

# Engineer

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*Engineer 2000*

*An Interview with Major General Daniel R. Schroeder*

*Engineer Initiatives for Desert Shield*

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# RETOOLING WITH DIGNITY

By Major John Davison

Operation Desert Storm has occupied our minds the past six months and focused our energies on getting that mission accomplished. During this crisis, thoughts of reducing the size of United States' armed forces, a hot topic only a few months ago, have faded from public view. But probably not for long. Recent news articles state the "build down" will resume.

In April 1990, General Vuono, Chief of Staff of the Army, explained the why's and how's of building down the force. He indicated the Army would keep good soldiers and maintain career viability. At the U.S. Army Engineer School, we are addressing part of that issue by looking at combining certain engineer military occupation specialties (MOS).

In this article, I will address one component of the force reduction initiative—reclassification training of non-commissioned officers (NCO).

The build down (force restructure) and need to keep good soldiers will create overages and shortages throughout the enlisted personnel management system. This, in turn, will create a need to reclassify soldiers to meet requirements in the new force structure.

It is not a new dilemma for the Army. In the 1970s, the Army restructured the force to gain more "teeth" in the combat arms, and less "tail" in the service support arms. We did this by combining MOS and reclassifying soldiers. As a training unit company commander at Fort Leonard Wood

at that time, I received forced reclassification soldiers through the rank of staff sergeant. All soldiers attended the entire initial entry training (IET) course, regardless of their rank.

Today's Army needs a better, educationally based instructional model to retrain NCOs—one based on credit for experience and maturity, as well as respect for members of the NCO Corps. This does not mean we can accept anything less than established performance standards for the new MOS. Every NCO must know his job. And, there is no substitute for personally building a bridge, emplacing a mine, or operating equipment.

I believe the Reserve Component School Model (RC3, Reserve Component Configured Courseware) can be used to properly retrain and retool NCOs efficiently and economically. The program provides classroom and field learning environments, interaction with other students, trained instructors, and most importantly, hands-on experience with the equipment and materials used by soldiers the NCOs will soon supervise.

In 1990 the Engineer School exported more than 8,000 student training packages to more than 150 Reserve Component Training Institutions (RCTI) located on Active, Reserve, and National Guard posts in all 50 states, Puerto Rico, and Germany. Most of them were for MOS reclassification training.

To ensure high quality training, all instructors are MOS qualified, instructor training course qual-

ified, and use the instructional materials provided by the Engineer school. Programs of instruction (POI), course management plans (CMP), lesson plans, and exams are also provided. The CMP list all required equipment, ammunition, training areas, etc., needed for the hands-on experience required to award the MOS.

The RCTIs also receive assistance from Readiness Groups, CONUSAs and proponent schools' Directorates of Evaluation and Standardization, further ensuring quality standards. Currently, the Regional Training Sites-Maintenance are receiving accreditation visits from team members furnished by the Engineer School.

There are several benefits for the "One Army" reclassification of all NCOs through the RC School Model. First, students in each class are all MOS qualification or reclassification soldiers of closer age and maturity—the program allows retooling with dignity. Second, the training blends Active and Reserve Component NCO experiences, improving the one-Army concept.

A major benefit is cost effectiveness. Because RCTIs activate only when we need to train soldiers to meet a specific requirement, there is low overhead in permanent staff. Travel costs are significantly reduced because soldiers attend nearby facilities. Also, there is no permanent pool of equipment waiting for the next cycle; in many cases, the RCTIs pull together  
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## UNITED STATES ARMY ENGINEER CENTER AND FORT LEONARD WOOD

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**Cover photo:** Soldiers of the 24th Infantry Division check their M-21 mine on a beach in Saudi Arabia. U.S. Army photo by Gil High.

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## LEAR THE WAY

*By Major General Daniel R. Schroeder,  
Commandant, U.S. Army Engineer School*

**O**ur victory in the Persian Gulf reflects positively on the Engineer Center's ability to train soldiers. We have focused on training to standards to provide warfighting commanders with highly motivated, physically fit, and MOS-qualified soldiers, and an engineer force that can operate as an integral part of the combined arms team. Our engineer force with Desert Storm is performing superbly, and is a fine example of training dividends.

Until the Persian Gulf crisis threatened world peace, the U.S. Army was beginning a major organization "build down" that probably will continue. The azimuth for this effort is focused on preserving a quality force, as articulated in the Chief of Staff's six imperatives. A strategic force that is versatile, deployable, and lethal will result from this initiative.

The Army will transition to a forward deployed, CONUS-based force that is capable of large-scale deployments such as Desert Shield, small-scale deployments, and nation assistance. Strategic focus will shift to contingency and reinforcement, nation assistance, and unique mission forces. Tactical focus will be on a more aggressive, offensive, and non-linear concept of warfare.

We must pool our defense resources and build defense muscle. With our allied forces, we will use numerous forums to achieve the rationalization, standardization, and interoperability needed to conduct successful military operations using coalition warfare. Regularly scheduled staff talks, the North Atlantic Treaty Organization (NATO), and the American, British, Canadian, Australian (ABCA) (Quadripartite) Armies Standardization Program are designed to eliminate obstacles to cooperation.

Although the world's geopolitical environment is in turmoil, the mission of combat engineers remains the same - to provide combat support to the warfighting force. For engineers to keep pace with the combined arms force, however, we must update the methods employed to accomplish our mission. This will lead to changes in doctrine for the way engineers fight and support maneuver, changes in training and force structure, and the production or improvement of engineer equipment.

The Army's style of fighting must adjust to a changing world. AirLand Battle-Future (ALB-F) is designed to defeat the enemy's main effort at times and places of our choosing. Evolving engineer doctrine supports

the ALB-F concept of fighting on a non-linear battlefield. Doctrine will continue to emphasize interoperability among the allied nations, joint forces, and the combined arms.

Battlefield mobility must be improved before we can implement ALB-F concepts. We need to move faster, strike harder, and finish quicker to win future battles. As Confederate General Nathan Bedford Forrest noted, the key to success in battle is to "Get thar fustest with the mostest." Engineer support to offensive operations is the key to getting there first with the most. Effective countermine and complex obstacle breaching capabilities are vital to improving friendly mobility.

Mine warfare will change drastically. Our goal in mine warfare is to counter the enemy's mobility and degrade their forces without human intervention. Future minefields will serve as combat multipliers in gaps or where few friendly forces are located. Countermobility efforts will focus on state-of-the-art mine systems with remotely controlled and "smart" technology.

The wise use of terrain will become increasingly important on the future battlefield. Topographic engineers will supply real-time topographic support to help maneuver commanders understand how terrain can help win a battle.

Communications and automation will be critical on the fast-paced future battlefield. Commanders must exploit the intelligence, logistical, and maneuver aspects of warfare at the critical moment.

Materiel solutions to engineer equipment problems and battlefield deficiencies will continue to be found by the Directorate of Combat Developments. Although research, development, and procurement dollars are scarce, we must modernize our engineer force.

Engineers lead the way in planning for a lean, effective Army. Our restructure initiative will realign engineer support to the maneuver force, and produce a leaner, more lethal, and more mobile engineer force than we have today.

And, tough, realistic training is imperative to readiness. Leadership, combat engineering, and hard engineering will continue to be emphasized. Your Engineer Center is committed to producing engineer soldiers who can respond appropriately to the complex challenges that face the combined arms team. The future will demand much from us, but the Regiment will, as it always has, clear the way.



## BRIDGE THE GAP

*By Command Sergeant Major W.E. Woodall  
U.S. Army Engineer School*

**A**wards, and the recognition they provide, are important to all of us. I will take this opportunity to talk about an award steeped in Army tradition that may be presented to Army officers, non-commissioned officers, or civilians. Specifically, I will discuss the de Fleury Medal, which is administered by the Engineer Regiment.

