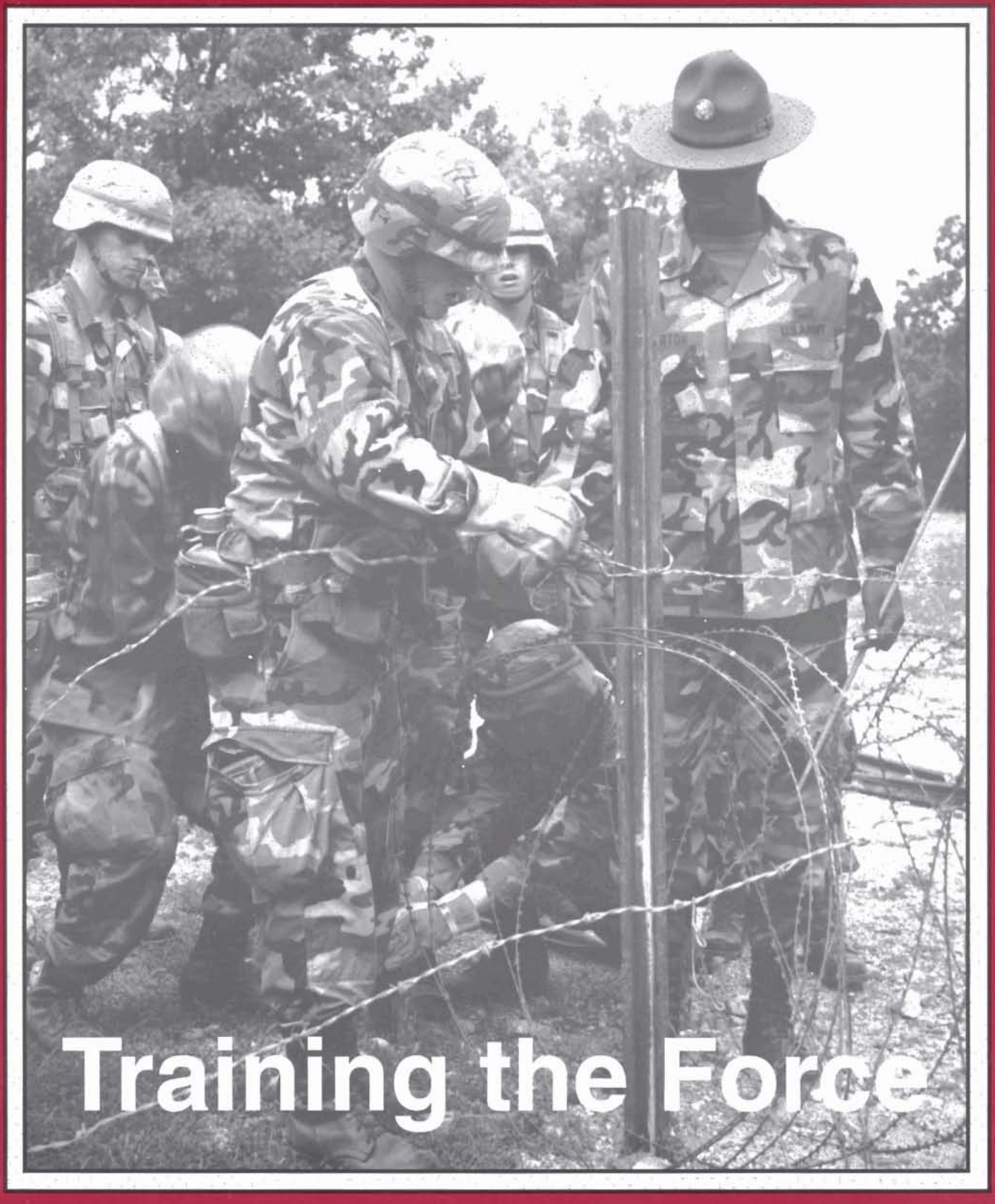
Engineer

THE PROFESSIONAL BULLETIN FOR ARMY ENGINEERS

November 1997



Training the Force

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CLEAR THE WAY

By Major General Robert B. Flowers
Commandant, U.S. Army Engineer School

One of the giants of the Corps of Engineers departed from Fort Leonard Wood in July: MG Clair F. Gill. His vision, drive, and initiative forged the course for the Corps of the future while ensuring that we remained a vital part of the combined arms team. I have just reread his last "Clear the Way," which emphasized the "One Corps, One Regiment, One Fight" theme. I echo that message—the entire Corps must continue to speak with one voice. We have many challenges in today's changing world and we will succeed only if we all work together.

My personal "high ground" has three imperatives. The foundation for success requires that each of us maintain situational awareness, personal fitness, and technical competence. We are inundated with information, and the news media seem to report on new natural or man-made hot spots every day. The time to read about a crisis in Algeria, the role of the Taliban in Afghanistan, or the new Iranian missile threat is not when we receive an alert notification. Citizens of the world turn to the United States for leadership, and if we are not informed and ready, they will look elsewhere. Each of us must stay abreast of world events for our nation to remain relevant.

The second part of the success formula is personal fitness. A PT program combining strength and cardiovascular exercises improves overall stamina, but personal fitness is much more than that. Eating healthily, maintaining proper weight, and completing medical physicals on time are also important. Stress and high blood pressure are silent killers; heed their warning signs. If you have skipped PT, delayed your over-40 physical, or ignored high cholesterol levels, change today and get fit.

Our education system does a fine job of familiarizing each of us with our jobs, but technical competence is more than familiarization. Whether you are new or have been in the same job for years, learning never stops. To establish credibility in a new assignment, review and read ahead of time to be certain that you use the correct terminology and thoroughly grasp the subject. Once there, your goal should be to become the subject matter expert (SME) by continuing to read and research. If you are already an SME with years of experience, read to stay current with emerging technologies. One of our country's historical strengths is the ability to develop and apply new technologies to save time, money, and lives. The master craftsman making flintlock rifles became a curiosity with the advent of center-fire ammunition. If you have been in the same job for some time, don't be satisfied with making the best flintlock. Read and learn and you will continue to grow professionally.

Next, I need the help of every Army engineer. Top priorities for new engineer equipment are the Grizzly and the Wolverine, and both of these programs will require our total support to survive future budget cuts. I charge every engineer to be an advocate and an ambassador for the Grizzly and the Wolverine. We must modernize! Our current breaching and bridging equipment is based on 1950's technology. This new equipment, based on the M1 tank chassis, is necessary to bring us into the 1990s. If we are to continue to contribute to the modern combined arms team, we must have the Grizzly and the Wolverine. The Grizzly provides (for the first time) armored protection for engineers to breach complex obstacles. Replacing many systems, this one vehicle can conduct a mounted breach in stride. Instead of a series of vehicles and dismounted squads separately breaching each part of the complex obstacle, the Grizzly will clear a lane through the minefield, breach the wire, fill the antitank ditch, and pull apart the log crib. The need for the Wolverine is clearly shown in the book *The Damned Engineers*, by Janice Holt Giles. In it, the *Kampfgruppe Peiper's* attack during the Battle of the Bulge failed because it could not cross a small stream. The 291st Engineers had blown the bigger bridges, and the smaller ones could not support the German tanks. Without organic, tactical bridging, the entire attack stalled. We must never let this situation occur in our Army. Bottom line: We need both the Grizzly and the Wolverine now.

Finally, in September I attended the Anti-Personnel Landmine Conference in Oslo, Norway. As the U.S. technical expert, I participated in many discussions our delegation had with other nations and nongovernmental organizations (NGOs). The end result was always the same: *Everyone,* to include the NGOs, agreed that the United States is not part of the problem, but most were reluctant to accommodate our concerns for fear of providing loopholes that others might exploit. This is just one battle in a long campaign to ban land mines. Expect more information later.

I applaud our President's decision not to sign the Oslo Treaty. He has put the lives of American soldiers first and shown he will not be overwhelmed by an international tide of well-meaning but misplaced efforts.

Fact: The United States spends as many dollars as the rest of the world combined to support demining operations even though none of the mines were made in the United States or emplaced by U.S. soldiers.

I am very honored to be the new commander at the home of the engineers. As MG Gill noted, we still face many challenges: the Divisional Engineer Brigade, joint doctrine, mine detection, resources, and many others. I look forward to successfully solving all of them. Fort Leonard Wood is a vibrant, growing post with a well-kept secret: It's a great place to train, raise a family, and serve our nation.

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Front Cover: *One Station Unit Training (OSUT) soldiers learning to prepare a concertina obstacle. Photo by Jim Ray, TSC, Fort Leonard Wood.*

Back Cover: *D7 dozers on line ready for attack. Photo by Jim Ray, TSC, Fort Leonard Wood.*

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A New Era Begins in the Personnel Realm

By Captain Matt Zajac

In today's era of reduced resources and escalating print costs, those of us in the personnel realm must determine how to disseminate information to the greatest number of people in the shortest amount of time. While we recognize the power of the Internet, we also recognize that not everyone has access to information posted electronically.

Personnel Update

With these concerns in the forefront, the Engineer Personnel Proponency Office (EPPO), the officer branch, and the enlisted branch proposed adding a new department—entitled "Personnel Update"—to the *Engineer Professional Bulletin*. The purpose of the "Personnel Update" is not to duplicate information available on the Internet but rather to focus on major issues facing the branch today.

This issue of *Engineer* includes articles on initiatives that have far-reaching impacts on both engineer officers and enlisted soldiers. The article on OPMS XXI (page 3) describes where we are and where we see ourselves headed, and "Changes in NCO Structure" on page 6 tells of our success during this endeavor. We ask you to take time to consider your future and provide EPPO some guidance. The EPPO staff will measure the success of the new department by the level of response received from you.

Internet Sites

Three Internet sites focus on engineer-specific personnel issues.

The Engineer Personnel Proponency Office maintains a site at http://155.9.32.3./EPPO/eppo_hp.htm. EPPO provides advice and assistance to the Engineer School commandant to attract, develop, and retain engineer officers, warrant officers, and soldiers. Typical articles cover the impacts of Department of the Army decisions on the branch, proposals on restructuring the branch, and "what-if" articles that ask field personnel where the branch should be headed. Topics currently at the EPPO site include creating a 12B additional skill identifier for combat engineer equipment, consolidating MOSs in the 62 series, and recent successes in expanding engineer Project Warrior positions to the Combat Maneuver Training Center and expanding Ranger coding in engineer units that support light, airborne, and air-assault infantry units.

The Engineer Officer Situation Report (SITREP), which replaces the discontinued paper *Engineer Officer Bulletin*, is maintained by the Engineer Branch at PERSCOM. The *Engineer Officer SITREP* reports the latest engineer-specific information on schools, promotions, and assignments. From it you can access links to related home pages (such as Army, PERSCOM, Fort Leonard Wood, USACE, OPMS XXI, and the *Engineer Unit Directory*).

The *Engineer Officer SITREP* is published biannually and updated as necessary. Through this medium, the Engineer Branch continues to provide timely and accurate information, trends, and statistical data to assist officers in managing their careers. Current topics include results of the FY97 Advanced Civil Schooling/Small-Group Instructor/Observer-Controller and the Year Group '91 Functional Area Designation Boards and upcoming board dates. The SITREP is available at http://www-perscom.army.mil/opmd/engineer/enbull.htm.

The Engineer Enlisted Newsletter, maintained by the enlisted branch, focuses on information enlisted soldiers need to successfully plan their future. Articles in the current *Engineer Enlisted Newsletter* include information on adjustments to the Selective Re-enlistment Bonus, force structure cuts, and an after-action review from the last promotion board for sergeant first class. The *Engineer Enlisted Newsletter* is at http://www-perscom.army.mil/enlist/eng_ltr.htm.

Essayons!

With the addition of this new department to *Engineer*, the personnel realm has gained an axis to ensure that you receive the information you need when you need it. As always, suggestions on ways to improve the Engineer Branch are welcome. Send correspondence to CPT Matt Zajac at zajacm@wood.army.mil.

OPMS XXI AND THE ENGINEER CORPS—WHERE ARE WE HEADING?

By Captain Matt Zajac

Since July 1996, PERSCOM's Officer Personnel Management System (OPMS) XXI Task Force has been analyzing the challenges facing the management and development of the Army's officer corps of today and tomorrow. After aligning these challenges with requirements posed by Force XXI, the task force formed a new vision and set of characteristics and established objectives for the officer development system.

First and foremost, the task force focused on creating a system that allows officers to remain in key developmental jobs for longer periods of time. Reduced personnel turbulence increases unit effectiveness and results in an officer corps with a greater depth of experience in each branch and functional area (FA).

Career Options

Relying heavily on input from the field, the task force created four career development system options for evaluation. The options range from merely adjusting today's system to severing it into four separate career fields (CFs) that will align with the Army functions in 2010. In June 1997, the Army Chief of Staff directed the OPMS XXI Task Force to implement an officer development system structured around four career fields: operational, operational support, institutional support, and information operations. Figure 1 shows how today's system transforms to a four-career-field development system.

The Operational Career Field includes the basic branches, FA 39 (Civil Affairs), and the Special Forces Branch. They focus on functions associated with fighting and training the force. The Engineer Branch, including the U.S. Army Corps of Engineers (USACE), remains in this career field.

The Operational Support Career Field contains the Army Acquisition Corps and FA 48 (Foreign Area Officer).

The Institutional Support Career Field produces officers skilled in obtaining and managing resources that the Army requires. FA 45 (Comptroller), FA 47 (U.S. Military Academy Professor), FA 49 (Operational Research and Systems Analyst), FA 52 (Nuclear Weapons), and two new

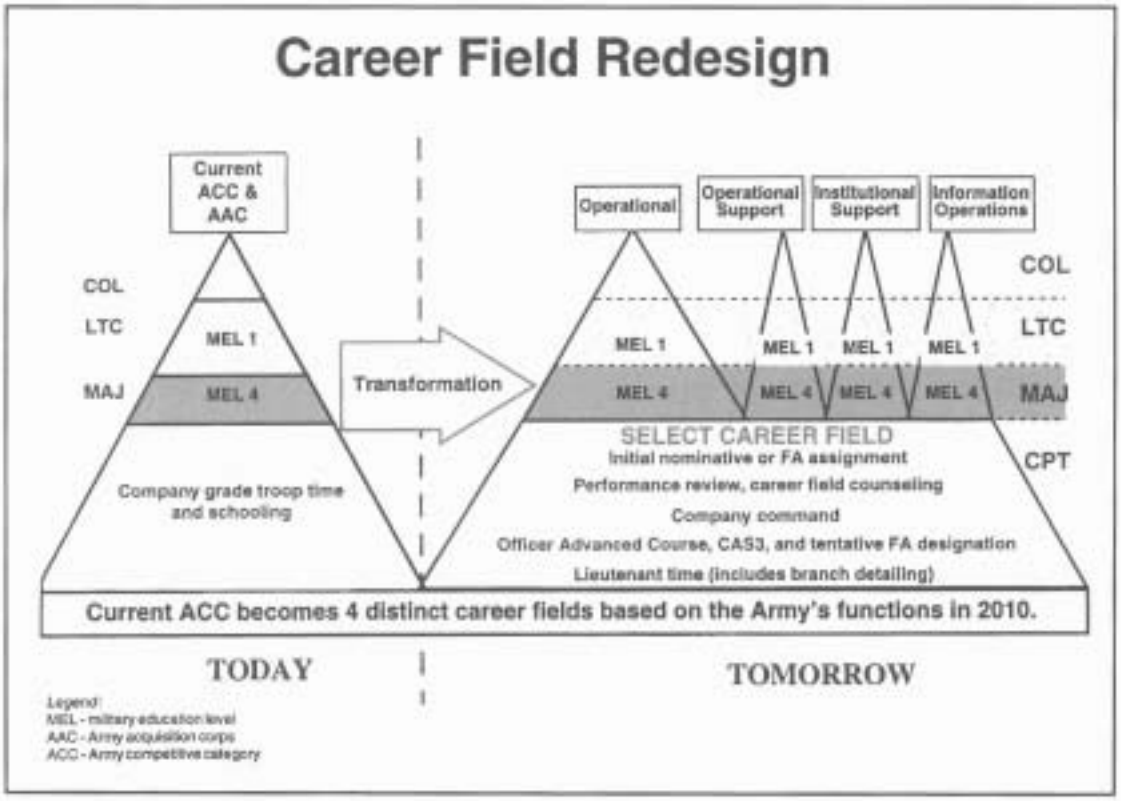


Figure 1

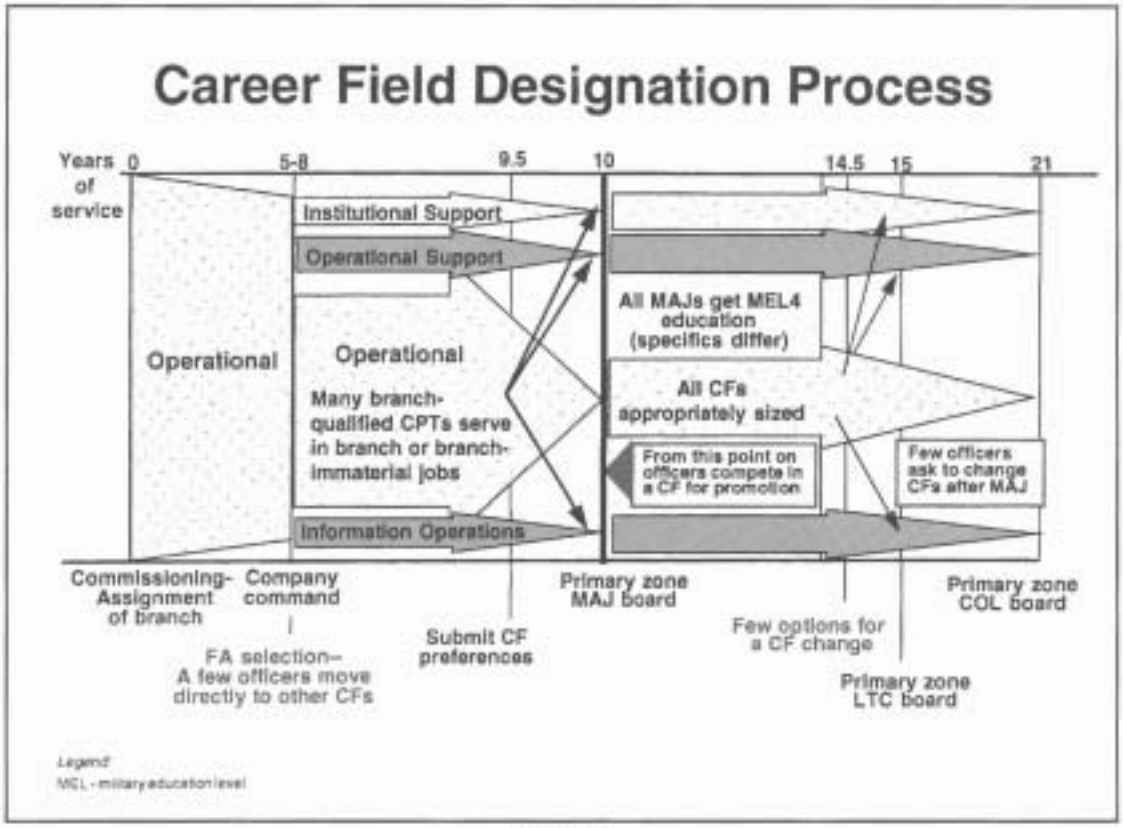


Figure 2

functional areas—FA 43 (Human Resource Manager) and FA 50 (Force Developer)—are grouped in this career field.

The Information Operations Career Field recognizes the Army's requirement for specialists skilled in collecting, organizing, processing, and disseminating intelligence across the full spectrum of the human, signal, and electronic information bands. The current FA 46 (Public Affairs) and FA 53 (Automation Systems) are joined with four new functional areas related to the collection and analysis of strategic intelligence, modeling and simulations, space-based operations, and the integration of information operations in support of joint/component commanders.

Focusing

Figure 2 shows how the proposed officer development system separates officers into the four career fields. Recognizing the necessity for grounding Army officers in solid, leadership-developing platoon and company experiences, the task force proposed a system that maintains the current, familiar initial developmental pattern. Officers continue to enter the Army with a branch designation and serve in that branch until they complete company command. Then (about their fifth year of service) they select a functional area. Single tracking will no longer exist. The functional area choice, their personal goals, and performance counseling will guide the officer's career into one of the four career paths. The path is permanently designated after their primary zone promotion to major. From this point on, they are promoted and selected for schooling from only the officers in their career path. No longer will there be "double" looks for promotion or schooling, which is possible now because of separate basic branch and functional area boards. Limited opportunities will exist to change career paths after selection for major. The new system allows officers with the desire and aptitude for performing roles outside of today's command track to continue to hone their skills, compete for challenging assignments, and serve the Army and the nation.

Challenges

The Engineer Branch faces two key challenges as we move toward OPMS XXI. The first is our need to remain one regiment. By aligning the entire engineer force under the operational force, the branch averted the consequences of an early task force recommendation to create a separate functional area, in a separate career field, for USACE officers. The current focus is to balance the officer inventory with our requirements and authorizations. The task force's recoding initiative directs that branch proponencies review their authorizations and, with specific guidance, determine which positions can be recoded. These recoded positions will help the task force develop the new functional areas and create viable career opportunities for each career field. The Engineer School's Personnel

Proponency Office is reviewing the branch authorizations and will brief the Deputy Chief of Staff, Personnel, on 10 December 1997.

Our second challenge is a function of our diverse assignments. The Engineer Branch is struggling to branch-qualify all of our majors with the few branch-qualifying (S3/XO) positions available. This shortage has resulted in an unacceptable level of unit turbulence, with engineer majors serving barely 12 months in these key developmental positions.

