as the packet is vetted though all of the offices that ensure that only fully qualified soldiers are sent to critical duties such as recruiting and drill sergeant.

In some cases, and in some MOSs, the number of available worldwide billets and the number of soldiers to fill those billets can dramatically impact the amount of time a soldier can expect between PCSs. It is not uncommon to move soldiers with only 24 months on station to ensure the operational readiness of forward-deployed units. Many NCOs are also moved early when they are selected to recruiting or drill sergeant duty.

The bottom line to all of this is my charter to man the force with the soldiers we have available. My goal is to treat each of you with respect and to provide as much input as possible to your career. Periodically you need to contact your assignment manager or professional development NCO to review your assignment eligibility, preferences, and family circumstances. Keep in mind that there are restrictions about where we can send you. First, your MOS has to be authorized at the desired location. (Sorry, but there are no combat engineer slots in the Bahamas.) Also, if you have managed to avoid overseas duty for many years, we need to send you there, so step up and enjoy the scenery. We also attempt to avoid repetitive TDA assignments. If you are an NCO, you will need to do drill sergeant, recruiting, and/or AC/RC assignments at some point. These are nominative assignments that our best NCOs are asked to fill. They are challenging assignments and recognized by selection boards as being career-enhancing.

To the staff sergeant 12B ranks, we have a great career opportunity coming available this next summer. Our authorizations for 12B30 soldiers assigned to the Special Forces Civil Affairs Company will increase from 6 slots to 24. Get your packets together now if you want in on this great chance to serve your country on the edge.

Promotions and Training

This is one topic that has the interest of almost all soldiers. The single biggest item that stifles the process is the inordinate amount of board-eligible E-4s who are never given the opportunity to go before the promotion board. My philosophy is quite simple: If you have an E-4 in an E-5 or E-6 billet, then how can you possibly claim that the soldier is not ready for the promotion board. If he is already doing the job, he should already be getting the money. The promotion orders state only that the soldier has demonstrated "the potential" for the next higher grade. Sometimes it appears that some units want the soldiers "fully qualified" for the next higher grade. It takes about 10 years to get 10 years of experience that our great NCOs possess. Let some of the experience occur with the requisite increase in pay and rank.

Conditional promotions have been on the street for some time. Remember, they require attendance in the requisite NCOES course (PLDC, BNOC and ANOC) within one year of the conditional promotion. Failure to meet this requirement can result in a demotion. There are exceptions to policy for operational and hardship reasons; however, it is imperative that

(continued on page 40)

The Sapper Leader Course

By First Lieutenant Joseph Roman



The term "sapper" dates back to 16th century Europe when British engineers were given the name from the French word *sappe*, which described an entrenching tool used to construct ditches. The way of the sapper is hard and dangerous and lies always across the ground between friendly forces and the enemy. The job of the sapper calls for the best and the bravest in any Army.

"What is a sapper?" asked the British Royal Engineer, Captain T.W.J. Connolly, 80 years ago. "He is a man of all work of the Army and the public, astronomer, geologist, surveyor, draghtsmen, artist, architect, traveler, explorer, antiquary, mechanic, diver, soldier, and sailor, ready to do anything or go anywhere; in short, he is a SAPPER."

Today, almost all engineers consider themselves sappers. However, to the approximately 450 soldiers a year who challenge themselves and their soldiering skills at the Sapper Leader Course (SLC) at Fort Leonard Wood, Missouri, the term means so much more.

Graduates from the SLC are physically tough, mentally proficient, and tactically sound. They volunteered to undergo some of the most rigorous training the Corps of Engineers has to offer. They successfully trained for 28 days at an average of 17.5 hours a day. They learned advanced skills necessary to be a strong combat multiplier for their task force. They earned the right to be called sapper.

Sappers must arrive at the course in peak physical condition. They begin their training with a standard Army Physical Fitness Test and basic in-processing requirements. The challenge often lies in the increased elevation provided by the Ozark Mountains and the demanding weather of the Midwest. All soldiers are eligible to attend the SLC, regardless of their military occupational specialty or gender. Although the majority of the students are combat engineers, any soldier with a strong train-up can be successful at the SLC. All are in the rank of E-4 or above, but they must have a waiver if they are not E-4 (P). Following their day of acclimatization, the sapper candidates begin one of the most rigorous training schedules they will ever face.

The connotation of combat engineer implies proficiency with demolitions. To ensure that this image is upheld, the SLC includes more than two days of instruction on safe and efficient employment of a variety of charges. A full day is dedicated to classroom instruction on safety, system emplacement, and charge calculation. A written examination confirms their proficiency and allows younger soldiers the opportunity to understand the mechanics of demolition placement. This instruction is validated with an overnight stay at a demolition range. The SLC is currently moving its operations to the new engineer qualification range, where a variety of charges will be discussed and emplaced. To complement the contemporary operating environment, an increased focus is being placed on charges used in military operations in urban terrain that focus on safety and a low standoff radius. Furthermore, sappers learn to construct field-expedient charges based on realistic supplies and contemporary missions.

In addition to the mobility support provided by the demolitions expertise, sappers also learn to move their task force through the water. Training is conducted at the Lake of the Ozarks, where students get hands-on training with Zodiac boats

in addition to field-expedient methods for crossing wet gaps. This training is complemented by instruction in crossing site reconnaissance, assault crossing, and setup. While the primary training lies in the efficient construction and use of the boats, students also are able to overcome fear of the water and moving heavy loads across gaps they might not normally swim. Based on the weather and aircraft availability, some classes have the opportunity to helocast and learn the technicalities of nonstandard theater entry. The water, however, is not the only obstacle sappers learn to conquer.

Three days of the SLC are dedicated to mountaineering operations. Sappers are first introduced to ropes and the proper care and use of these essential items of equipment. They learn to tie knots that are incorporated in many of the individual and collective tasks used throughout the course. Additionally, they construct one-rope bridges and an A-frame to enhance both horizontal and vertical mobility. Sappers then practice ascent and descent techniques on a tower and at our own cliff site. In addition to individual rappels and climbs, students learn the essentials for casualty evacuation down a vertical drop and practice these techniques. The training culminates with a 90-foot night rappel with equipment.

Sappers not only must provide mobility but also must identify and combat the enemy. To this end, a day is dedicated to enemy capabilities. Sappers are introduced to some of the most common mines in the world today. An instructor fresh from Afghanistan who received hands-on training on our enemy's "weapon of choice" teaches this training. By learning to successfully identify these weapons, engineers can make a greater impact in the planning and reconnaissance of their task force.

Additionally, students are taught the components and capabilities of the most common rifles in the world. Students are then able to assemble and disassemble an AK-series weapon and, in the coming months, will be able to fire these weapons. see their capabilities firsthand, and learn their signature sound. Furthermore, sappers learn the intricacies of booby trap employment and detection. Classroom instruction is provided to familiarize students not only with the conventional booby traps available via normal supply channels but also innovations commonly seen throughout the world. Students construct their own booby traps, limited only by their imagination, and then clear lanes produced by other students to enhance detection and disarming abilities.

Finally, students are given an introduction to air operations. A sapper has knowledge of airborne, air assault, and pathfinder operations and landing/pickup zone setup and operations. Additionally, students soon begin training on fast rope techniques on our tower. They are required to put this knowledge to the test by guiding in an actual aircraft and controlling its operations based on the classes they received.

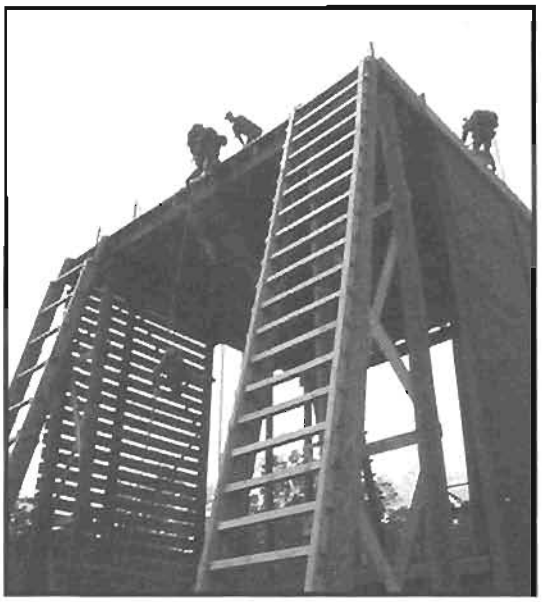
Intermixed throughout the beginning two weeks of class are various exams to test the proficiency and physical toughness of the students. A 12-mile road march, which is regularly described as the toughest course the students have ever walked, is given at the end of the first week. While the three-hour time limit is difficult, it is clearly attainable for anyone who trained at home station. Following the road march, a medical techniques class is given to check the students' knowledge, which includes applying an IV to fellow students to replenish fluids lost during the march. Additionally, students are paired up and complete a land navigation course that can best be described as humbling. The majority of the attrition at the SLC comes from this event, with injuries as the second largest reason for not completing the course. Again, home station training and toughening are the keys to success.

Following two weeks of intense individual training, students then transition into the patrolling phase of the SLC. Here, they are required to put all their newly acquired knowledge to work in a field environment. They begin with a few days in a classroom, simply to arm themselves with a working knowledge of basic patrolling methods and small-unit leadership skills. Although students should show up with some experience, the standardization allows the class to better perform as a sapper platoon for their upcoming 10-day field problem.

While the focus of the field problem is the successful employment of the five basic principles of patrolling, the SLC is shifting the patrolling missions toward more of an engineer focus. Students will rotate through leadership positions and



Staff Sergeant Plimpton conducts jump master personnel inspection.



Sapper students prepare to rappel from the tower.

will each face some unique and challenging tactical problems requiring detailed planning, focused leadership, and violent execution.

To better represent the contemporary operating environment, students will now see an increased mobility requirement in their patrols. Challenging breaches will be necessary to fully close with and destroy the enemy, along with a more challenging enemy objective. To better replicate an actual mission, objectives are being rebuilt which will require detailed analysis on-site to effectively destroy enemy equipment. Also, the vertical and horizontal mobility skills learned during the previous weeks will be necessary to complete all missions issued. Mobility, however, is not the only skill that is trained at the SLC.

As the Army shifts to a smarter mine system, so too will the SLC. To be successful, students should show up at the SLC with a working knowledge of all the mine systems available to them, as some missions will require hasty defenses or mine incorporation in an ambush. These, mixed with traditional wire obstacle construction, will be a good refresher for students and better illustrate the difficulty of emplacing obstacles under demanding physical and mental conditions. Mine emplacement must complement mine awareness, as students will be forced to extract both themselves and friendly forces from minefields. Lessons learned in recent years preach extraction methodology, and the SLC helps hone these skills. Of course, with extraction comes the implied task of identifying and marking minefields.

Culminating the SLC field problem, students will be required to perform a live breach using mechanized transportation. While the mechanized lifestyle cannot be replicated, this mission will provide an introduction for light fighters and a chance for mechanized soldiers to shine in their own environment. Following a dismounted route clearance, students will link up with transportation and finish their field problem.

The field environment is demanding, with students getting little sleep or food if a team environment is not present. Students who show up in top physical shape can best handle the stresses induced by these harsh conditions. However, the stress and their body's reaction are some of the best training that students claim they receive. Similar to a field problem at Ranger School, students learn how their body will react, how to push their mental and physical limits, and how to lead another student who only wants to close his eyes.

Success at the SLC depends on a quality train-up program. Units are encouraged to send students with their leadership to better foster a team environment. Historically, when this happens, graduation rates increase significantly and individual training is complemented with a strong team unity upon returning to their home station. The unit should prepare for the SLC by conducting tough physical training daily, focusing on road marching. Additionally, students should arrive with a basic understanding of math skills and basic demolitions calculations. Land navigation is a critical, yet perishable, skill that dooms the majority of sapper candidates. About one of every three sappers who do not graduate did not successfully complete the land navigation course. Students cannot learn to move cross-country in an hour block of instruction. They must practice before arriving at Fort Leonard Wood. An introduction to basic knots will enhance the students' performance during the mountaineering portion of the SLC.

Finally, sappers must show up knowing their jobs as combat engineers. Many basic skills are required during the field problem; however, they are not taught at the SLC. For example, students are expected to know their own weapon systems, how to breach, and how to emplace a minefield. Students who struggle with their basic individual tasks will not be able to focus on the development of their leadership skills. Units do best when their NCOs and leadership accompany their young soldiers through the SLC.

Students who meet all graduation requirements know the meaning of the word sapper. They understand how to best utilize all of their engineering and soldiering skills to strengthen their task force. Those who complete the course but do not graduate return to their units much stronger soldiers and more effective leaders. No one leaves the SLC without a better knowledge of himself, his equipment, or his soldiers. The SLC emphasizes the ability to organize on the move and transition quickly along the spectrum of conflict, and it trains leaders to be adaptive.The SLC is relevant with the new core competencies and imperatives in FM 1, *The Army*.

Questions about the SLC can be directed to *romanj@wood.army.mil*. You can visit our Web site at *www.wood.army.mil/sapper*.

First Lieutenant Roman completed EOBC in 2000. Following Ranger School, he was assigned as a platoon leader in the 307th Engineer Battalion, Fort Bragg, North Carolina. After serving as a company executive officer, he became chief of training at the Sapper Leader Course.