When the Corps of Engineers adopted the "whole branch" concept of the Army Regimental System in 1986, our leadership recognized a need to preserve our history and traditions and to provide a means of instilling pride in the Corps. The senior engineer leadership discussed several ways to accomplish that mission, and decided to create a special award to bestow on people who made significant contributions to the Regiment. This award would derive its heritage from the very beginnings of the U.S. Army Engineers, the Revolutionary War. And, it would be a source of pride and prestige for the recipient and the Corps itself.

Research revealed that the Continental Congress of the United States had issued such a medal to one of our first engineers of courage and boldness in an important battle: Captain Francois de Fleury, a former French soldier who enlisted in America's fight for democracy.

With his background and education, de Fleury was commissioned a captain of engineers. As an assistant to Baron von Steuben, he helped write a drill manual that contributed much to the war effort. Then, on June 1, 1779, the British captured two small forts on the Hudson River, about 30 miles from Manhattan Island. A special corps of hand-picked combat veterans was formed to recapture the forts, one of which was Stony Point. BG "Mad" Anthony Wayne was in charge of the operation; de Fleury was second in command of the 1st Regiment.

Stony Point was surrounded by 150-foot cliffs, rocky slopes, and swamp. To provide an additional barrier system, the British had constructed strong entrenchments and double abatis. Thus, the American's decided that conventional tactics could not be used to recapture the fort. Instead, their attack would take place in total darkness in order to gain surprise. Except for a small diversionary group, the soldiers were ordered to unload all weapons and turn in all ammunition.

Then, as now, engineers went first. Sappers wielding axes breached the abatis in front of the advancing

infantry. With his commander wounded and fallen, de Fleury led the American soldiers through the withering fire and was first over the wall. Fierce hand-to-hand combat raged, and De Fleury was personally credited with striking the British colors from their staff and trampling them underfoot.

For his courageous behavior, the Continental Congress awarded a medal struck in de Fleury's honor. Benjamin Franklin commissioned the chief engraver of the French National Mint to cut the die. It is understood that the de Fleury Medal was the first Congressional Medal struck, if not the first medal authorized. George Washington was one of the first recipients.

The Engineer Regiment adopted the de Fleury Medal as their award in 1989 because of the values demonstrated by the man for whom it was struck—values with special meaning to engineer soldiers.

There are three levels of the award. To be eligible for a bronze medal, an individual must have rendered significant service or support to an element of the Engineer Regiment. The bronze medal may be approved by a member of the Engineer Regiment who is a colonel currently in command; a divisional engineer battalion commander; an engineer district commander; DEH director with the rank of lieutenant colonel; the president, Engineer Regimental Association; or a general officer.

The silver medal must be approved by the Commanding General, U.S. Army Engineer Center and Fort Leonard Wood. It is awarded to a person who has rendered outstanding and significant support or service to the Engineer Regiment.

One gold medal is awarded annually by the U.S. Army Chief of Engineers to an individual who exemplifies boldness, courage, and commitment to a strong national defense.

The Engineer Regiment began presenting de Fleury Medals after the Engineer School moved from Fort Belvoir to Fort Leonard Wood in 1989. To date, more than 150 medals have been awarded to persons ranging from sergeants to generals, the chief of staff of the French Army, and civilians. Anyone with the knowledge of the facts showing the criteria have been met may start the award process.

Today the de Fleury medal is awarded for the same reason that the Continental Congress awarded the original in 1779—for outstanding service to the Regiment and the nation.

# Engineer 2000

*The White Paper, Engineer 2000, has been prepared to address the azimuth for the Corps of Engineers as we move into the twenty-first century. The following article is a condensed version of the paper, covering some of its more important issues that I want to share with you.*

*The Army is changing. The events in the world's political environment in the past two years have created a watershed of changes in priorities clearly impacting on our profession. Yet, the mission of the combat engineer has been, and will continue to be, to provide combat support to the war-fighting force.*

*It is the structure and purpose of the new war-fighting force, and the scope of our combat support, that must be understood if we are to move into the next century as a true member of the combined arms team. Steady leadership, focused on the ultimate objective of improving our ability to execute our missions, and a commitment by all members of the force to achieve those goals are the essential elements of improving the Regiment.*

*To this end, Engineer 2000 has been prepared. It is purposely not specific in nature. It serves only as a guide to look at where we and our Army are going as we move toward the year 2000.*

**DANIEL R. SCHROEDER**  
Major General, U.S. Army  
Commandant  
U.S. Army Engineer School

*"At every crossing on the road that leads to the future, each progressive spirit is opposed by a thousand men appointed to guard the past."*

Count Maurice Maeterlinck  
Belgian Philosopher, 1862-1949  
Nobel Prize for Literature, 1911

## The Engineer Center

**B**old, diligent, technically competent, fully trained, and properly organized and equipped sappers of the twenty-first century will be the products of your Engineer Center. Today's engineers are moving through a period of transition to a leaner war-fighting force, mission-focused to support the commanders in chief (CINCs) in whatever contingency, nation assistance, or force sustainment role they face.

Through the next decade, we will continue to refine the tremendous training advantages of the new Engineer Center, where every engineer from private to colonel will receive their engineer training. Our efforts will establish your Engineer Center as the focal point of military engineering, training, and expertise in the world.

Fort Leonard Wood will see more changes in the future, with soldiers training in fewer military occupational specialties (MOS) and shorter, more concentrated professional courses. Increased use of automation and simulation will change the funding balance somewhat, but the net effect will be more training for the dollar.

Through this evolutionary period and well into the next century, the primary mission of the Engineer Center will remain the training of soldiers to become sappers and visionary leaders in the new total force. As never before, our sappers and their bold and aggressive leaders will have a role in preparing the Army to counter the emergence of new battlefield threats across the continuum of operations, and under any terrain and weather conditions.

## An Azimuth For The Regiment

**C**hanging world events have caused the United States to redesign its military strategy for war fighting and nation assistance. Critical missions for our Army in the year 2000 go beyond "shoot, move, and communicate." In supporting complex national



**Above and Left:** Changing world events will cause a strengthening of the Army engineer's dual role as a combat element and as a key player in nation assistance programs.



and international priorities, we will be expected to provide support and assistance to developing democracies in South and Central America, expand the effort to combat the national and international drug trade, and most importantly, project our power worldwide to protect our vital interests. The Regiment is, and will continue to be, actively engaged in pursuing these purposes with no indication of a diminishing tempo.

*"Any good Engineer Officer must wonder about the problems of the German Engineers in the assault on Stalingrad, and about the problems of the Russian Engineers in its defense. Any good Engineer will never pass a bridge but what he gives a thought as to how that piece of terrain might best be organized for defense, or as to how it might be attacked if it were organized by the enemy."*

**MG Eugene Reybold**  
*Chief of Engineers*  
 October 1942

## Doctrine

**A**irLand Battle doctrine will continue to mature and adjust to a changing world. AirLand Battle-Future (ALBF) sees forces employed on a nonlinear battlefield. The key to ALBF is flexibility. While the Army will be smaller, it must remain versatile, deployable, and lethal. It will provide forward-deployed forces and be more capable with contingency, reinforcing, and nation assistance forces.

Our evolving engineer doctrine supports the ALBF concept. The doctrine for traditional fixed-battlefield functions—mobility, countermobility, survivability, sustainment engineering, and topographic engineering—is continuing to evolve as new techniques, procedures, and material become available. The force structure is also changing to meet the operational requirements of ALBF.

To win on the future battlefield, the deployability, survivability, lethality, effectiveness, and operational capabilities of the Army combat and combat-support forces must be maximized. However, with reduced force levels and emerging political, economic, and geopolitical environments, the complexion of future engagements is changing. With fewer forces, there will be large gaps in the lines. To compensate, commanders must analyze the capability of their forces as a function of the terrain, maintain fluid operations, and rapidly mass and disperse their forces on the nonlinear battlefield. Additionally, units must still be capable of conducting linear operations when needed.

Such combat operations of the future will exist throughout the depth of the battlefield. Commanders will capture and maintain the initiative through the highly synchronized and agile employment of forces. Operations will be conducted in overlapping, continuous stages. Sensor acquisition, fires, maneuver, and recovery stages will blend into a continuous, quick-paced process.