So how does the Engineer Branch develop officers and then increase their depth of experience? Perhaps by expanding the definition of "branch qualification" to include certain USACE positions and division staff positions (such as assistant division engineer). We must also determine lieutenant colonel/colonel "command qualification" and if there are any formally recognized paths to either the table of organization and equipment (TO&E) or the USACE commands. Balancing the qualification of engineer officers while maintaining one regiment remains fundamental to our branch's success as OPMS XXI evolves.

Supporting Force XXI

The Army faces major challenges in the years ahead. The OPMS XXI Task Force and the Engineer Branch have made significant progress toward an officer development system that supports both the Army's future vision and the needs of today's engineer officers. Our success during this redesign period is a direct result of your input. With your support, tomorrow's Engineer Branch will continue to provide officers unparalleled challenges and unequaled job satisfaction. Equally important, we will ensure that the Engineer Corps remains ready to meet the nation's challenges in the future.

For more information on OPMS XXI, refer to the Engineer Personnel Proponency Office's home page: http://www.wood.army.mil/EPPO/eppo_hp.htm.

We welcome suggestions on forming our future officer career development pattern. The point of contact is CPT Matt Zajac at DSN 676-4087 or commercial (573) 563-4087. The e-mail address is: zajacm@wood.army.mil.

Captain Zajac, officer coordinator in the Engineer Personnel Proponency Office, has coordinated USAES efforts with the OPMS XXI Task Force for the past 18 months. Previous assignments include commander, C Company, 2d Engineer Battalion, Korea; executive officer, 362d Engineer Company (CSE), Fort Bragg, North Carolina; and platoon leader, 264th Engineer Company (MGB) during Operations Desert Storm and Desert Shield. CPT Zajac holds a bachelor's degree in civil engineering from the University of Illinois and is completing a master's degree in engineering management from the University of Missouri at Rolla.

Carrying Your Concerns Forward

By Captain Matt Zajac

On 15 October 1997, MG Robert B. Flowers, Commandant, U.S. Army Engineer School, presented the 1997 Functional Review (FR) to LTG Frederick E. Vollrath, Deputy Chief of Staff, Personnel (DCSPER). As the personnel predecessor to the annual Functional Area Assessment (FAA), the FR allows the DCSPER to address issues within the personnel arena before they are presented to the Vice Chief of Staff of the Army during the FAA. The commandant and representatives from the officer, warrant officer, and enlisted branches; the Office of the Chief of the Army Reserve; and the National Guard Bureau presented their assessments of and concerns about the engineer force.

Enlisted Concerns

MG Flowers stated that the shift of 76 percent of the engineer force to the Reserve Component during the drawdown has affected the branch's ability to rapidly respond to and maintain support for extended stability and support operations. A prime example of this challenge is the personnel status of our active duty bridge units. The 12C military occupational speciality (MOS) continues to experience an initial-term retention rate average of only 33 percent (FY96 to present) and only a 14-month CONUS tour stabilization. Low initial-term retention rates during FY97 for MOSs 12B, 51M, 51T, and 81T were also discussed.

The continuing shortage of active duty master sergeants and sergeants major in career management fields (CMFs) 12 and 51 is another concern. Promotion rates have exceeded the Army's average since June 1996, but retention rates are well below average.

Another enlisted concern is the Department of the Army's elimination of the 285th Engineer Detachment (Quarry). While the Reserve Component still has significant quarry assets, the Active Component cannot maintain viable career progression for this MOS (only 16 authorizations remain). Our challenge now is to identify how to train and support those units in the Reserve Component.

Officer Concerns

Engineer officers are concerned about the effects of OPMS XXI and the Officer Restructuring Initiative (ORI) on the branch's structure and career progression. Other concerns are the diversity of the branch—particularly with regard to developing and retaining female and African-American field grade officers—and the continuing shortage of branch-qualified captains. In response to these last two concerns, MG Flowers requested that PERSCOM initiate a *Call to Active Duty* for engineer officers who have recently left the service. LTG Vollrath agreed in concept but directed that the effects of OPMS XXI and ORI authorization reductions be studied before bringing officers back to active duty.

Changes in NCO Structure (CINCOS)

By Sergeant Major John Murphy

When an *Army Times* article reported in June 1997 that an estimated 8,700 Army NCO jobs would be eliminated in an effort to trim the NCO content from 50 to 47.5 percent, the Engineer School and the Engineer Branch received an avalanche of phone calls, e-mail, and letters expressing grave concerns about potential cuts.

The school's Engineer Personnel Proponency Office (EPPO) is pleased to report that the engineer force is in an exceptionally stable position and, because of the bottom-up review of each engineer military occupational specialty (MOS) during the Changes in Noncommissioned Officer Structure (CINCOS) initiative in 1996, promotion opportunities will increase in most MOSs. The engineer leadership worked long and hard to prepare a proposal that meets the Army's needs, provides balanced career progression, and enhances the branch's ability to meet its diverse missions as we move into the next century.

CINCOS Review

On 18 June 1996, the Deputy Chief of Staff for Personnel (DCSPER) directed all personnel proponencies to conduct a bottom-up review of every MOS. This initiative, termed the CINCOS, resulted from a $170 million reduction in the Army personnel budget. The guidance was to align MOSs with the Army's goal of a 47 percent NCO structure. However, the DCSPER realized that some MOSs would have higher or lower percentages, depending on their mission requirements. The guidance also allowed proponencies to correct stagnation in MOSs that historically displayed poor promotion opportunities.

CINCOS Proposal

EPPO began its analysis immediately. The first challenge was to determine where to trim, since the engineer force's NCO content was already at 44.7 percent. The Engineer School formed a task force to analyze each MOS from the bottom-up. EPPO's proposal focused on table of distribution and allowances (TDA) authorizations, so it had only a minor impact on table of organization and equipment (TO&E) structures.

In August 1996, a board of command sergeants major, which included the engineer sergeant major, reviewed the proposal for its impacts on combat readiness and career progression. The board's final adjustments resulted in a proposal that—

- Provided the overall engineer force with better career progression.
- Fixed two MOSs that historically had poor career progression.
- Enhanced the capabilities of the warfighting force.

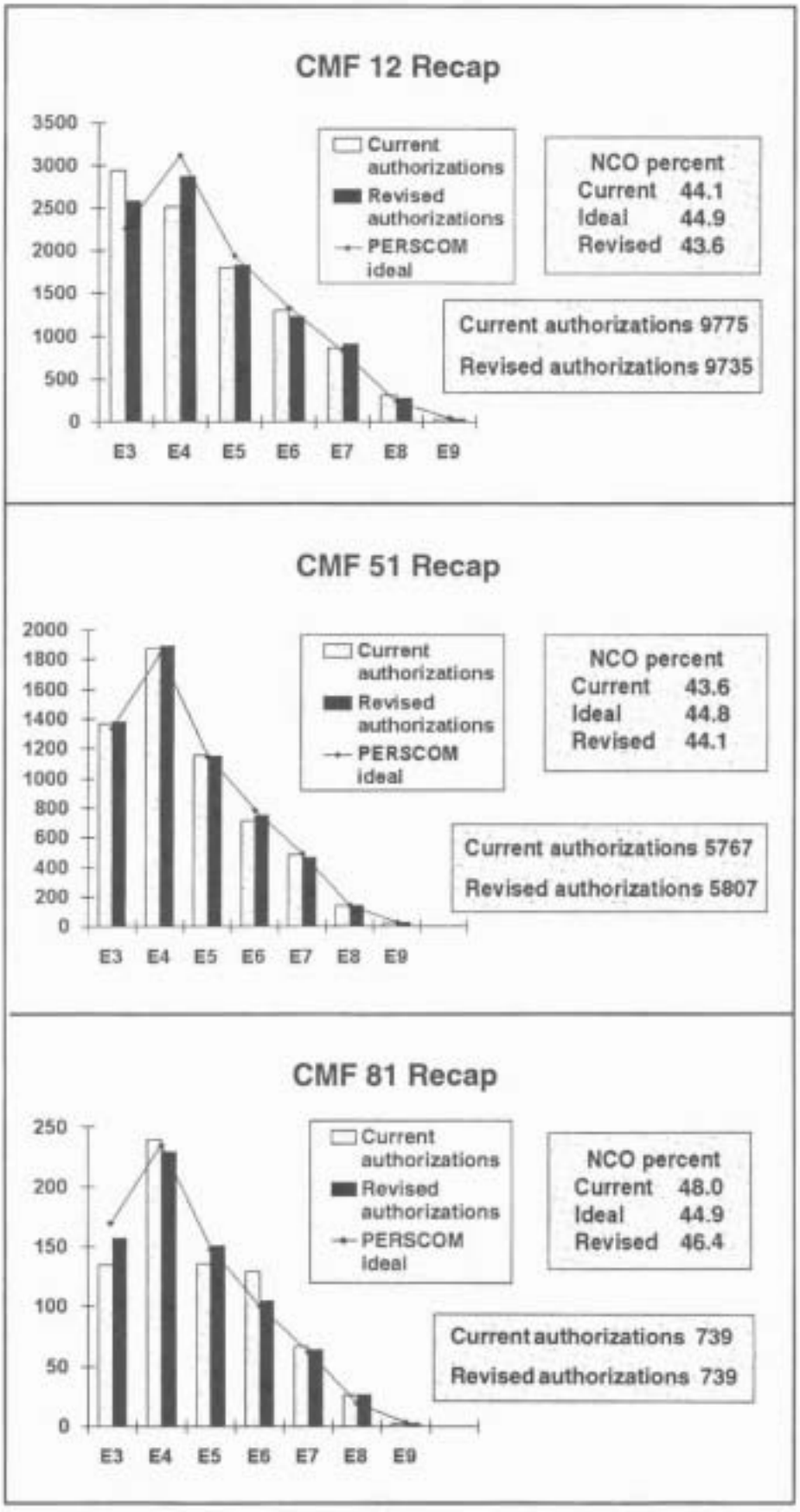
The DCSPER accepted the engineer CINCOS proposal on 21 May 1997, with an implementation date of 1 October 1998. This initiative will affect promotions early in FY98.

Career Management Field (CMF) 12. The CINCOS proposal for CMF 12 restructured 123 positions and transferred 40 staff sergeant positions to MOS 62N Construction Equipment Supervisor. The positions affected were 38 MOS 12Z Combat Engineer Senior Sergeants, who were intelligence sergeants in the battalion and brigade S2 sections. Those positions were reduced from master sergeant to sergeant first class. Thirty-eight staff sergeants in Active and Reserve Component observer/ controller positions were reduced to sergeants, because the senior NCO board believed it was within a sergeant's capability to complete that mission. As for MOS 12C Bridge Crew Members, Bosnia highlighted a requirement for a senior boat operator in our bridge units; therefore, 20 sergeants were upgraded to staff sergeants and given the title of Senior Boat Operator. The need for more skill level 10 boat operators resulted in 27 sergeant positions being downgraded to specialist. These adjustments balanced out career progression in MOS 12C. Finally, recognizing the disproportionate number of MOS 12B Combat Engineer E3's waiting for the opportunity to pin on E4 rank, CINCOS allowed 350 E3 positions to be upgraded to E4.

CMF 12 currently has an NCO strength of 44.1 percent and, after implementing CINCOS, will shift to 43.6 percent.

CMF 51. The bottom-up review revealed that in CMF 51, 30 positions from MOS 51H Construction Engineer Foreman in garrisons and Departments of Public Works could be downgraded from sergeant first class to staff sergeant, because staff sergeants possess the level of technical expertise needed to perform this function. Historically, MOS 62N displayed a poor promotion rate, and the DCSPER's guidance allowed this problem to be rectified. A total of 99 sergeant first class and staff sergeant positions were transferred to MOS 62N from MOSs across the engineer force: 54 from 51H, 40 from 12B, two from 51M Firefighter, and three from 51T Technical Engineering Specialist. Transferring these positions does not completely fix the current stagnation problem, but it improves career progression for 62N soldiers.

CMF 51's current NCO content of 43.2 percent will be increased to 43.5 percent.



CMF 81. The CINCOS review affected 20 positions in CMF 81. Ten MOS 81L Lithographic Operations Sergeant positions in battalion S3 sections shifted from staff sergeant to sergeant. Two MOS 82D Topographic Surveyor positions in the Aerospace Activity in Saint Louis and eight battalion S3 Survey Operations Sergeants were reduced from sergeant first class to staff sergeant.

CMF 81's current NCO strength of 48 percent was reduced to 46.4 percent.

Career Progression

The three bar graphs depict the changes to career progression for the Engineer Corps. PERSCOM's guidance to the EPPO is represented by a single line across the top of each graph. This ideal line provides the best career growth for a particular CMF. The light gray bars indicate total positions at the present time (August 1997). The black bars represent the changes made by CINCOS.

As indicated by the graphs, the changes being implemented bring our engineer CMFs either to the ideal line or very close to it. This means that our MOSs will offer reasonable promotion opportunities well into the future.

The CINCOS initiative does not hinder engineer promotions, reduce job opportunities, or eliminate any positions. The majority of changes to engineer NCO strength are in positions where there is redundancy of leadership and an excess of technical expertise. The CINCOS initiative allows the Engineer Personnel Proponency Office to increase both promotion opportunities and the combat readiness of the Engineer Corps.

Sergeant Major Murphy is assigned to the EPPO. Previous assignments include operations sergeant, A Company, 864th Engineer Battalion, Fort Lewis, Washington. He is a graduate of the Advanced Noncommissioned Officers Course and the Operations and Intelligence Course. SGM Murphy holds an associate degree from Perice College, Tacoma, Washington.

Marine Engineers:

Developing a Strategic Vision for Engineer Support

By Major Jay E. Johnson

For several years the U.S. military engineering community has struggled to speak as one voice and attack from a united front. As we move into the 21st century, it is time for Marine Corps engineers to move forward and prepare to support Operational Maneuver From the Sea (OMFTS), as described by the Commandant of the Marine Corps in a 1996 White Letter. This Navy/Marine Corps concept builds on the foundation laid by two earlier documents: "From the Sea" (1992) and "Forward From the Sea" (1994). These documents present landmark shifts in operational focus and a reordering of coordinated priorities for naval forces engaged in forward areas. Their objectives are to prevent conflicts and control crises in areas known as the "chaos of littorals," which refers to chaos in shore or coastal regions. OMFTS is the centerpiece of our preparations for future expeditionary, littoral, and amphibious warfare.

Principles of OMFTS

Operational Maneuver From the Sea describes the Marine Corps' concept for the future. It—

- Focuses on an operational objective.
- Uses the sea as maneuver space.
- Generates overwhelming tempo and momentum.
- Pits strengths against weaknesses.
- Emphasizes intelligence, deceptions, and flexibility.
- Integrates all organic, joint, and combined assets.

To remain a relevant military engineer force in the future, all military engineers must be able to "deal explicitly with the full spectrum of challenges that we will have to face, the dangers and opportunities created by new technologies, and the very exciting prospect of adapting the tradition of maneuver warfare, not merely to amphibious operations, but to all aspects of warfare in, and around, coastal waters." (OMFTS, 1996)

Marine Engineer Vision

With the OMFTS concept in mind, Marine Corps engineers landed 28 July 1997 on Camp Lejeune, North Carolina, to conduct the Naval Expeditionary Engineering Conference. Participating in the conference with us were guests from the Navy Seabees and Army engineers from the 20th Engineer Brigade, the U.S. Army Engineer Center, the XVIII Airborne Corps, and the U.S. Army Corps of Engineers. Our mission was to develop a common Marine Corps vision for engineer support, identify strengths and weaknesses in engineer support, and establish critical issues and objectives for engineer support. Armed with that information, we will soon develop strategies and action plans that will lead to our campaign plan for naval expeditionary engineering support to the Marine Air/Ground Task Force (MAGTF). The intent of the week-long conference was to both inform and guide the advancement of Marine engineer issues (doctrine, organization, training, equipment, and support) in the context of joint engineering and the Marine Corps development process to create a strategic plan. That plan will serve as our azimuth for the 21st century.

This was not a "typical" conference with numerous speakers where attendees reunite with old friends. Under the tutelage of Colonel Phillips, Commanding Officer of the Marine Corps Engineer School, we quickly realized that this was a working conference with a specific goal: to unite the engineer community by creating a strategic vision for the Marine Corps that encompasses and has applications across the other services.

The Marine engineer vision is to—

- Deliver focused engineering support across the total spectrum of military operations.
- Provide flexible, mobile force multipliers.
- Provide units that are sized to get to the fight with the capability of supporting sustained operations.
- Support MAGTF joint and combined operations.
- Enhance momentum, sustain the force, shape the battle, and win!

This vision is a beacon that demonstrates the Marine Corps' commitment to a joint engineer environment.

Challenge

For success in future conflicts, all U.S. military engineers must have the capability to link with the MAGTF and combine into a relevant combat force multiplier that the joint commander can bring to any mission. The full spectrum of conflict has no limits; it encompasses an asymmetrical enemy that may range from humanitarian relief to full-scale war. Engineers must be prepared to operate in a seamless, interoperable environment and have a diverse structure that is task organized to support the MAGTF and joint commands.

Opportunities

With this new challenge come new opportunities to exploit and add to our "tool box." For example, we must create new doctrine that supports OMFTS and develop or procure assets that provide adequate force protection. By tailoring our engineer capabilities to fit the mission, we will maximize our efforts and "showcase" engineers as the force multiplier for today and tomorrow.

To fill the doctrinal void, joint service engineers recently received approval to publish Joint Publication 3-34, *Engineer Doctrine for Joint Operations*. The initial draft of JP 3-34 is due out for review in November 1997. This publication outlines engineer fundamentals, organizations, planning, operations, and the capabilities of all service engineers for the joint force commander and his staff. It supplements two other joint doctrinal publications with an engineer focus: JP 4-04, *Joint Doctrine for Civil Engineering Support*, and JP 3-15, *Joint Doctrine for Barriers, Obstacles, and Mine Warfare*. These publications provide the joint force commander with the tools he needs to maximize engineer efforts and make them a true part of the joint team.

Some opportunities are already a reality. Interservice engineer training has been conducted at Fort Leonard Wood, Missouri, and other locations since October 1995, and we are developing training exercises that will strengthen our complementary capabilities with all services.

Our Marine engineer vision sets the stage for a new era of naval expeditionary engineering. Now we must revise the role, training, equipment, and structure of Marine engineers to more fully support OMFTS and joint operations. This should be done gradually in a continuous process rather than take quantum leaps that create a major event. A gradual, well-planned process will ensure that Marine doctrine and the new assets we procure adequately support and keep pace with OMFTS and the other services.

Role. The Marine engineer role is clearly defined by our four basic pillars (mobility, countermobility, survivability, and general engineering). These pillars will not change. However, we require further amplification on how our role will support the evolving tactics and operations required for OMFTS. First we must develop tactics, techniques, and procedures (TTPs) that will help define the engineer role in supporting OMFTS. Then we must test and validate our TTPs and inform the MAGTF of our capabilities. Until the Marine engineer role in supporting OMFTS is clearly defined, we should not develop a unified priority list relative to funding, personnel, equipment, and training.

Training. As MAGTF tactics evolve, we must reorient Marine engineer training to support OMFTS. If we do not adequately train Marine engineers to support the OMFTS, we will cease to be a combat multiplier in joint environments. It is critical that we revise and modify the current engineer training program of instruction and individual training standards at our formal schools and Fleet Marine Force units to sustain OMFTS.

Equipment. Current equipment and resources do not provide Marine engineers sufficient capability to support the MAGTF or the joint community. We must review the MAGTF table of equipment with regard to ground tactical mobility requirements and develop an armored engineer vehicle for use in highly mobile environments. One option may be to develop an engineer variant of the Advanced Amphibious Assault Vehicle. We must develop a united Marine engineer Program Objectives Memorandum strategy to procure equipment that supports OMFTS and joint missions, or we will continue to be left scrounging for crumbs at all future congressional funding hearings.

Structure. Finally, the current organization of Marine engineer units may not adequately support future operational concepts of OMFTS and joint missions. To be effective, Marine engineer units must be structured to support the dynamics of the MAGTF, OMFTS, and joint commands. We must formulate an analysis tool to validate future operation concepts in their planning stages. These analyses should indicate how to revamp the Marine engineer structure to fully support OMFTS and joint operations.

Setting the Course

The July 1997 conference was successful in that it gave our engineer community a shot in the arm or wake-up call upon which we can build for the future. We Marine engineers now must focus on our vision and implement an engineer campaign plan. An engineer steering group (consisting of six colonels, one Navy captain, and one GS-15 civilian) was introduced at the end of the conference. This group will guide our community; the executive-level decision makers; Headquarters, Marine Corps; the Marine Corps Combat Development Center; Marine Corps Systems Command; and Marine forces in accomplishing this mission.

As the conference came to a close, we were reminded to "be patient, work the tactical issues, and spread the word of our campaign plan." That plan will unite our engineer community as one voice and not only support but lead the way in OMFTS for others to emulate.

Major Johnson serves as commanding officer, Engineer Equipment Instruction Company, Marine Corps Detachment, U.S. Army Engineer Center, Fort Leonard Wood, Missouri. He previously served as Combat Engineer Company Executive Officer, Combat Assault Battalion; Engineer Support Company Commander; S4, 3rd Combat Engineer Battalion, 3rd Marine Division, Okinawa, Japan. MAJ Johnson holds a master's degree from Webster University.