Command—Challenging and Rewarding

By Captain Dale Snider

Company command can be the most challenging and rewarding period of personal sacrifice and professional growth an engineer captain may ever experience. As commander of an engineer construction company (combat heavy), I experienced the greatest ups and downs of my 10 years with the Army. I would like to share my experiences with you in an attempt to help you avoid my early mistakes and allow you to build on my company's successes. The areas I focused on during my command, in their order of priority, were basic soldier discipline, training, leader development, and maintenance.

Basic Soldier Discipline

To me, basic soldier discipline is the underpinning of everything a unit does and does not do. Upon entering command, I believed if my company was disciplined, it could function as a unit in the most difficult of environments, and individuals would act professionally and ethically even when no one was watching. I believed that a disciplined unit could be given a mission it had never trained on and still be successful because the soldiers and NCOs would be thoughtful, creative, and safe in executing an unfamiliar mission. I also believe history teaches that, in a developing theater of war, it is critical that units be able to execute missions that are unfamiliar at a tactical level for strategic missions to be successful.

I tried to create a disciplined company by supporting and reinforcing the authority of the company's NCOs. When an NCO gave an order, it was to be obeyed. There was no compromise in this area. If an NCO told a soldier to do something and the order was lawful, ethical, and moral (and I never had an NCO give an order that was otherwise), I supported that order with the full weight of corrective training and the Uniform Code of Military Justice.

I also stressed the use of the chain of command. I required that when soldiers came to see me, they had already talked to their squad leader and platoon sergeant or platoon leader. I ensured that all soldiers' administrative requests had been reviewed by their chain of command. I believed that this reinforcement would solidify, in both the soldiers and their chain of command, that their chain of command was responsible for their welfare in every area. As a result of these efforts, our company had fewer military police reports and soldier and NCO discipline problems than our sister companies over an 18-month period.

Training

Training, training, training—virtually everything an individual soldier and a unit does is training of some kind at some organizational level. Training is dynamic, fluid, and the one organizational area that should be attacked with every asset in the company with as much vigor and aggressiveness as possible—then require 20 percent more from your subordinates.

I approached training objectives by putting all training events of squad size or larger on the company training calendar as far out as possible. Usually, scheduling 8 to12 weeks out would still give company leaders clear objectives for the training event. These events on the calendar became "stakes in the ground" on which the company focused. The stakes acted as anchors for organizational effort such as hip-pocket training, short-term training, maintenance preparation, and supply actions. I was regularly surprised at how these stakes affected the company. For example, I heard team leaders planning training materials—such as Class II and Class IX—with the maintenance platoon sergeant and supply sergeant, so their team would be successful.

At the weekly training meetings, we synchronized the training calendar with all leaders. We started with tomorrow and worked our way through the calendar day by day until we reached T+ three months. Normally, we reviewed only squad-sized and larger events. I required that the officer or NCO in charge of whichever event we were currently reviewing answer *when*, *where*, and *who*. For example, for events such as the Army Physical Fitness Test, *who* was required to take the test, *when* and *where* was it going to be given, and *who* would be grading (by name).

I planned backward, with the company's leaders, the major events that would prepare our unit for the upcoming training:

- Warning order and operations order briefs
- Lieutenant and key-leader lunches (where we reviewed training objectives and mission training plan leader tasks and clarified my intent)
- Company in-progress reviews (IPRs)
- Rehearsals at both platoon and company levels
- Back briefs and milestone reviews (to track critical requirements that would ensure a successful company preparation) (See Figure 1, page 38)

Week 1		Monday's PMCS
Monday	Platoon sergeant (PSG) picks up DA Form 5988 at 0900. Operators perform PMCS on equipment and identify high-priority faults. Mechanics are assigned to each platoon and initiate repairs.	Perform PMCS on the following: Dozers (338,339,340,341,342) Scrapers (314,315,316,317) Fuelers (302,303) 5-ton trucks (102-230) Trailers (102A-230A)
Tuesday	Operators look up low- and routine-priority parts and NSNs and check DA Form 5988 against parts received/installed. PSG and platoon leaders (PLs) review and check for discrepancies.	
Wednesday	PLs brief DA Form 5988 with XO and maintenance section.	
Thursday	Maintenance platoon performs PMCS on its equipment.	
Friday	Mechanics continue repairs and services.	
Week 2		Perform PMCS on the following: HMMWV (300,301) Light sets (300T, 301T) 5-ton/2.5-ton trucks (304,305) 105 trailers (304T, 305T) Scoop loaders (312,313) 916s (331,332,333,334,335,336,337) SEE and crane Rollers (325,326,327,328) 870s (331T,332T,333T,334T,335T) Water trailers (336T,337T) Tampers, pumps, generators
Monday	Perform PMCS with last week's DA Form 5988. Mechanics continue to verify, repair, and perform services.	
Tuesday	Operators look up low- and routine-priority parts and NSNs and check DA Form 5988 against parts received/installed. PSG and PLs review and check for discrepancies.	
Wednesday	PLs brief DA Form 5988 with XO and maintenance section.	
Thursday	Maintenance platoon performs PMCS on its tools and shop equipment.	
Friday	Print new DA Forms 5988 for the following week.	

Figure 1. Two-Week Maintenance Cycle

- Vehicle staging in serial order (to focus the company on the upcoming convoy and the associated convoy briefs, internal commo checks, load plans, commo rehearsals, and leaders' recons)

If the mission, enemy, terrain, troops, and time available (METT-T) allowed, I took the XO and other key elements to the expected company tactical assembly area (TAA) and reconnoitered major training sites and talked through the training plan and critical timing. This really helped during the weeks before the company deployed. As questions came up, the XO and others could provide intelligent answers. This early recon also brought up many good questions that we worked on before deployment.

The XO talked the leaders through the TAA setup, timeline for day one, and platoon's sectors. During this second recon, there were opportunities to conduct hip-pocket training for the lieutenants in areas such as terrain association.

Leader Development

I know from personal experience that leaders are not born, they are developed. And developing strong, self-confident, competent leaders takes thought, patience, and effort. Leader development was a training event I planned for and tried to find opportunities "in the moment" to train.

I approached leader development by putting an event, such as a rock drill, on the calendar. Then we set up the event by preparing the site, sand tables, timelines to be reviewed, and briefers. My goal was for the key leaders to be a part of the drill and see how an effective rock drill was set up and executed. I used this same method of training for teaching lieutenants how to execute training meetings, IPRs, back briefs, leaders' huddles, and after-action reviews. In environments such as convoys or platoon movements, soldiers helped by acting as larger elements during these training sessions and moved from one rock or dirt pile in a quickly created but large sand table by time sequence or phase lines.

Training could be fun and demanding at the same time by running squad competitions at individual and squad-level events. These events would continue over a period of several weeks. We also initiated constructive competitions among the platoons in physical training (PT) and in scheduled sports by running a company multisport, single-elimination challenge roster on Tuesdays during PT. All of these leader development events were intended to build individual and team self-confidence, while training and bonding us as a unit.

Maintenance

Army doctrine says that maintenance is training, but I believed it was so vital to our unit's mission accomplishment that we created a separate area of emphasis. Before taking command, I spent 18 months as the battalion maintenance officer. During that time, I saw maintenance platoons with too little time to accomplish all that was required of them and a DA Form 5988E, *Equipment Maintenance Worksheet*, flow that was paper heavy because of a too frequent cycle. This delay often demoralized operators because they repeatedly wrote down the same routine or low-priority faults without getting action from the maintenance platoon. In addition, low-density equipment such as hand tampers, saws, pumps, and generators received less attention than they deserved. To respond to these areas, we created a two-week maintenance cycle (see Figure 2) that allowed time for

Milestone	1st Platoon	2d Platoon	Earthmoving Platoon
Identify MTP tasks to be trained/evaluated			
Identify platoon construction project for FTX	29 Sep 00		26 Sep 00
Identify training area (for bivouac)	20 Sep 00		
Conduct site reconnaissance	4 Oct 00		
Turn in milestones		20 Sep 00	
Establish timeline for FTX		5 Oct 00	
Brief commander on milestones, timeline, tasks to be trained			
Brief commander on OPORD, convoy plan, risk assessment		10 Oct 00	
Issue MTP tasks to be trained/evaluated			
Issue warning order to platoon	21 Sep 00		25 Oct 00
Request training area			TBD
Request Class I		3 Oct 00	
Request Class III			
Request Class IV		ASAP	
Request Class V (and pickup date)			
Request MILES			
Request miscellaneous expendable supplies			16 Oct 00
Request field sanitation support	3 Oct 00		16 Oct 00
Submit convoy request to XO	20 Oct 00	10 Oct 00	20 Oct 00
Schedule washrack			
Submit equipment packing list	16 Oct 00		16 Oct 00
Issue packing list to platoon			
Issue precombat checks for platoon FTX construction project	16 Oct 00		TBD
Pick up approved training area request			23-27 Oct 00
Draw Class I		3 Nov 00	
Draw Class V			
Draw and zero MILES			
Draw miscellaneous expendable supplies			
Establish field sanitation on bivouac site			06 Nov 00
Issue OPORD to platoon	5 Oct 00	23 Oct 00	3 Nov 00
Brief evaluators			
Brief opposing force			
Inspect individual equipment	03 1600 Nov 00	30 Oct 00	30 1300 Oct 00
Load equipment onto vehicles	30 Oct - 3 Nov 00		2 Nov 00
Ensure load plans are complete			31 Oct 00
Ensure vehicles are topped off with fuel	03 1500 Nov 00	2 Nov 00	
Perform PMCS on vehicles and equipment	30 Oct - 3 Nov 00		30 Oct - 3 Nov 00
Perform PCCs and precombat inspections (platoon equipment)	03 1500-1700 Nov 00	2 Nov 00	03 1300-1600 Nov 00
Perform rehearsals		2 Nov 00	
Dispatch vehicles	03 1500 Nov 00		
Stage vehicles	03 1500 Nov 00	3 Nov 00	03 1130 Nov 00
Draw weapons		06 0530 Nov 00	06 0600 Nov 00
Draw Automatic Net Control System		06 0600 Nov 00	06 0600 Nov 00
Fill radios; establish and verify commo	06 0600 Nov 00		06 0730 Nov 00
Account for personnel and sensitive items			06 0600 Nov 00
Eat breakfast		06 0730 Nov 00	
Give convoy brief	06 0830 Nov 00	06 0830 Nov 00	06 0830 Nov 00
Deploy	06 0900 Nov 00	06 0915 Nov 00	06 0900 Nov 00
Conduct FTX	6-9 Nov 00	6-9 Nov 00	6-9 Nov 00

Figure 2. November 2000 FTX Milestones

the maintenance platoon to respond to all priority faults and involve operators in the parts-ordering process.

We had Command Maintenance Week One where we used new DA Forms 5988E to record preventive maintenance checks and services (PMCS) performed on all prime movers and trailers on the first day of the week. Then, over the next two days, the maintenance platoon verified the faults and the operators ordered all routine and low-priority parts. When we first started this program, all NCOs and officers were trained on how to look up and order parts using a parts request form and the appropriate technical manual (TM).

A TM library was created for the operators separate from the one used by the maintenance platoon. We also created a cross-reference sheet that showed the operators which TMs went with each piece of equipment. This process of having operators order their own equipment parts did two things for our unit: It created ownership and involvement in the maintenance process by the owners of the equipment, and it freed up a tremendous amount of time for the maintenance platoon to work off deadlines and required services.

The second week of our two-week cycle was identified on our company training calendar as Command Maintenance Week Two. During this week, we performed PMCS on and cleaned and lubricated the low-density equipment such as hand tampers, generators, and skill saws. The rest of the week was the same as week one. Another change we made to this week was to move command maintenance for the maintenance platoon to Thursday afternoon. This allowed the maintenance platoon to be with the rest of the company on Monday to perform simple fixes and work on equipment that was identified as not mission capable during PMCS. Our two-week maintenance cycle was adopted by our sister companies, and it became the battalion standard.

I made it a point to be available to all soldiers. I only closed my office door when absolutely necessary and spent as much time as possible at the project sites, with the platoons during PT, and on the weapon ranges. When a group of soldiers conducted training, I went out to be with them. My intent was to get to know the soldiers by name and learn something about their families, where they were from, or what their hobbies were. One of the best things about being a commander is getting to know America's sons and daughters and becoming a team member in the best of America's organizations. Of all the things you do during command, spending time with your soldiers, hearing their stories, and helping them solve their problems will be the most rewarding. If you are not committed to the well-being of the soldiers or are not willing to take on their issues to help solve them, then my advice is to turn down command and help your unit through good staff work.

Summary

In my opinion, if you pick more than four or five areas on which to really focus during your command, you will spread yourself too thin and be less successful in the areas you are most interested in. Command time means that you will sacrifice family time and personal interests, but you will be compensated by professional development and acceptance by the NCOs and soldiers as the commander of a great organization.

You may contact Captain Snider at *martin.dale.snider@us.army.mil*

Captain Snider is pursuing a master's in construction management at Texas A&M. He previously commanded A Company, 52d Engineer Battalion, Fort Carson, Colorado, and served as the assistant S3 and battalion maintenance officer. CPT Snider is a graduate of Texas Tech University and the Field Artillery Officer Advanced Course.

(Enlisted PERSCOM Notes, continued from page 33)

you attend the NCOES courses as soon as possible. Do not hesitate to contact this office if you have questions about NCOES attendance or conditional promotions.

For information on pending selection boards, visit the PERSCOM Web site *(www.perscom.army.net)* for the latest news. It's up to you to review your Official Military Personnel File. You can obtain a copy by following the procedures posted at our Web site.