This will require commanders to exploit the intelligence, logistical, and maneuver aspects of warfare at the critical moment. The engineer, in mobility, countermobility, survivability, sustainment, and topographic engineering roles, is inextricably linked to every facet of the new battlefield.

*"If used correctly before a battle, a platoon of engineers can be more valuable than a company of tanks."*

Coyle, TEAM YANKEE

## Organization

**E**ngineer units on the future nonlinear battlefield will be leaner, more focused on combat, and

better tailored to support brigade maneuver forces.

A sapper battalion organic to each maneuver brigade will enhance command and control, put more engineers forward in the battle area, and provide synchronization for the use of engineers as a combat multiplier. These sapper battalions will provide immediate engineer and topographic support to each brigade without the necessity or the time required to task organize for specific missions.

The division headquarters will include a division regimental engineer and staff. The regimental colonel will plan engineer operations, advise the division commander on engineer matters, and will plan and develop training guidance for the sapper battalions.

The corps commander, through the use of mechanized and wheeled combat engineer battalions from the corps engineer brigade, will support mobility and survivability of the maneuver brigades from the corps rear area to just short of where the fight is to occur. To ensure proper bridging assets are available where needed, all fixed- and float-bridge assets will be consolidated at the corps level.

Operations in Southwest Asia have shown that it is absolutely essential that engineers accompany the initial maneuver unit deployments to establish the sustainment base from which our forces will operate.

To meet the support needs of deploying headquarters, the present combat-heavy engineer battalion will evolve into a new structure, with new roles and missions. It will be able to support deploying, reinforcing, and contingency forces. As necessitated by shrinking budgets, it will also be designed to provide infrastructure support to continental United States (CONUS) installation commanders. The Army Reserve or National Guard round-out battalions, with one or more Active Army separate companies attached, will also be capable of fulfilling a nation assistance role when deployed.

In addition to his mobility, countermobility, survivability, and sustainment engineering capabilities, the division regimental engineer will have real-time topographic support through the division terrain team, which will be the primary topographic staff for the tactical commander. Through the next decade, topographic engineers will transition from a map production mission to one of providing battlefield environment information. Topographic engineers will be integrated into the total engineer force, providing direct and general support to corps and echelons above.

Engineer commanders will use the new technology and new organizations to play a major role in operational and tactical decision making. The engineer must be an active part of the commander's combined arms team at all levels, not just an advisor.



With reduced force levels in the next decade, commanders will have to maximize the capabilities of their units on the nonlinear battlefield. Such forces will have to be highly synchronized and agile.

*Colonel Anderson reported the barrier lines shaped mainly by the 291st and 51st Engineer Combat Battalions were now in the hands of five infantry and three armored divisions, from Malmedy all the way back to the Meuse River. Little wonder that "...Peiper could only sit with leaden heart and face the fact that time had run out...he could only sit helplessly, pound his knee and swear, 'The damned Engineers! The damned Engineers!'"*

*Colonel David E. Pergrin First Across The Rhine*

## Materiel

New equipment initiatives for the force in 2000 focus on providing in-stride breaching and gap crossing, terrain visualization, intelligent/autonomous mines and minefields, multispectral camouflage, and increased support to nation assistance. Near-term emphasis will be on systems enhancing terrain visualizations and analysis for the maneuver commander and countermine systems.

The ability to breach minefields and obstacles in stride and under fire will increase the survivability and maneuverability of the combined arms team. A true in-stride breach capability will be realized with the fielding of the combat mobility vehicle (CMV). Another armored system, the new mine-clearing line charge

(MICLIC), mounted on the armored vehicle-launched bridge (AVLB) chassis, has been effective in assault breaches. Should ongoing research and development programs be approved, mobility in 2000 will be further enhanced by the introduction of heavy assault bridging equipment and an improved ribbon bridge. Improved handheld mine detectors, explosive line charges, improved dispersed explosives, and scatterable mine clearing devices are being developed to further enhance mobility.

Continued research and development of a scatterable mine system, improved fusing for conventional mines,

an anti-helicopter mine, and concept exploration of intelligent and autonomous mines will improve our countermobility capabilities. Improved explosives systems will be developed to rapidly emplace antitank ditches. These systems may also be employed to create rubble obstacles in urban areas, to reduce obstacles, and for general purpose demolition tasks.

Soldier survivability has already been enhanced with the introduction of the M-9 armored combat earthmover (ACE) and the small emplacement excavator (SEE). It will be further upgraded by the fielding of developmental systems which quickly provide underground shelter and overhead cover to individual fighting positions, as well as multispectral camouflage and terrain masking technologies.

In the next decade, tactical topographic equipment will be supplemented, and eventually replaced, by compact, highly mobile, transportable, self-supportable, automated systems. A digital topographic support system will be fielded by the year 2000 to provide topographic information and terrain analysis.

*"No method of education, no system of promotion, no amount of common sense ability is of value unless the leader has in him the root of the matter—The Fighting Spirit."*

*Field Marshall Earl Wavell*

## Training and Professional Development

**T**ough, realistic training is the key to readiness. Emphasis on training will continue to focus on fully integrating engineers into the combined arms team. Force realignment will progress further toward placing the engineer regiment as the organic support for a maneuver division. The Army Reserve and National Guard will continue to experience realistic integrated training. They will train more frequently and vigorously with their Active Component partners.

Within the resource constraints of a leaner, more battle-focused Army, a trend toward MOS consolidation will continue. Wherever two similar functions exist under different occupational specialties, the two will be merged, if possible. This will require individual soldiers to function in a broader variety of roles.

On the AirLand Battlefield of the future, engineer leaders must be quick thinking, flexible, and creative to provide dynamic support to the maneuver commander. Engineer support is a combat multiplier, but only when it is correctly focused. Development of these engineer leaders begins with early identification of leadership strengths and weaknesses; during the Engineer Officer Basic Course (EOBC) for officers, and the first assignment for enlisted personnel. Assessment of soldiers' actions during rigorous, realistic, combat-oriented training will indicate who leads and who follows.

Leaders will assume responsibility for portions of their professional development. Beginning in the next decade and refined into the next century, NCOs will be tested annually with the new self-development test (SDT). The SDT will consist of technical, leadership, and training questions. As with the old skill qualification test (SQT), the technical questions will come from the soldier's manual. NCOs will be required to prepare for the SDT on their own time.

Officers will be trained to doctrinal and technical proficiency using the military qualifications standards (MQS) system. This system will provide a common ground for training our officers as part of the combined arms team. As with the SDT, the major responsibility for maintaining technical and tactical proficiency will rest with the individual soldier.

Engineer warrant officers will continue to fulfill critical roles in engineer maintenance and utilities management. Our warrant officer population for all technical skills will be developed from experienced enlisted soldiers in related fields who have appropriate military and civilian educations. But most importantly, all will be required to expand their troop leader role. No longer just a technician, the engineer warrant officer will be a leader first, then a technician.

Leadership opportunities from squad leader to regimental command will not suffer under the en-

gineer restructuring. In fact, in the engineer force 2000, leadership opportunities will be at least as good proportionately, if not better in some grades. Even in the leaner, lethal force of the future, chances for assignment to a troop-leading position for both enlisted and officer personnel should match current opportunities. Accordingly, resident school selections, promotion rates, and unique leadership opportunities will be as good or better than current levels.

The focus in the year 2000 will be on individual professionalism, with an emphasis on self-improvement. A more lethal, technical, contingency-based force will require an intelligent, flexible, and innovative Army of leaders. The proficiency of the force will improve, not as much by a designed training program, but more by natural development of our professional leadership cadre.

Combat leaders, and that is what all engineers are, must be proficient in the basics of soldiering. Engineers at all levels must be proficient in weaponry and technical skills, confident in their battlefield leadership abilities, and competent in their design and management techniques.

Proficiency, demonstrated competence, and performance will be rewarded through selection for schools, promotions, and command leadership positions.

However, with the reduced force structure, sub-caliber performance will be quickly culled out. The resulting cadre will truly be the best engineer force America can field.