Training Combat Engineers the OSUT Way

By Captain Lawrence Farrell

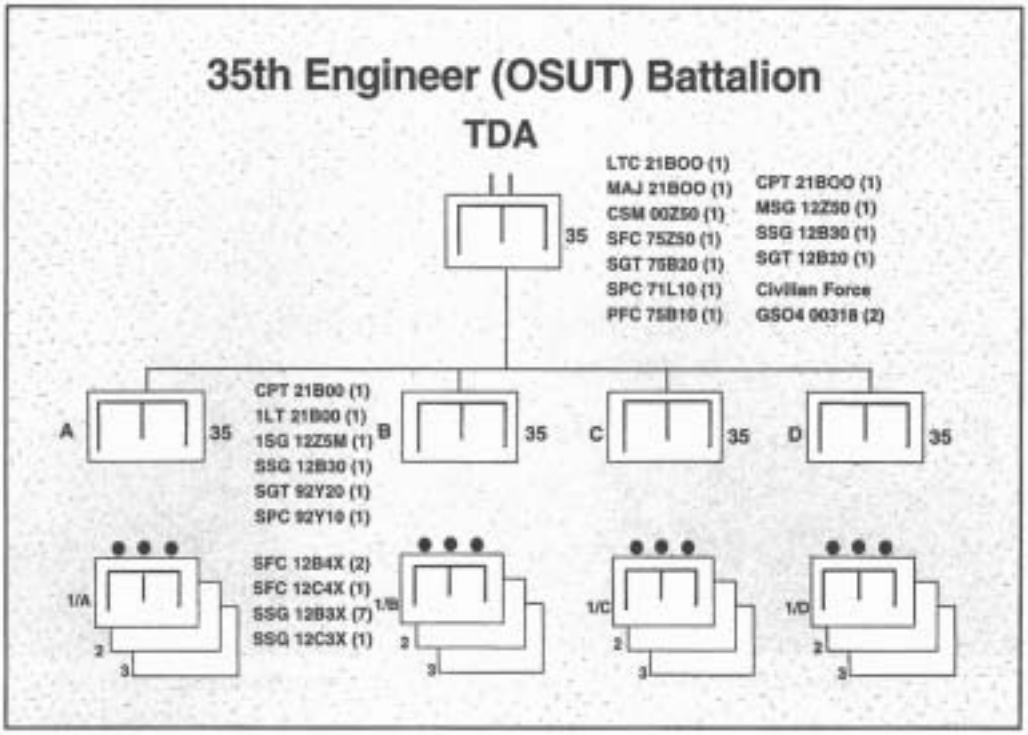
30 March 1997, 10:05 hours: CPT Striker was not pleased; his armored vehicle-launched bridge (AVLB) maintenance readiness rate was 49 percent for the month. When he briefed the company's highlights, the battalion commander wanted to know if all the AVLBs had two soldiers assigned to them. Striker answered, "No." Irritated, the battalion commander asked, "Why don't you fully man your AVLB crews?" CPT Striker's reply was, "Sir, I am at 85 percent strength. If I fully man my AVLBs, I won't have six trained engineer squads for the upcoming National Training Center rotation." The battalion executive officer interjected, "Your company is getting six new 12B soldiers today from the replacement center. That should help alleviate your personnel problem."

Later, as CPT Striker walked into the company orderly room, the first sergeant approached and said, "Sir, here are Alpha Company's six soldiers." Half-seriously, CPT Striker asked two of them, "How much AVLB training do you have?" The first soldier replied, "Sir, I have three hours of stick time in an AVLB." The second soldier answered, "Sir, I have nine hours of stick time in an AVLB." CPT Striker was more than a little confused. He asked his first sergeant, "Top, did both of these soldiers graduate from the same 12B school at Fort Leonard Wood?"

Training Structure

This article provides an update of the current combat engineer career management field (CMF) 12 training at Fort Leonard Wood. Unlike other engineer training there, combat engineer training is not a joint effort among the four services. It is only offered to Army soldiers.

All CMF 12 training conducted at Fort Leonard Wood occurs in a One-Station Unit Training (OSUT) environment—the Army's method of combining basic combat training (BCT) with advanced individual training (AIT). OSUT provides the following benefits:



- It is relatively inexpensive compared to other training. Soldiers performing OSUT at Fort Leonard Wood do not travel between posts during BCT and AIT. However, soldiers who graduate from BCT at Fort Jackson, South Carolina, are shipped to different posts around the country for AIT. Besides the obvious savings on travel costs, many hidden expenses are saved in an OSUT environment. For example, soldiers do not draw and clear equipment from the central issue facility twice or obtain a set of orders for each type of training. When viewed on an Armywide basis, the time, money, and effort saved quickly become enormous. OSUT also allows the unit to focus on additional training.
- It allows units more time to mold and train soldiers than BCT, which lasts only eight weeks. With OSUT, engineer companies keep soldiers from reception to graduation. The two OSUT engineer battalions at Fort Leonard Wood—the 35th and the 169th—have identical tables of distribution and allowances and both are part of the 1st Engineer Brigade.

OSUT companies are authorized 17 permanent-party soldiers: 11 drill sergeants and six headquarters personnel (see figure). One drill sergeant is always off because of charge of quarters, leaving 10 available for training. Each company is structured to have three platoons at full capacity with three or four drill sergeants in each platoon. OSUT companies have the same standards as any other unit in the U.S. Army. They have brigade, battalion, and post inspections as well as the more routine requirements (such as officer and NCO development classes, mandatory training requirements, family support group meetings and activities, and a variety of other events). When these responsibilities are viewed collectively, it is understandable why drill sergeants earn an additional $275 per month as "Special Duty Pay."

Training Phases

OSUT is divided into five phases. Phases I through III occur in BCT and Phases IV and V occur in AIT. Although not the official names of each phase, the following descriptions accurately portray the training soldiers receive.

Phase I: Soldierization and Common Task Training

Phase II: Weapons Training

Phase III: Fire and Maneuver Training

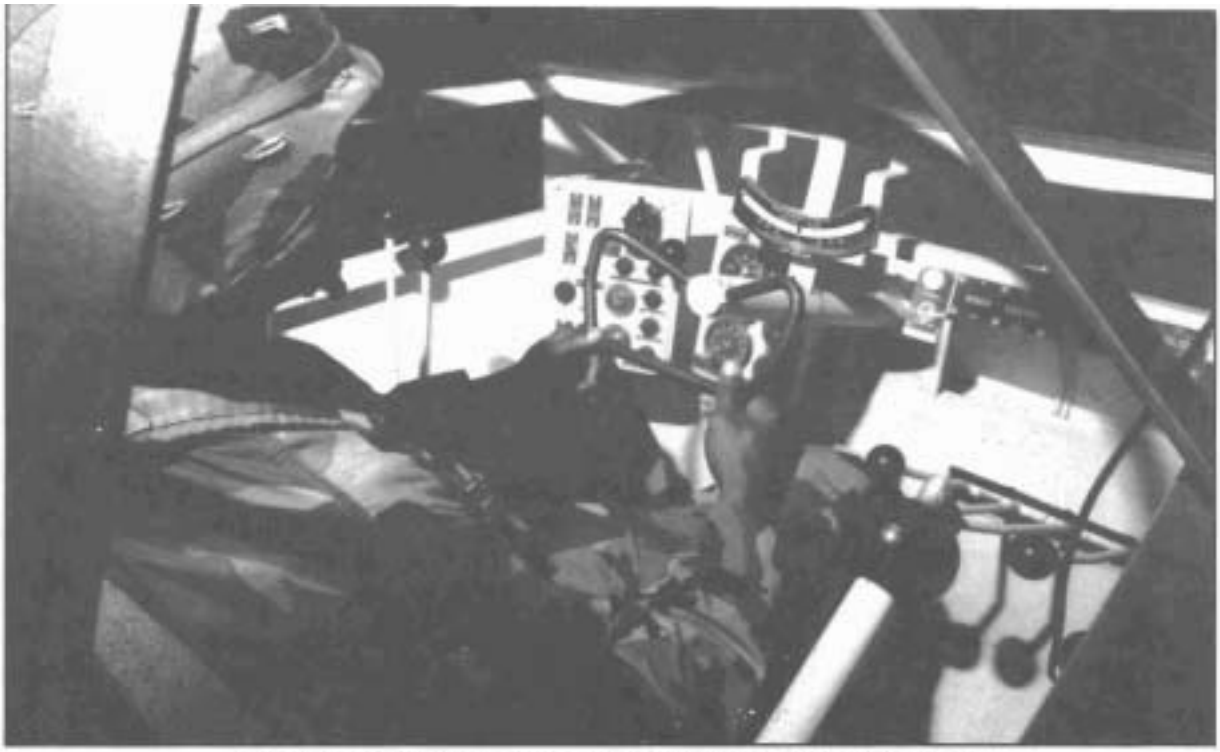
Phase IV: Light Engineer Training

Phase V: Mechanized Engineer Training

BCT Phases

Phase I. Soldierization lasts 14 days and focuses on basic soldiering skills. It includes more than thirty subjects, such as drill and ceremony; wearing and appearance of the Army uniform; first aid; map reading; nuclear, biological and chemical procedures; Army family team building; and environmental awareness. Soldiers train continuously for 14 days and are constantly in the drill sergeant's presence. This is the most critical training phase, because it provides the foundation on which all follow-on training is based.

Phase II. Weapons training lasts 11 days and teaches soldiers to properly fire, maintain, and qualify on the M16A2



A soldier trains on the AVLB simulator in an indoor environment.

semiautomatic rifle—a requirement for successful phase completion. It also familiarizes soldiers with other weapons, such as the M203 grenade launcher, the M249 semiautomatic machine gun, and the M60 automatic machine gun.

Phase III. Fire and maneuver training introduce soldiers to live-fire ranges and grenades and their first field problem. During this phase, soldiers are aggressively and repeatedly tested on their ability to shoot, move, and communicate.



OSUT training includes training with mine-detection systems.

They train at five live-fire ranges to hone this skill. Soldiers must qualify on two hand-grenade ranges—live-fire and combat assault (inert)—to successfully complete this phase.

At the end of Phase III, soldiers must pass two more tests to move into the AIT portion of the OSUT cycle. They must score at least 80 percent on the End-of-Cycle Test, which serves as a final exam for BCT and ensures that each soldier knows how to execute basic combat tasks on the battlefield. Soldiers must also pass the Army Physical Fitness Test (APFT) according to BCT standards, which differ from regular Army standards. A minimum score of 50 percent in each tested category is required, which is a challenging requirement.

There is no Army requirement concerning physical fitness for soldiers enlisting in the Army. The only weight requirement states that they cannot be more than 60 pounds over their maximum allowed weight. If an overweight soldier enlists in the Army, he is placed on the overweight program and treated like any other soldier. In today's society, where physical fitness and total health are not highly valued or emphasized, many soldiers cannot successfully complete one push-up when they arrive at the reception station.

Soldiers who complete all the BCT requirements are awarded a weekend pass, which is the only pass given during the entire cycle. It is a motivational tool for the advanced individual training that is about to begin.

Phase IV. Light engineer training includes 13 days of demolitions and land mine warfare training. During demolitions training, soldiers learn to properly construct electric and nonelectric firing systems and to detonate demolitions. They participate in two demolitions ranges to test their proficiency in these tasks. Then they are taught the fundamentals of mine laying and mine clearing with a variety of antitank mines.



In simulated mine training, recycled tires are used in place of traditional sawdust.

Phase V. Mechanized engineer training, which lasts 10 days, consists of M60 chassis training, AVLB emplacement, and armored combat earthmover (ACE) operations. Class size is extremely important during this phase. Simply stated, the fewer soldiers in a class, the more driving time per soldier, which answers CPT Striker's question in the opening scenario.

The military occupational specialty (MOS) 12B Combat Engineer program of instruction states that the minimum, optimum, and maximum class sizes are respectively 135, 150, and 200 soldiers per company. Often, these classes are either overbooked or not filled at all. During the summer and fall, many classes have more than 250 soldiers per company because of the large number of soldiers who enter the service after high school graduation. From November to May, classes are small due to the limited number of recruits. The Engineer School tries to prevent this accordion effect, but potential recruits usually enlist in whichever service has the quickest opening (and paycheck). Competition is especially keen between the Marines and the Army, because both services have similar combat MOSs and are often recruiting the same potential enlistees.

The last three major events of AIT are the End-of-Cycle Comprehensive Test (EOCCT), the five-day field training exercise (FTX), and the APFT according to regular Army standards.

To successfully complete the EOCCT, soldiers must score a "GO" in every category. Every aspect of the 12B POI, including M9 ACE and AVLB employment, is tested. This is accomplished by using realistic simulators and training aids, which are fabricated at the local Training Support Center. They provide soldiers the opportunity to train and be tested on equipment in an indoor environment.

After the EOCCT, soldiers must complete the combat engineer FTX and APFT. These two events are conducted using the same standards as a regular modified table of organization and equipment unit. Once soldiers successfully complete these events, normal outprocessing occurs and they graduate from OSUT.

Team Training

The training that each MOS 12B soldier receives at Fort Leonard Wood is challenging, realistic, and demanding. The Engineer School continually reviews and adjusts the training and subjects taught to meet demands of the modern battlefield. Suggestions and input from warfighting units are requested regularly. For example, before 1995, MOS 12B soldiers received training on the Bailey bridge. However, this instruction was eliminated when the Engineer School consolidated MOSs 12B and 12F and determined that more critical tasks should be taught in the time allowed. The "demise" of the combat engineer vehicle and requests from field units caused two days of Bailey bridge training to be reinstated into OSUT.

Each year more than 3,500 combat engineers are trained at Fort Leonard Wood. The soldiers come from unique backgrounds and circumstances, but each is expected to meet the same standards. These standards could not be met without the hard work and dedication from the team of quality civilians and soldiers who train them. The caliber of the combat engineers entering the Total Army force today is a direct reflection of this team-training approach.

Captain Farrell is commander of Alpha Company, 35th Engineer Battalion (OSUT), Fort Leonard Wood, Missouri. He was previously assigned to the 44th Engineer Battalion (Mech), Camp Houze, Korea, and has served combat tours in Saudi Arabia (Operations Desert Shield and Desert Storm) and Somalia (Operation Restore Hope). CPT Farrell holds a degree in civil engineering from Virginia Military Institute.

Photographs by Jim Ray, TSC, Fort Leonard Wood.

Operation Desert Strike: An Engineer Commander's Perspective

By Lieutenant Colonel Gregory S. Kuhr

In September 1996, the National Command Authority ordered an Army brigade combat team (BCT) to deploy to Kuwait in response to Iraqi military actions against Kurdish minorities in northern Iraq. The 1st Cavalry Division's 3rd "Greywolf" BCT responded, along with its supporting 8th Engineer Battalion. The 3rd BCT already had a task force in country as part of the normal Central Command rotations, so it deployed an additional armor and infantry task force with supporting arms. This article describes the deployment from an engineer commander's perspective and highlights lessons learned during each phase of the operation.

Pegasus Strike

Now that deploying to a theater and drawing pre-positioned sets of equipment is becoming the norm for many units, commanders must develop deployment plans to adequately prepare for these missions. Since deployment readiness is the top priority for the 1st Cavalry Division, it has developed an excellent deployment standing operating procedure (SOP). Known as *Pegasus Strike*, it is continuously refined as each redeploying unit offers new lessons learned. The SOP has five subelements:

- Pegasus Point - all deployment preparations through departure from home station.
- Pegasus Landing - reception, staging, onward movement, and integration of all forces.
- Pegasus Fury - combat operations.
- Pegasus Calm - regeneration of pre-positioned equipment and transport of unit equipment and personnel to the home station.
- Pegasus Recoil - full recovery of equipment and personnel.

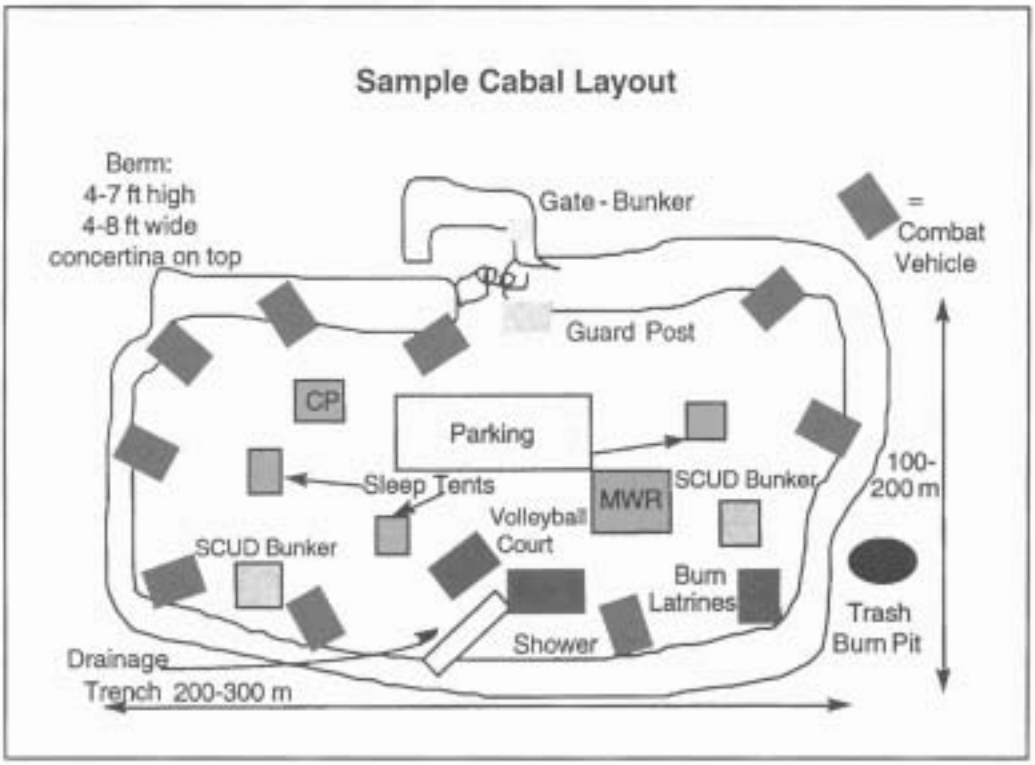
Pegasus Point. Personnel availability is an immediate concern for deploying commanders. The goal is for all units to be at 90 percent personnel strength or more. We were at 94 percent, but once the deployment criteria were established, we were 54 soldiers short of the objective. Additional soldiers were attached from the engineer brigade's other two battalions. Company commanders verified the soldiers' deployment readiness and integrated them into their units. Their families were added to the rear detachment notification rosters and family support group telephone trees.

Lesson Learned: Deploying commanders must develop a plan to integrate attached soldiers into their units. This plan must address not only soldier readiness but also inclusion of families into rear detachment notification rosters and the company family support group structure.

In the 1st Cavalry Division, commanders track deployments daily with charts (weapons qualifications, training and personnel status, and family readiness). Standards are detailed in the



The Volcano mine-laying system proved to be a significant force multiplier in a desert lacking obstacles to limit cross-country movement.



Pegasus Strike SOP. When called to deploy, a commander can immediately assess current posture, identify shortcomings, and develop a plan to attain the standard.

After establishing the deployment criteria, the rear detachment was formed from personnel identified as nondeployable. A rear detachment order addressed physical security, equipment maintenance, and property accountability.

To prevent a maintenance backlog, our home station fleet of more than 150 prime movers must be maintained during the deployment. The fleet consisted of 29 M113A2 armored personnel carriers, 12 armored vehicle-launched bridges (AVLBs), 21 armored combat earthmovers (ACEs), 29 HMMWVs, and 13 HEMMTs. The rear detachment order included instructions for exercising and maintaining the equipment on a weekly basis.

Our direct support work was transferred to a forward support battalion (FSB) that did not deploy. The engineer brigade gave the FSB a priority for the work, and it was understood that some assets would be dedicated to meet this requirement.

AR 750-1, *Maintenance Operations*, allows services to be postponed and vehicles put into administrative storage; however, our command decided to leave a maintenance NCO and a prescribed load list clerk behind to supplement four nondeployable mechanics. The rear detachment performed wheeled services, and we performed services for tracked vehicles and engineer equipment when we returned.

Lesson Learned: Ensure your rear detachment has an order or SOP that describes its duties and responsibilities, especially in the areas of physical security, equipment maintenance, and information dissemination to families.

Our family support groups were very active before deployment. Commanders ensured that all soldiers, including those attached from another battalion, were on telephone lists. Each soldier provided a strip map to his house in case of an emergency. NCOs talked to soldiers about managing bills and other affairs while they were deployed. A nondeployable senior NCO was designated the battalion's command financial specialist to assist families with financial problems.

Lesson Learned: Single soldiers residing off post frequently do not have anyone to manage their affairs during deployment. They must make arrangements for their apartment, utilities, telephone, cable, etc.

We contacted the Army War Reserve (AWR)-5 contractor, ITT Corporation, to determine what equipment could be drawn out of the AWR-5 at Camp Doha, Kuwait. Equipment not available was considered "to-accompany-troops (TAT)" equipment, which must be air-loaded. We compared equipment available from the AWR-5 with our authorized modified table of organization and equipment (MTOE) to produce an initial list of TAT equipment. This list was reduced through mission analysis and the availability of 463L pallets. After the BCT decided on a final TAT list, each company movement officer built an authorized unit equipment list in the Transportation Coordinator's Automated Command and Control Information System.

Lesson Learned: You cannot draw or ship all authorized equipment just because it is on your MTOE. Conduct a mission analysis to determine essential equipment and prioritize its shipment as TAT.



All cabals were constructed with a serpentine entrance in order to slow approaching vehicles.