Contacting Us

The sole function of Engineer Branch is to support soldiers and commanders in the field. I encourage you to contact your assignment manager PDNCO, Branch sergeant major, or me with any questions about assignments or professional development. The PERSCOM Web site has all the information on how to contact us. Remember, the only thing in the assignment process that does not have to be a variable is your preference. Take the time to let us know your preference.

Lieutenant Colonel Smith is chief of the Engineer Enlisted Branch in the U.S. Total Army PERSCOM. Other assignments include commander, 44th Engineer Battalion (Brokenheart), Camp Howze, Korea; war plans analyst, U.S. Strategic Command, Offutt Air Force Base, Nebraska; and executive officer, 20th Engineer Battalion, 1st Cavalry Division, Fort Hood, Texas. He has a master's in nuclear engineering from Penn State, a master's in military science from the Advanced School of Military studies, and a master's in strategic studies from the Army War College.

TRAINING MODEL OF POLISH EOD ENGINEERS



By Colonel Andrzej Zarczynski

Since the end of World War II, Polish engineers have taken part in numerous peacekeeping missions. During these missions, mine-clearing operations have been the main task of explosive ordnance disposal (EOD) teams. Mines have become a very simple and effective means of battle, because most of them are simple to construct, inexpensive to manufacture, and easy to use. Mines have now become one of the principal threats to NATO and UN operations and soldiers. Clearing these mines is not only costly and slow but also extremely dangerous. Therefore, engineers from EOD teams must be specially trained if they are to be involved in mine-clearing operations.

The Polish armed forces train young engineer officers for assignments as EOD platoon leaders, warrant officers and noncommissioned officers as EOD team leaders, and conscripts as EOD team members.

Peace Support Training

Training Polish engineer soldiers for EOD team operations consists of three phases:

Skills Training

This six-month phase is conducted in selected military engineer units within Poland, where soldiers learn the basics in Polish military doctrine on mine operations. They learn the types of mines and minefields (purpose, description, and method of operation and handling) and the methods of laying and removing mines. Soldiers also receive instructions on minefield construction, such as where to use antipersonnel or antitank mines and the kinds of mines to use in various areas (fields, forests, roads, etc.).

The soldiers receive extensive training in mine-clearing operations, which includes—

- Methods of marking and fencing minefields and minefield lanes.
- Basic rules of safety during mine-clearing operations (for example, the minimum safe distances for mine clearance and EOD operations appropriate to the threat of blast and shrapnel).
- Disposal procedures during electrical and safety fuse methods of blast initiation.

During this time, engineer officers (who have graduated from the Military Academy) and warrant officers or NCOs (who are graduates of the Engineering Training Centre in Wroclaw) respectively serve as platoon leaders and squad leaders in a military engineer unit.

After their initial six months of training, conscripts—if appointed to serve in a mission area—and a cadre from a selected military unit take part in a ten-day course at the



A soldier uses a probe during mine detection training.

Engineering Training Centre, training to be EOD team members. These soldiers prepare for a specific mission area. Currently, we train EOD soldiers for operations in Lebanon, Syria, Kosovo, Bosnia, and Afghanistan.

Correlate Training

During this five-week phase, training for UN peacekeeping missions is conducted at the Sikorski Military Training Centre in Kielce. Training for NATO missions is at selected military engineer units in Poland. During this phase, soldiers are specially trained in EOD mine-clearing operations.

Advanced Training

The last phase of training is conducted in the mission area (for example, Kosovo) for five days. The newly arrived team receives instruction on the operational environment from the team that is currently in the mission area. During this phase, the two teams develop a training plan and use actual mines, which have been rendered safe, that the conflicting sides have been known to use in that area.

Engineering Training Centre

Training at the Engineering Training Centre consists of classroom instruction, followed by practical field training. The classroom instruction, which comprises about 10 to15 percent of the training syllabus, is conducted at the Engineering Training Centre. The practical field training is conducted at selected battle camp locations that are specifically designated to train Polish EOD personnel.

During the classroom instruction, there are lectures about current ongoing UN or NATO missions; characteristics of antipersonnel and antitank mines, unexploded ordnance (UXO), and booby traps; and other mine-related threats. The instructors have a wealth of experience to share with the students, because each instructor has completed at least one rotation in an actual mission area. Additionally, we use a great deal of original documentation, such as mission instructions and operational maps, from mission areas where Polish soldiers have been and are currently operating.

Training Requirements and Content

EOD teams are trained according to NATO or UN procedures and Polish doctrine. There are many standard operating procedures (SOPs) and instructions that we profit from during training. We continually revise and develop training materials (training aids, instruction syllabi, and drafts) to better train our soldiers. Recently, we produced a detailed mine-clearing video based on actual operational mission experience to supplement the standard training package. Our operations experiences have been published in military magazines, including an article titled "Mine Threats in Mission Areas" in the February 2001 issue of *Engineer*.

Methods of Work

Soldiers receive training in individual and panel activities during mine-clearing operations. In addition, they learn the dangers of handling ammunition and UXO. Every Polish EOD engineer soldier is trained in—

- Detection–using various kinds of equipment, such as probes, types of mine detectors, and grapnels.
- Identification and on-site evaluation–identifying types of mines, ammunition, and UXO that may be encountered in a particular mission area.
- Rendering safe or recovery–being able to operate independently and having the self-confidence to know how to render safe or recover mines, ammunition, or UXO.
- Final disposal of mines, ammunition, and UXO–performing demolition or burning in place, removal to a disposal area, or other means appropriate to the mission area.

During training, we use mines that were used in previous military conflicts and have been rendered safe. We now have about 100 drill mines from current conflict zones. (There are about 700 types of mines in use worldwide, with more than 300 of them being antipersonnel mines.)

Booby Traps

The construction of booby traps depends greatly on the inventiveness of the people and soldiers who make them. They are normally made of readily available, commonly used items

and military equipment such as a weapon or bayonet. We train our soldiers on the methods of preparing booby traps, to include the various types, the materials that can be used to construct them, and where they can be used effectively. As always, special attention is devoted to the history and details of the use of booby traps that soldiers may encounter in a specific area of operation. Our training, based on operational experience, includes the following examples:

- An antitank mine is connected to an inductive short-circuiting switch by an electric circuit. The inductive short-circuiting is situated adjacent to an antitank mine. When a mine is swept by a mine detector during clearing operations, the detector generates an electromagnetic impulse, which causes the electric circuit to close and the antitank mine to detonate.
- A direction mine is connected to a plate short-circuiting switch (an aluminium plate and a pressure plate with nails) by an electric circuit. When the pressure plate is stepped on, it perforates the aluminum plate, which causes the electric circuit to close and the mine to detonate.
- Military equipment (such as a weapon, sidearm, or binoculars) is connected to TNT or a mine by wires to an electric circuit or antihandling device. When the equipment is moved or lifted, the TNT or mine detonates.
- Maps in a briefcase are attached to TNT by an electric circuit. When the maps are taken out of the briefcase, the electric circuit closes and the TNT detonates.
- Ammunition or an antitank mine is buried under another antitank mine. An antihandling device connects the two, and the mines could detonate when the first one is lifted.
- A grenade in a glass is attached to a door or window handle. When the door or window is opened, the device falls out of the glass and detonates.
- A bounding (or fragmentation) mine is connected to a shovel by a trip wire. When the shovel is lifted, the mine detonates.
- TNT is placed in a telephone, videocassette, or night lamp. When the receiver is lifted, the videocassette opens or the night lamp switches on, a fuse activates, and the TNT detonates.

Safety Rules

Soldiers are given instructions on safe distances for conducting mine clearance and EOD operations appropriate to the threat of blast and shrapnel. This is achieved by ensuring strict adherence to SOPs and established NATO or UN procedures and training doctrine. Safety procedures also require soldiers to wear personal protective equipment (full body armor, helmets, and visors) during mine-clearing operations.

Minefields and Minefield Lanes

We train our soldiers to mark and fence minefields and minefield lanes according to current NATO or UN procedures, as required within the mission area.



A soldier trains on antitank mine render-safe procedures.

Psychological Aspects

EOD engineers are trained on the psychological impact of constantly dealing with antitank and antipersonnel mines and booby traps. During training, we show new soldiers films and photos of mine accidents to increase their sense of safety and reinforce the proper procedures for handling explosive devices.

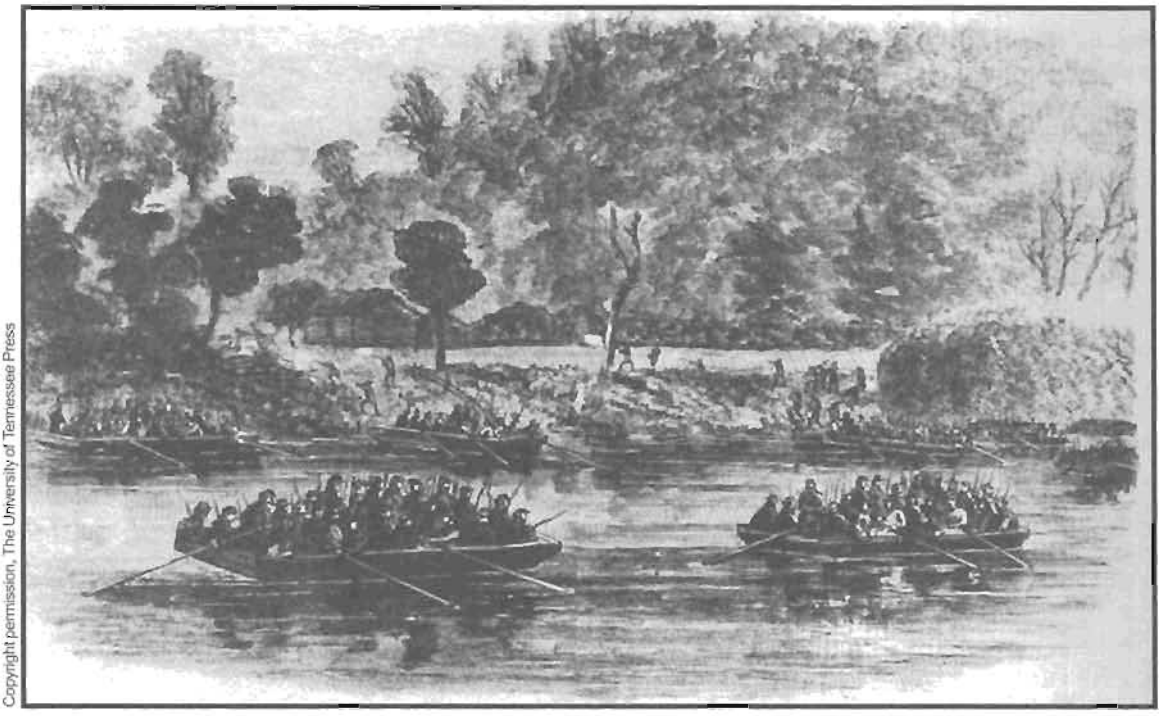
First Aid

Soldiers are trained to provide immediate first aid to mine victims, and they learn the proper procedures for requesting medical evacuation of casualties.

Conclusion

Our training model and education prepare excellent engineer soldiers for EOD teams, as demonstrated by their continued high-quality performance during actual operational missions. During both training and mine-clearing operations, we teach soldiers to be safety conscious and impress on them that their actions can ensure the safety of the local civilian population and the environment. Our training program is intensive and focused. And it benefits greatly from having cadre with actual operational field experience to teach the next generation of engineer EOD specialists.

Colonel Zarczynski, an officer in the Polish armed forces, is currently the chief of the Engineer Branch, HQ SFOR, Sarajevo/Butmir, Bosnia and Herzegovina. He also has served in the UNEF mission in Sinai, the UNPROFOR mission in Croatia, and the ASIDT in Albania. Colonel Zarczynski is head of the Tactics Department of the Engineering Training Centre, Tadeusz Kosciuszko Military Academy, Wroclaw, Poland, where he trains Polish engineering units for UN and NATO missions.



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Bridging the Tennessee River

By Captain Darman Place

On 27 October 1863, Brigadier General William "Baldy" Smith (see photo), Chief of Staff and chief engineer for the western army, emplaced a pontoon bridge across the Tennessee River. This bridge was the key link in creating a supply line—"the cracker line," as it was the first time the garrison at Chattanooga was able to receive a steady supply of rations—for the Union army at Chattanooga. This action allowed the Union army to reestablish its combat strength, take the offensive, and rout the Confederates from their positions, leaving Chattanooga in the hands of the Union and the Confederate army weakened from a terrible loss.

On 20 September 1863, General William S. Rosecrans, commander of the Union forces in the West, received what would be for him a career-ending defeat at the Battle of Chickamauga. Confederate forces led by General Braxton Bragg routed the Union army when Lieutenant General James Longstreet attacked with his Corps through a gap in the Union line. Longstreet enveloped the Union line and rolled up its defense. General Rosecrans and his army were forced to retreat to Chattanooga, hoping to establish a hasty defense to stop what he was sure would be a quickly pursuing Confederate army.[1] General Bragg did not pursue the fight into the city but decided to surround Chattanooga and simply starve the Union out. Bragg had a viable plan, considering that the Confederate army controlled all the high ground surrounding the city to the south and east, and the Tennessee River served to block the Union forces in from the north and west (see map).

Suffering from a recent defeat and the knowledge that he had caused it, General Rosecrans lost confidence in his ability. He quickly relegated himself and his men to an eventual defeat when the Confederates decided to attack. However, weeks went by and the Confederates showed no signs of attacking.