## A Final Thought

**T**hrough progressive leader development, with ethics and integrity as the bedrock, unselfish service to the nation will be instilled throughout the Regiment. Then, should the need arise, we will have produced for the country the new Putnams, Lees, Fremonts, Warrens, MacArthurs, Groves, and Itschners when strong, competent leadership is required in challenging positions of leadership.

*"If we learned nothing else from the recent operations in Grenada and Panama, we have learned that soldiers fight exactly as they are trained in peacetime. We must command in peacetime as we command in war. We must place the same responsibilities upon subordinates in peacetime that we expect of them in combat."*

*General John W. Foss  
Commanding General,  
Training and Doctrine Command*





# Combined Arms Breaching

By Captain James R. Brannon

**B**reaching is one of the most critical engineer missions on the battlefield. Advances in mine technology, debate over breaching methods, and a continuing real-world threat—like that recently posed by Iraq—all combine to make breaching a hot topic among engineers.

Well, take note, because FM 90-13-1, *Combined Arms Breaching Operations*, is finally on the street. Breaching operations, particularly during tactical maneuvers at the National Training Center (NTC), have been under intensive study by the Engineer School for the last two years. This article describes that study, and its impact on our breaching doctrine. A 1988 study conducted by then-Lieutenant Colonel Robert J. Greenwalt, from the Engineer School's Department of Combined Arms, has been replicated and verified in a follow-up study completed by the School's Directorate of Evaluation and Standardization (DOES). The purpose of this follow-up study was to complete the work started by LTC Greenwalt as an on-going part of NTC Engineer Trendline Analysis. This summary will present the final conclusions of those studies and a brief overview of tested and verified doctrine for combined arms breaching.

## Study Conclusions

**O**ur combined arms breaching doctrine is sound, it works, and has been field-verified at the NTC in more than 100 battles. The proper application of our breaching doctrine virtually assures a successful breach. Study confirms that units which correctly employ proper doctrine succeed. Those that do

not—fail. It cannot be overemphasized that your best assurance of success in breaching is proper application of our new doctrine.

Using METT-T (mission, enemy, terrain, troops and time available), an IPB (intelligence preparation of the battlefield) process with sufficient detail, good reconnaissance, combined arms team rehearsal, and synchronization of forces and SOSR (suppression, obscuration, security and reduction) are central to that doctrine. Commit the fundamentals of breaching doctrine (page 11) to memory and file it in your "smart book."

Time and experience shape doctrine. But once put on paper, few components of the military art are as challenging to test and validate as doctrinal concepts. Solid, quantifiable evidence often does not exist. But perhaps the greatest challenge is the acceptance of doctrine by those who stand to benefit from it. Revised methodologies, especially when they differ from former, more familiar ways of doing business, are often viewed with suspicion. This natural reluctance to change must be met with clear and convincing evidence.

## Research

**I**n 1988, LTC Greenwalt reviewed the results of 47 battles fought at the NTC during FY 1988. The DOES conducted a similar study of 56 battles which took place during FY 1989. Each of these studies compared the application of combined arms and engineer breaching methods with the outcome of breaching operations. The results of the study, reported at the Engineer Commanders Conference in

May 1989, examined these trend issues: reconnaissance of obstacles, templating of obstacles, rehearsal of breaching obstacles, breaching doctrine application, and breaching equipment.

LTC Greenwalt's study surfaced conclusions that were both interesting and alarming. First, doctrine was applied only 25 percent of the time in combined arms breaching of obstacles. Not surprisingly, 72 percent of the breach efforts fell below standards and 57 percent failed at the obstacle. The standard used in his study was 30 minutes effort, with light casualties. This should not be construed as "the" standard, but it was used as a point of departure for classifying various breaching operations in the study.

Secondly, the application of breaching doctrine resulted in an 80 percent success rate. Those parts of doctrine contributing most to successful breaching were:

- Rehearsal of combined arms team with engineers (100 percent successful).
- Application of breaching fundamentals (SOSR) (80 percent successful).
- Reconnaissance of enemy obstacles (75 percent successful).

These results come as no real surprise. It should be noted that this particular order of merit was not fully conclusive in the 1988 study. However, the very same observations were repeated in the 1989 DOES study.

While breaching doctrine was being reviewed and FM 90-13-1 was being staffed, DOES set out to replicate the original 1988 study. The purpose of our study was to clarify, confirm and complete the observations of the earlier study, to examine the use of doctrine and the effects of using it, to determine the interrelationships between doctrinal elements (if any), and to attempt to build a regression equation that would permit prediction of battle success.

The 1989 study director was Dr. William Dannenmaier, chief of the DOES analysis division. Study team members were Captain Neal Lovell and Captain Anthony Bailey.

The 1989 DOES study confirmed what LTC Greenwalt had discovered. Doctrine for combined arms breaching operations is employed less than half of the time at the NTC. When doctrine is employed, breaching operations are successful. When doctrine is not used, units are very likely to fail. Shadowing the 1988 study, it was found that those elements of doctrine most critical to successful breaching operations are (in order):

- Application of breaching fundamentals (SOSR).
- Organization for the breach.
- IPB (specifically, reconnaissance and templating).
- Combined arms team rehearsal (with engineers).

The 1989 study applied some sophisticated analysis techniques in an attempt to find correlations between the application of doctrine and success in breaching. Using a nine point scale (nine being highly successful and one being total failure), five points was established as the threshold for successful breaching operations.

All breaching operations were classified first by subdividing them into three categories (poor, average, and successful), and further dividing each of these again into three categories (poor, average, and better). Using a modified Delphi technique, scores were assigned to breaching operations based on the descriptions contained in NTC take-home packages.

After classifying each breach operation, the breaching doctrine employed in each battle was type-classified as either present or not present (assigned a score of one or zero). This allowed the construction of a matrix and the calculation of correlation coefficients between doctrinal procedures and battle success.

Using multiple regression analysis, regression weights that describe the contribution of each component of breaching doctrine were determined. The regression weights computed in the study are shown in the following table:

<i>Item of Doctrine</i>	<i>Weighting Factor</i>
1. Application of SOSR	2.54
2. Organized for breach	0.93
3. IPB/templating	0.93
4. Combined arms rehearsal	0.53
5. Reconnaissance	0.05

The usual model employed in multiple regression is an equation that attempts to relate some event (in this case breaching success) to some orderly collection of independent events. Normally, we see this equation as:

$$\text{Outcome} = \text{Constant} + \text{Contribution from event 1 (2, 3 and so on)}$$

The constant in this expression represents the minimum expected value for the predicted outcome, given that all contributions from each event are zero. Beyond that description, the constant has no real meaning. The weights from the table may be used in a simple prediction equation with a constant of 3.04.

## Breaching Doctrine

- **Intelligence:** Perform an IPB (intelligence preparation of the battlefield) with terrain analysis, enemy doctrinal templates, situational templates with enemy obstacles noted, and finally a decision support template. Include an engineer squad with the task force reconnaissance platoon. Understand how the IPB process works and exploit every opportunity to know the battlefield. You must know what to expect and how to counter it in order to maintain your initiative and capitalize on any opportunities.
- **Breaching Fundamentals:** Suppress, obscure, and reduce (SOSR) (Figure 1). Understand what these terms mean and make sure your actions are coordinated and synchronized with these key activities. Breaching actions performed by the maneuver forces cannot succeed unless you are aware of the total plan of fire support, the movement through the obstacle and to the objective, the needed lanes through the obstacle, when and where obscuring smoke is placed, how long it will last, and how you can get more. Securing the far side is key to effectively breaching any obstacle; you must know how this will happen, who will do it, and what engineer forces will go forward. Far-side security provides protection and time to reduce the obstacle to support the task force scheme of maneuver.
- **Breaching Organization:** Support force, breach force, and assault force. Are you prepared to react and reorganize to breach different types of obstacles? When will the support force be in place? What sector of fire or avenue of approach will they cover? Who's in charge? When and where will you meet?
- **Mass:** Crack the obstacle, rupture the defense; find a weakness or create one. You must open enough lanes to push sufficient maneuver forces to the far side (Figures 2 and 3). Doctrine calls for a minimum of two lanes per task force. Mass enough engineer force against the obstacle to reduce it using multiple techniques. To prepare, make this part of your engineer estimate. What resources will you need to open two, three, or four lanes? Where and when will you get them? How will you replace casualties and continue to press the fight?
- **Synchronization:** Plan, practice, and execute the synchronization of SOSR, support, breach, and assault forces (Figure 4). Rehearsal is key. Can you find the obstacles under cover of smoke? Do your soldiers know what to do, can they move quickly? Will they confuse enemy artillery with friendly artillery suppressive fires? Do they know where to go after breaching, who links up and where? Timing is critical, you must plan thoroughly to make it happen the way you want it. Start with the reverse planning process: the actions at the obstacle must support the actions on the objective. Which squad or team moves to the objective with the maneuver forces, what is their mission, who will lead them? You must know in advance how you are going to get your soldiers to where you want them to be and when they must be there. It takes a lot of tough thinking. (See Chapter 2, FM 90-13-1)