Alpha Company, 8th Engineers, which had been in country since August 1996, found that dozers were essential, because the ACE lacked sufficient power to cut into hardpan soil beneath the top 1- to 2-foot layer of sand. However, dozers require an M916 truck and trailer to move between distant sites, and divisional engineer battalions have neither operators nor mechanics for dozers and M916s. Before deploying, we trained 10 ACE operators on basic dozer operations, and when we arrived in country, we drew five dozers and trained the ACE operators on the job. We also drew an M916 and an M920 truck with 40-ton lowboy trailers and used soldiers already licensed on the equipment to operate them. Our mechanics learned to troubleshoot and repair the equipment as problems arose. Now engineer battalions within the division are directed to incorporate dozer training in their training plans.

Lesson Learned: Engineer units must be versatile and able to adapt to the METT-T (mission, enemy, terrain, troops, and time available) conditions to ensure their missions are accomplished. Deployments cause units to stretch their capabilities, so leaders must be flexible in their problem-solving processes.

Pegasus Landing. The goal is for each company's pre-positioned set of equipment to be drawn within six hours of the company's arrival at Camp Doha. Major tasks during the draw include:

- The operator performs before-operation preventive maintenance checks and services on all equipment.
- The company draws weapons; supplies; and sets, kits, and outfits.
- The company commander signs for equipment on a master hand-receipt.

Home station load plans for equipment and supplies could not be used because models and quantities of some of the available equipment differed (for example, the M113A3 at Fort Hood differed from the M113A2 available in AWR-5). Some items had to be left behind for a return trip, including part of the Class III package materials and much of the Class IV barrier materials.

Lesson Learned: Home station load plans cannot always be applied to the pre-positioned fleet. To expedite the equipment draw, units should scrutinize the unit basic load for all classes of supply and make a tentative plan before the deployment.

Before initiating training, units were allowed 10 days to complete inventories, finalize hand receipts, and build cabals (see figure on page 15). A cabal is a tactical assembly area (TAA) with a 6- to 8-foot berm that defines a company's perimeter and enables it to establish a force-protection scheme (traffic flow, crew-served weapons, and perimeter security). Tents were set up, field latrines and showers emplaced, trash burn pits constructed, weapon-firing platforms and serpentine entrances built, and soldiers acclimatized to the weather.

Pegasus Fury. To prepare the force for all possible missions, an aggressive training program was initiated after the 10-day acclimatization. Units began with individual training, which included weapons qualification, common task testing, and military occupational specialty training. This evolved sequentially to squad, platoon, company, and battalion situational training exercises. The following eight-step training model was used:

1. Plan the training
2. Train/certify the leaders

3. Reconnoiter the training site
4. Issue the plan
5. Rehearse
6. Conduct the training
7. Conduct the after-action review
8. Perform retraining

The brigade commander established five priorities which were discussed daily among commanders: force protection, quality of life, safety, training, and maintenance.

Force Protection. Throughout the deployment, force protection was paramount. Several reports of threats made by terrorist organizations against U.S. soldiers in Kuwait were taken seriously due to the recent bombing of the Khobar Towers in Saudi Arabia. In the cabals, each unit maintained 25 percent security around the clock, crew-served weapons and night vision goggles were mandated, and ammunition was carried in magazines but not loaded. No single-vehicle convoys were authorized outside of the brigade's TAA unless approved by a battalion commander. The brigade's entire TAA was secured with manned checkpoints to control unauthorized access and ensure that civilian vehicles (such as water trucks) were escorted.

Lesson Learned: A strong force-protection posture serves as a deterrent for external threats.

Quality of Life. We worked hard to improve our quality of life. Lights and wooden floors in tents, hot water for showers, video players and televisions for each company, tables and benches for eating areas, sports competitions, and unit barbecues kept the soldiers involved in improving their facilities and made life in the desert bearable.

Lesson Learned: Quality of life is a morale builder and force-sustainment issue.

Safety. We emphasized safety in every activity, beginning with a risk assessment and implementation of control measures to make the risks acceptable. We conducted classes to remind soldiers of basic safety precautions. Topics included everything from operations (weapon misfires, vehicle maintenance, etc.) to personal care (preventing dehydration, field sanitation, etc.).

Lesson Learned: The key to safe training is for commanders to religiously conduct risk assessments and implement risk-management controls.

Training. The brigade commander wanted soldiers to consider this deployment the best training they had ever experienced. Weapons qualification ranges were constructed from bare desert, and the live-fire and fire-control exercises challenged crews with an assortment of targets. All weapons were brought into the "fight" and often combined the dismounted infantry with the M1A1 Tank and the M2 Infantry Fighting Vehicle. The combined arms team participated in all aspects of the training, which included artillery impacting just forward of the friendly units, engineers firing MICLICs or blowing demolition charges while covered by maneuver forces, and smoke tracks laying down a heavy screen of covering smoke. Soldiers looked forward to getting on the range, because it was challenging and exciting.

Maintenance. Commanders ensured that proper preventive maintenance was conducted and intensively managed all pacer and combat-essential deadlining deficiencies.

Pegasus Calm. Toward the end of the deployment, we focused on regenerating the AWR-5 equipment set so it was ready for reuse in combat when we turned it in. We established a command post at Camp Doha to receive convoys from the desert, manage the limited facilities, track the regeneration process, and troubleshoot problem areas. Because limited facilities at Camp Doha forced the brigade to sequence its units through regeneration, normal brigade command and control nodes continued to operate in the field. Thus, the 8th Engineer Battalion received the mission to control regeneration operations for the brigade. We did not regenerate other units' equipment, but assigned responsibilities, set up schedules, designated facilities, communicated standards, and tracked and reported progress. The task force and company commanders were responsible for meeting the regeneration standards and timelines.

Lesson Learned: Regeneration is like any combat mission. Assigning a controlling headquarters significantly aids communication flow, adherence to standards, scheduling, and reporting.

Wheeled convoys and heavy equipment transports carrying tracked vehicles were escorted to Camp Doha's primary turn-in lot, where the regeneration process and schedule were briefed to commanders. Every option was considered to bring nonmission-capable (NMC) equipment to a fully mission-capable (FMC) status, including local repair or purchase of parts, controlled substitution between vehicles, and parts shipment from the states.

Lesson Learned: Regeneration is not just turning in equipment to the AWR-5 contractor. It is getting the fleet ready for quick reissue if an operational emergency arises. Set a goal to regenerate the fleet to the highest standard possible, then intensively manage all NMC equipment.

The 8th Engineer Battalion developed a system using a Microsoft Excel spreadsheet to track the brigade's operational readiness (OR) rate as equipment was turned in. We established a file for each company and when their OR rates were updated, the



At the Camp Doha washrack, a soldier cleans his M113 thoroughly prior to a technical inspection.

spreadsheet automatically reflected a revised OR rate for them, the battalion, and the BCT. This data allowed the brigade to focus maintenance resources on companies or equipment with problems.

Perhaps the most demanding task during regeneration was managing the life support area. Insufficient facilities at Camp Doha required that units redeploy from the desert in a sequential manner. The camp could accommodate approximately 2,200 soldiers, but there were more than 4,000 in the brigade. The battalion established a billeting plan and arranged for sufficient latrines and showers. When a company regenerated its equipment, it moved out of the billets (warehouses with beds) and into holding areas (also warehouses) until the unit departed for the airport. This movement allowed another unit to begin its regeneration process.

Lesson Learned: The life-support requirements must be closely managed to ensure that the commander's intent for mission accomplishment is met.

Pegasus Recoil. As companies completed the regeneration process, home-station equipment was prepared for shipment and soldiers were manifested for the return flight. When possible, companies from the same battalion were manifested on the same plane to facilitate the family support group reception at Fort Hood.

Back at Fort Hood, recovery was the battalion's immediate concern. Tasks to be accomplished included:

- Re-establish property accountability to first- and second-line supervisors.
- Inventory all TA-50 equipment and make appropriate adjustments.
- Recover equipment that was shipped.
- Re-establish the unit maintenance program.
- Designate compensatory time for soldiers to recover with their families.
- Ensure the unit's deployment readiness is back to standard as soon as possible.
- Assign new soldiers who arrived at Fort Hood during the deployment.
- Prepare NCO Efficiency Reports for soldiers attached to the battalion from a sister unit.

It took at least three months to get equipment back to standard and allow soldiers to fully recover. We were exempted from additional missions, or it would have taken even longer.

Lesson Learned: Allow sufficient time to fully recover after a deployment. Develop a plan of tasks to be accomplished, establish milestones, and work to meet your goals.

Conclusion

The deployment to Kuwait reinforced the 1st Cavalry Division's deployment standards and methodology. *Pegasus Strike* enabled us to think ahead and develop plans for each follow-on phase of the operation. The lessons we learned will not only contribute to further development of the division's deployment procedures but will also help other units prepare for deployments in the future.

Lieutenant Colonel Kuhr is a Regimental Tactical Officer at the U.S. Military Academy, West Point, New York. Previous assignments include Commander, 8th Engineer Battalion; Deputy Commander, New Orleans District; S3 and XO, 2d Engineer Battalion, Korea; and Senior Engineer Observer Controller, National Training Center, Fort Irwin, California.

Letter to the Editor

The Engineer Reconnaissance Platoon: Overcoming the Lack of Engineer Reconnaissance Assets

Mr. Sayer's article (*Engineer*, August 1997, page 46) presents some interesting concepts on engineer-specific intelligence gathering. However, just down the block from the AWE's 299th Engineer Battalion, the 8th Engineer Battalion of the 3rd (Greywolf) Brigade, 1st Cavalry Division, has been practicing a variant of engineer reconnaissance for the past three years.

My battalion recognized the same need for timely engineer-specific intelligence that Mr. Sayer identified. We attacked the problem by attaching sappers from the line companies to both the task force scout platoons and the brigade combat observation lazing teams (COLTs). Typically, each line company would attach two sappers from one platoon to their task force scouts and the other platoon would attach two sappers to the brigade COLT section (12 soldiers/6 teams per BCT).

The soldiers were senior specialists or junior sergeants, and they trained with their supported element for a 9-month period, beginning with the ramp-up for a National Training Center (NTC) rotation and culminating with the NTC rotation. They conducted as much joint training as possible, ranging from daily PT to advanced scouting techniques.

These engineer augmentees painted a detailed picture for each task force and the brigade as a whole. Each sapper operated with a different scout section or COLT that covered engineer-specific named or targeted areas of interest. This typically yielded four sets of engineer eyes in each task force sector (two teams of two soldiers), and they provided detailed reports on such activities as enemy defensive preparations or breaching attempts on friendly obstacles. The sappers operating with the COLTs proved to be extremely valuable, because they were usually air assaulted to their outposts (OP) and were therefore much more survivable than their scout counterparts.

I think this is a more feasible solution to the engineer scout dilemma than Mr. Sayer's. First, it is something that each mechanized engineer battalion can do now, without having to wait years for modified table of organization and equipment (MTOE) changes. Second, although taking these soldiers "out of hide" decreases the line companies' ramp strength, this loss is minimal and is greatly outweighed by the timely and accurate intelligence that the scout-sappers generate. Third, this plan yields twice as many engineer OPs as does the proposed engineer reconnaissance platoon, increasing both their survivability and intelligence-gathering capability. Finally, this option only requires half as many soldiers and none of the specialized equipment that the reconnaissance platoon mandates. In light of today's ever-decreasing budgets and troop strengths, this augmentation plan appears to be a much more realistic option.

Captain Mark A. Geraldi
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Author's reply:

I appreciate your comments concerning the 8th Engineer Battalion's decision to implement a scout capability. Your experience is another example of many minds recognizing a common problem. Attaching scouts to the task force scouts and brigade COLTs is one method I considered but ultimately rejected. There were four reasons for this rejection.

- I don't think this method is sustainable in the long term. There would be no engineer presence within the scout training plan except when a unit is preparing for deployment to the National Training Center.
- I don't think engineer skills would be maintained when engineers are attached to maneuver units.
- Attachment does not allow the engineer commander enough influence over the employment of this costly asset. The engineer companies and battalion are, in fact, taking these soldiers out of hide, and I think the battalion should retain greater command and control of them.
- As stated in my article, the level of training these soldiers receive is directly tied to their ability to survive on the battlefield. When attached to different units, there is no method to verify that their knowledge, skills, and abilities meet the requirements for combat employment.

Additionally, you state that your method provides more eyes to cover the task force area. The method I propose delivers eight engineers to each task force. As I understand your method, four soldiers from each company are provided for the reconnaissance mission, with two soldiers going to the supported maneuver task force and two going to the COLTs. Therefore, each individual scout would be task organized to separate scout and COLT teams. I have always been uncomfortable with assigning missions to elements without back-up. Your method provides six sets of eyes with the brigade COLTs (one team of two soldiers from each line company), totaling 12 sets of eyes within the brigade boundary. My method provides eight sets of eyes (soldiers) for each task force, totaling 24 sets of eyes on the brigade battlefield, with engineer scout teams assigned to the COLTs based on mission requirements and METT-T. While this method costs more in terms of manpower and equipment, I feel that the benefits of the redundancy outweighs the cost.

Finally, I believe that activating the scout platoon as depicted in my article probably is less difficult than you think. The commander can get the additional HMMWVs and radios needed to equip the platoon (probably the most difficult items to acquire) by listing those items as a commander's requirement within the battalion MTOE documentation. Possessing sufficient organic vehicles and communication assets is critical for accomplishing scout platoon missions. As you state, the teams co-located with COLTs probably would arrive at their positions by air insertion. While this method provides short-term benefits insofar as insertion is concerned, sustaining the teams after insertion becomes more difficult if they are discovered or sustain combat losses. In that scenario, any scout who is injured or who is required to evade the enemy is limited to a foot-march egress from his position. The availability of air assets to withdraw scouts is questionable at best. Duty to our soldiers requires better planning than "I hope that..." Too many times we have seen soldiers "die of wounds" or be overrun because their extraction was only cursorily planned or executed without planning. Many units at the NTC struggle to accomplish this critical mission, and very few succeed.

Again, thank you for contributing your ideas and continuing the discussion on this important topic.

Michael W. Sayer

ENGINEER COMPANY OPORDS

By Captain Joseph F. Birchmeier

Company operations orders (OPORDs) provide subordinate company leaders a clear visualization of tasks the company must accomplish for an upcoming operation and describe how the commander expects to accomplish them. Appendix B of FM 5-71-2, *Armored Task-Force Engineer Combat Operations*, includes a good example of a company OPORD. However, the OPORDs prepared by many company commanders who train at the National Training Center (NTC) do not include details their units need to be successful during the mission. This article focuses on problem areas that I have observed in company OPORDs.

Planning the OPORD Briefing

Before the OPORD briefing, the commander must decide—

- Who will attend.
- When it will be given in relation to the task force (TF) OPORD briefing.
- What briefing products will be used.
- What products will be issued to the platoons.

Attendees. My recommendation is that the first sergeant, platoon sergeants, platoon leaders, and a company command post (CP) representative attend the company OPORD. For defensive operations, the NCO providing engineer expertise at the Class IV/V point also should attend.

The platoon sergeants provide each platoon another set of ears at the OPORD to ensure that all information is captured. Their presence gives the commander immediate access to some of the most experienced personnel in his unit to quickly spot problems with the company's plan. They will also hear paragraph 4, which the platoon leaders will expect them to execute.

A representative from the company CP also should attend the OPORD briefing, so he can take any changes back to the CP.

Briefing Time. I believe the commander should issue the company OPORD before the TF OPORD to capitalize on the company's ability to parallel plan with the TF. This sequence allows platoon leaders to link up with the supported company team immediately after the TF OPORD to help develop the company team OPORD. If the platoons remain under the engineer commander's control during the upcoming mission, platoon leaders can continue their troop-leading procedures.

Briefing Products. At a minimum, a commander should use the modified combined obstacle overlay (MCOO), the situation template (SITEMP), the fire support overlay, TF maneuver graphics, and the obstacle overlay, if applicable, during his OPORD. The combat service support (CSS) overlay should also be used, if available.

The commander should provide a hard copy of the company OPORD to platoon leaders, or at a minimum, he should provide a copy of the OPORD form so they can fill in the blanks. The commander should also provide the SITEMP (if not provided with one of the company's warning orders), the fire support and CSS overlays, maneuver graphics, pertinent terrain products (such as Terrabase), and the obstacle overlay, if applicable.

Before beginning an OPORD, commanders should require that platoon leaders post the maneuver graphics on their maps and allow them to make notes on the overlay. This information will help them understand the OPORD. The commander may also require that platoon leaders provide the current status of personnel, equipment, and supplies (to include demolitions, small-arms Class V, and marking materials) before the OPORD. The status reports provide an early warning of potential "show stoppers" that may need immediate attention or require changes to his plan. Information that the commander requires from platoon leaders should be in the unit SOP. The commander should issue his OPORD from a location that helps platoon leaders visualize the upcoming mission. It is not always possible to issue an OPORD on terrain overlooking the objective; however, if terrain leading to a key pass through which the unit will maneuver is visible, the view will greatly assist platoon leaders.

Paragraph 1

This paragraph often lacks sufficient detail and contains several problem areas.

First, many commanders do not discuss the impact of terrain on breaching operations. For example, based on an analysis of the terrain, they should indicate where the use of mine-clearing blades will be restricted because the soil is too rocky or undulating. Platoon leaders must understand this information, especially if they will be task organized to a company team, so they can explain it to the company team commander during OPORD development. The MCOO can greatly assist in the platoon leader's visualization of the terrain.

Second, commanders rarely provide details about the enemy other than his composition, disposition, and strength. They should brief all of the enemy's combat multipliers, their purpose, and where they expect the multipliers to be employed.

The NTC teaches seven forms of enemy contact. If all of them are briefed at the company OPORD, we have gone a long way toward discussing the enemy. The forms of contact are—

- Visual (if divisional/regimental reconnaissance is in sector and where the division reconnaissance teams will be)
- Direct fires (where we expect to come within range of the antitank systems, T-80, BMP, etc.)
- Indirect fires (when we expect to enter indirect-fire range of the enemy's various rocket and cannon systems)
- Air (both fixed- and rotary-wing aircraft) (where and when we expect them to attack)
- Nuclear, biological, and chemical (NBC) agents (where and when we expect the enemy to employ nonpersistent and persistent agents)
- Obstacles (what we expect the composition and depth of the obstacle(s) to be; the type of mines we expect to be in the minefields; where we expect scatterable mines—both artillery delivered and by the UMZ—and the mobile obstacle detachment to be used)
- Electronic warfare (if and when we expect the enemy to jam our communications during operations)

The commander should ensure that platoon leaders understand the mission of the remainder of the engineer battalion because engineers often are shifted from one TF to another as the battle progresses, especially during offensive operations. Similarly, the company CP should ensure that consolidated brigade graphics are available to facilitate movement to another TF zone or sector. To prevent fratricide, the commander should also inform platoon leaders of obstacles emplaced or to be emplaced by sister units. This includes the Volcano and ADAM/RAAM (area denial artillery munition/remote antiarmor mine) obstacles.

Change 1 to FM 5-71-2 moves the Scheme of Engineer Operations (SOEO) from paragraph 3.a. to paragraph 1.b. in the OPORD format (see *Engineer*, April 1997, "Change 1 to FM 5-71-2/3"). My observation is that the commander often fails to develop an SOEO. FM 5-71-2 provides outstanding examples of how to develop one. The commander should brief the SOEO as discussed in FM 5-71-2, because it explains what the company expects to accomplish in a well-organized, easily understood format. Each platoon leader must understand the company's perspective on the operation before he focuses on his platoon's piece of the pie. Just as a company may be shifted to an adjacent TF, a platoon may have to complete tasks initially assigned to another platoon.

Paragraph 2

This paragraph normally consists of a generic sentence. For example, "D Company will provide mobility/countermobility support to the TF to support the TF's attack." The paragraph should describe tasks the platoons must accomplish for the company to be successful. FM 5-71-2 provides excellent examples.

Paragraph 3

Change 1 to FM 5-71-2 incorporates a "Concept of Operation" paragraph into paragraph 3 of the OPORD. This paragraph allows a commander to explain how engineers under his control will accomplish their assigned tasks. The paragraph is especially useful for a breach force commander during an offensive operation.

A problem with paragraph 3 is that commanders fail to develop detailed timelines that platoon leaders can refer to so they know when tasks are to be performed. Examples include the "no later than" time to have an obstacle constructed to support breach rehearsals or when the commander expects 1st platoon to have obstacle group A1A emplaced. Timelines should be as detailed as possible and include the times scheduled for TF rehearsals, logistical packages (LOGPACs), and precombat inspections (PCIs).

Commanders must provide as much detail as possible for all activities. For example, state where the obstacle for the breach rehearsal will be constructed and how many obstacles (and what types) 1st platoon will emplace in obstacle group A1A. (Details will be refined by the platoon leader on the ground.) State where the commander's PCIs will be conducted and what will be inspected.