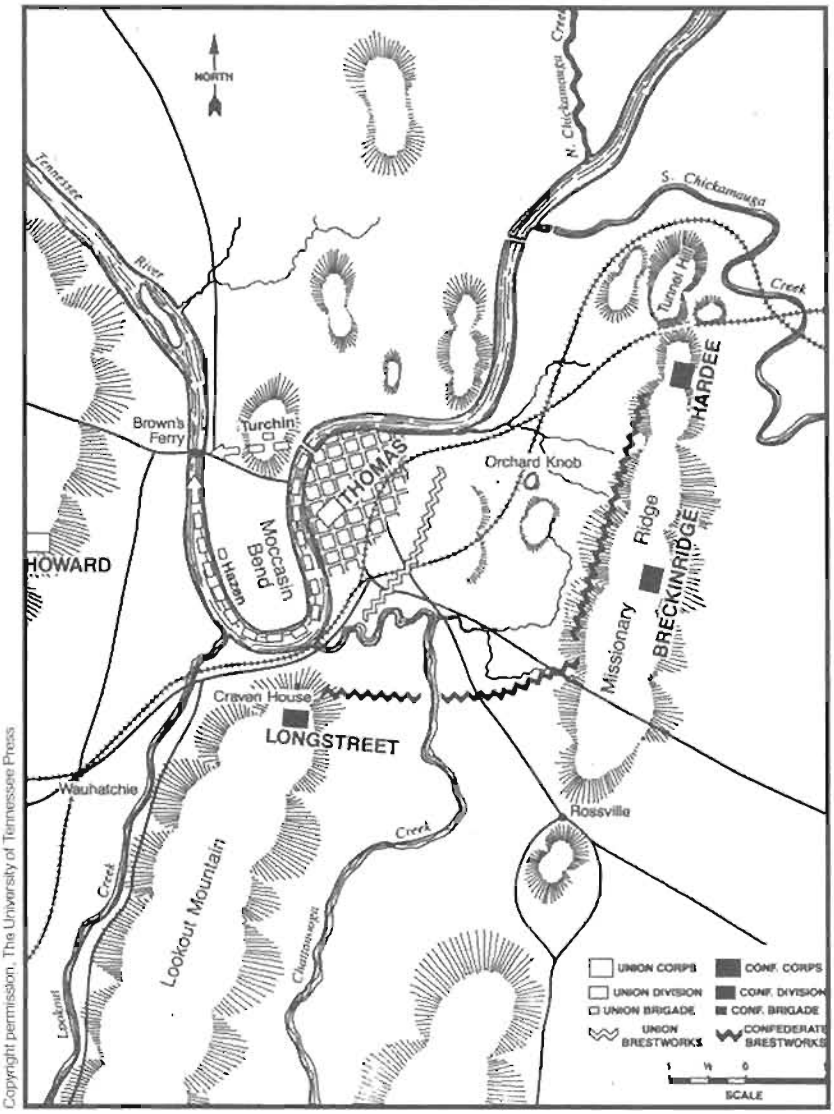


Brigadier General William "Baldy" Smith

Rosecrans continued to improve the defense, but General Bragg's plan to starve the Union army out was starting to take effect. Surrounded on all sides by either the Confederate army or unforgiving natural obstacles, the Union army was receiving barely enough resupply to keep from starving. Supply wagons dispatched to support the Union army were subject to Confederate cavalry raids, and a treacherous route through the mountains served to destroy more of the supply wagons than did the Confederate cavalry.

The situation was desperate for the Union army at Chattanooga. The wire dispatches Rosecrans sent to Washington sounded like those of an already defeated commander; thus, President Lincoln wired General Grant and informed him either to retain Rosecrans or replace him as he saw fit. Grant immediately wired Rosecrans that he was to relinquish command to General Thomas and that he (Grant) would be arriving soon to take overall command of the situation in Chattanooga. This city was considered the gateway to the South and of extreme strategic importance to both armies.

General Grant arrived at Chattanooga on 23 October 1863 to find the Union army in a desperate situation.[2] It was secure in its fortifications within the city but, with no means of effective resupply, the army would soon starve and be virtually incapable of defending against a Confederate assault. Grant's first objective was to open an effective supply line. Brigadier General Smith offered a plan to achieve that objective. His plan called for establishing two pontoon bridges across the Tennessee River: the first would be uncomplicated; it would be positioned directly behind the city, terrain the Union controlled. The second bridge would be much more difficult, because to connect the Union to the west and its resupply, it would have to seize and bridge the area at Brown's Ferry—an area controlled by the Confederates (see map).



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Assault on Brown's Ferry (Map by J.L. Moon, Jr.)

The Union assault of Brown's Ferry began early on the morning of 27 October.[3] Smith's plan was simple and courageous and required the element of absolute surprise. Brigadier Generals John B. Turchin and William B. Hazen were assigned the infantry mission; Major John Mendenhall, commander of three batteries of artillery, was to support the infantry assault. A portion of Hazen's brigade was the main effort; the success or failure of the mission would rest largely upon its shoulders. Hazen's after-action report effectively stated the goal and method he intended to use to achieve the objectives Smith had given him:

"We were to organize into fifty squads of one officer and twenty-four men each, to embark on pontoon boats at Chattanooga and float down the river...a distance, by the bends of the river, of nine miles, and land upon its left bank, then occupied by the enemy, making thereafter, immediate dispositions for holding it, while the remaining portions of my brigade and another one should be speedily sent over the river in the same boats to reinforce me; the movement was to be made just before daylight..."[4]

The other brigade Hazen referred to was Turchin's. His brigade was to move along a hidden road through Moccasin Point, take up a position directly across from Brown's Ferry, remain hidden from enemy pickets in the wood line, and wait for the assault of Hazen's brigade. Pontoon boats used by Hazen to negotiate the river would be launched to pick up Turchin's men and ferry them across to exploit the penetration of the Union line caused by Hazen's brigade. Mendenhall's artillery took up a position overlooking Brown's Ferry to support



Photo National Archives

A pontoon bridge such as this was used to bridge the Tennessee River at Chattanooga.

the withdrawal of the Union force should it become overwhelmed and find it necessary to retreat to the near shore of the Tennessee.[5]

Brigadier General Smith's plan called for a swift assault, focusing on the element of surprise to help the Union achieve victory. To achieve the element of surprise at the assault point, Brigadier General Brown decided to launch the boats well above the assault point, some nine miles by river. Smith took a tactical risk in this area stating,

"It was deemed better to take this risk than to launch the boats near the ferry because they would move more rapidly than intelligence could be taken by the infantry pickets and, in addition, though the enemy might be alarmed, he would not know where the landing was to be attempted and therefore could not concentrate with certainty against us."[6]

Because the success of the mission depended largely on the element of surprise, only Grant, Smith, the brigade commanders, and the engineer officers in charge of the pontoon flotilla and the actual laying of the bridge knew the plan. The soldiers who executed the plan only knew that they were attacking the confederates and the mission was dangerous. But if the mission was successful, it would spell supplies and relief for the Union army within Chattanooga.

On 26 October at 2200 hours, Hazen's brigade marshaled at the launch site, and the soldiers were given the details of their mission. The brigade broke into fifty 25-man squads, loaded the pontoon boats, and prepared to launch the miniflotilla. The pontoons were launched at 0300 on 27 October, their movement screened by a mist that hung over the river. The soldiers were ordered to lay down in the boats. The only person exposed above the gunwales of the pontoon was the boatswain—an engineer soldier with the job of guiding the pontoon down the river. Absolutely no talking was allowed during movement.[7]

The flotilla moved silently down the river using only the current for volition. The flotilla's movement was as near to perfect as Smith could have hoped for. The boats hugged the tree-fringed banks of the river opposite the enemy. Confederate pickets spotted the boats but perceived no danger because they didn't see any men; thus, they didn't raise an alarm, assuming that the boats were merely a pontoon bridge that had been destroyed, a common site throughout the war. Only two incidents marred the boat movement: a soldier was reportedly knocked out of the boat by a tree limb but was recovered, and another soldier apparently fell out of the boat and drowned. By 0430, Turchin's soldiers were in position across from Brown's Ferry, awaiting the arrival of Hazen's men (see map, page 45). They built fires to guide the flotilla to the proper landing site and waited for the time when they would cross the river and reinforce Hazen's brigade.[8]

As the Union forces came ashore at Brown's Ferry, they surprisingly met little resistance. The only Confederate troops occupying the actual ferry site were a thin picket line that was easily routed. Behind the pickets and in a position to reinforce them, the Confederates had less than a regiment of soldiers. Had Smith's plan been executed two days earlier, an entire Confederate brigade commanded by Brigadier General Law would have met him. As it was, Hazen's brigade closed arms with the Fifteenth and Fourth Alabama of Longstreet's Corps, not nearly enough combat power to repel the Union's massed assault. Upon seizing the foothold for the farside bridgehead, the boats were sent to ferry Turchin's brigade across while Hazen's soldiers began etching out a defensive line. Colonel Oates, commander of the Fifteenth Alabama, immediately launched a counterattack against the intruding Union brigade, with the following orders, "Every man is to walk forward at one-pace intervals on a lateral line and fire only upon placing the muzzle of their weapon against the body of a Yankee soldier."[9] Though gallant, the Confederate counterattack was quickly repelled, and the Union pushed farther inland from the ferry head.

By this time, Brigadier General Turchin's brigade was quickly moving across the river. With each unit that came to the farside, the Union defensive line was pushed out farther. Brigadier General Smith ordered an abatis placed around the perimeter of the Union bridgehead to establish a hasty defensive position and provide cover from Confederate muskets. Colonel Oates continued to attempt counterattacks throughout the morning until he was wounded. Later that day, Brigadier General Law arrived with three more regiments and a regiment of the Texas Brigade to find Oates in a nearby farm house, recovering from a wound.

Oates informed Law that he had arrived too late to make a difference. The Union had managed to cross a sizeable force and had gained a very tenable position. Law went forward to a vantage point from which he could oversee the Union position. With one look, he turned around, returned to Colonel Oates, and remarked that Oates was quite correct in his assessment. By that time, 1630 hours, the Union had seized the bridgehead and emplaced the pontoon bridge (see map, page 45), thus creating the Union's cracker line. This one small action was the beginning of the end for the Confederates at Chattanooga.[10]

Establishing the cracker line enabled the Union to effectively resupply its garrison in Chattanooga—not only with food and ammunition but also with troops. Opening this supply line coincided with two other events. First, Longstreet's Corps departed from the Confederate perimeter to attack Major General Burnside's Union force at Knoxville. Second, Major General Sherman's army arrived to reinforce Grant at Chattanooga. The result was a reinforced Union army and a weakened Confederate force. The ability to resupply the Union force at Chattanooga hinged completely on Brigadier General Smith opening the cracker line. Establishing the bridge across the Tennessee River was arguably the decisive point of the battle of Chattanooga for the Union army.

Brigadier General Smith expertly employed the principles of a river crossing to emplace a pontoon bridge across the Tennessee River and establish a supply route for the Union forces at Chattanooga.

Advance to the river, phase one, requires a unit to seize the terrain on the nearside of the river, including road networks and favorable crossing sites. Smith moved Turchin's brigade to the nearside of Brown's Ferry, a site that obviously had a trafficable road network and a preconditioned crossing site. This move ensured that Hazen's assault force would have a reserve and that the assault force would not arrive at Brown's Ferry to find the Confederates already occupying the nearshore and, thus, become flanked.

Assault across the river, phase two, is designed to place combat power rapidly on the far shore to eliminate the enemy's ability to place direct fire on the crossing site and secure terrain for attack positions. Smith executed this phase perhaps better than any other portion of the operation. Using the principle of surprise, he massed a large force on the far shore rapidly and with little resistance by the Confederate army. Brigadier General Smith made it impossible for the Confederates to place direct fire on the bridge site, which allowed him to cross Turchin's brigade.

Advance from the exit bank, phase three, is intended to extend the initial foothold created by the assault force. Once Turchin's brigade crossed, Smith pushed the bridgehead line out farther—known today as seizure of an intermediate objective. The intent is to prevent direct fire from being placed on the bridge site and to deny observation of indirect fire. By pushing his lines out farther into the enemy-controlled area of the bridgehead, Smith negated the enemy's ability to see the river-crossing site. This allowed Smith to begin emplacing the pontoon bridge and prepare for the crossing of even larger units to secure the foothold created by the initial assault.

Secure the bridgehead, the final phase, is designed to create a position secure from enemy counterattack and large enough to accommodate follow-on forces as they cross the bridge. When Smith ordered the felling of an abatis and established his initial defensive perimeter, he effectively repelled at least four counterattacks by Colonel Oates and his Alabama brigades. When Brigadier General Law and Confederate reinforcements arrived, Smith's position was immovable by the available Confederate forces; by 1630 hours, the bridge was emplaced. Smith's two brigades now held a very tenable position, and the Union supply line to Chattanooga was open.

Captain Place currently commands A Company, 326th Engineer Battalion, 101st Airborne Division (AASLT), Fort Campbell, Kentucky.

Endnotes:

[1]James Lee McDonough, *Chattanooga-Death Grip on the Confederacy*, Knoxville: University of Tennessee Press, 1997, p 8.

[2]Ibid, p. 54.

[3]Ibid, p. 76.

[4]United States War Department, *War of the Rebellion: Official Records of the Union and Confederate Armies*, Series 1, Volume 31, Part II Reports: *Lookout Mountain and Missionary Ridge*, Harrisburg: Historical Times Inc., 1985.