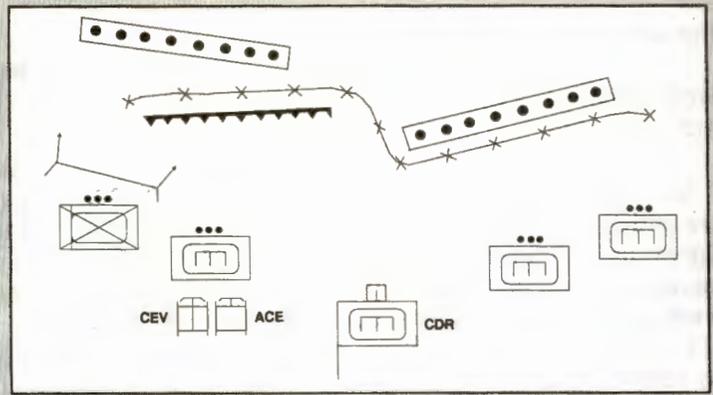


Figure 1

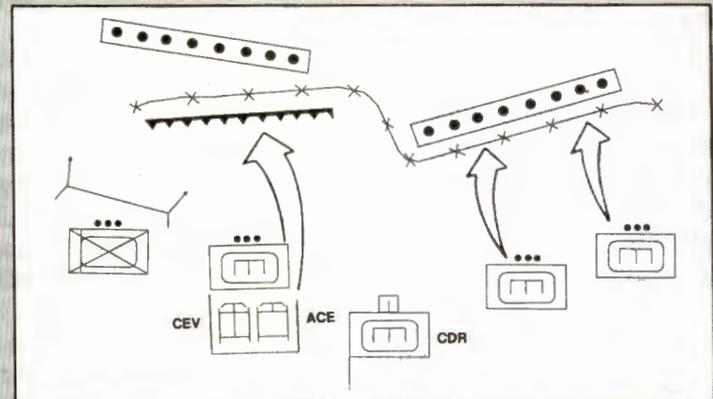


Figure 2

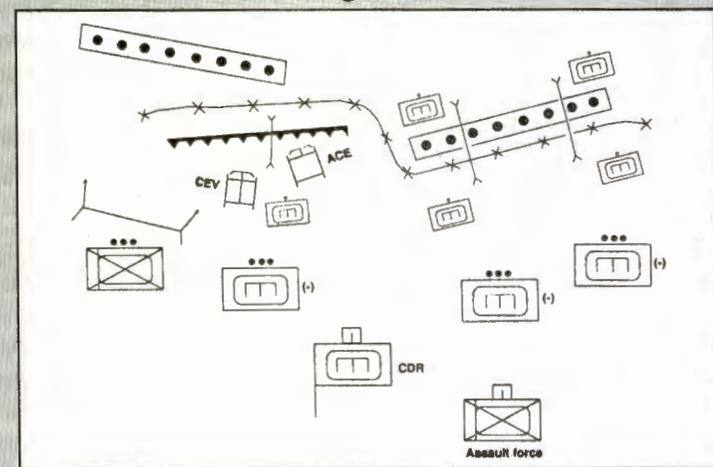


Figure 3

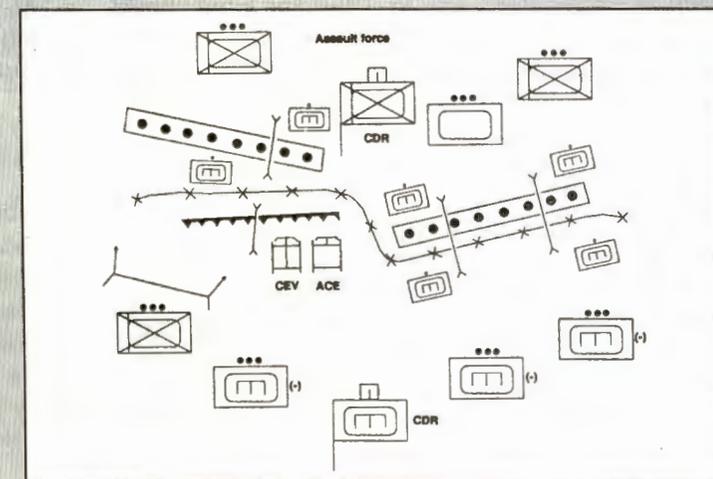


Figure 4

This equation may be expressed as:

*Breach score = 3.04 + (sum of doctrine weight factors)*

Developing this prediction equation was one objective of the study. The more doctrine employed, the higher the score. A score of near 8 was classified as representing successful multiple breaches. Using the prediction equation and employing all of the elements of breaching doctrine, a breach score of 8.02 would be calculated as:

$$\text{Score} = 3.04 + 2.54 + 0.93 + 0.93 + 0.53 + 0.05 = 8.02$$

We can simply add the contribution weights because we ascribed a score of zero or one to each doctrinal element (either the doctrine was used or it was not). It is important to note that the weights (regression coefficients) were determined from evaluation of the interrelationships.

### Insight

**H**ard data were scarce, and the DOES study had to make some reasonable assumptions. Foremost was the assumption that breaching at NTC is sufficiently real to validate doctrine for the battlefield. Also, it was assumed that after action reports (AARs) from the NTC accurately reported exercise results. Of course, the study was limited to NTC rotations in FY 89 and also by the degree of detail in AARs. These assumptions and limitations became less of a concern when the 1989 study independently confirmed the observations made in 1988, and supported the significant, unsolicited feedback from subject matter experts, observer/controllers, and others at the NTC.

In the two years of study concluded by DOES, we found answers to many important questions. The essence of the research was to determine what impact combined arms breaching doctrine had on the outcome of breaching efforts. Admittedly, doctrine is not a lock-step, by-the-numbers application of isolated procedures. The fact that breaching can require just as much art as science made the analysis very challenging.

Part of the analysis required researchers to examine doctrinal interrelationships and make reasonable judgments regarding the strength of those relationships and their impact on the execution of a breach. Fortunately, the tools of analysis (regression and correlation) produced results with a high margin of confidence that was statistically significant.

### Conclusions

**T**he battlefield is a highly unpredictable place. This study does not claim to set in concrete any type of cause and effect relationships. It does, however, help formulate reasonable conclusions. The range of possibilities runs from a highly successful breach employing no doctrine at all, to a completely failed breach employing all doctrinal elements.

What we are concerned with are the probabilities, the actual likelihood of events. The importance of this study is that it quantifies those likely events into reasonable form.

The facts of the study are fairly clear. Breach failures at NTC were conspicuous by their lack of sound doctrine. Successful breaching operations were consistently characterized by the application of breaching doctrine. The strength and reliability of these characterizations is the real essence of the numerical analysis. The numbers tell us that properly applied combined arms breaching doctrine is highly effective.

While the DOES study confirms that our breaching doctrine is sound, the "fog of war" provides unpredictable variables that can never be tested or quantified. It's often said that "no plan survives the first enemy contact." What happens to you when you attempt a breach under fire cannot be predicted by any study or any equation.