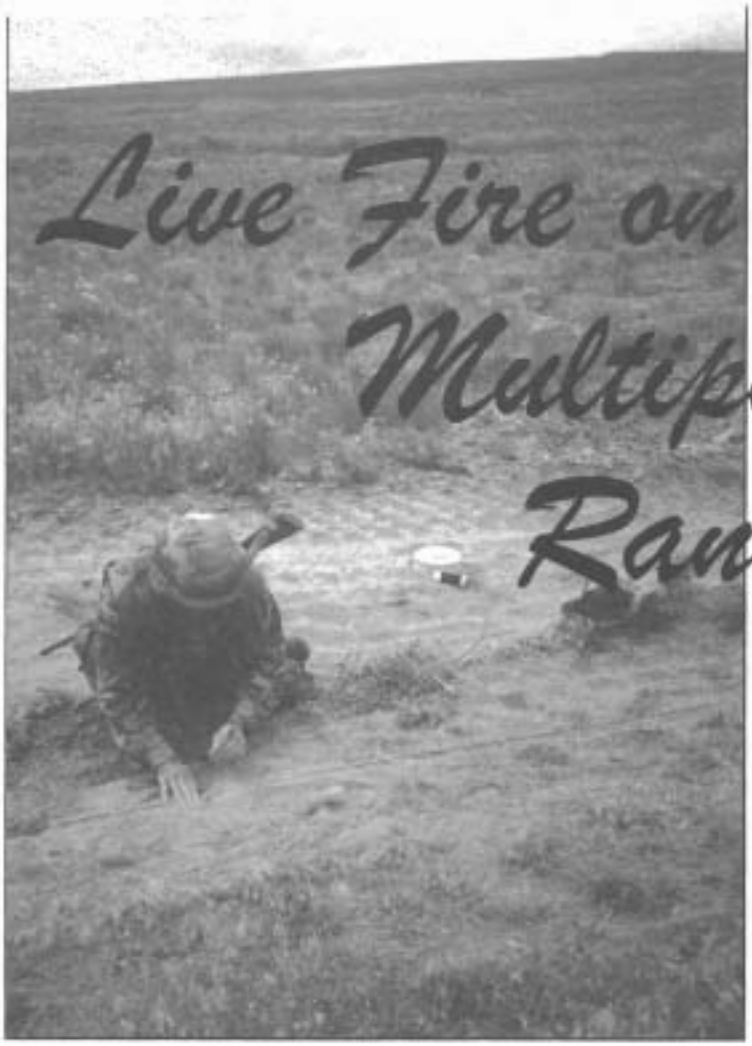
Finally, although intent graphics are supposed to describe the effect, target, and relative location of the obstacle group in the defense, I recommend that commanders define the target for platoon leaders (perhaps by placing the obstacle overlay on the SITEMP). Additionally, I believe commanders should provide platoon leaders a proposed design of the obstacle group.

Paragraph 4

Most successful units integrate the first sergeant into the development of the CSS plan and brief this plan at the OPORD. Paragraph 4 should include the following—

- How platoons will be logistically supported if they are task organized to another unit.

(Continued on page 24)



Live Fire on a Multipurpose Range Complex

By Captain Christopher R. Felchlin

In July 1996, the 1249th Engineer Battalion at Salem, Oregon, became the first engineer unit since 1987 to conduct a live-fire exercise on the Multipurpose Range Complex (MPRC) at Yakima Training Center in Washington.

The concept was born through the efforts of the 3rd Engineer Training Battalion (ETB), 2d Regional Training Brigade (RTB), at Fort Lewis, Washington. The 2d RTB was formed in 1994 as a result of a congressional mandate, the Ground Force Readiness Enhancement Program. This program governs the conduct of evaluated platoon lane training for high-priority National Guard units, with top priority given to units designated as enhanced brigades or force support package units.

Planning

In November 1995, the 3rd ETB worked with the 1249th Engineer Battalion to plan the 1249th's two-week annual training (AT) for 1996. The training battalion includes three company teams—each with an engineer captain, a sergeant first class, and three staff sergeants—and a headquarters section. These teams evaluated the 1249th's company and platoon operations for the entire training period.

B Company, 3rd ETB, developed the MPRC live-fire exercise as part of the overall AT plan. The company produced tactical orders for the companies and platoons participating in the live-fire exercise and projected the Class IV and Class V supplies needed during each phase.

Conducting tank and Bradley gunnery is commonplace on the MPRC, but an engineer unit using the facility for training was a new concept. When briefed on the concept, the RTB and the 1249th commanders recognized the excellent training opportunity the exercise presented and the retention and recruiting possibilities it held for the battalion.

The ETB scheduled the exercise toward the end of the training period so the soldiers would have time to perfect their tasks. The lane focused on three mission training plan tasks: Troop-Leading Procedures, Conduct an In-Stride Breach, and Breach Obstacles. Another critical factor for success was to certify the platoons in both demolitions and M2 crew-served weapons before they arrived on the MPRC. The unit accomplished this during the first week of training.

The Scenario

The plan, which was finalized after several recons to Yakima Training Center and brief backs, included a six-part scenario. In this scenario, an engineer platoon



Soldiers from the 1249th A Company start a minefield breach.

supported an armor company team as the lead element of a task force attack against a motorized rifle company (-). The ETB company observer/controller (OC) (an engineer captain), role-played the task force commander and the armor company team commander. The remainder of the ETB company OCs were safety personnel and rode in the back of the squad armored personnel carriers going downrange. Each platoon OC (a staff sergeant) rode with the platoon leader and evaluated his actions while executing the lane. Targetry on the MPRC was set up to accommodate M113A3s with M2s. Gunners engaged crew-served targets at positions from 600 to 1,800 meters, and small-arms personnel targets were engaged from 50 to 1,100 meters.

Under the platoon leader's control, three squads simultaneously proceeded down individual lanes. The platoon encountered two obstacles along the route to the objective: a wire obstacle overwatched by a combat security outpost and a 120-meter, surface-laid minefield with a concertina fence. The platoon moved through the obstacles, consolidated on the objective, and prepared for a counterattack. After completing the counterattack portion, a dismounted live fire, the platoon moved forward on order and conducted a MICLIC breach of a minefield. At this point the lane ended and the platoon returned to the staging area for shakedown and an after-action review (AAR).

The After-Action Review

When the first platoon completed the lane and moved to the AAR, the next platoon began its run down the lane. B Company timed the training schedule so that each platoon moved through the entire scenario in one day. This included two dry runs and a live-fire exercise, along with repairing the lane and policing all marking and breaching equipment left on the lane. Scheduling was met by moving a repair team one phase line behind the platoon conducting the live-fire exercise. The technique maximized time and allowed the follow-on platoon to start within minutes of the platoon returning from the lane.

Each AAR was based on mission training plan tasks and was an in-depth analysis of what happened, how it happened, and what could be done to improve the next exercise. The platoon OC facilitated the AAR and kept the platoon on track with leading questions that allowed soldiers to discuss their perceptions of strong and weak areas. The platoon received a video and photographs showing their performance while conducting the lane and the AAR to use later as training tools.

Lessons Learned

When planning an undertaking as complex as this live-fire exercise, prior planning may prevent mishaps that have mushrooming effects.

- Push logistics to the site and prepackage items so the platoons can make final preparations.
- Deliver Class V supplies (including the MICLIC trailer, rocket, and box) at least 24 hours before the event so platoons can conduct precombat rehearsals.
- Complete weapons qualifications for soldiers before they arrive for annual training.
- Set aside one day (per company) at AT to fire the mounted M2 at both stationary and moving targets. If the MICLIC is to be used, preventive maintenance checks and services and battle drills must be routine.The MICLIC is a key piece of equipment that is frequently

neglected until needed in the heat of battle. OCs at the combat training centers have found that the MICLIC has approximately a 50-percent success rate during actual firing, and the operational rate is even lower.

- Maintain sufficient lane-marking equipment to train three or more continuous breaches. Each mechanized engineer squad must be able to breach and mark its own lane.

The Rewards

A live-fire exercise on an MPRC provides a sense of accomplishment because the event allows all organic systems to fire. The 1249th's annual training was conducted with no accidents or safety violations and at combat speed. The platoons ran the lane in less than two hours, and obstacle breaching was completed (breached and marked) on an average of 7 minutes and 15 minutes, respectively. Smoke and pyrotechnics were used extensively throughout the exercise.

The training was extremely challenging and rewarding, and most of the soldiers thought it was one of the highlights of their AT. It was the most realistic training the unit had conducted and greatly benefited combat readiness. The 1249th took home another valuable asset that will undoubtedly contribute to its overall improvement. Excited, motivated soldiers went back to Oregon with a film filled with realistic training. Both the film and lessons learned will assist the command throughout the next year with retention and re-enlistment.

The 1249th Engineer Battalion plans to make the live-fire exercise the apex of the unit's annual training. The 3rd ETB and the 1249th commanders and staff are proving the benefits of the Ground Force Readiness Enhancement Program with continued high quality, challenging training.

Captain Felchlin is an exchange officer at the Canadian Forces School of Military Engineering, Chilliwack, British Columbia (moving December 1997 to Gagetown, New Brunswick). Previous assignments include observer/controller and company commander, 3rd Engineer Training Battalion, 2d Regional Training Brigade, Fort Lewis, Washington; company commander, assistant S3, and S4, 82d Engineer Battalion, Bamberg, Germany; executive officer and platoon leader, 10th Engineer Battalion, Schweinfurt, Germany.



(Continued from page 21)

- Details on when, where, and what type of LOGPAC the unit will use for the operation.
- Details on what type of mine resupply method will be used in the defense; what assets will be used to move Class IV/V supplies around the battlefield; if applicable, when mine dumps will be activated and closed; and how much material has been allocated to support each obstacle group.
- Adjustments to mine resupply methods throughout the operation. For example, use the tailgate method initially to upload trailers and begin the push of materials. Then transition to service station resupply once obstacle construction has begun and mine dumps are established. Revert to the tailgate method as the enemy attack nears to prevent mines from being left on the battlefield.
- A detailed casualty evacuation (CASEVAC) plan for the company—specifically, who will control the CASEVAC, which vehicles and radio net will be used, and whether casualty collection points or some other method will be used.
- A plan to evacuate vehicles off the battlefield.
- Reload plans for the MICLIC and/or Volcano. Consider adding internal company graphics to the maneuver graphics to facilitate these plans.

Paragraph 5

Paragraph 5 is normally not a problem. However, I recommend that commanders require platoon leaders to provide "jump" plans for company teams they may be attached to so communications with the platoon is maintained throughout the mission.

For the most part, commanders do not conduct safety and fratricide risk assessments or brief them and their control measures to subordinate leaders. Assessments should be well-planned and should identify specific risks to soldiers during this operation and how leaders can reduce those risks.

Summary

When stress and fatigue set in, an effective OPORD can prevent confusion on the battlefield. Commanders increase their ability to effectively communicate if they use every training event as an opportunity to give OPORDs to subordinates. An organized and detailed OPORD briefing will help ensure successful combat operations.

Captain Birchmeier is a doctrine writer in the Department of Training and Doctrine Development, U.S. Army Engineer School. He previously served on the Sidewinder 12 Team, National Training Center, Fort Irwin, California. CPT Birchmeier is a graduate of the U.S. Military Academy.

EXPEDIENT COLD-WEATHER CONCRETING

By Charles Korhonen

Imagine for a moment that you are the engineer officer or NCO in charge of a project requiring that you pour concrete—and the temperature falls below 40 degrees Fahrenheit (F). This may not sound like a big deal, but Army manuals such as FM 5-742, *Concrete and Masonry*, and industry standards direct that fresh concrete should not be cooled below 40 F after emplacement. Therefore, some form of thermal protection must be used during cold weather or your project may come to a screeching halt. If you don't have the luxury of falling behind schedule and the project budget is tight, what do you do? Fortunately, the Army's Cold Regions Research and Engineering Laboratory (CRREL) is working on a solution called *antifreeze admixtures*. Read on to learn how you soon may be able to emplace concrete at temperatures as low as 15 F or lower.

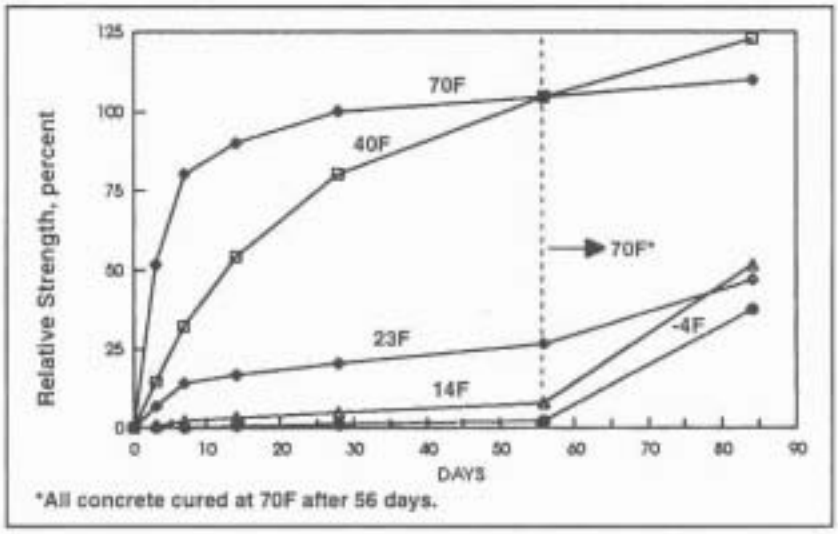


Figure 1. Effect of temperature on normal concrete.

The Technical Challenge

The simplest way to protect concrete from the cold is with insulation. But when the outdoor temperature dips below 40 F, concrete usually must be protected by heated enclosures, which are resource intensive (labor, time, equipment, and budget). Under battlefield conditions or in emergency situations where concrete must be placed regardless of the temperature, engineers may not have any thermal protection, let alone a heated enclosure. If concrete must be placed unprotected in the cold, it may freeze. If it does, the results can be disastrous.

When the water in fresh concrete freezes, the ice—which takes up roughly 9 percent more volume than water—can generate disruptive pressures that create microcracks in the concrete. Later, when the ice melts, the damage done by freezing can cut the strength of concrete in half (Figure 1).

Another interesting effect of cold weather on concrete is that it gains strength more slowly, which is not a problem if there is time to cure it a bit longer. Under the right conditions, it may become stronger than concrete cured in warm weather. Figure 1 illustrates this potentially positive effect. During the first month, the strength of concrete cured at 40 F, the lowest tem-

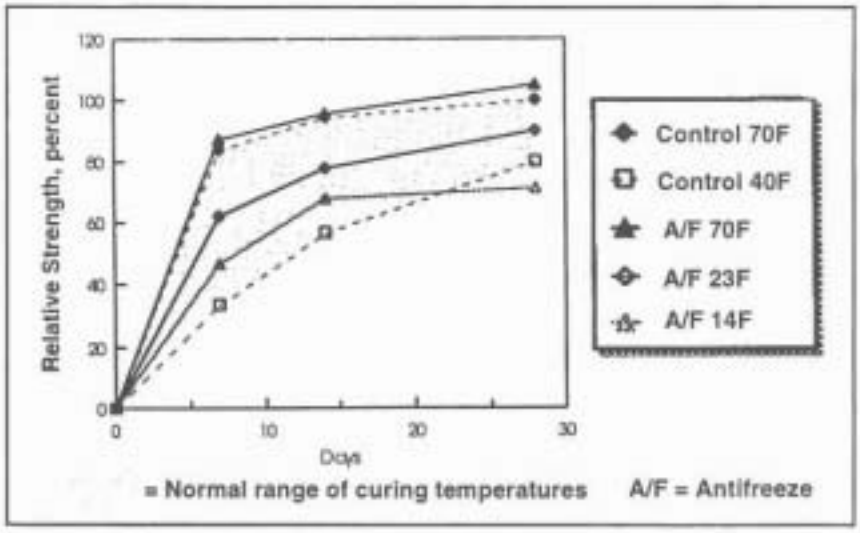


Figure 2. Results for one antifreeze chemical tested.

The following excerpt is from guidance developed for winter concreting operations in Bosnia.

A User's Guide to Antifreeze Admixtures

Description

An antifreeze admixture is a chemical compound that depresses the freezing point of water and accelerates the hydration rate of cement at temperatures below 32 F. Chemicals used in the present formulation are sodium nitrate and sodium sulfate. Available in dry form, they are dissolved in water before being mixed with other concrete ingredients.

Preparing the Chemicals

Weigh a quantity of water sufficient for one batch of concrete. Slowly stir in and dissolve a quantity of sodium nitrate equal to the weight of 6 percent of the cement required for one batch of concrete. Slowly add a quantity of sodium sulfate equal to the weight of 2 percent of the cement required for one batch of concrete.

Mixing Procedures

Follow standard mixing procedures. Add coarse aggregate and some mixing water. Start the mixer, add fine aggregate, cement, and the remainder of the water while the mixer is turning. Mix for several minutes until the mixture is thoroughly blended. (The mix water contains the dissolved antifreeze chemicals.)

Dosage

Use the following quantities per 611 pounds per cubic yard of portland cement.

sodium nitrate ..... 36.6 pounds
sodium sulfate ..... 12.2 pounds

Performance

Admixture Dosage by cement weight, percent	Temperature (internal) of concrete, degrees Fahrenheit	Compressive Strength[1] Relative to 28 days, at 70 degrees Fahrenheit, percent			
		7 day	14 day	28 day	56 day[2]
8	23	60[3]	75	85	100
8	14	50	65	75	100

[1]The relative strengths shown are based on a limited number of laboratory tests, so field results may vary from those shown.

[2]Cured an additional 28 days at room temperature.

[3]The strength of concrete cured 7 days at 23 F is 60 percent of the strength of the control concrete cured 28 days. Thus, if the control mixture has a 28-day strength of 5,000 pounds per square inch, the 7-day strength of the 23 F mixture is 3,000 pounds per square inch.

perature allowed by FM 5-742, is less than that of concrete cured at 70 F. However, the concrete eventually becomes stronger than concrete cured at 70 F. Although cold weather often is the best time for making good, durable concrete, too much cold can be devastating.

The Solution

Developing an admixture capable of allowing concrete to gain strength at below-freezing temperatures has long been a goal of builders in the north. As early as the 1950s, the Soviet Union used ordinary salt when pouring concrete in the winter. Though corrosion was later found to be a major drawback, the use of salt as a freeze-point depressant proved that chemicals can protect concrete from freezing. Lingering concerns about the long-term effects of any antifreeze chemical on concrete discouraged their widespread use, despite the existence of chemicals that are compatible with concrete. FM 5-742 states, "...do not try to lower the freezing point of concrete with accelerators (antifreeze compounds or similar products), because the large quantities required seriously affect compressive strength and other concrete properties."

We now have evidence to ease some concerns about possible harm to concrete. Data from almost two years of laboratory and field testing with private industry (concluded in 1996) show that certain chemicals can be added to concrete to allow it to gain strength at below-freezing temperatures without detrimental side effects. Unfortunately, these findings have not resulted in commercial products to date, so military engineers still lack an off-the-shelf answer to cold-weather concreting.

To fill this gap, CRREL is using experience gained from working with private industry to create expedient admixtures for the military. Their goal is to develop guidance that will enable military engineers to formulate their

own antifreeze admixture from chemicals likely to be found in a cold-region theater of operation. The search for candidate chemicals is not limited to those that are benign to the long-term performance of concrete. Chemicals that allow concrete to remain structurally viable for as little as 6 months also will be considered. The product of this effort will be a "How To Do" pamphlet, which will detail mixing procedures, mixture proportions, chemical dosages, concrete strength estimates, and handling advisories. It will be followed by an update to Army manuals.

Figure 2 presents one of CRREL's findings. It shows that this particular admixture promotes a strength gain at 14 F that compares to that of normal concrete cured at 40 F. What's more, preliminary findings (not shown) suggest that concrete made with this admixture may be unaffected by temperatures as low as minus 4 F. Although it gains little usable strength at this low temperature, concrete seems to recover its full compressive strength when thawed.

The main drawback to this chemical is that it contains an alkali that may adversely affect the long-term durability of concrete. It causes certain siliceous aggregates to swell and crack the concrete. However, even in very high dosages, which CRREL does not recommend, the first cracking probably would not occur for 5 to 10 years. Concrete so affected probably would last many more years before its strength was greatly compromised. Since the only concern is for long-term applications, the chemical in Figure 2 was recommended as an antifreeze admixture for expedient cold-weather concreting in Bosnia (see user's guide, page 26).

Conclusions

Normal concrete cannot be exposed to freezing weather without some form of thermal protection, which places serious constraints on the use of concrete in cold-region theaters of operation. An alternative approach to cold-weather concreting is under development. When completed, it will allow military engineers to place fresh concrete for short-term applications at below-freezing temperatures without the need for heat. Following this 2-year study, longer-term topics aimed at providing military engineers with enhanced winter construction capabilities will be addressed.

For more information about cold-weather concrete operations or to see other cold-weather construction practices developed, contact Mr. Korhonen at the U. S. Army Cold Regions Research and Engineering Laboratory, 72 Lyme Road, Hanover, New Hampshire 03755; telephone, (603) 646-4438; fax, 603) 646-4640; e-mail, korhonen@crrel.usace.army.mil.

Mr. Korhonen is a research civil engineer at CRREL, dealing with maintenance and rehabilitation issues of military facilities in cold regions. He holds a master's degree in arctic engineering from the University of Alaska and is a doctoral candidate at Purdue University.

Army Division Advanced Warfighting Experiment

By Vern Lowrey

Six senior military evaluators from the U.S. Army Engineer School's Maneuver Support Battle Lab participated in the Army Division Advanced Warfighting Experiment (DAWE) at Fort Hood, Texas, 5-13 November 1997. The DAWE was a key event in Force XXI warfighting experimentation. Results of the DAWE directly impact the heavy division design decision, which is expected in February 1998.

The 4th Infantry Division conducted the exercise using the conservative heavy division design force structure. This design has three combat engineer battalions located in the division troops but no engineer brigade headquarters or commander. A 24-person engineer planning and operations staff is located at the division level.

In addition to the new force structure, several new engineer systems were included in the experiment. The three systems tested in each maneuver brigade and division tactical operations center were the Engineer-Obstacle Planner System/Tactical Engineer Command and Control System (E-OPS/TECCS), Digital Topographic Support System-Mobile (DTSS-M), and the Raptor Intelligent Combat Outpost. New systems simulated were the Grizzly, the Wolverine, the Heavy Dry Support Bridge, the Airborne Standoff Minefield Detection System (ASTAMIDS), the Deuce, and the multirole bridge company. These systems directly support the Force XXI objectives of gaining information dominance and conducting dominant maneuver.