[5]Ibid.

[6]Ibid.

[7]McDonough, p. 79.

[8]Ibid.

[9]United States War Department.

[10]McDonough.

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Professional Registration: Advice for Aspiring Army Engineers

By Captain Richard J. Gash

Almost two years ago, a group of Engineer Officer Advanced Course (EOAC) classmates and I struggled through the professional engineer (PE) application process. After hours of toiling over experience forms, making innumerable telephone calls to the Missouri Board for Professional Engineers, and spending a small fortune on express mail, some of us met the application deadline. Many did not.

The purpose of this article is to capture the lessons we learned while applying and share them with engineer officers aspiring to do the same. In keeping with most military operations, I have broken the process into four phases. The first phase involves becoming an engineer in training, which is designed to set up an applicant for success. The second phase is filling out the application. The third phase, which is generally everyone's favorite, is studying and preparing for the exam. The final phase is taking the examination.

Phase I: Engineer in Training

This phase begins before commissioning and continues through the Engineer Officer Basic Course (EOBC) and assignments leading up to the EOAC. The first step is to become an engineer in training by graduating from an engineering program approved by the Accreditation Board for Engineering and Technology and passing the Fundamentals of Engineering Examination. This requirement is written in Missouri law. The second step is EOBC. My advice for the course is threefold. First, pay attention. Second, keep the construction handouts. Third, start a professional journal. While it may be possible to succeed without the first two pieces of advice, the journal is essential.

Engineer's Creed

As a professional engineer, I dedicate my professional knowledge and skill to the advancement and betterment of human welfare. I pledge—

- To give the utmost of performance.
- To participate in none but honest enterprise.
- To live and work according to the laws of man and the highest standards of professional conduct.
- To place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations.

In humility and with need for divine guidance, I make this pledge.

Your professional journal should include a record of all the engineering-related projects you work on. The EOBC practical exercises are a great place to start. This record will make filling out the experience portion of the PE application much easier. Another important aspect of the journal is contact information. The application requires the officer who was your supervisor at the time to verify your engineering work experience. While at EOBC, get a good permanent standard or e-mail address from your platoon trainer and company commander. You will have to mail one of them a part of your application for signature four years later. Your journal should also include contact information for PEs you work under. You will need recommendations from three of them for the application. If anyone in your EOBC chain of command—from platoon trainer to brigade commander to course director—is a PE, introduce yourself, state your intentions, and get good contact information.

Phase I continues with the jobs you hold as a lieutenant. Keep updating your journal with contact information for PEs and supervisors. Continue to record engineering projects you work on. While some of us are lucky enough to work in construction units or even for the U.S. Army Corps of Engineers, most of us are more familiar with concertina wire and C-4 than construction. *This is not a problem.* Believe it or not, much of the work done by mechanized and light engineers *is* engineering related. Route, bridge, and ford reconnaissance; bridge classification and demolition; terrain and trafficability analysis; and even combat obstacle and fighting position construction all require engineering and project-management skills. Record them in your journal. Always fight to get projects that will add to your experience. A combat engineer platoon can easily clear and construct a live-fire range or even a playground!

Phase I culminates with the transition to EOAC and the start of the application process for the Principles and Practice of Engineering Examination. Fortunately for most engineer officers, the engineer-in-training experience required to apply generally coincides with the move to Fort Leonard Wood, Missouri. The end state for this phase is four years of experience and good contact information for supervisors and PEs. If your experience doesn't quite add up to four years, don't panic; EOAC and postgraduate education (University of Missouri–Rolla) will add to your time.

Phase II: Application

The application to take the Principles and Practice of Engineering Examination is probably the biggest obstacle separating Army engineers from professional registration. Timing, perceived lack of engineering experience, and the inability to obtain signatures combine to discourage

many officers from applying. Selecting the proper exam date and completing the application early will give you the best chance for success.

The Missouri Board for Architects, Professional Engineers, and Professional Land Surveyors and Landscape Architects administers the examination semiannually in April and October. I recommend taking it right after graduation from EOAC. Although it is tough to juggle course requirements, studying, and trips to the Lake of the Ozarks, staying on for the University of Missouri–Rolla degree will give you a chance to take the exam a second time in Missouri if you fail. Get an application from the Missouri Board as soon as you begin EOAC. You can request one through the board's Web site at *http://www.ecodev.state.mo.us/pr/moapels/*. Even though applications are generally due three months before each examination, complete yours as soon as possible and turn it in early. If the board finds any problems with it, you will have time to correct it. I found the board very willing to help.

The two sections of the application that cause the most headaches are Section V, *References*, and Section VI, *Engineering Experience*. Section V requires applicants to obtain character recommendations from five individuals, three of whom must be PEs. I strongly advise sending out additional recommendation requests. Since military life is transient by nature, at least one of the officers on whom you were banking will be deployed to a classified location, in the middle of a PCS, or will simply not receive your request. The recommendation form is easy to fill out. A couple of completed extras will ensure that you do not get caught short. It is also very likely that you have been out of contact with many of your potential references for some time. Your EOBC brigade commander or former college professor may not remember who you are. If you fear this may be the case, include a copy of Section VI from your application and the telephone number of your last battalion commander for them to contact.

An early start should allow you plenty of time to get the recommendations you need. However, if you find yourself closing in on the application deadline and still in need of recommendations, there is one last course of action available. Start knocking on doors at the U.S. Army Maneuver Support Center at Fort Leonard Wood. Because it is the home of the U.S. Army Engineer School, it has one of the highest concentrations of PEs in the Army. With a proper introduction and the right testimonials, you should find the recommendations you need. *(Note: The Engineer School point of contact shown in the figure on page 50 maintains a list of PEs on post.)*

Section VI is the meat of the application. In it you must account for four years of engineering experience—all accrued subsequent to baccalaureate graduation. Here is where the experience part of your professional journal will come in handy. The application requires a brief synopsis of the work you have done in each job you have held. A supervisor who oversaw your work must verify each synopsis with his or her signature. Although the application appears to imply that this supervisor must be a PE, this is not the case. Keep in mind that you cannot use the same person as a supervisor and as a reference. Remember to include EOBC and EOAC as part of your experience. *(Note: The Engineer School point of contact has examples that might be helpful.)*

If you have any questions while working on your application, the best thing to do is contact the board or the Engineer School point of contact. The end state for this phase is an accepted application and a letter from the Missouri Board authorizing you a seat at the examination. Once you have this letter in hand, it is time to focus all your energy on studying and Phase III.

Phase III: Preparation

The question of how much effort to put into studying for the Principles and Practice of Engineering Examination is foremost on every applicant's mind. The best answer—although probably not the one you want to hear—is, of course, enough to ensure that you pass! This can range anywhere from a few weeks to a few years. Each applicant should conduct an introspective assessment to determine how long and how hard he needs to study. I recommend erring toward longer and harder. It is important to note that for many, this period of preparation may need to start well before Phase II is completed.

The next questions most applicants have are what and how to study. Fortunately, I can offer much more explicit advice in this area. Concerning what to study, I strongly recommend that civil engineering applicants purchase Michael R. Lindeburg's *Civil Engineering Reference Manual, Practice Problems for the Civil Engineering PE Examination*, and *Civil Engineering Sample Examination*. Used together, these three books will serve as excellent study guides. They will also function as invaluable resources during the examination. The reference manual contains detailed information about the examination, step-by-step sample problems, and a wealth of up-to-date reference material. The practice problems book includes sample problems covering engineering fundamentals and all disciplines of civil engineering. The sample examination offers a great way to gauge the progress of your preparation. All three books are well worth the cost.

How to study is a little more complicated. It is best to develop a solid plan of action that will streamline your preparation process. A good place to start is by researching the examination, which recently underwent significant revision. The new civil engineering exam format has two sessions. The morning session includes 40 multiple-choice questions that encompass all disciplines of civil engineering. The afternoon session also has 40 multiple-choice questions focused on one of five disciplines. Applicants must choose from water resource, transportation, geotechnical, environmental, and structural engineering. Decide on a discipline early in your preparation, and focus your studying on that field.

After selecting an area of emphasis, the best way I found to study was to work through the practice problems in Michael

Lindeburg's books. The first section in the reference manual is devoted to engineering fundamentals. Although these may seem rudimentary at first, I found them invaluable as a review of complex unit conversions and how to use my calculator. Mastering these two areas alone will greatly enhance your chances for success on the examination. The next sections are each devoted to one of the five afternoon disciplines. Don't be disheartened by the difficulty of the sample problems. With practice, answers will begin to come easily.

While you work through sample problems, take time to become familiar with your reference materials. Chances are that you have the information needed to answer all of the examination questions somewhere in your references. The trick is being able to find the right information quickly. Try to avoid always looking for answers in Michael Lindeburg's books. One slight flaw with using them as study guides is that by design, almost all the information needed to solve his sample problems can be found somewhere in his reference manual. Some of the actual exam questions may require you to dig through other references. You need to become familiar with your other manuals as well.

As examination time draws near, I recommend taking a break from studying. Take some time to relax and mentally recharge. You definitely do not want to be burned out before starting the eight-hour exam. Take the last few days to finish organizing your references and supplies and make the transition from Phase III to Phase IV. The end state for this phase is the confidence that you are ready to pass the examination.

Phase IV: Examination

Taking the Principles and Practice of Engineering Examination is the last step in the process of becoming a registered PE. This phase involves actions on the objective. I can offer advice on what to bring with you, along with some final hints. Taking the examination is up to you!

Applicants often lose sleep while trying to determine which reference books to take to the exam and which to leave behind. I can clear up any confusion. If in doubt, take it. Take every book you own that remotely relates to engineering. Go to the Maneuver Support Center library and check out any additional books you think you might need. Take a good dictionary, the thicker the better. Inevitably, questions will include obscure words you have never seen before. Take your Engineer School handouts. They present a surprising amount of pertinent information in an easy-to-follow format. Don't worry about being overloaded. No matter how many books you take, you will see people at the exam with more. It is easy to tell the first-timers from the veterans of several examinations. The novices struggle from their cars to the exam room, dropping books out of overflowing cardboard boxes. The veterans have bookshelves on wheels they can push along with them. I recommend the middle ground—a collapsible luggage dolly.

In addition to your reference materials, make sure you think through the logistics involved in taking the exam. You will need a good transportation plan. This is partly to accommodate your reference materials, but mostly because of the road network in central Missouri. The board makes every effort to centralize the exam location for applicants from across the state. Unfortunately, this ensures that a direct land route will not exist between the exam site and Fort Leonard Wood. Take the time to conduct a good route recon before the examination. Struggling down unfamiliar Ozark roads in the predawn darkness will only add unneeded stress to your day. A better plan would be to spend the night before the examination in a local hotel so you won't have to worry about getting to the examination site on time.

Having the proper amount of supplies is also essential to success. Determine how many pencils, erasers, batteries, and even calculators you think you will need—and double that amount. Halfway through the afternoon session is not the best time to realize that the "7" key on your calculator has stopped working.

My final piece of advice is to stay relaxed. Don't panic or get frustrated. Stick to your plan of action. Don't try to switch afternoon disciplines at the last minute just because you overheard someone during lunch saying that transportation was easier than water resources. Trust your preparation. Keep a positive attitude. The end state for this phase is walking out of the exam site with full confidence that you passed!

Captain Gash commands the Headquarters and Support Company, 864th Engineer Battalion, Fort Lewis, Washington. Previous assignments include plans officer for DCSPER, I Corps, Fort Lewis, and mechanized engineer platoon leader and company executive officer, 70th Engineer Battalion, 3d Brigade, 1st Armored Division, Fort Riley, Kansas. CPT Gash is a graduate of the United States Military Academy and the Engineer Officer Advanced Course and holds a master's in geology and geophysics from the University of Missouri-Rolla. He is a professional engineer in Missouri.

Becoming a Professional Engineer

The licensure of PEs is important to the public because of the significant role engineering plays in society. The profession regulates itself by setting high standards to help protect the public safety and welfare. Becoming registered as a PE increases your opportunity for promotions, pay raises, credibility, respect, and security.

The U.S. Army Engineer School maintains a Web site at *www.wood.army.mil/ENGR/register.htm* that provides general information about registering military personnel as PEs.

The registration process involves the following steps:

- Graduate from an Accreditation Board for Engineering and Technology accredited program.
- Pass the Fundamentals of Engineering Examination.
- Gain a minimum of four years (three years with a master's) of verified practical engineering experience.
- Pass the Principles and Practice of Engineering Examination.

Examinations are typically administered twice a year, once in April and once in October. Applications must be completed 45 to 120 days before the examination date, depending on the individual state regulations.

The Engineer School point of contact for questions pertaining to the PE registration process is Mr. Kenny Light, PE, at *lightk@wood.army.mil*.

Developing an Engineer Exit Strategy for Road Repair and Maintenance

A Roadmap for Returning Responsibilities Back to the Host Nation in Bosnia-Herzegovina

By Colonel Michael J. Ulekowski

As the number of peacekeeping missions increases, countries involved with these missions look for a means to decrease their engineer forces within that country and return the responsibility for road repair and maintenance back to the government entities that were initially responsible for them. This becomes much more important as the costs for the military presence increase over time and the total numbers of military forces within countries involved with peacekeeping are decreased with the lessening of Cold War tensions.