What the study does prove, however, is that you can stack the odds in your favor by correctly employing breaching doctrine. 

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# Engineers and Combined Arms Training Strategy

**F**or years, a method of ensuring that engineer units conduct integrated combined arms training has been high on the wish list of many commanders and training officers. A way was also needed to outline the methodology used to determine engineer training strategies and the resources required to support them.

The Army's answer to this need is the Combined Arms Training Strategy, or CATS for short. CATS is designed to provide an "executive summary" of master plans for training. The summary provides a link between combat and combat support units, institutional and unit training, and individual and unit training.

## Background

**C**ATS is an evolving strategy designed to capture, on one document, the effect of the Army's current and future training requirements for unit training. The new strategy provides subordinate units with guidance on developing annual training calendars. CATS is the Engineer School's recommended model for keeping an engineer unit within the band of excellence described in FM 25-101, *Battle Focused Training*. CATS outlines the recommended training frequencies and the resources

needed to support them.

The CATS concept evolved from a 1988 tasking from Army Chief of Staff General Vuono to Training and Doctrine Command (TRADOC). TRADOC was given the task of developing a strategy to train the entire Army to operate effectively as a combined arms force. For strategy developers, "combined arms" meant the integration of active and reserve forces, and heavy, light and special operations (SOF) units. The strategy would serve as the driving force for defining, developing and managing training and training resource requirements.

The Combined Arms Center, Training (CAC-TNG) at Fort Leavenworth is charged with integrating the CATS strategies vertically from higher to lower headquarters. They are also responsible for ensuring that the strategies are coordinated horizontally between combat arms, combat support and combat service support units.

## Structure

**U**nit and institutional training strategies are the two major components of CATS. Since institutional strategies are still under development, this article deals primarily with the former. The institutional side of CATS is briefly covered at the

end of this article.

The unit training strategy consists of three baseline strategies: maneuver, gunnery and soldier. These recommend the type and frequency of training events that will allow units to stay proficient. The three strategies are also configured to allow flexibility for current resource constraints.

As the CATS program matures, the Engineer School will develop "projected" strategies in an effort to meet future training and resource requirements.

## Maneuver

**T**he four engineer maneuver training strategies now in place are listed at the top of page 14. A fifth strategy for engineer groups/brigades is also being developed. Those units which do not have a strategy, like specialized detachments and separate companies, will use the strategy of the engineer unit to which they are attached.

The unit maneuver strategy for the Combat Engineer Battalion, Wheeled/Mechanized, is shown at Figure 1, page 14. Each unit, from individual crews to the whole battalion, are matched to specific training events. These include command post exercises (CPXs), situational training exercises (STXs), and field training exercises (FTXs). The STXs and FTXs

## Maneuver Training Strategies

- Engineer Battalions, Wheeled/Mechanized
- Engineer Battalions, Light/Airborne/AirAssault
- Engineer Battalions, Combat Heavy
- Engineer Battalions, Topographic
- Engineer Groups/Brigades

found in each unit maneuver training strategy are tied to the sample STXs and FTXs found in ARTEP (Army Training and Evaluation Program) mission training plans.

Each training event is considered a separate activity. All events emphasize the training of engineers for their role in supporting a maneuver task force. The training event frequency for the engineer company/platoon, for instance, calls for participation in "engineer-only" company exercises as well as maneuver brigade/battalion exercises. Distinctions are also made between Active and Reserve Component training.

Critical gates are identified at the bottom of each event column. These gates require units to train tasks using a low-cost event, like a drill, before attempting to train at a high-cost event, like a field training exercise. Requiring successful completion of the task at a low-cost event reduces the possibility of poor performance at a high-cost training activity. Obviously, this gives the Army—and the soldier—more proficiency for every dollar spent on training.

An example of a critical gate is requiring the crew of a combat engineer vehicle (CEV) to successfully fire the 40 millimeter (mm) sub-caliber device before conducting live fire with full-size rounds.

Another example is preliminary marksmanship instruction (PMI). This is basic rifle instruction which soldiers must pass before weapons qualification on a firing range.

Critical gates will allow commanders to better analyze and judge the combat readiness of their units. The gates will ensure that soldiers know the basic skills for tasks before undertaking time-consuming and costly training events.

For each unit maneuver strategy, the resources are broken down into three tables: OPTEMPO (operating tempo), ammunition, and TADSS (training aids, devices, simulators, and simulations).

OPTEMPO mileage figures are taken from the battalion level training model (BLTM). Because a unit strategy can apply to more than one type of unit (i.e. light infantry, airborne, air assault), and OPTEMPO figures apply to single units, a "base" OPTEMPO was selected for each unit strategy.

Since a number of different

### COMBAT ENGINEER (WHEELED/MECH) MANEUVER STRATEGY

ARTEP 5-145 MTP SERIES															
EVENTS	DRILL	MAPEX	TEWT	CELL TRNG	TOCEX	STAFF EX	CPX	STX	LCX	CFX	DEPEX	FTX	EXEVAL CTC	OTHER	
CREW AC RC	12 4														
SQUAD AC RC	12 4							12 2							
SECTION AC RC															
PLATOON AC RC		12 2	8 2				4 1	8 2		6 0.5		4 1	1 0.25		
COMPANY AC RC		12 2	4 1		4 2		4 1	6 2		2 0.5		2 1	1 0.25		
BN AC RC		12 2	3 1	WKLY 4	4 2	12 2	4 1		4 0.5		6 0.5	2 1	1 0.25		
CRITICAL GATES						CELL TRNG	STAFF EX	DRILL		STX		STX	FTX		
RESOURCES															
OPTEMPO	X				X			X		X		X	X		
AMMO	X							X		X		X	X		
TADSS	X	X	X			X	X	X		X		X	X		
LAND	X				X			X		X		X	X		
RANGES															
OTHER															
ANNUAL EVENT FREQUENCIES ARE DESCRIPTIVE, NOT PRESCRIPTIVE. FM 25-101 DEFINES EVENTS. COMMANDER'S ASSESSMENT, UNIT METL, AND AVAILABLE RESOURCES DICTATE ACTUAL FREQUENCIES. STRATEGY RECOMMENDS TRAINING MIX TO STAY WITHIN BAND OF EXCELLENCE (FM 25-101).															

Figure 1

**COMBAT ENGINEER BATTALION (MECH)**  
**COMBAT ENGINEER VEHICLE (CEV) TRAINING STRATEGY**

**GUNNERY**

LEVEL	AC/RC	MOS TASKS	GST	DRILL	CRT	OPS TEST	ZERO & TBL 1-V	LFX	CALFEX
Individual		DAILY/MONTHLY	4/2						
Crew			4/2	12/4	4/1	2/1			
Squad					4/1	2/1			
Platoon							2/1	1/25	1/25
Company									
Battalion									
Critical Gates		MOS TASKS	MOS TASKS	DRILL	DRILL	GST & CRT	TBL 1-V QUAL	LFX	

**RESOURCES**

OPTEMPO Base:	M113	LTA/GARRISON	LTA/GARRISON	LTA/GARRISON	LTA/GARRISON	LTA/GARRISON	48 MILES	48 MILES	24 MILES
Ammunition		NOT REQ'D	165MM TP/SUBCAL	165MM TP/SUBCAL	165MM TP/SUBCAL				
TADSS/Equipment							M970 CEV SUBCAL	M970 CEV SUBCAL	M970 CEV SUBCAL

TC 5-117 PROVIDES TRAINING METHODS AND QUALIFICATION TABLES.  
DA PAM 350-38 PROVIDES CEV AMMUNITION ALLOCATION.

**Figure 2**

tasks can be trained in each event, ammunition requirements cannot be tied to events. STRAC (Standards in Training Commission) provides ammunition allocation by task. Commanders must determine ammunition requirements based on the types and numbers of tasks to be trained during an event. They must also carefully manage their ammunition to meet the frequencies recommended in the gunnery model.