The following key issues are being evaluated as a result of the DAWE:

- Operational and tactical impacts on the removal of the engineer brigade headquarters for the experiment.
- Operational and tactical implications of an engineer force structure that includes a mix of Active, Reserve, and National Guard forces.
- Impact of the combat service support redesign on engineer operations and logistical support to divisional and echelon-above-division (EAD) engineers.
- Impact of changing engineer capabilities for line-of-communication and main-supply-route missions throughout the division battlespace.
- Impact of digital terrain data management on the maneuver commander's visualization of the battlespace.
- Impact of EAD engineers integrating into a digitized environment with possible incompatible communication systems.

The DAWE has given us a view of the future of our Army. We have a long way to go, but there are new and exciting implications for mobility and survivability systems as well as for other operating systems.

Vern Lowrey is technical director, Maneuver Support Battle Lab, Fort Leonard Wood.

Engineer Qualification Tables:
A New Training Methodology

By Second Lieutenant Patrick O. Corr

In March 1997, the 10th Engineer Battalion at Fort Stewart, Georgia, conducted its annual Skybridge Focus field training exercise in preparation for deployment to the National Training Center. During this exercise, squads were qualified using Table VIII from the battalion's newly developed Engineer Qualification Tables (EQTs).[1] Engineer equipment crew certification was integrated into the EQT sapper training. This was the first time the unit used this qualification method, and we saw dramatically improved results.

Inspired by the success of armor and infantry gunnery tables (and previous combat engineer vehicle [CEV] gunnery tables) and the need for an organized method of sapper qualification, the 3rd Infantry Division Engineer Brigade introduced EQTs to the brigade's engineer battalions. These tables link existing programs such as the MTP, marksmanship training, and engineer battle drills into a sequential battle-focused qualification process. They build from individual tables through platoon live-fire tables and roughly correspond to armor and infantry gunnery tables.

The proficiency of squads and platoons was previously tested through exercise evaluations (EXEVALs) based on fragments of the mission training plan (MTP) and local drills. However, these EXEVALs were not well standardized or systematically resourced, tasks were not arranged or tested in an ascending degree of complexity, and individual tasks were not specifically grouped to be practiced before squad or platoon tasks. No program exists to justify a standard package of resources that can be accurately projected through the Standards-in-Training Commission (STRAC). Adequate amounts of ammunition and demolitions are rare, and most posts do not have areas large enough for demolitions training. There is no priority for logistical requirements for training engineers, because we do not have a system that speaks the same language to our maneuver brothers. These conditions do not facilitate quality engineer training. All this changes when individual units are given priority, because they train under a system of qualification tables recognized by installation and unit commanders.



During Exercise Skybridge Focus, soldiers are rated on how quickly they successfully reduce a surface-laid minefield.



Combat engineers construct a wire obstacle.

Execution of EQT VIII

Exercise Skybridge Focus was the test bed for EQT VIII, and it provided significant evidence of EQT success. Eighteen squads from six line platoons were qualified on EQT VIII tasks. Four of those squads received 100 percent first-time GOs and were rated as "Killer Squads."

Sapper squads and assault and obstacle crews performed mobility, countermobility, or survivability tasks each day. The training was set up using scenario-based lanes and grouped into drills based on mobility, countermobility, and survivability. Each line company set up and evaluated a portion of the lanes based on the EQT and crew certification tasks.

Throughout the week, mobility drills were run and evaluated by A Company. Individual lanes were planned by the company, and internal leadership served as observer/controllers for each lane. It is important that NCOs provide input concerning lane planning, because their squads are being trained and evaluated. The mobility lane included a combination of squad drills and crew certification tasks. The tasks were not part of the EQT but complemented the sapper lane training well. They provided an excellent opportunity for the battalion to certify all armored combat earthmover (ACE), armored vehicle-launched bridge (AVLB), small emplacement (SEE), and Volcano operators. Each drill lasted approximately three hours. The following paragraphs briefly describe each drill and certification task :

Mobility Table VIII Drills

- **Clear a footpath with a bangalore torpedo.** Since this drill requires live demolitions, a three-hour dry rehearsal was conducted. Each squad was first certified on inert demolitions.
- **Breach a surface-laid minefield, dismounted.** Squads were rated on speed and the successful completion of a dismounted breach of a surface-laid minefield while using live demolitions. This drill was performed on the same lane as the bangalore breach to simulate a complex obstacle and on terrain where such obstacles might be emplaced (not the demolitions range).
- **Conduct minesweep operations.** Minesweeping is a lost art, and this drill proved to be extremely challenging. We found that doctrinal rates for minesweeping are twice as fast as those normally achieved on the ground. Four to five hours were required to properly execute this drill.

Mobility Crew Certification Tasks

- **Proof a vehicle lane using an ACE.** This task requires significant operator training before certification because herringbone operations are a challenge for operators.
- **Reduce an antitank ditch.** This lane was very successful. We used the same ACEs to reconstruct the antitank ditch after they reduced it. A maintenance team should be kept on site when digging with ACEs, because one downed ACE can bottleneck the crew certification lane.
- **Defeat a wire obstacle.** We seldom use this task at the NTC, but it can be very effective and has minimal impact on the ACE.

B Company executed the countermobility lane. They provided evaluators and did the planning for four EQT drills

and three crew certification tasks. Each lane lasted three hours except for the antitank ditch lane, which lasted six hours.

Countermobility Table VIII Drills

- **Construct a wire obstacle.** This is an old staple for combat engineers. Every squad qualified at night using double the normal time. Nearly all of the squads received first-time GOs.
- **Create a hasty road crater.** Live demolitions were used on this lane. To add realism, the operation was conducted on a tank trail, not a range. Because a nonstandard area was used for demolitions, all entries to the area were blocked. Additionally, the lane officer-in-charge coordinated use of an ACE to fill the craters after each squad went through. A dry-fire rehearsal of this drill was conducted before it was executed with live demolitions. This helped ensure safety and squad success since not enough demolitions were available to retrain with live demolitions.
- **Emplace a row in a deliberate minefield.** Inert mines were used during this task. This is an easy drill to set up, and the squads performed it proficiently.
- **Emplace a nuisance minefield with the modular pack mine system (MOPMS).** The 10th Engineer Battalion used the MOPMS for this drill since it is a critical task that supports our mission essential task list. This task is very technical and required the most retraining. It was most responsible for squads falling short of obtaining "Killer Squad" status.

Countermobility Crew Certification Tasks

- **Emplace and mark a Volcano minefield.** Our crews were certified, but we encountered problems with maintaining the Volcano. Operators must perform preventive maintenance checks and services on the racks as well as the vehicle to help prevent the Volcano from going down during certification.
- **Construct a tank ditch.** All ACE operators were certified. A lot of digging is involved, which presents ideal conditions for an ACE

10th Engineer Battalion Engineer Qualification Table Program

EQT training is conducted in three phases: basic (individual), intermediate (squad), and advanced (platoon).

The *basic* phase, Tables I-IV, establishes the lowest level of sapper skills and culminates with weapons, mines, and demolitions qualifications. These are stand-alone events involving sapper teams or individual soldiers. This training is normally executed during "sergeants' time," range weeks, demolition ranges, and other unit training.

The *intermediate* phase, Tables V-VIII, builds on the skills developed during the basic phase. This phase develops team and squad skills and culminates with a battle drill certification and live-fire qualification course.

The *advanced* phase, Tables IX-XII, develops platoon coordination and execution. It culminates with a platoon qualification course for both offensive and defensive scenarios.

The following tables are included in the EQT Program:

Table I - *Leader Certification.* 12B NCOs and line platoon leaders are certified in mines and demolitions within 90 days of their assignment to the unit.

Table II - *Individual and Crew Certification (Inert).* Squad leaders conduct individual training on mines and demolitions using inert training devices. Individuals must be certified before Table IV training is conducted.

Table III - *Individual and Crew Weapons Qualification (Live).* Squad leaders conduct preliminary marksmanship instruction for individual and crew-served weapons, and squad members qualify with their assigned weapon.

Table IV - *Mine and Demolitions Qualification (Live).* Companies certify squads on mine and demolitions training using live mines and demolitions.

Table V - *Squad Battle Drill Training.* Squads train on seven drills: construct a wire entanglement; create a hasty crater obstacle with explosives; emplace a row in a minefield; emplace a point minefield; breach a surface-laid minefield, dismounted; clear a footpath with a bangalore torpedo; and conduct minesweep operations.

Table VI - *Squad Battle Drill Certification.* The platoon leader evaluates and certifies squads on the seven sapper drills based on Table VIII conditions without live ammunition. Squads will not execute Table VII until they are certified by the platoon leader.

Table VII - *Squad Battle Drill Qualification Course (Dry Run).* Squads execute sapper battle drills in a tactical scenario using blank ammunition and realistic demolition-effects simulators. Tasks are performed on terrain similar to the training area used for live certification.

Table VIII - *Squad Battle Drill Qualification Course (Live).* Squads execute sapper battle drills in a tactical scenario using live ammunition and demolitions and inert mines. The company commander evaluates and certifies squads. Additionally, all ACE, AVLB, SEE, and Volcano crews are certified on their equipment.

Table IX - *Platoon Battle Drill Training.* The platoon trains on six tasks: conduct an in-stride breach with a MICLIC, conduct an in-stride breach dismounted, establish a mine dump, emplace a tactical minefield, emplace wire entanglements, and site and mark a Volcano minefield.

Table X - *Platoon Drill Certification.* The company commander evaluates and certifies the platoon on six platoon drills without live ammunition or live demolitions.

Table XI - *Platoon Drill Qualification Course (Dry Run).* The platoon executes the drills in a tactical scenario using blank ammunition and demolition-effects simulators. Tasks are performed on terrain similar to the training area used for live certification.

Table XII - *Platoon Drill Qualification Course (Live).* The platoon executes the drills in a tactical scenario using blank ammunition, live demolitions, and inert mines. The battalion commander evaluates and certifies the platoon.



The 10th Engineer sappers complete the breach.

breakdown. Make sure a maintenance team is on site to repair ACEs.

- **Construct a tank berm.** This lane is very intensive and requires a maintenance team on site.

Survivability Table VIII Drills

The survivability lane did not have any Table VIII drills but concentrated on key tasks that directly supported crew certification—a combination of survivability and force protection tasks. D Company planned and executed this lane. All the company nuclear, biological, chemical (NBC) NCOs were attached to D Company, headed by the battalion NBC NCO, to run a complex NBC lane. The line squads executed two lanes lasting two hours each. The first lane was centered on bivouac force protection, while the second lane was an NBC lane. The crew certification lanes lasted four hours each.

Survivability Crew Certification Tasks

- **Construct a fighting position for the M1 with an ACE.** Again, a maintenance team must be on site to conduct repairs.
- **Construct a modified two-tier M2 position with an ACE.** Due to the similarity to Lane 1, the same site and observer/controller were used.
- **Construct crew-served fighting positions with the SEE.** This lane was successful, and all operators were certified.

Sapper Drills

These drills are not a part of Table VIII but provide direct support.

- **Conduct NBC skills procedures.** This training is necessary for every soldier. Squads conducted dismounted movement and performed unmasking procedures with and without an M256 kit. Each squad faced several different NBC scenarios with realistic effects. Most soldiers said they wanted more NBC training conducted this way.
- **Perform bivouac procedures.** During this lane, each squad performed multiple tasks ranging from practicing camouflage techniques to constructing battle positions, occupying a squad sector and employing an M8 alarm, setting up wire communications, and preparing range cards and sector sketches.

Training Success

Skybridge Focus proved the effectiveness of EQT VIII. The EQTs are an excellent way to efficiently measure sappers' proficiency and resource training. During the quarterly training brief before Skybridge Focus, the 3rd Infantry Division commander saw what the resource requirements were for the EQT program and that the normal engineer Standards in Training Commission (STRAC) did not support those requirements. Since no training area supported this lane training, he gave instructions to find suitable real estate on Fort Stewart. The G3 was directed to provide real estate and ammunition support to the maximum extent possible. Because the EQTs are similar to gunnery tables, the commander understands their importance and supports changing future STRAC allocations. He also supports constructing an area to conduct the EQTs.

The 10th Engineer Battalion was extremely successful with this new approach and significantly improved training development in preparation for the NTC. The organization of the tables yields a solid foundation for instructing and evaluating soldiers, squads, and platoons. Each soldier trained with the EQTs is fully capable of performing all sapper tasks to standard. The EQTs proved invaluable throughout our recent NTC rotation. They are a great tool for both Active and Reserve Component units.

Endnote:

[1] The battalion developed these qualification tables (shown on page 30) for their heavy engineer unit. During the second quarter of FY98, the U.S. Army Engineer School will publish a training circular with qualification tables covering all combat engineer units.

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Modernizing Sets, Kits, Outfits, and Tools

By Tom Knotts

The Army's old Pioneer Tool Set has a new look and a new name. Formerly known as the Set, Tool Outfit, Pioneer (Portable), line number (LIN) W58486, it has been updated and given a new designation—the Hydraulic, Electric, Tool Outfit (HETO). It is mounted on a 3 1/2-ton M353 trailer and pulled by a 5-ton truck.

HETO Improvements

The old system has been transformed from a marginally acceptable end item into an outstanding piece of equipment. The HETO boasts several improvements:

- It can be used with its onboard hydraulic or electric tools, which include a portable hydraulic motor generator, drills, saws (including a chain saw), lights, an impact wrench, sockets, and pumps. The HETO can simultaneously power one electric and one hydraulic tool or two hydraulic tools.
- The trailer is outfitted with six molded plastic boxes, two on each side of the trailer and two across the back. To minimize the cleaning associated with hydraulic fluid, all the hydraulic tools are packed in one box. They are mounted on a plate and secured with tie-downs, thus making it easier to remove and return them for stowage.
- Access to the power panel is more convenient, which simplifies maintenance on the power unit. The radiator opening is protected by a screen, and the engine cover on the opposite side of the controls is modified with vents. With these changes, the HETO can be operated without removing (and possibly losing) the panels. The power unit is rotated on the trailer and mounted with the radiator and fuel openings in front of the trailer. This configuration prevents spilled fuel or hydraulic fluid from falling on the trailer bed, which could cause the trailer deck to become slippery or fuel to drip off the trailer onto the ground and damage the environment. The position of the power unit



The M353 trailer carries the HETO and its power unit.



One of the HETO boxes contains a sump pump and hoses.

also eliminates possible environmental damage from leakage when draining the radiator or refueling the motor.

- The hydraulic motor generator is mounted on a plate and fastened in one of the plastic boxes, making it portable.
- Halogen lights on the HETO have roughly 10 times the life expectancy of the floodlights on the old system.

Fielding of the HETO will begin in the first quarter FY98.

Other Updates

In addition to the HETO project, the following sets, kits, outfits, and tools (SKOT) are being updated:

- ***Shop Equipment, Woodworking, Base Maintenance, Trailer-Mounted, LIN T16988.*** This set includes reciprocating saws and blades; chop, circular, table, and jig saws; routers and router bits; pneumatic nailers; and a compressor tool kit.
- ***The Platoon Box (Carpenter's), LIN W34511.*** It is equipped with electric rechargeable power tools such as saws, drills, an electric shear/nibbler kit, and an electric grinder.
- ***The Squad Box (Carpenter's), LIN 34648.*** This box includes manual tools such as a chisel set, a hacksaw with blades, hammers, a circle cutter, and a set of flat boring bits.
- ***The Tool Outfit, Hydraulic Systems Test and Repair Unit (HSTRU), NSN 4940-01-036-5784, LIN T30377.*** New state-of-the-art equipment will replace out-dated tools and fittings in this unit.

The trailer-mounted woodworking set has a General Service Administration National Stock Number (NSN) and can be purchased directly by units. The Platoon and Squad Sets will soon be given NSNs.

Supply catalogs containing changes to the SKOT above will be published on CD-ROM.

Most tools in the sets above are in the General Services Administration SCIT (Standardization and Control of Industrial-Quality Tools) Program, which lists 20,000 tools that are guaranteed for life. If one of them breaks, the contractor will replace it at no cost.

Future Updates

Sets to be updated soon are the Tool Kit, Mason, LIN W44923, and the Tool Set, Electric, LIN W60925. As additional SKOT revisions and improvements occur, information will be published in *Engineer* and on the *Combat Developments Newsgram* on the Internet at http://155.9.32.3/DCD/CD%20NEWS/newsgram.htm.

A kit containing the SCIT catalog and CD-ROM can be obtained by calling GSA Centralized Mailing List Service, Fort Worth, Texas, at (817) 334-5215.

The Engineer School's Directorate of Combat Developments welcomes ideas concerning how to change and improve these sets. The point of contact is Tom Knotts at: Commandant, U.S. Army Engineer School, ATTN: ATSE-CD-F-F, 320 Engineer Loop, Suite 166, Fort Leonard Wood, Missouri 65473-8929. The telephone number is DSN 676-7273 or commercial (573) 563-7273; the e-mail address is knotts@wood.army.mil.

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The Light Task Force Engineer

By Captain Treavor J. Bellandi



Route clearance in restricted terrain is one of the most difficult and most common tasks a light engineer platoon will perform.

With the fast operating tempo of today's Army, new platoon leaders must "hit the ground running." For those fortunate enough to be in light, airborne, or air assault units, being a platoon leader is only part of the job. They must also fill the role of task force engineer for the infantry battalions they support, which is a full-time job in itself.

To help new platoon leaders perform their task force engineer missions as painlessly as possible, I have compiled lessons learned and suggestions garnered from the Joint Readiness Training Center (JRTC), the National Training Center (NTC), and other exercises I supported as a task force engineer.

The following information addresses how to prepare for an upcoming mission, staff planning, the engineer annex, and the tactical operations center (TOC). It is followed by three of the most common missions that engineers support. This article is not intended to replace doctrine or address all engineer missions. It is one soldier's perspective.

Mission Preparation

Proper preparation will save time later. For a field exercise, learn the scenario by reading everything distributed by the S2 and S3. Visit the infantry unit you support to get more information. Know your unit's capabilities. Use book times for obstacle preparation and route clearance only until you have worked with the platoon long enough to determine how much time these tasks actually take.



Soldiers in the TOC at JRTC prepare for an upcoming mission.

Rehearse staff planning skills by working with the infantry in both staff and field exercises. Staff rapport is more a function of your desire to help and learn than your technical knowledge. Obtain a copy of the infantry battalion's tactical standing operating procedures (SOP) and understand how they operate. To communicate effectively, understand your battalion, brigade, and division SOPs. Know the staff planning sequence (mission analysis, course of action development, etc.), your requirements to support the planning process at each stage, and what other staff officers are doing. FM 101-5, *Staff Operations*, and the Command and General Staff College manual, ST-101-5, *Command and Staff Decision Processes*, describe the sequence of tasks. Include the platoon sergeant and squad leaders in the planning process by bringing them to staff exercises with the infantry. Meet the people you support to build a better working relationship and a more cohesive team.

Once you know the basic scenario and your requirements, conduct battlefield preparation and prepare a shell for the engineer battlefield assessment (EBA) and engineer annex before the exercise begins. Prepare the written requirements as soon as possible to allow more time for troop-leading procedures once on the ground. After completing preparation and rehearsals, begin the actual planning process.

Planning and Coordinating

The staff sets the conditions of success for every mission through the PCISE (plan, coordinate, integrate, synchronize, execute) process. Execution is the culmination of all previous events, and following the PCISE process improves the likelihood of a successful operation.

Intelligence Preparation of the Battlefield (IPB). The S2 starts the planning process by developing the IPB. Task force engineers play a critical role in its development, because they are the staff experts on terrain analysis and enemy and friendly engineer assets and capabilities. Give the S2 initial information based on the EBA and fill in the gaps later. This allows him to begin constructing the IPB without being overwhelmed by extraneous information. The likely enemy course of action and the enemy engineer role in it are critical pieces of information the S2 needs. During wargaming, wear a red hat often to portray the enemy engineer and give the staff a better feel for their adversary.

Engineer Annex. As the task force engineer, you have a wealth of knowledge to give the staff, but you must use the proper vehicles to relay it. Fortunately, many assets (vehicles) are available. The brigade prepares an engineer annex, which should include an overlay and possibly a "trap map," which is a list of potential enemy ambush or mining sites within the sector. After you receive the brigade engineer annex, make a copy of the obstacle overlay so you can brief the infantry battalion commander. It may help to carry a personal map board with a small overlay.

Engineer Estimate. Develop your engineer estimate, then create and post execution and survivability matrices. Although you know what your squads are doing at any given time, a matrix helps the commander and the rest of the staff quickly see how engineers are supporting the fight.

Risk Assessment. Finally, conduct a risk assessment and be proactive in briefing the commander on risk management in areas where engineers are working. This will save time and possibly lives. Once you understand the plan, coordinate with other staff members to help solidify the engineer role in the scheme of maneuver.

Relay Information. The staff lives or dies with the passing of information. Since everyone immediately grabs his own annex from the brigade operations order, give the rest of the staff a summary of your annex. Share the trap map with the fire support officer (FSO) so he can target those locations. Information benefits no one if you keep it to yourself, so share it with others, including other platoon leaders, higher headquarters, and subordinates.

When passing information, remember that you have two chains of command to inform: the infantry task force and the brigade engineer. Send your target and obstacle lists to higher headquarters, using specific grid coordinates. Finally, don't wait for information to come to you. Acquire information from adjacent units on routes, obstacles, and displaced civilians who may affect traffic flow on main supply routes (MSRs) in your sector.

Integration. Although the commander and the rest of the staff want you to be part of the team, only you can ensure that engineers are integrated into the task force plan. When working with the staff, pace yourself. Marathon planning sessions are often necessary to produce the operations order in a timely manner. To remain effective, work to expand your staff planning span of attention. This requires sorting critical information from the less important, as well as learning to focus on the task at hand. Be assertive with the staff in getting your voice heard. Don't be intimidated because you are the lowest-ranking member. The staff is a team, and as the engineer, you are a critical member. While the commander makes the final decision, everyone must contribute so he can make that decision wisely.