Initial Engineer Mission

When initial forces arrive in a host country with the intention of being peacekeepers, the immediate mission is for control of the country. For engineers, this means a return of freedom of movement—primarily road and rail—for the incoming troops. Host nation government involvement in this phase is either very minimal or nonexistent. Engineer troops are brought into the country in sufficient numbers to perform temporary repair and minimal maintenance. The standard at this point of the mission is the minimum military requirement, which is normally marked by the ability of the roadway to handle a military four-wheel-drive vehicle. There is no contingent for providing a means for civilian traffic to move on the roadway.

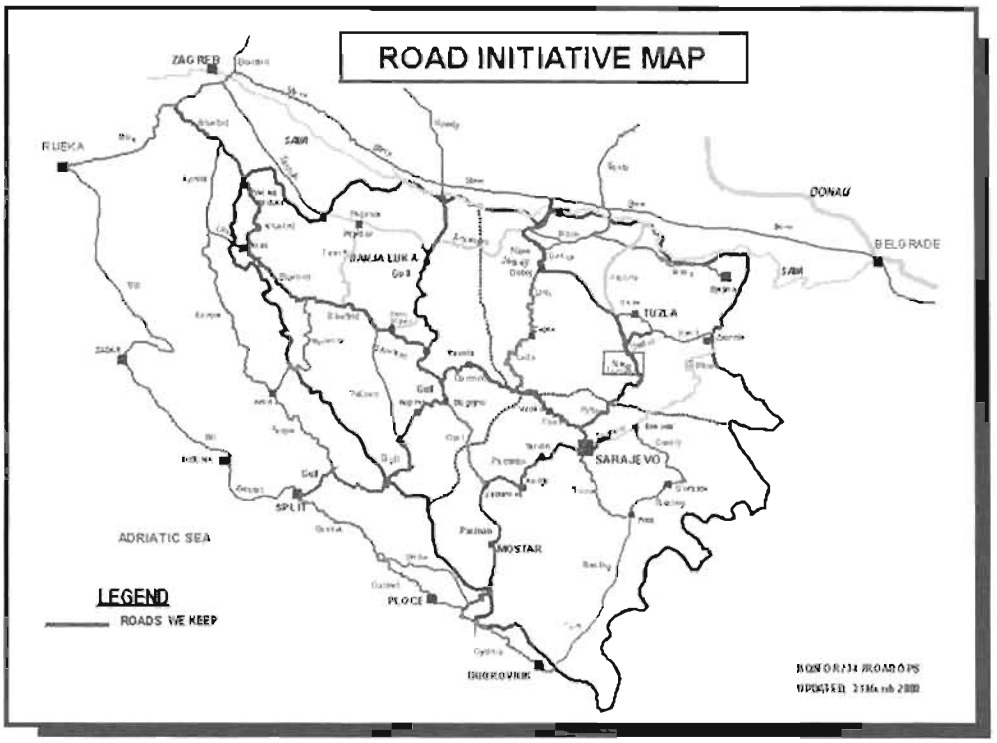
Bridge repair is accomplished through the use of temporary military bridges, such as the Mabey Johnson or Bailey truss bridge. These bridges are not designed to be permanent structures, nor are they designed for heavy civilian traffic. During this time, only major roads—which include those designated as main supply routes or theater-controlled roads—are opened. All others are either ignored by the peacekeeping forces or left to subordinate unit control.

The initial return to normalcy is marked by direct contracts between the peacekeeping force contracting agency and civilian contractors for road repair and maintenance. Normally, governments are not in this loop since they are still in the process of recovering. Also, it is easier and faster to work directly with the contractors.

Unfortunately, during this period, there is no incentive for the government agencies to develop ethical procedures in dealing with contractors and outside agencies providing money for roads. As a result, previous procedures that were not up to U.S.-acceptable ethical and moral standards continue to flourish. With the concentration of international money coming into the country and the desire of government agencies for this cash flow, the situation can easily develop into one of government corruption and mismanagement.



Route Sparrow in Bosnia, March 2000. Some of the results from improper road construction by the old Yugoslavian government were spectacular in their failures. Using the MOU and the oversight by SFOR engineers, the reconstruction will follow more on Western European guidelines, keeping these roads from failing.



For the initial MOU with the Federation of Bosnia-Herzegovina and the Republic of Srpska, certain roads remained under SFOR control for maintenance and repair. All other roads were considered part of the joint venture initiative in March 2000.

Engineer Operation in Bosnia-Herzegovina

With the breakup of the former Yugoslavia, numerous wars erupted within the fragments of that country during the 1990s. A group of nations led by NATO entered Bosnia-Herzegovina following the failure of the United Nations Protective Force to keep the peace. As time progressed, a strategy was developed to reduce the engineer mission within that country and bring about a return to normalcy for the government agencies responsible for road repair and maintenance.

During the three years that the warring factions fought each other in Bosnia-Herzegovina, much of the national infrastructure was destroyed. When the Implementation Force (IFOR) moved into the country in 1995, the primary mission of the engineers was to regain freedom of movement. When IFOR became the Stabilization Force (SFOR) on 20 December 1996, military forces—especially engineers—were decreased by the participating nations. This decrease occurred deliberately and rapidly, especially after commitment of troops to Kosovo.

Government Structure

Within Bosnia-Herzegovina, two different governments were set up: the Federation of Bosnia-Herzegovina and the Republic of Srpska.

Federation of Bosnia-Herzegovina

The Federation, which consisted of Bosnian Croats and the Muslims (later known as Bosniacs), was formed from two entities within the government structure that had previously fought with each other. Politics and a lack of desire for true unity further complicated issues.

The Federation's road directorate was responsible for road maintenance and repair. Under the former communist system, there was no free enterprise used in contracting for roadwork. Instead, each area had Putevies (the Yugoslavian term for contractors), who were completely responsible for certain roads. There was no open bidding or competition for the work. Since only one contractor was responsible for an area's road network, the quality of construction varied from area to area.

Many of the records for road and bridge construction had been destroyed during the war, making it difficult to engineer good renovations or replacements. However, with the capital of the Federation residing in Sarajevo, the government agencies were able to use old government offices and facilities that weren't destroyed in the war to make their return to normalcy more efficient. The few records that survived were in these facilities, making it easier on the new government road directorate.

Republic of Srpska

The Republic of Srpska government consisted of Bosnian Serbs. Even though this portion of Bosnia-Herzegovina had no problem with internal politics, the posturing of the government during the initial days of the peacekeeping mission—and its inability to work with IFOR—resulted in minimal funds from international sources. With little money to perform the needed repairs, the roads suffered. Since

government offices were needed that did not exist before the war, money was used to develop these offices rather than for other purposes that would have helped with the civilian freedom of movement. An open government hostility to the United Nations and peacekeeping missions also resulted in a more difficult situation for the road directorate in dealing with the external forces within its boundaries. As the government matured, this hostility became less of a problem and international money previously withheld became available to the Republic of Srpska. Again, the former communist system did not provide for open competition and hiring of the best available contractor for roadwork.

Snow and Ice Clearance Operations

In 1997, military snow removal assets were reduced in Bosnia-Herzegovina, requiring an alternative method for removing snow and ice from the national road system. SFOR headquarters also decided to increase the number of roads cleared during the winter months. The result was that SFOR contracted with 13 different snow and ice clearance contractors for plowing the roads. The military regional engineer offices (part of SFOR) were insufficient to ensure that contractors were performing properly. Both Bosnia-Herzegovina governments were unwilling to help enforce the contracts since the contractors reported directly to SFOR. Clearing of ice and snow that winter became an unenforceable nightmare.

Memorandum of Understanding

In 1998, a memorandum of understanding (MOU) was set up through each of the two government road directorates so that they would receive payment from SFOR to contract directly with the snow and ice clearance contractors. This allowed SFOR to use the government entities to enforce proper performance of the contractors. It also provided a means for money to flow through the government agencies, giving them credibility as well as a certain amount of cash flow. Of course, because of the situation, the MOU included penalties for not performing to a given set of standards and also for not paying the contractors, a problem that was prevalent during the beginning of the season. Because of the success of these contracts in both 1998 and 1999, a decision was made within SFOR to use this method of returning more of the responsibility for road maintenance and repair back to the Bosnia-Herzegovina governments.

The Road Initiative

In the summer of 1999, SFOR military assets funded the maintenance of 2,300 kilometers of roadway, while an additional 3,300 kilometers were the responsibility of the divisions within SFOR. In January 2000, MOUs were developed for execution with both road directorates for future road maintenance and repair projects. Because of the experimental nature of this initiative, certain roads were kept under the old system of complete SFOR responsibility, specifically two major east-west roads and two major north-south roads. The majority of other road maintenance was to be accomplished through joint ventures between SFOR and the road directorates.

A list of possible joint venture projects was developed twice a year, or when warranted by changes in the road conditions, by both SFOR and the road directorates. Both must approve each project for joint venture. Naturally, if each of these organizations thought that a project was important enough to fund completely through its own resources, this was acceptable. However, for the first series of projects, SFOR would fund 50 percent of each with the remainder funded by the respective government.

SFOR stipulated in the MOU that only preapproved contractors would be allowed to bid on the roadwork. Also, contractors would be allowed to bid on any road repair projects, even those that previously had been the responsibility of another contractor in the old Yugoslavian system. Because NATO is the primary funding agency for SFOR, NATO contracting procedures apply to the invitation for bid and the contract execution process. This brought more of a western approach to the construction contracting process through the governments.

SFOR freedom of movement engineer teams that had replaced the previous regional engineers were responsible for random quality assurance inspections. The road directorates were responsible for selecting the contractors and maintaining the contracts with them. The directorates were also responsible for providing joint supervision of the construction work, ensuring proper completion and a quality of work that was comparable to SFOR and NATO specifications. Payment from SFOR was scheduled at the end of the project, following a "joint declaration of acceptance of the works." For long, expensive projects, partial payments could also be agreed to on a case-by-case basis.

Both governments agreed to the wording of the MOUs in May 2000. The initial percentage of SFOR participation in the funding process was set at 50 percent. As civilian traffic increased and SFOR traffic decreased, the percentage of the total amount paid to the governments for the projects would decrease. This decrease was planned to correlate to the amount of SFOR traffic on the roadways, according to a survey jointly conducted by SFOR and the governments. As time passed, SFOR would become more of an investor in the roadway system of Bosnia-Herzegovina than an implementer of the construction work. There are also provisions in the MOU for modifications as the road situation changes. All roads are reviewed annually on 15 March, which provides a means of adding or subtracting more roads to the MOU, depending on the current situation.

Importance of an Engineer Presence

An important factor in this process was the presence of a civilian engineer assigned to SFOR who kept the process on track through the rotations of chief

(continued on page 57)

Let's Get Our Volcano Systems into the Fight

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

As a silver-dollar-sized drop of semifrozen rain found its way down the back of his neck, Captain Buck Rogers noted that the weather was just about as miserable as it could possibly be. It had been a long, cold night for his Ruff Riders, a company of 135 of America's finest young warriors. They were in a defensive position in Orangeland, as part of the new, elite Early-Entry Deployment Force (EEDF). A brigade-sized unit that's part of the newly formed Joint Reaction Force, the EEDF was the most modern, high-speed unit in the U.S. military. The Ruff Riders had been training for the past six months and had three more months scheduled when this crisis erupted. It didn't matter what the training status was; Captain Rogers knew that you go when you're called. Until three days ago, he and most of his soldiers had never heard of Orangeland. He just wished he had more time to work out the details of employing the new joint standoff weapon systems.

Another challenge not seen in the train-up was the failure of the situational-awareness system. The NCOIC said that something was wrong with the satellite, so the company set up local repeaters. Two of the five sites had been overrun the first night. Thirty of Rogers' 135 warriors had been detached to protect one of the remaining sites.

Captain Rogers was finally able to slip away for some sleep. With all that was going on, he hadn't slept in more than 72 hours. Almost, it seemed, before he closed his eyes, he was roughly shaken awake. It was the first sergeant, who reported some activity on the southern side of their position. Rogers gave orders for Situation Charlie—Ruff Rider talk for 100 percent security—and to lock and load all systems. Local sensors identified a number of dismounts and 15 vehicles approaching. They were represented by red icons, so they had to be the enemy.

Captain Rogers directed that the new standoff antitank weapons engage the vehicles and the new standoff antipersonnel systems engage the dismounts. The system operators pushed their "execute" buttons and received a "Code 6" error. This meant that a commander higher in the chain of command had overridden his systems with a nonengagement order. He called his next higher commander—the brigade commander—who said that he had no enemy showing on his display; thus, he hadn't released engagement authority. After a heated discussion, the brigade commander said he would contact the corps for guidance. The corps commander was adamant that he couldn't release engagement authority. His information flow and display showed no enemy anywhere near the Ruff Riders.