TADSS developed by the Engineer School and other branch schools are also incorporated into the strategies. Also included are TADSS currently in the system and those that are in different stages of production.

**Gunnery**

The second of the three baseline unit strategies is gunnery, which is broken down by weapon system. The Engineer School has developed gunnery strategies for the CEV, mines and demolitions. These strategies are tied to DA Pam 350-38 (STRAC).

Engineer units will also use weapons strategies developed by

the Infantry School. That school is the proponent for small arms, machine guns, grenades, claymores, and antitank weapons systems.

Figure 2 shows the gunnery strategy for the CEV. Like maneuver strategies, all needed information is identified, including the unit conducting the event, the event, frequencies, critical gates, and resources. Several of the events identified for the CEV, like the gunnery skills test (GST) and the combat readiness test (CRT) are taken from TC 5-117, *CEV Operations*. This manual also provides training methods and qualification tables for the CEV.

**Soldier**

The last of the three training strategies is for the engineer soldier. Strategies have been developed for the three engineer career management fields (CMF). The Engineer School is responsible for CMF 12, combat engineer; CMF 51, general engineering, and CMF 81, topographic engineering.

Figure 3, page 16 shows the en-

gineer soldier training for the CMF 51 field. The subject areas in which the soldier should be proficient are listed across the top of the chart, and the training frequency is listed down the left side.

**Institutional Strategies**

Institutional strategies are still in the developmental stage, and first drafts are scheduled for completion later this year. When finished, these strategies will allow the Engineer School to provide training that is more likely to help soldiers once they arrive in their units. For instance, soldiers will receive more institutional familiarization with training aids and devices commonly used by line units.

These strategies are being developed for the engineer officer basic (EOBC) and advanced courses (EOAC), advanced noncommissioned officer course (ANCOC), basic noncommissioned officer courses (BNCOC), and the advanced individual training courses (AIT). Follow-on CATS development may also include work on a strategy for the

ENGINEER SOLDIER TRAINING STRATEGY — CMF 51											
FREQ	EVENT	PHYS TNG	CTT	MOS	MAINT TNG	WPNS TNG	DRVR TNG	CMT	NBC TNG	LAND NAV	PROF DEV
DAILY		A		A	A						
WEEKLY			A						A		A
MONTHLY				R	R	A				A	
QUARTERLY			R				A		[A] R	R	R
SEMI-ANNUAL	[A]					[A] R	R				
ANNUAL	[R]	[A]	[A]			[R]			R	[A,R]	
BIENNIALLY		[R]	[R]								
AS REQUIRED	R				[A,R]		[A,R]	A,R			
<b>RESOURCES</b>											
OPTEMPO							60				
TADSS			X	X		X			X	X	
OTHER											

A = ACTIVE COMPONENTS    R = RESERVE COMPONENTS  
 [ ] = TESTING FREQUENCY (i.e., APFT, SDT, etc.)    CMT = COMMON MILITARY TRAINING (TABLE 4-1, AR 350-1)  
 SDT = SOLDIER DEVELOPMENT TEST FOR MOS TRAINING APPLIES TO SKILL LEVELS 2, 3 & 4  
 IF NO STANDARD ARMY TEST EXISTS FOR A TRAINING EVENT (i.e., MAINT TEST, NBC TEST, ETC.), DEVELOP A UNIT TEST.  
 REFER TO THE APPROPRIATE GUNNERY STRATEGY FOR ADDITIONAL WEAPONS TRAINING GUIDANCE.

Figure 3

engineer portion of the pre-command course (PCC).

### The Future

As the CATS program expands, "projected strategies" will be developed for the maneuver, gunnery and soldier areas. These project strategies will attempt to forecast training and resource requirements by looking 5 to 10 years into the future.

These projections will reflect the influences of a changing threat, new technology, budget, and mission. They will also keep an eye on changes in the linkage between institutional and unit training, and will facilitate the development of acquisition plans for training resources.

TRADOC envisions that CATS will become a decision support software module in the existing Standard Army Training System (SATS) software package, fielded in FY 90. This software will manipulate a data base containing training resources and training requirements, and will assist in the development of unit training

calendars. It will also help in determining resource requirements, and coordinating the appropriate mix of training instruction and materials. An initial concept of the automated baseline strategies is expected later this year.

Once automation is completed, CATS will function simultaneously on several different levels within the Army. It will operate in units on the ground, in the TRADOC and AMC (Army Materiel Command) development process, with DA resource planning, and with field army planners.

Education and information programs for CATS users are now in the works. CATS classes will soon be included in PCC, EOAC and EOBC instruction. Briefings are planned for major command conferences, as well as engineer commander's conferences.

Articles like this one will also serve to get the word out on the new system. In the future, unit strategies will be included in appropriate ARTEP mission training plans.

Unit training can be affected by a seemingly infinite number of things, including institutional

training, individual command direction, material developers, and material resourcers. CATS allow leaders to get a clearer picture of how all of these influences work together—or, sometimes, against each other. Only then can they determine where we are going, and what we need to do to get there.

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# MOS Qualification

## *in the Pacific*

*By Captain William E. Bowers*

**S**oldier proficiency is the backbone of Army combat readiness. A trooper skilled in his military occupational specialty (MOS) is a full member of the fighting team. Unfortunately, attaining that proficiency can sometimes be tough for Reserve Component soldiers.

Active duty engineer units receive soldiers who have graduated from basic and advanced individual training (AIT). These soldiers are fresh from intense training in fundamental MOS skills.

A large portion of reserve strength, on the other hand, comes from prior service soldiers with reserve service obligations. Often, units do not have duty positions that match an incoming soldier's prior MOS. And this doesn't help the soldier because qualification in the Guard and Reserve is based on duty MOS. Resident attendance for AIT at service schools is often not an option because it usually conflicts with the reserve soldier's full-time job.

The result is a significant number of soldiers in Reserve and

Guard units who are not fully qualified in their duty MOS. Travel time and distance compound this problem for overseas units located in Hawaii, Guam and Alaska.

The 411th Engineer Battalion (CBT-HVY), a Reserve unit stationed in Honolulu, Hawaii, came up with their own solution to the problem.

The 411th, like many other Reserve Component units, was having difficulty maintaining its combat readiness because of a shortage of MOS-qualified soldiers.



A soldier from the 411th Engineer Battalion, an Army Reserve unit from Hawaii, drives a roller during the unit's MOS training program. The unit found an answer to its MOS training problems by using a mobile training team from the Engineer School.

Of particular concern were high-density specialties like carpenter (51B), construction equipment operator (62E), and general construction equipment operator (62J).

The battalion's solution to the MOS shortages centered around the use of mobile training teams (MTT). These teams, manned by service school instructors, travel to a unit's home station to teach designated courses. Equipment and assistant instructors are provided by the host unit.

Knowing that there was no foreseeable end to the shortage of carpenters and equipment operators, the battalion began planning for MTT assistance about a year before classes were held. The 411th, in conjunction with the 4960th USARF school in Hawaii, and the Army's Western Command (WESTCOM), requested instructor support from the Engineer School at Fort Leonard Wood. The MTT plan called for instruction to take place during the unit's two weeks of annual training in June 1990.

Since mobile training teams had never been used for MOS certification in Hawaii, planning had to begin from scratch. Further complicating matters, the 62J course had never been validated for MTT instruction.

The Engineer School provided the battalion and the USARF school with copies of the MOS programs of instruction (POI). Each POI outlined the type of training that had to be completed, and the standards which had to be met. It was then up to the battalion to develop an annual training schedule that would fulfill all of the POI requirements within the available 14 days.

Training support was no simple task. More than \$16,000 worth of lumber and construction materials was purchased for carpentry training. Part of South Range at Schofield Barracks was reserved to provide a training area for the equipment



Nearly 70 students were trained during the two-week period. NCO instructors from Pacific-based units augmented the instructors from Fort Leonard Wood.

operators. The battalion also provided all organic tools and equipment for the course.