Synchronization. This is an important part of the planning process. Take an active role in synchronizing engineer assets, especially scatterable mines. It is essential to understand scatterable mine assets and firing procedures, as well as the approval authority.

"Producing a concise, informative (engineer) annex is critical to mission success."

The Modular Pack Mine System (MOPMS) and the Volcano are important to both the offense and defense, and you are the subject matter expert. Help prepare both the friendly and enemy decision support templates. Calculate trigger points for scatterable mines and reserve targets (remember that triggers include decision time plus execution time plus transmission time). Keep in mind that trigger points must tie in to named and targeted areas of interest to be successful.

When the staff finishes the operations order, read it immediately and identify information that has not been coordinated, especially information not coordinated with the other slice elements. This will avoid conflicts in the different annexes and in the information put out to company commanders. Continue to coordinate and synchronize until execution is complete.

Updates. Your job in the TOC is not finished when the staff disseminates the order. Maintain contact for intelligence updates and fragmentary orders to which you should contribute. Also, think about follow-on missions, because at some point you will return to the TOC to begin the planning process again. PCISE is a dynamic process that requires continual updating and constant attention to make it work.

Engineer Annex

The engineer annex to the task force operations order is an important tool for informing infantry company commanders and subordinate leaders. Producing a concise, informative annex is critical to mission success.

First, decipher the annex you receive from higher headquarters. Carefully examine the mission statement, which contains both a task and a purpose. Learn the doctrinal terms for task and purpose to better understand the mission, and use doctrinal terms in your mission statement. After analyzing the mission, review the commander's intent, which has three parts: purpose, method, and end state. Read them to determine exactly what you must achieve for mission accomplishment. The commander's intent revolves around the decisive point and how he defines success. Communicate the intent to all of your soldiers, so they can carry on in your absence.

When writing an engineer annex, remember that the engineer mission is not necessarily the same as the infantry mission. For example, the infantry mission may be to conduct counterreconnaissance operations, while the engineer mission may be to construct an engagement area. The mission directly affects the tasks you designate to subordinate units. Depending on the mission statement, subordinate tasks may address either your squads or the infantry units to which your squads are attached. If the platoon is under task force control, the tasks refer to individual squads. Include any attachments to your unit, especially heavy equipment. Remember that the engineer annex is not the same as the platoon operations order, which your platoon will require when the task force order is complete.

The engineer annex is a vital part of any maneuver operations order. Although the S3 may limit the amount of space allocated to the annex, always include information the battalion and company commanders need to properly use engineers when they execute the plan.

TOC Procedures

Most new platoon leaders want to spend as little time in the TOC, and as much time with



Sappers move to the breach site at the NTC.

their troops, as possible. To accomplish this, hone your TOC operations to increase efficiency.

Keeping abreast of current events is key to working in the TOC. A lot can happen in a short time, so use DA Form 1594, *Duty Staff Journal*, to keep a log with a brief description of each event and the time it occurred. Also, track requests for information that you send to higher headquarters. As the battlefield changes and fatigue sets in, a written record serves as a reminder. Others in the TOC need to know what is happening, so include both friendly and enemy obstacles on the battle captain's map. Update your overlay and inform higher headquarters of changes regularly.

Bring enough supplies (acetate, markers, etc.) to the TOC to avoid having to borrow from others. Also, bring applicable mission training plans and other pertinent manuals. An old demo box makes a good storage container for manuals and an effective way to carry and protect written materials. You can also use it to establish your area in the TOC or to sit on. After being in the TOC once or twice, you will determine exactly what you need. Ask fellow platoon leaders for suggestions.

At times, the planning process and task force TOC will seem chaotic. Develop a plan for operating with the staff to avoid getting caught up in the confusion and failing to produce a successful plan.

Engineer Missions

The planning process is dynamic. While no two operations orders are the same, there are many similarities among the various missions that engineers perform. The following tips pertain to three of the most common engineer missions: offense, defense, and stability and support operations.

Offense. An offensive mission for the light task force engineer can be extremely difficult, because you may have to plan an attack without knowing what is on the objective. Resist the temptation to split squads piecemeal, one per company, just so everyone has engineer support. You only have one platoon, so you will have the greatest impact by massing the forces.

The most important aspect of an attack is the initial obstacle intelligence received from reconnaissance elements and the scouts. Send one or two of your best soldiers with them to provide engineer expertise before the breach. While the intelligence collection efforts are taking place, concentrate on other tasks, such as route reconnaissance and clearance on MSRs and infiltration lanes and countermobility on your flanks to prevent enemy counterreconnaissance efforts. As part of the initial EBA, consider the effects of illumination, weather, and sleep deprivation on both the attacker and the defender, and use these factors to your advantage. Also, consider the enemy's use of scatterable mines. Decide how you would breach a scatterable minefield if one is discovered in your sector.

When planning an attack, consider the number of breaches and their separation distance. Doctrinally, a battalion task force requires a minimum of two breaches at least 100 meters apart. Unfortunately, the rest of the staff and the commander may not agree to this because of the amount of support required. Be prepared to support your position, but remember that the commander has the final say. Coordinate with the S3 and the FSO on the length and type of suppression and obscuration during the breach, and make sure you discuss the elements of SOSR (suppress, obscure, secure, and reduce) during the task force rehearsal. To increase command and control, consider positioning yourself at the breach site with the main effort.

Last, but not least, prepare for success. In other words, prepare for the transition to a hasty defense once an attack succeeds. Develop some realistic logistics requirements and time estimates to prepare the newly taken objective for the defense. Scatterable mines are one of the quickest and most reliable methods for repelling enemy counterattack forces. Short of that, using resupply convoys or helicopters to bring in Class IV and Class V supplies in preconfigured packages can be very effective, as long as you clear the route for the resupply convoy.

Defense. Every successful offense results in a defense, either hasty or deliberate.

Regardless of how long you expect to

defend the position, certain key concepts are relative to all defensive missions.

The most important elements of a defense are time and resource management. To speed the process, plan for a defense well in advance. It is better to build one obstacle to standard than to build several of them poorly. Ask the S3 to allocate infantry platoon hours to help with the countermobility effort.

After preparing a survivability matrix, ask the infantry battalion commander to sign it. This helps diffuse any problems your digging assets have with overzealous company commanders. Before digging, ensure that the supported unit sights in positions. Maintain strict accountability of the dig assets and carefully select who will be in charge of them. Based on experience, the infantry battalion command sergeant major is the best choice, but the maneuver commander must allow this.

Proper discussion of engagement area development warrants an entire article, but a few key concepts follow. Remember that your obstacle intent—block, turn, disrupt, or fix—must coincide with the maneuver commander's intent and that your obstacle plan must support his defense.

When planning tactical obstacles, be sure that counterattack lanes are open and have a plan for closing them. MOPMS works well for closing lanes, as long as the senior soldier on the site understands the firing procedures, trigger points, and safe distance. Determine casualty evacuation routes; some of these need to stay open during the entire engagement, and counterattack lanes may need to stay open as well. Coordinate with the infantry to provide security while emplacing obstacles, and try to walk the ground with the commander to ensure that the engagement area you create is fully used. At the same time, plan fires on all obstacles with the FSO.

Tactical obstacles are your responsibility, but also advise the company commanders on their protective obstacles and survivability positions. This is a good job for squad or senior team leaders. It also reminds the infantry to properly report their protective obstacles.

Locate yourself either at the TOC or in the sector with the counterattack force, so you can verify that lanes are open before the commander launches the reserve into battle.

Stability and Support Operations. These missions include peace-enforcement operations and low-intensity conflicts. As you struggle to keep abreast of the status and location of your assets, minefields are the greatest threat.

The primary engineer tasks during stability and support operations are route reconnaissance, route clearance, and force protection. Obtain minefield rules of engagement for the employment and removal of mines, as well as when to clear minefields and when to simply mark them and find a bypass. Clearing is not the same as demining, so do not clear everything since it wastes resources and puts soldiers at needless risk.

During stability and support operations, you probably will have to deal with static security points (SSPs), better known as checkpoints. Develop a plan that includes relieving existing SSPs and building new ones. Be prepared for other construction projects as well, since not all stability and support operations are hostile in nature.

Battle tracking is key throughout this type of mission. Everyone must know minefield locations and how they are marked. Try to include engineers with all convoys traveling through your sector. This requires extensive S4 coordination, because the tendency is to send vehicles down MSRs before they are cleared. Coordinate with the S2 to update the IPB continuously. Identify and disseminate information on any new enemy mines located within the sector, including their type and changes in their employment (for example, whether they are buried, booby-trapped, or equipped with anti-handling devices).

To prepare troops for this type of mission, SOPs for minefield marking and clearing must be up-to-date. Rehearsals are important, too. If possible, practice combined arms clearance with the infantry, such as using thermal sights from their antitank weapons for mine detection.

Communications during stability and support operations are crucial. Give your soldiers specific information through the use of good troop-leading procedures. Maintain communications with other platoons and coordinate with adjacent units when doing route clearance and convoy operations. The best place to maintain command, control, and communications is at the TOC.

Deployments to Haiti and Somalia, as well as exercises at JRTC, have shown that the task force engineer must manage assets all over the battlefield. While the enemy threat during stability and support operations may not be as great as in other missions, the danger is just as high.

Filling in the Blanks

The task force engineer's job is demanding, to say the least, and platoon leaders need help to accomplish everything the job requires. They must prepare and execute staff requirements effectively and efficiently to allow more time to lead their platoon. The information in this article will fill in some of the blanks that remain after the Engineer Officer Basic Course is completed and will give new lieutenants a base for working as a member of the combined-arms team.

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CTC Notes

Joint Readiness Training Center (JRTC)

By Captain John C. DeJarnette

Integration of the engineer company into the light brigade combat service support (CSS) system remains a substantial challenge. There are three principle areas of concern:

- Unit Level Logistics System (ULLS) maintenance support.
- Management of Class IV/V supplies at the brigade level.
- Integration of the brigade rear engineer cell (BREC) into the forward support battalion (FSB) operations cell.

ULLS Maintenance Support

Light engineer companies lack organic ULLS ground computer systems and prescribed load list clerks. These assets are consolidated at the engineer battalion level and rarely deploy to the FSB with an engineer company. Because light companies have no organic ULLS support, automated equipment maintenance and dispatch must be provided by another unit. More importantly, without ULLS support, engineer company commanders lack access to the automated Open Document Control Register and the Nonmission Capable reports. Lack of access to these reports significantly complicates the company's ability to manage parts requests. Many units observed at the JRTC manually order parts using DA Form 2765-1. The manual system works, but visibility of engineer maintenance issues is lost at the brigade level because FSBs use automated products to prioritize and manage maintenance. The best solution to these shortcomings is to provide each engineer company with an organic ULLS ground computer. If that is not possible, we recommend the following procedure.

When an engineer company is attached to a maneuver brigade, the engineer company will "depart" its equipment from the engineer battalion ULLS and "arrive" it to the B Company FSB ULLS. This procedure provides automated maintenance management support to the engineer company and increases brigade-level awareness of engineer maintenance issues. Because the engineer company command post is located in the brigade support area, this arrangement allows the engineer company executive officer ready access to maintenance management information at both unit and direct support levels.

Management of Class IV/V Supplies

Rotational units lack viable standardized Class IV/V combat configured loads (CCLs). While most brigade tactical standing operating procedures (TACSOP) list CCLs and their contents, the FSB does not configure trucks, containerized delivery system packages, palletized load system packages, or low-velocity air-dropped packages in accordance with the brigade's standardized CCLs. As a result, unorganized packages are delivered to the forward logistics element or task force Class IV/V point. This means that task force leaders must organize the materials into packages that support the obstacle and survivability plans. The effect at the JRTC is loss of valuable preparation time while materials are sorted, reconfigured, and delivered. Typically, whoever arrives at the task force Class IV/V

point takes what they want regardless of the distribution plan. Engineers often are left to fend for themselves with little support from the task force S4 or executive officer. Frequently, critical Class V items such as MOPMS are not accounted for and end up in a unit other than the intended recipient. This undesirable effect is a result of poor planning and supervision of CCL construction and distribution. It is critical that CSS units package and distribute Class IV/V materials in accordance with the brigade TACSOP and operations order. Extensive leader involvement at the FSB and supervision by the brigade S4 and brigade engineer are required to correct this deficiency. We recommend that units comply with information in Appendix C, FM 90-7, *Combined Arms Obstacle Integration.*

Integration of the Brigade Rear Engineer Cell Into the FSB Operations Cell

The engineer company command post doctrinally serves as the BREC. However, it generally occupies the FSB perimeter as a separate tenant unit. This arrangement does not support effective integration of mobility and survivability operations in the rear area, as shown in the following paragraphs.

The BREC lacks organic mobile subscriber equipment. Therefore, it cannot receive or send fax traffic or be integrated into the brigade's local area network (LAN). The BREC typically is manned by the engineer company executive officer, first sergeant, supply sergeant, and one or two drivers. The workload associated with operating a separate company command post and the physical separation from the FSB reduce the effectiveness of the BREC.

The FSB has a significant requirement to track the status of supply routes within the brigade area of operations but is reluctant to call on the BREC for assistance, because that requires someone to walk from the FSB TOC to the engineer company command post. Additionally, the BREC can guide the preparation and distribution of Class IV/V CCLs but is not typically integrated into the CSS planning process at brigade level, because the BREC is not part of the FSB TOC.

We recommend integrating the BREC into the FSB TOC. This arrangement allows the BREC to become an important resource to assist the FSB with mobility and survivability functions that parallel those of the brigade engineer and the brigade main engineer cell. The engineer company gains visibility on Class IV/V issues and engineer company maintenance issues, gains access to mobile subscriber equipment support, and improves manpower efficiency. Information flow is improved for both the FSB and the engineer company.

Please continue to send us questions and recommendations about mobility and survivability operations and techniques. Call (318) 531-0266/0282 or DSN 673-0266/0282. The e-mail address is: brooksje@polk-emh2.army.mil or dejarnjc@polk-emh2.army.mil.

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National Training Center (NTC)

A Disconnect in the Desert: Integrating Heavy and Light Engineers at the NTC

By Captain Chuck Samaris and Captain Otis Cagle

Commands and staffs must effectively integrate mechanized and light engineers to maximize their impact on the battlefield. Effective integration requires planning, coordination, and supervision. However, the engineer force seldom trains to effectively integrate these units except during heavy/light rotations at the NTC. Current trends indicate that problems develop when the mechanized engineer battalion commanders and staffs of a heavy brigade combat team (BCT) lack involvement in the planning, preparation, and execution of engineer support to a light infantry task force (TF).

Background

During typical rotations of heavy and light units at the NTC, the BCT deploys with three task forces—one armor, one mechanized infantry, and one light infantry. A mechanized engineer battalion consisting of a

headquarters and headquarters company and two sapper companies deploys with the BCT, and a light engineer platoon deploys with the light infantry TF. The BCT and light infantry TF usually have no habitual training relationship and have had little collective training prior to deployment. As a result, brigade engineers often overlook the engineer capabilities available within the light TF, and the light engineer platoon leader fails to consider that a higher engineer headquarters is available to provide guidance and support. These oversights inhibit effective integration of the mobility and survivability battlefield operating system (BOS) throughout the depth of the BCT battlespace.

Observations

The following considerations are based on observations that repeatedly lead to separate light and heavy engineer support to what should be a seamless fight.

- Consider the impact of the light task force's accelerated time line.
- Include the light engineer platoon's capabilities when conducting the engineer battlefield assessments (EBAs).
- Base the task organization on identified engineer tasks that have clear command and support relationships, decision points to shift units and assets, and link-up procedures. Do not task organize based solely on habitual relationships.
- Ensure that command and control requirements include reporting procedures and battle tracking of all engineer events in the brigade area of operations.
- Provide brigade engineer support to the preparation of the entire engineer force, including logistics and rehearsals.

Techniques and Procedures

The following techniques and procedures will help the light engineer platoon leader and brigade engineer collectively support heavy/light BCT operations.

The brigade engineer must consider support to the light TF early in the EBA and scheme of engineer operations (SOEO) development process. The light TF may cross the line of departure up to 12 hours before the main body of the BCT. Their early departure requires accelerated planning and execution time lines. Early in the planning process, the brigade engineer must plan and coordinate the critical resources and events that affect the light TF engineer. For example, a BCT plans to infiltrate a light TF to establish a blocking position, and the brigade engineer resources the effort with Volcano and MOPMS minefields. For that to happen, the light engineer platoon leader must clearly understand the location of resources, link-up procedures, and the obstacle intent (if any) before the light TF military decision-making process is initiated so that he can integrate these assets into the scheme of maneuver.

The brigade engineer or his representative (S3, XO, assistant brigade engineer, or battle captain) must maintain routine contacts with the light engineer platoon leader during the planning and preparation phases of an operation to provide guidance and supervision. Contacts may be face-to-face or via mobile subscriber equipment or FM radio and are in addition to standard reports. Routine contacts should parallel those that occur between the mechanized engineer battalion and its organic companies. These contacts ensure that the total brigade engineer effort is properly focused and coordinated. They also provide the young light engineer platoon leader with senior engineer leadership in the absence of his company commander.

A liaison officer (LO) facilitates coordination between the brigade and light engineers. FM 101-5 provides a clear purpose for employing an LO, selection criteria, and general guidelines. The LO's mission is to coordinate and support engineer operations within the light TF, not to burden the TF TOC or engineer platoon leader. To maximize the LO's effectiveness, the brigade engineer must provide him with proper tools, including a vehicle with driver and a radio with dual-net capability. Use of an LO greatly improves engineer input to the TF military decision-making process, engineer tracking, engineer reporting, and future planning during continuous operations. In addition, use of the LO enables the light engineer platoon leader to focus on preparing his unit to execute the mission.

Note: *For more information about liaison officers, see CALL Newsletter 95-7 (http://call.army.mil/call/newsltrs/95-7/tocsec5.html).*

When task organizing mechanized engineer assets to the light TF, the brigade engineer must clearly define command/support relationships and provide required engineer command and control (C2) nodes. For example, if a mechanized engineer platoon is task organized to a light infantry TF, the brigade engineer should immediately provide a C2 node to participate in

the TF military decision-making process and to coordinate the efforts of the light and mechanized platoons. The C2 node can be an S3 battle captain with a vehicle-mounted radio, who is assigned as the TF engineer. The C2 node will improve brigade engineer battle tracking of light TF operations. It also synchronizes the efforts of the two engineer platoons that are task organized to the light infantry TF and eases the transition of designated engineers to the new main effort after the light TF mission is completed.

The above observations and techniques revolve around command, control, communication, staff coordination, and leader supervision. We hope they provide both mechanized engineer battalions and light engineer platoons with some important insights to help their units prepare for a successful heavy/light rotation. Remember the bottom line: Planning, coordination, and supervision are required to effectively integrate heavy and light engineer forces and maximize their impact on the battlefield. Good luck—and Train the Force!

Captain Samaris serves as the engineer battalion tactical operations center trainer, National Training Center, Fort Irwin, California.

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Engineers in the Future Army

By James L. Allen

With the exception of our senior leaders, few of us appreciate or understand two documents that shape our Army's future. They are *A National Security Strategy for A New Century* and the *National Military Strategy of the United States of America.* This article contains my views on how these documents impact the Engineer Regiment.

National Security Strategy

Dated May 1997 and signed by the President of the United States, this document is not currently available from the Government Printing Office. However, it is on the National Security Council's home page on the Internet at http://www.whitehouse.gov/WH/EOP/NSC/Strategy.

The *National Security Strategy* states that "The U.S. military plays an essential role in building coalitions and shaping the international environment in ways that protect and promote U.S. interests. Through means such as the forward stationing or deployment of forces, defense cooperation and security assistance, and training and exercises with allies and friends, our armed forces help to promote regional stability, deter aggression and coercion, prevent and reduce conflicts and threats, and serve as role models for militaries in emerging democracies."

This document outlines the various threats military personnel may become involved with, which primarily include small-scale contingencies and major theater warfare. But military personnel also will help counter a host of other concerns, which are called "transnational threats"—terrorism, drug trafficking, international organized crime, and environmental and security concerns. In all, the *National Security Strategy* says that we "... in concert with regional allies, must remain able to deter credibly and defeat large-scale, cross-border aggression in two distant theaters in overlapping time frames."

National Military Strategy

This document is under revision, but the new version is expected to closely parallel the 1995 edition available through the Government Printing Office and on the Internet in various locations. The current *National Military Strategy* defines international dangers as—

- Regional instability
- Weapons of mass destruction
- Transnational dangers
- Dangers to democracy and reform

The document says that we will achieve our national military objectives through—

- Peacetime engagement
- Deterrence and conflict prevention
- Fight and win

This last area (fight and win) also focuses on engaging in two major regional conflicts simultaneously.

Engineer Locations

The Army has been reduced to 10 active divisions, with a total active duty force of 495,000 soldiers. Two or more divisional brigades

Research, Development, and Procurement Budget FY97-FY06	
MDEP	*Percent*
Engineer	00.6
Aviation	23.7
Combat Service Support	16.3
Command, Control, Communications, and Computers (C4)	15.0
Ammunition	13.7
Fire Support (includes Artillery)	10.0
Close Combat (includes Armor)	07.1
Air Defense Artillery	06.7
Intelligence and Electronic Warfare	04.9
Other	02.0
TOTAL	**100.0**

are located in Europe, Korea, and Hawaii; a contingency corps is stationed in the United States for rapid deployment; and reinforcing force divisional units are stationed throughout the United States. The active force in Europe is composed of four brigades, two "2-brigade slices" of the respective divisions—not two entire divisions. Engineers are assigned to each division. The third brigade of each division is CONUS-based.