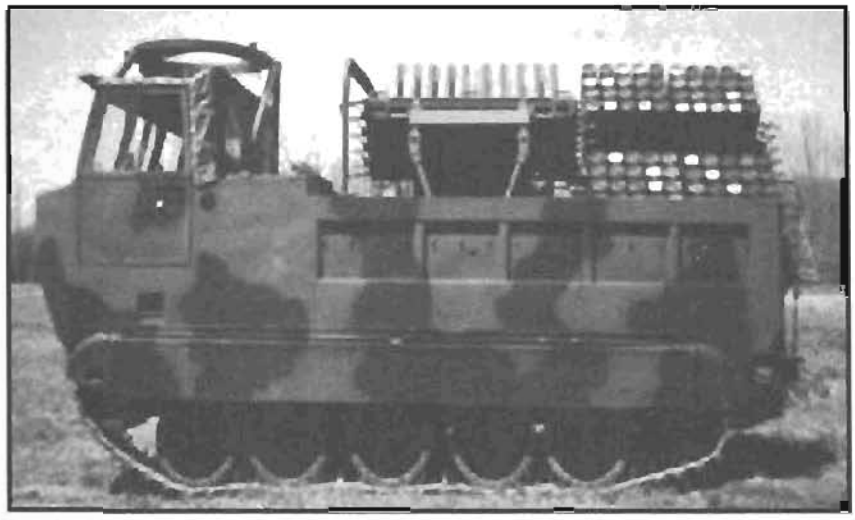
As the brigade commander attempted to get engagement authority from the corps, Captain Rogers rushed to assess the developing situation on the southern part of his position. By the sounds of it—a crescendo of small arms with machine guns, mortars, and an occasional main gun—Rogers figured he was getting hit by a company-sized unit supported by up to 15 tanks. Tanks hadn't shown up on his order-of-battle display. He guessed that they didn't show up on the brigade or corps commander's display either. The standoff fight never occurred; close combat was the order of the day.

This scenario may sound outlandish, but we have the same problem today. Higher commanders are the emplacement authority for the scatterable mine systems in our inventory. According to FM 20-32, *Mine/Countermine Operations*, obstacle emplacement authority is the jurisdiction that a unit commander has to emplace tactical obstacles. In a theater of operations, theater commanders have the authority to emplace obstacles. In most cases, they delegate this authority to corps commanders, who further delegate it to division commanders. Division commanders then have obstacle emplacement authority in their area of operations, unless authority is withheld or restricted by a higher commander. Commanders subordinate to the corps and division do not have the authority to emplace obstacles unless the higher commander delegates authority for a current operation.

During my time as a combat engineer commander and staff member, I had difficulty in getting authority for using our organic Volcano systems. Often we could get authority for 4-hour-duration mines. The problem came when we requested 48-hour- or 15-day-duration mines. I occasionally received 48-hour permission, but I never received 15-day permission. At the same time, I had permission to emplace conventional hand-emplaced mines that didn't have a self-destruct capability. They are armed and deadly until removed or destroyed.

Why will permission to use a temporary mine be denied while permission to use a permanent mine be routinely allowed? The usual reasons that I received for denial were concerns about fratricide and constraints on future maneuverability. Both of these concerns can be mitigated. Before any land Volcano system can be used to emplace a minefield, fratricide fences must be erected, just like those used for conventional hand-emplaced minefields. The concern about future maneuverability can be mitigated with the use of lanes, which can be left in the Volcano minefield. They can be closed with Modular Pack Mine Systems (MOPMSs). They can also be opened with the self-destruct feature of the MOPMS.

As we move to the future, we have to get used to replacing conventional hand-emplaced mines with scatterable mines. We need to do this for three primary reasons: much reduced logistical requirements, much faster emplacement times, and much smaller manpower requirements. In the logistical arena, a Volcano antitank mine weighs about 4 pounds versus about 30 pounds for a conventional M15 antitank mine. This is more than an 85 percent reduction in weight for countermobility logistical requirements. Two soldiers with one vehicle can emplace a 1,000-meter minefield in about 10 minutes versus the 10 hours it takes an engineer platoon to emplace a surface-laid conventional minefield of the same length. This is extremely significant when you consider the significant reduction of sappers in combat engineer companies.



A Volcano system mounted on an M548A1 tracked cargo carrier

As a company commander, my company had nine 10-man sapper squads. As a brigade commander, my companies had six 8-man squads. The last version of future divisional engineer companies that I saw had four 8-man squads. We have a reduction from 90 sappers to 32 in combat engineer companies. This greatly reduces the ability to hand-emplace mines in a time-constrained situation. We have to depend on scatterable mines emplaced by the Volcano system.

We need to routinely use the Volcano as we would conventional mines. We need to let people know it's all right to use them in the 15-day mode if the situation dictates. I found that the brigade commanders I supported didn't routinely plan 15-day Volcano minefields, because they couldn't count on getting the required authority. Instead their fallback/default was to depend on conventional mines.

We have an Army based on decentralized mission command, but we routinely restrict the use of the Volcano. The same commanders who impose these restrictions don't think twice about delegating conventional mine-emplacement authority to the battalion level. What's wrong with this picture? They are very concerned about scatterable mines that will never last longer than 15 days but will use conventional mines that last for years without a second thought.

My message to commanders is this: Don't tie the hands of subordinate commanders. Don't routinely withhold authority for using the Volcano. Only withhold the authority as you would for conventional mines. Don't restrict commanders from bringing all their combat multiplier systems into the fight. Let your commanders know what their Volcano assets are and allow them to use these assets. Use specific and not blanket restrictions. A commander would never assign a defend-in-sector mission to a subordinate commander and withhold the use of organic weapons. They need to do the same for the Volcano. If not, this valuable tool will never be used to its potential to make up for the lack of sapper manpower and reduce the logistical requirement for tactical obstacles.

I recommend the following to commanders:

- Use specific obstacle restrictions for specific reasons rather than simply using blanket restrictions because "that's the way we've always done it" or "that's the way we did it at NTC."
- Allow people on the ground to determine the best way to fight their ground, especially if they are assigned a defend-in-sector mission.
- Use the Volcano to make up for reduced sapper manpower, provide faster obstacle emplacement, and reduce the obstacle logistics.
- Develop unit rapid mine teams and drills using the Volcano.
- Mitigate fratricide concerns with fratricide fences.
- Mitigate future maneuverability concerns with lanes and closure with the MOPMS.

Appropriate use of the Volcano system won't get better until maneuver commanders demand it. Plan it, and do it. Don't stand for being limited any more than you would with your main weapon systems.

Colonel Littlefield (now retired) was assigned to the U.S. Army War College 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 in operations research/systems analysis from the Naval Postgraduate School. He was a joint specialty officer and is a registered professional engineer in Virginia. He is now a contractor for Sonalysts, Inc., working in joint experimentation.

Note: A variation of this article was published in the Spring 2002 issue of *Infantry*.



CTC Notes

Joint Readiness Training Center

Mobility/Countermobility/Survivability Battlefield Operating System Needs Emphasis (4th Quarter 2002)

By Captain James C. Moses

TREND 1

Subject: Troop-Leading Procedures (TLPs)

Observation: **Detailed TLPs are inconsistent at the platoon level.**

Discussion: After receiving the task force order and subsequent fragmentary order (FRAGO), the platoon does little analysis before issuing its own FRAGO. Similar actions are taken at the squad level, resulting in ill-prepared soldiers to execute the mission. Detailed backward planning would help establish a timeline for the platoon leadership to follow. The absence of any engineer battlefield assessment (EBA) leads to hasty plans with noticeable gaps. Most FRAGOs lack sufficient detail in the situation paragraph and also fail to address branches and sequels adequately. Too often, platoons conduct no rehearsals. Precombat checks (PCCs), precombat inspections (PCIs), and squad rehearsals are essential for mission success. This will require extensive involvement by the platoon sergeant and platoon leader. The last step of TLPs—supervise—also requires attention. Officers and NCOs must get involved and supervise their soldiers to ensure mission success. The absence of detailed TLPs causes soldiers to be unsure of their specific requirements during movements, reconnaissance missions, and clearance operations.

Reference: ARTEP 5-145-11-MTP, 05-3-1018, *Mission Training Plan for the Combat Engineer Platoon, Heavy Division/Corps/Armored Cavalry Regiment.*

Techniques and Procedures: Continue to refine the TLP process within the platoon so that leaders are adequately involved in both planning and execution to achieve not only mission success but also the highest possible standard. Mission analysis begins immediately after developing facts and assumptions from the received mission statement. Efforts should be made to assign mission warning orders to platoons, a minimum of 24 to 48 hours out, to allow for effective TLPs. If this time frame is not available, it should begin immediately upon receipt of the mission. Ensure that squads are doing complete orders and that brief backs are conducted at all levels, to include squad leaders to platoon leader and platoon leader to commander.

TREND 2

Subject: Combined-Arms Rehearsals

Observation: **Platoons rarely conduct rehearsals to validate battle drills, standard operating procedures (SOPs), or plans.**

Discussion: We often do not see productive combined-arms rehearsals during mission preparation at any level. Rehearsals for breaching and obstacle reduction are critical for mission success. There are many situations that require rehearsals and sufficient time to conduct them. Rehearsals are also a means of refining PCC and PCI checklists. Oftentimes, mission execution is slow or incomplete for reasons that could have been identified and corrected by proper rehearsals. Rehearsals should cover planned operations as well as contingencies. Battle drills and recurring tasks, such as casualty evacuation, should be rehearsed periodically.

Techniques and Procedures: Adequate time needs to be programmed into the timeline to allow for combined-arms rehearsals. Analyze the situation to prioritize the appropriate rehearsal type and technique. The more detailed the rehearsal, the greater the understanding the soldiers will have. Leaders at all levels need to ensure that once time is allocated, full-dress combined-arms rehearsals will take place and cover actions on the objective and contact contingencies. For information on the different types of—and techniques for—rehearsals and obstacle reduction, refer to FM 3-34.2, *Combined Arms Breaching Operations*, Chapter 4 and Appendix C.

TREND 3

Subject: Battle Tracking

Observation: **Platoons do not initially track enemy and friendly minefield status in their area of operation and area of interest.**

Discussion: Platoons do not initially track enemy or friendly minefields or route status in their area of interest. This lack of tracking occurs throughout the platoon from the platoon leader to squad leaders and results in little to no situational awareness within the platoon. Because of these tracking problems, task force and supported units traveling on the routes do not know the status or condition of the route or if there are minefields along the route. This contributes to the continued problem of mine strikes within the brigade. The task force and units also need to track all mobility/survivability/countermobility issues within the supported unit's tactical operations center (TOC). Some of these issues are combat power status (personnel and equipment), attached engineer assets, Modular Pack Mine System (MOPMS) remote-control units, MOPMS batteries, and minefield clearance and route status. Platoons do not have the proper tracking tools and need a system of tracking charts that are easy to update. Platoons need to establish a system and then provide the means of ensuring that the entire platoon can keep it updated and disseminated. Platoons need to become familiar with the TOC SOP. The platoon leader needs to be proactive and play an integral part in developing the engineer portion of the TOC SOP.

Techniques and Procedures: The platoon should develop a standardized tracking mechanism to monitor the status of combat power, current enemy situation, obstacle locations, route status, and important supply issues. The actual use and understanding of the standardized tracking mechanisms/reports and the use of standard map boards for all vehicles would greatly facilitate information flow within the platoon and between the platoon and its higher headquarters. The platoon should develop an SOP for daily information updates that follows a set agenda covering these important command and control issues.

Captain Moses is a platoon engineer observer/controller at the Joint Readiness Training Center, Fort Polk, Louisiana. He commanded the HHC/20th Engineer Brigade and served as a platoon leader in the 618th Engineer Company (Light Equipment) and the 307th Engineer Battalion (Airborne), all at Fort Bragg, North Carolina.

("Engineer Exit Strategy" continued from page 53)

engineers and chiefs of engineer operations. Without this individual, the process would have taken much longer to implement and would have required constant revisions and different viewpoints among the participating soldiers. This constant presence is essential to the process and should be included with all peacekeeping forces. SFOR was fortunate to have a very experienced, hard-working local engineer on staff throughout the process.

Lessons Learned

A number of lessons were learned during the maturation process of the SFOR engineer operations. When a peacekeeping force initially moves into a war-torn country, the military engineer units are important to maintain freedom of movement. This is accomplished through the primary use of military engineer units. As the country moves toward self-sufficiency, an exit strategy must be developed to return road maintenance and repair back to the government agencies that are normally responsible for their upkeep.

Joint-venture projects can be developed with the government agencies to allow them more funds, yet keep the peacekeeping forces and NATO involved in the product—in this case, road repairs and maintenance. These joint-venture projects also allow local governments to develop standards that are more fair and equitable with their contractors. In time, the peacekeeping force can contribute less and less of the total amount of the cost as its presence decreases in the host country. Eventually, the cost of road maintenance and repair will be borne completely by the host nation, with minor contributions by the peacekeeping forces for the portion of the traffic on the national roadways. The final document should have provisions for change. As time passes, the road situation, as well as the peacekeeping force, will change. The MOU should allow for this.

Finally, it is important to have a person in the engineer operation who will ensure that the direction of engineer movement within the country remains consistent. This person can provide a bigger picture of the peacekeeping engineers and reinforce the need to return the country to its normal procedure for road repair and maintenance.

Colonel Ulekowski, United States Army Reserve, was the SFOR engineer chief of operations in Sarajevo, Bosnia, from August 1999 to May 2000. He is a graduate of the United States Military Academy and a registered professional engineer. His expertise is in construction management and engineering of construction projects. He was a vice president of a construction management firm in Houston, Texas, until he was activated for Operation Enduring Freedom. He is currently the Coalition Forces Land Component Command forward engineer at Camp Doha, Kuwait.

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

Directorate of Training (DOT)

Countermine/Counter-Booby Trap Center (CMCBTC). The 11 September attack raised the prospect of deploying ground troops to fight terrorism in Afghanistan. This focused attention on the capability of U.S. ground forces to operate in mined environments and created an urgent need to assess the countermine landscape. The TRADOC commander commissioned a combined-arms Countermine Task Force (CMTF) to evaluate doctrine, training, leader development, organization, materiel, and soldier (DTLOMS) solutions to address near-term countermine requirements for current forces and to develop a countermine operational concept to support the Objective Force. The CMTF met from October through December 2001 and developed materiel and science and technology recommendations. The TRADOC commander approved the recommendations.