About 76 percent of the engineers are in Army Reserve and National Guard units. That percentage is roughly parallel to the percentage of Reserve forces in transportation, quartermaster, and ordnance units. These reserve forces will deploy with their active duty brethern in the event of a real shooting war.

Facts of Life

Force Emphasis. The continued drawdown of the Army—and of engineer forces—has created some unique problems for future operations that are not intuitively obvious. We have shifted from a forward-deployed force to a power-projection force. Our forces once were planned for deployment into mature theaters with road, port, rail, and air networks. Now they are more likely to deploy into austere environments, with Somalia being a prime example. Host forces may have limited engineer capabilities, and host-nation contractors may also be scarce. We may have to fight our way in, ruling out host-nation support altogether. Each of these events will impact the engineer force's ability to quickly perform its mission, which is to support the maneuver force.

Funding. Added to this new fact of life is another: Engineers are not being modernized at the same rate as some other branches—Armor, Infantry, Artillery, and Aviation. A look at the research, development, and procurement budget from FY97-FY06 shows that the seven separate Engineer and Mine Warfare MDEPs (Mine Warfare Management Decision Packages) are scheduled to receive less than 1 percent of the total (see table). That tiny amount includes development and fielding of both the Grizzly breacher and the Wolverine heavy assault bridge. The combined research, development, and procurement budgets for two systems—the Commanche helicopter (Aviation) and the Crusader cannon (Artillery)—dwarf all other development efforts. The Armor Branch's armored gun system was successfully progressing through the development process but was killed to provide funding to other, higher priority systems. It is the first major system to suffer that fate but probably will not be the last.

For engineers, the stark reality of too many needs competing for too few resources means that to be successful on the "budget battlefield," we must first prove our worth to the Army's senior decision makers—who advanced primarily from the Infantry, Armor, and Artillery Branches—and to the maneuver force we support.

One impact of this resource-constrained environment is that the Army is currently pursuing a policy called "cascading." As new equipment is purchased, it goes first to those units most likely to use it, primarily Force Package 1 (FP1) units. Force packages are based on the "first to fight" principle, with those units most likely to go to war first being equipped with the most modern, most capable equipment. Equipment replaced in FP1 units is "cascaded" down to FP2, FP3, and FP4 units, each in turn. The Army sees this as a way of ensuring that the most modern equipment is in the hands of those



The Combat Engineer Vehicle (CEV) entered manufacture in 1966. It was retired in 1996, except for use in Korea and Bosnia. The CEV was never upgraded. The CEV will be replaced in engineer units with the Grizzly breacher, but not until 2004.



Photo courtesy General Dynamics Land Systems

When the CEV was fielded, the M60A1 was the Armor Branch state-of-the-art tank. It has been upgraded or replaced nine times since 1969, with current state-of-the-art being the M1A2. Two future upgrades are being developed.

"Simulations and simulators play an ever more important role in engineer training and battle planning."

most likely to use it (i.e., the contingency corps). It also helps ensure that our return on the original investment increases as lower priority units use older, less capable equipment.

But cascading has some unanticipated impacts. For example, in the field of topographic engineering, cascading means that as engineer units receive the latest digital terrain-portrayal equipment, they must remain capable of supporting lower-priority units as well. It does no good to have the most complete digital terrain data in the world if you cannot pass that information to a supported FP3 unit. That unit will need paper maps and terrain products long into the future, which means that topographic engineers must maintain multiple capabilities in both equipment and personnel.

This burden may be partly rectified by a political fact of life. Both the Army Reserve and the National Guard have some clout in Congress. Their backers have dedicated funds for certain equipment buys that cannot be afforded by the active forces. For example, in the sustainment engineering construction area, Reserve forces often have newer equipment than active duty units, which have a low priority for new construction equipment.

In some instances, active forces have taken advantage of this phenomenon by tacking their requirements onto Reserve buys, thus lowering the overall price of each system. As the budget for active forces becomes smaller, this unusual purchase arrangement probably will increase.

Goldwater-Nichols. Another fact of life Army planners must deal with is the Goldwater-Nichols DoD Reorganization Act of 1986. All Army table of organization and equipment (TO&E) units now are assigned to a joint command, as are their Air Force, Navy, and Marine counterparts. Goldwater-Nichols forced the military services to think "joint."

An outcome of "jointness" is the introduction of multiservice training at Fort Leonard Wood. Engineers and truck drivers from all four services receive part of their instruction here. In turn, we send Army engineers to Navy and Air Force facilities to learn other specialties.

The emphasis on jointness has carried over into materiel and doctrine development. Where possible, joint development efforts save time, duplication, and dollars. They also add to the interoperability of equipment among the four services and even with our allies. The future will include more joint training, perhaps at the National Training Center (NTC) or other locations.

Simulated Training. Simulations and simulators play an ever more important role in engineer training and battle planning. What we can simulate, we can "experience" to a near-real level of intensity without the cost associated with on-the-ground training operations. Both of the major new engineer systems under development, the Grizzly breacher and the Wolverine heavy assault bridge, are being developed with embedded simulator technology. Other systems will follow their lead.

Battle simulations are equally important. Historically, these high-tech computer games have not played engineer missions or have played them badly. New computer games bring engineer realities and dynamic environmental effects to the screen. What takes two hours to complete in the real world will take approximately the same amount of gaming time on the screen.

Practicing Engineer Skills. The need to practice all necessary engineer skills during live simulations is increasing, with those performed at the NTC being a prime example. One reason bridging the Sava River in Bosnia took so long is that river crossings are seldom practiced at the unit level, even at the NTC. In Bosnia, bridging was a seldom-tested skill for everyone involved. Only the Americans would attempt to cross the Sava in the winter under flood conditions, but our relative inexperience increased the time and resources needed to accomplish the mission.

Conclusion

Warfighters of the maneuver force like to talk about being at the very end of the "pointy stick," and they are certainly out there in harm's way. But in reality the soldier who is truly at the end of a pointy stick is often an engineer, and the pointy stick is usually a mine probe. For the near future, that situation will not change, because cascading will make it necessary for engineers to retain their current mine-probing skills.

A significantly reduced budget will allow new equipment to be developed and fielded, but it will be in too few numbers to impact the entire force. Much of the force will remain equipped with older, less capable equipment, which will increase training and maintenance requirements. Although the quality of training will improve, tight funds may not allow units to receive all the training their leaders think is required. But when the next war comes and the next minefield has to be breached, or the next bunker defeated, or the next airfield repaired, engineers will be called to complete these missions—just as they are today.

Mr. Allen is chief of the Productivity and Management Division, Directorate of Combat Developments, U.S. Army Engineer School. He is retired from the U.S Army Reserve with 24 years of active and reserve duty. Mr. Allen served with the 4th Infantry Division in Vietnam and with the 1st Infantry Division in Germany. He is a graduate of the U.S. Army Command and General Staff College, the National Defense University's National Security Management course, and the Army Management Staff College.



Make a Difference!

By Major Thomas H. Magness and Major Kenneth W. McDonald

Engineer senior lieutenants and junior captains who are deciding what to do during their "post command" years—after company command and before a field-grade assignment—have many exciting, challenging, professional development jobs available to them. But perhaps none can rival teaching at the U.S. Military Academy at West Point, New York. No other assignment offers greater educating, training, and mentoring opportunities as well as opportunities for developing technical expertise and experience in a relevant engineering field. Most importantly, nowhere else offers the opportunity to make a more profound impact on the future of our Army!

Successful Leadership

Assignments as senior captains and junior majors mark the transition point for most officers. Lieutenants and captains teach, train, and mentor privates and junior noncommissioned officers, while field grade leaders teach, train, and mentor junior officers.

The Command and General Staff College (CGSC) selection board recently indicated that a successful field grade officer should demonstrate the ability to deal with abstract concepts; teach and coach; communicate effectively; plan, organize, and coordinate; lead and work with officer groups; check the effectiveness of systems, and understand systems and make them work. In addition, they should be ethical, concerned with soldiers and their families, and dedicated and selfless.

What better place to hone these abilities than at the single largest commissioning source of our Army's lieutenants? Practiced in an arena where subordinates (cadets) may be a future Chief of Engineers or other leader in the Corps, these leadership skills will make a difference for the Army and the nation.

Dealing With Abstract Concepts. Engineer officers on the West Point faculty teach courses in mathematics, physics, chemistry, engineering (civil, mechanical, systems, and environmental), and relevant liberal arts and applied-science topics. Instructors are given broad guidelines (course objectives) and a mission to structure a course to meet them. The course director, a title that most instructors carry sometime during their tour, especially in departments with many elective courses, ultimately is responsible for structuring lessons to accomplish the required mission. Abstract concepts (objectives) must be structured in a logical, flowing manner and fit into a 40-lesson load. The specific approach is usually left to the course director. Engineer officers deal with abstract concepts when designing courses in wastewater treatment, hydraulic design, land-use planning, and other critical engineering and applied-science topics. Planning, organizing, and coordinating a semester of instruction is similar to organizing a major field exercise: Instructors must forecast for both the close battle (daily preparation) and the long term (resources, lectures, field trips, designs, etc.).

Teaching and Coaching. The classroom size of about 15 cadets allows time for each student to receive personal attention at West Point. Those needing additional help may meet with instructors after class or on weekends. Engineer officers also teach military skills in military-science courses (two-week intercession between semesters) and during summer training. Here, teaching and coaching in the profession of arms can

truly make a difference in how these cadets view their future employment. This is the fun part for both the cadets and the instructors!

Communicating Effectively. Communication skills, both oral and written, are challenged regularly. Instructors not only structure 55 minutes of classroom time but also present information to young men and women who may not understand the material and who possess different levels of motivation for learning. Instructors must make the material interesting and stimulating enough to meet both ends of the intellectual spectrum. Additional communication tasks include technical writing, professional presentations, and numerous targets of opportunity which are always available to the faculty at West Point, such as community speaking engagements and cadet clubs.

Leading Officer Groups. As course director, an instructor normally leads groups of up to 10 officers, although some groups may be larger. Structuring a course to meet academy expectations and determining course learning objectives (the mission) and lesson objectives (intermediate objectives) has military parallels and future leadership benefits. Conveying this information to fellow instructors, some of whom may be senior in rank, helps develop the ability to lead officer groups. Ultimate responsibility for the course lies with the course director and requires proficiency in time management, mission focus, and diplomacy. Balancing this requirement with teaching demands, additional instruction, cadet mentoring, and other extracurricular activities develops skills for future use in the BDU Army.

There are similar opportunities to work with fellow officers during the summer. Being a tactical or training officer during cadet field training at Camp Buckner can directly affect cadets' impression of the Corps of Engineers. Cadet sophomores train at the engineer committee's sapper training site on a variety of combat engineering missions. This is usually the first time that most of these cadets have seen engineer soldiers in action. Engineer officers serving as committee members, or as company or platoon trainers, have a great opportunity to "sell our branch." Terrain visualization (land navigation), dismounted sapper skills (infantry committee), and other combat arms skills are taught at other sites. Designing a site and its training objectives, forecasting resource requirements, and leading groups of fellow officers in field training, mentoring, and coaching will pay big dividends for future missions. Working with and leading groups of cadets in combat-related tasks provides a great environment for developing those critical field-grade skills.

Moral and Ethical Development

At West Point, you may be asked—almost on a daily basis—about dedication, ethics, morals, and philosophical concerns. Cadets are taught and engage in these issues constantly as part of their developmental process. The cadet honor code is a cornerstone of their education and moral development. West Point faculty serve as company honor representatives and in the consideration-for-others program. Instructors are challenged to provide examples of moral and ethical scenarios from which cadets may learn. This provides opportunities for them to ask questions about the "real Army." Cadet questions are not limited to formal instruction periods. Often a class may begin with "hot" issues that lead to discussions on morality and ethics in the field. These opportunities are a large part of the overall character development process for each cadet.

Targets of Opportunity

Technical expertise developed in graduate studies, course preparation, and West Point research opportunities fills a great need for the Army and the Corps. Many theses completed by future West Point instructors have direct links to Army issues and often fulfill a research need for the military. These include studies and instruction in fields such as construction, construction management, environmental engineering, civil and mechanical engineering, land-use planning, water resource management, hazardous-waste management, dam stability, and coastal engineering. Many instructors schedule the Professional Engineer Examination during their assignment at West Point, since they are likely to be better prepared for it there than at any other time in their career. Passing this exam enhances an engineer's credibility in future Corps assignments.

Supportive Data

The authors conducted a survey of students from the Class of 2000 to identify the importance and role of rotating junior military faculty in regard to influencing cadets. The survey indicated that 47 percent of the 1,042 cadets surveyed thought the junior faculty had the most positive influence on them. The remaining 53 percent were split between four other categories. Of the cadets surveyed, 90 percent indicated that West Point provided the type of officers the cadets wanted to emulate. An amazing 86 percent of the cadets indicated that the military faculty were the greatest influence in their decision-making process for branch selection. These results indicate a need for the best officers in the Army to go to West Point, so they can make a difference in the lives of future Army officers.

The Bottom Line

The leadership of high-quality engineer officers at West Point has a tremendous impact across the academy's wide spectrum of activities. Mentoring future leaders in the role and importance of engineers on the battlefield occurs daily—both in and out of the classroom. We need our best, most motivated officers to convey a positive message to young cadets who are thinking about the Army and their future in it. The challenge is a great one. The rewards—both personally and professionally—are immeasurable. Make a difference!

Major Magness is attending the Command and General Staff College. He was previously an instructor of geography and environmental engineering at the USMA. MAJ Magness holds a master's degree in environmental engineering from the University of Texas and is a registered professional engineer in Virginia.

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Engineer Professional Bulletin

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Directorate of Training (DOT)

Monthly DOT Notes Newsletter. Engineer leaders now can subscribe to *DOT Notes*, a monthly newsletter from the Director of Training. *DOT Notes* will improve communication between the Engineer School and field personnel by—

- Informing leaders of issues concerning doctrine, training, leadership, and personnel proponency.
- Informing leaders of changes to the Fort Leonard Wood home page.
- Soliciting comments and feedback on issues and publications.

The first issue of *DOT Notes* was sent via e-mail to about 60 battalion and brigade commanders in June. Request your assistance to expand the subscriber list to all engineer leaders. To subscribe to this valuable new service, e-mail the following information (in the sequence shown) to Jim Evans at evansj@wood.army.mil.

- Location (state or country)
- Component
- Unit
- Position in unit
- Rank
- Name

POC is Jim Evans, -6197.

Department of Training and Doctrine Development (DOTD)

Postal Address Changes. New postal regulations require that all bulk mail be addressed with 9-digit ZIP codes. To update our mail list, we request everyone check the address on the envelope containing this magazine and provide us a corrected military mailing address. All military unit addresses (including APO and FPO addresses) must include a U.S. Post Office-approved street address and full 9-digit ZIP code (ZIP plus 4). To update your address, send us both the OLD and NEW addresses (see form on page 42). POC is Catherine Eubanks, -4104.

Field Manuals (FMs) Distributed. The following publications are scheduled for distribution:

- FM 90-13, *River-Crossing Operations*, will be distributed 2d quarter FY98. This manual describes how divisions and brigades conduct river crossings. It shows the relationship to corps operations, where appropriate, and includes details for lower echelons to support the brigades.

- Change 1 to FM 5-71-2, *Armored Task-Force Engineer Combat Operations* and Change 1 to FM 5-71-3, *Brigade Engineer Combat Operations (Armored)*, are scheduled for distribution in November. These changes update the format for the engineer annex to the maneuver operations order (OPORD) and the engineer unit OPORD to comply with the revised FM 101-5. The most significant change is in the engineer unit OPORD. The scheme of engineer operations (SOEO) has been moved from paragraph 3 to paragraph 1. The SOEO is replaced in paragraph 3 by a concept of operations paragraph. This change allows engineer commanders to fully explain how their unit will accomplish its mission, especially in offensive operations in which the engineer commander is the breach force commander.

These manuals are on the Engineer School's Publications Page on the World Wide Web: http://www.wood.army.mil/DDD/PUBS/pubs.htm. POC is Lucius Warrick, -4015.

Staffing of Draft Publications. The following publications are staffed for review:

- FM 20-3. The draft revision of FM 20-3, *Camouflage, Concealment, and Deception*, will be staffed to the field for comment using a combination of disk copies and the Internet. The draft is currently posted on the Engineer School's Publications Page (address previously given) with a suspense date of 28 February 98. POC is CPT Joe Birchmeier, -4015.

- FM 5-434. The draft revision of FM 5-434, *Earthmoving Operations*, is scheduled for distribution and posting to the Engineer School's Publications Page in December. POC is Lucius Warrick, -4015.

Engineer Personnel Proponency Office (EPPO)

Itschner Award and Sturgis Medal. It's time for engineer companies to focus on the past year's achievements and prepare submissions for the 1997 Itschner Award and Sturgis Medal. These submissions reflect the culmination of a year of hard work for the company and the selected NCO. Submissions are due at Fort Leonard Wood by 10 February 98. The best submissions from an engineer company and an engineer NCO from each major Army command will be selected in April. Each unit should consider its own time line and plan from that point. Information on the composition of both the Itschner and Sturgis nominating books are in Fort Leonard Wood (FLW) PAM 672-1, dated 11 March 96. A winning Itschner book is described in an article published in the August 1995 issue of Engineer (page 49.) POC is SGM John Murphy, -4087.

New Grizzly Award. The Grizzly, a new award sponsored by the Army Engineer Association, recognizes outstanding contributions to military engineering, as demonstrated by technical and leadership expertise. The Grizzly Award is offered annually to an engineer platoon leader in each Army component (Active, Reserve, and National Guard). Selection criteria and nominating procedures for the Grizzly Award are the same as those for the Sturgis Medal, as described in FLW PAM 672-1. The deadline for submitting nominations to the Engineer School is 10 February 98. POC is SGM John Murphy, -4087.

Department of Tactics, Leadership, and Engineering (DTLE)

Terrain Visualization Instructional CD-ROM. The first version of an instructional CD-ROM created to help professional engineers become more effective terrain experts is being distributed to engineer units in November. Titled *Terrain Visualization*, the CD-ROM provides tutorials to guide soldiers through the important terrain issues, map information, and digital requirements of Army XXI. Included are a gallery of terrain visualization products, points of contact at the Engineer School, and a copy of the latest Terrabase II program with several sets of elevation data and imagery. The Terrabase II software program is designed to give staff officers and leaders at brigade level and below a simple yet powerful terrain visualization tool. Instructions for operating the Terrain Visualization CD-ROM and Terrabase II are provided. If your unit does not receive the CD ROM, call CPT Wendell Stevens or Mark Adams at -4134/4123.



Cover of CD-ROM

Lead the Way



By Command Sergeant Major Robert M. Dils
U.S. Army Engineer School

Greetings from your Engineer Center! Much has happened since CSM Julius Nutter and I transitioned this summer, and many of the issues that have surfaced will impact non-commissioned officers (NCOs) throughout our great regiment. CSM Nutter is a consummate professional command sergeant major, who always has the right answer to every problem and situation. The Engineer Regiment will miss him, and we wish him well in his new career. I will do my best to follow his great lead.

For the past few months, there have been sensational stories in the news media about sexual harassment and the courts-martial at several posts, including Fort Leonard Wood. A very small number of the nearly 500,000 soldiers on active duty chose to violate a sacred trust, and now those we serve and protect are having doubts about our Army. All of our victories, accomplishments, and sacrifices are overshadowed and somehow tainted. Good soldiers working hard in Macedonia, Namibia, and Laos pass unnoticed while headlines focus on the criminal misconduct of a few. This sickens me. Now, I want to devote the rest of this article to what we have done and plan to do to improve our great Army and the Engineer Regiment.

The Army has defined what constitutes sexual harrassment. A simple test for appropriate behavior is to treat every soldier as if you are in public in front of your mother and father. Would your parents be proud of you? The best policy is to make certain they always are. Treat every soldier with the respect the uniform demands, and all forms of harassment and discrimination will vanish. Those guilty of misconduct have been punished, and now we must heal ourselves and get on with the mission.

Since arriving at Fort Leonard Wood, I have visited our NCO Academy, the Drill Sergeant School, and many of the training units on post. My intent was to see firsthand if we have the proper foundations to train America's sons and daughters. I was very favorably impressed by what I found. Our nation's most precious resource could not be in better hands. Our institutions are sound and vibrant, and they are producing the finest NCOs to train America's finest soldiers. Our foundations are rock steady.

So what can we do to heal the wound? Nearly three months ago our new commanding general, MG Flowers, jumped on this problem with both feet, and I was right with him. First, he spoke with every drill sergeant on post to allay fears, dispel rumors, and express his personal confidence and trust in all of them. Next, he tasked each drill sergeant to write him a letter stating how to improve our post. The ideas and concerns expressed in more than 400 letters were distilled into 30 issues. Process Action Teams (PATs), made up of NCOs, have considered these issues, developed solutions, and recommended changes. As I write this article, the changes are being implemented to hone and fine-tune our post to better serve our Army. In future articles I will address some of the specific changes we are making and highlight our successes.

I will close on an up-note and express a friendly challenge to our fellow combat-arms NCOs. It is a pleasure to recognize the unique accomplishment of an outstanding engineer, CSM Harold Montgomery, who was recently chosen to be command sergeant major for the 1st ID. Hooah! He is the first engineer NCO I can recall to receive such an honor and vote of confidence. So, to all other combat-arms branches, be warned. Engineers are leading the way.

Your Engineer Center Army 10-Miler Masters' Team was first again—three years in a row. Hooah!

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