The CMTF presented its findings and recommendations to the Army Review Oversight Council (AROC) on 19 December 2001. The AROC approved recommendations to acquire available countermine equipment and accelerate other systems. The AROC also approved funding to establish a CMCBTC to focus the Army's countermine efforts and to evaluate commercial off-the-shelf and nondevelopmental items of equipment. The U.S. Army Engineer School updated the AROC on 22 August 2002 on the status of systems recommended at the December AROC and made further recommendations based on lessons learned from Operation Enduring Freedom. The AROC approved establishing a mine-detection-dog unit, procuring area and route clearance sets, updating countermine doctrine, developing countermine functional courses, conducting countermine experiments and studies, and continuing the CMCBTC.

POC is Mr. Dorian D'Aria, (573) 596-0131, ext 35361; DSN –5361; or e-mail *dariad@wood.army.mil*.

Quality Assurance Element (QAE). The Army School System (TASS) has reorganized as the QAE under the assistant commandant of the U.S. Army Engineer School (USAES). The mission initially will remain the same in regard to TASS Battalions but will now include evaluation of training and assistance to the USAES. This reorganization is the result of the activation of the TRADOC Quality Assurance Program and the MANSCEN Quality Assurance Office.

POC is MAJ James Avants, 34114; DSN –4114; or e-mail *avantsj@wood.army.mil*.

Title XI Reorganization. Effective 1 October 2002, all engineer TASS Battalion Title XI soldiers will be aligned with the U.S Army Engineer School Quality Assurance Element.

POC is MAJ James Avants, 34114; DSN –4114; or e-mail *avantsj@wood.army.mil*.

WANTED! Applicants for Terrain Analysis Technician Warrant Officer. MOS 81T NCOs with 5 to 12 years of service may apply. The duty description is in Department of the Army Pamphlet 611-21, *Military Occupational Classification and Structure*. Soldiers who wish to become warrant officers may obtain information on the home page of the Warrant Officer Career Center at *http://leav-www.army.mil/wocc/* or the U.S. Army Recruiting Command at *http://www.usarec.army.mil/hq/warrant/*.

POC is SGM Michael Cline, 34087; DSN –4087; or e-mail *clinemi@wood.army.mil*.

Proponent Guidance "Promotion Book." The Engineer Personnel Proponency Office (EPPO) prepares proponent guidance for panel members to use to select soldiers for promotion to senior grades (E-7 through E-9). The guidance is posted on the EPPO Web site for NCOs to check where they stand. New guidance is posted on the day the annual board meets. Guidance for the upcoming command sergeant major/sergeant major board is currently being worked.

POC is SGM Michael Cline, 34087; DSN –4087; or e-mail *clinemi@wood.army.mil*.

Captain (CPT) Officer Education System (OES). The original proposed CPT OES concept remains unchanged pending any guidance that may emerge from the briefings to the Chief of Staff and Vice Chief of Staff of the Army.

The Combined Arms Staff Course (CASC) consists of five weeks of training (three weeks advanced distributed learning [ADL] and two weeks of resident instruction). All officers, regardless of branch, must complete the CASC common core module consisting of two weeks of ADL. Officers selected for primary staff positions (such as S1, S2, assistant S3/S3 air, S4, S5, or battalion maintenance officer) will, upon completion of the CASC Common Core,

complete a third week of ADL before assuming the staff position. Officers being assigned to a special staff position (such as fire support officer, assistant brigade engineer, or petroleum officer) will, upon completion of the CASC Common Core ADL module, complete a third week of ADL tailored to that staff position, followed by two weeks of resident technical training at their respective branch school/center.

The Combined Arms Battle Command Course (CABCC) consists of ten weeks of training (four weeks of ADL and six weeks of resident instruction). Officers selected for company command must compete CABCC before assuming command. Each phase of CABCC must be completed sequentially before starting the next phase of training. CABCC consists of four weeks of ADL instruction with two distinct focuses. The first two weeks of ADL, referred to as CABCC Common Core, will be developed by the Combined Arms Command according to TRADOC and will contain all non-branch-specific topics. The second two weeks of ADL, referred to as the Preresident Company Commander's Course, will be developed by individual branch schools/centers and will focus on specific branch skills and knowledge. Upon completion of all ADL, officers will attend the resident training referred to as the Company Commander's Course, which focuses on company command. Upon completion of the Company Commander's Course, all officers will complete a Train-the-Trainer Course, consisting of two weeks of resident training at one of the Combat Training Centers.

POC is MAJ Dale Scherer, Transformation Cell team chief (573) 596-0131, ext. 35747; e-mail *schererd@wood.army.mil*; or LTC Jeff Bedey, Director, Department of Instruction (573) 596-0131, ext. 35647; or e-mail *bedeyj@wood.army.mil*.

Center for Engineer Lessons Learned (CELL). The Web site repository of lessons learned is continually being updated. We have now added a listing and short synopsis of Operation Enduring Freedom lessons learned. You can obtain this material by viewing the CELL Web site, selecting the items you want, and sending an e-mail request or calling the CELL POC. Most of the current operations material is FOUO and cannot be placed on a public Web site but can be sent to a *.mil* e-mail address.

We thank the units and individuals that have sent digital copies of lessons learned and after-action review (AAR) products. We request that all units forward engineer lessons learned and AARs from exercises and operations to the CELL POC. This material is used to revise/develop doctrine and training and is provided to units preparing to conduct similar missions. Others can benefit from your experiences.

POC is MAJ Jan Kirkton, 38112; DSN -8112; or e-mail *kirktonj@wood.army.mil*. The CELL Web site address is *http://www.wood.army.mil/CELL/index.htm*.

Directorate of Training Development (DOTD)

Field Manual Update. The following field manuals have recently been sent to the Army Training Support Center for print and distribution. Look for them in the near future on the Reimer Digital Library at *http://155.217.58.58/atdls.htm*. The revisions in all three manuals incorporate the "expert" operator procedures for conducting mine detection operations with the AN/PSS-12 mine detector.

- Change 3 to FM 3-34.2, *Combined-Arms Breaching Operations*
- Change 3 to FM 20-32, *Mine/Countermine Operations*
- Change 2 to FM 5-34, *Engineer Field Data*

POC is Tina Waters, (573) 596-0131, ext. 35288; DSN -5288; or e-mail *waterst@wood.army.mil*.

Visual Archive. The History Office at the Engineer School is developing a visual archive. It currently has more than 18,000 photographs, largely from World War II and Korea. Units that would like to contribute photographs (copies) or other visual material should contact Dr. Larry D. Roberts, Historian, U.S. Army Engineer School, Fort Leonard Wood, Missouri 65473. Where possible, caption information should accompany the images. If you have questions, please call Dr. Roberts at (573) 563-6109.

News and Notes

Contract Awarded for Production of DTSS-L. The Engineer Research and Development Center's (ERDC's) Topographic Engineering Center, Alexandria, Virginia, recently awarded a production contract totaling more than $5 million to SECHAN Electronics Inc., Lititz, Pennsylvania., to build 16 Digital Topographic Support System-Light (DTSS-L) units in FY02, with an option for 15 additional units in FY03.

The DTSS provides digital maps and updates to battlefield commanders and weapons platforms in support of mission planning, rehearsal, and execution. The DTSS automates terrain analysis and visualization, database development and management, and graphics reproduction. The system uses the latest commercial off-the-shelf technology in printers, scanners, and computer workstations, combined with image processing and geographic information system software.

The DTSS-L version is shelter-mounted on high-mobility, multipurpose, wheeled vehicles (HMMWVs) and is capable of providing digital, computer-generated terrain analysis data and products to combat commanders located at brigade through echelon-above-corps levels. They are transportable by air, sea, rail, and land and are capable of worldwide deployment.

This is the second production contract for DTSS-Ls; SECHAN previously built 52 DTSS-Ls (FY99-01). ERDC's Combat Terrain Information Systems Project Management Office has a requirement to procure and field 83 DTSS-Ls. The new contract with SECHAN will complete this requirement in FY03. The DTSS-Ls procured in FY02, as a result of this latest contract award, will be fielded to various U.S. Army engineer terrain teams.

POC is Mark Hainsey, Project Manager, (703) 428-6734.

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 notes at the end of the article, not at the bottom of each page. Spell out each acronym the first time you use it; don't assume that everyone knows what it means. 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. (The reason being that *Engineer* is available for sale through the Superintendent of Documents.) We do not require a hard copy of the clearance.

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.

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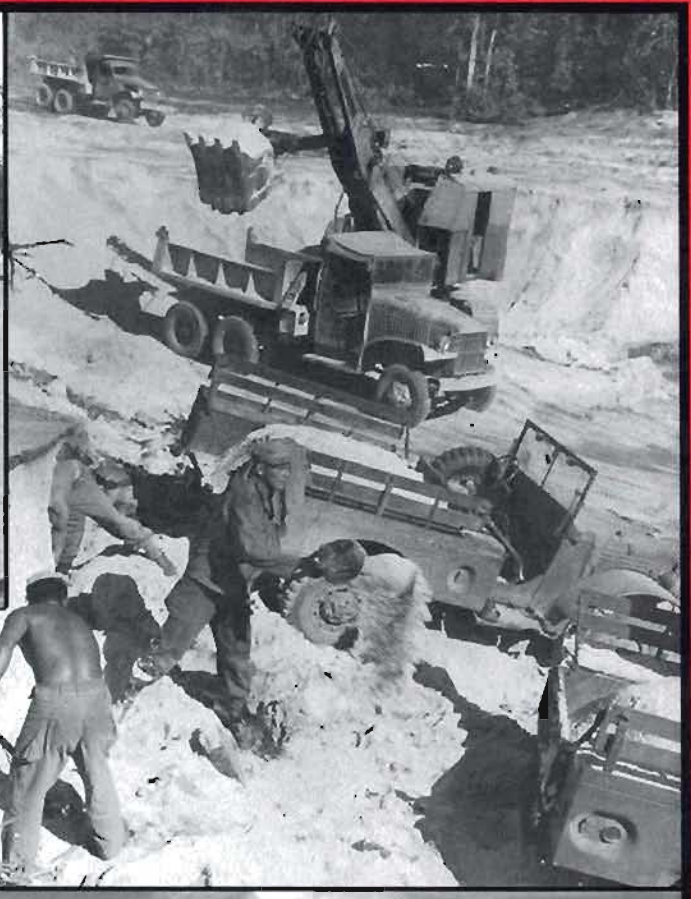
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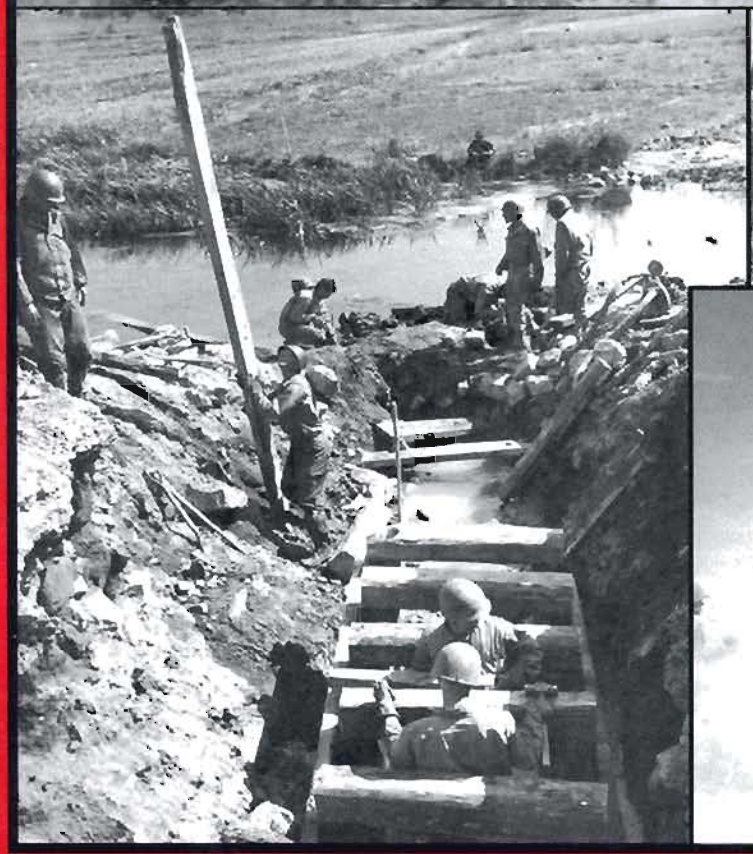




Photo 1, top left: Bridging the Marne River. Trestle and crib bridge being constructed by Companies A and C, 6th Engineers. 24 July 1918. **Photo 2, top right:** Loading operations in the coral pits on the Los Negros Islands in the South Pacific. Heavy-duty bulldozers loosen the coral sand and 2-cubic-yard shovels load the loose sand into the heavy-duty 2 1/2-ton G.I. trucks and 3/4-ton weapon carriers. **Photo 3, bottom right:** 815th Engineer Battalion (Construction), ATT, 15-19 May 1961. Spreading aggregate on asphalt road construction, Fort Bliss, Texas. **Photo 4, bottom left:** Engineers putting in stringers after posts and sidewalls have been placed. Stringers will be covered with two layers of planking. Italy, 1944.

(Photos courtesy of the U.S. Army Engineer School History Office.)

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