To make maximum use of the MTT, the 411th invited other Pacific-area units to the training. In addition to 45 students from the 411th, Alaska's 813th Engineer Battalion (CBT-HVY) sent 13 students, and Guam's 297th Engineer Company (CBT-HVY) sent six.

Finding enough instructors to teach such a large group required close coordination. Funding constraints limited the size of the Engineer School's MTT to no more than five instructors.

The recommended instructor-to-student ratio was approximately one to five. Because the USARF school in Hawaii did not have enough qualified instructors to adequately augment the classes, a decision was made to train Pacific-based engineer NCOs to teach the material.

The 84th Engineer Battalion (CBT-HVY), an active duty unit stationed in Hawaii, provided four NCOs to be trained as instructors. The 411th provided six personnel, and the Engineer School was able to send four instructors. This cooperative effort marked the first



**For engineers taking part in the training, each day began at 5 a.m., and ended about 6 p.m. Students worked through the weekends, and remedial work was conducted at night.**

time that the Engineer School, an active duty unit, and a Reserve Component unit joined together to conduct an MOS-qualifying school.

The limited time constraints for the classes meant that a no-nonsense schedule was absolutely necessary. The training day began at 5 in the morning and finished about 6 in the evening. For soldiers who required remedial work, the training day was extended into the night. There were no weekend breaks, and no time off for the students' personal affairs.

The typical training day normally began with a short period of classroom instruction. This provided the students with the basic principles and concepts that would be put into practice later in the day.

Training for the carpentry students centered around the construction of 15 foot by 15 foot wooden buildings with gable roofs. Students were broken down into groups of six. Each of these groups was assigned an instructor, and given the mission of constructing a building, complete with doors and

windows. Training included preparation of the building site, floor and wall construction, and installation of the roof, doors and windows. Also included was instruction on building walls with concrete masonry unit (CMU) blocks.

Equipment operators were given the opportunity to work with all heavy engineer equipment. These students were also divided into smaller groups, and given instruction on proper operating procedures and maintenance requirements. Along with practice in using the equipment for a single task, students were taught how to work as team members. For instance, one student would operate a 20-ton dump truck, while another used a bucket loader to fill it.

The hard work paid off. All students completed the course, and the 411th's MOS qualification status was improved by more than 10 percent. In addition to providing soldiers with valuable training, the classes presented a significant cost savings to the Army. Training by other methods would

have cost an estimated \$30,000 in additional travel expenses. And because students lived and worked out of general purpose medium tents, billeting expenses were minimal. Special funding for the soldiers' salaries was not necessary because the classes were given during regular annual training.

A key to the success of this particular program was the establishment of a strong working relationship between Active and Reserve Component units. In these times of reduced budgets, training efficiency is a must—even when unit location makes it difficult to maintain soldier proficiency. Mobile training teams are a good way for many reserve units to beat the MOS qualification problem. The 411th and the Engineer School proved it can work. 

*Captain Bowers is the engineer branch chief for Army Readiness Group-Pacific. He is a West Point graduate, and holds a master's degree in mechanical engineering technology from Northern Illinois University. He is a graduate of Command and General Staff College.*

## Major General Daniel R. Schroeder, Commandant of the Engineer School

Interview by Phil Howell  
Features Editor, *ENGINEER Professional Bulletin*

**ENGINEER:** *The Army is facing significant changes in its size, structure and the role it will play in world affairs. What are your views on those changes, and how do you think they will affect engineers?*

**MG Schroeder:** The strategic setting in which the Army operates is changing dramatically. When you look at the changes that are taking place in the world, the emphasis has been on central Europe. The end of World War II is what you're seeing.

For the last 45 years, we've had the Army fully deployed and demonstrating its capabilities with great resolve. I think that's contributed significantly to the changes you see taking place in central Europe and the Soviet bloc. Especially during the past decade.

The Total Army has demonstrated its resolve by standing fast in the face of certain threats and some ambiguous circumstances. And its demonstrated ability to do that evolved from good warfighting doctrine, a quality force, and tough, realistic training. So in terms of those world situation changes that are taking place, I think the Army has made a substantive contribution.

What do those changes portend for the Army? I think it's going to be a watershed period for the U.S. Army. As a result of those changes you now have budget pressures. The cohort, that is, the

demographic population from which we draw soldiers, is getting smaller. Resources are getting smaller, and as a consequence you're going to find the Army getting smaller. But I think its strategic value to the nation is probably going to become more important as we enter into the 90's and get ready for the 21st century.

You're going to see a continued emphasis on forward deployed, or forward presence forces, and an increased emphasis on our ability to project forces to handle an unanticipated contingency. Lastly, you're going to see the requirement for us to have the capability to reinforce either the forward deployed or forward presence forces, or the contingency forces. One of the variants on that theme is the notion that you would have a reinforcement from a forward deployed force to a contingency force, not unlike what happened in Desert Shield/Desert Storm.

At the same time putting our work into the notion of "how do we shape the Army for the late 90's." That is, make it smaller, and yet preserve its quality and maintain its competence.

It's an opportunity for us to take a good healthy look at our doctrine, at our equipment, at our structure, at our development of young leaders, and at our training.

Traditional answers won't work. What's needed is a little creativity and good, intellectual thought toward the future, while at the

same time keeping our feet on a sound historical foundation.

**ENGINEER:** *What has the move to Fort Leonard Wood done for the school's ability to train engineers?*

**MG Schroeder:** The environment itself, the opportunity to put those kinds of courses in a realistic setting—a more realistic setting than we enjoyed in other places, is the first marked improvement. We now have all the NCO courses here. We started bringing those up in early 1988. The first warrant officer course was graduated from here in October 1988. The first officer course started here at Leonard Wood in January 1990.

Another plus is having the non-commissioned officer and the officer share in the same climatology, if you will, as the one-station unit training soldier. To be able to see those initial-entry soldiers receiving training on very fundamental engineer skills has been an enhancement in terms of the socialization of our engineer leaders.

I think the real payoff has been the shared training that we're exploiting. Taking the Basic Officer Course, for example, and affiliating the course with one of the engineer training companies—letting lieutenants share an experience with a basic training company. For example, letting him learn how to administer physical

training to a unit. Allowing him to see how basic rifle marksmanship is taught by a drill sergeant and an instructor, and then letting him receive the same training. Because when he becomes a platoon leader, he's going to have to do those things.

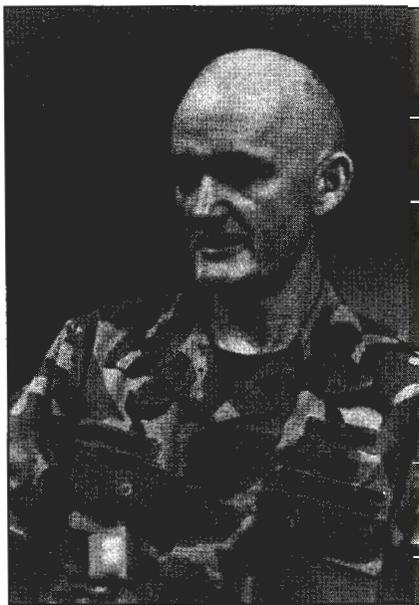
We then have the opportunity to take them out to our Normandy Training Area, where we teach them at three different stations: engineer skills like equipment, survey and road construction. We let our BNCOC students teach officers in the combat engineer vehicles—the M-9 ACE, the CEV, and others. That creates an interesting cultural exchange among those guys. BNCOC student feedback? Super! Their team leaders say they really had to do their homework. And the lieutenants say they got good instruction. Team leaders who oversee the entire process say the interaction between the two groups is superb.

Another advantage. Putting together the advanced course officers and the advanced NCO students on a tactical exercise, organized like a company. There, they both receive instruction at the same time on engineers in support of a task force in the offense, and engineers in support of the task force in the defense. Then they go out together and do a tactical exercise without troops (TEWT) on the ground, in our Crocker training area, where the problem is set. When these two groups of leaders can get together like that, sharing the experience of instruction on the same piece of ground, it gives us an absolutely super group of engineers.

We could never have done that before we moved to Fort Leonard Wood—but we do that now.

Commanders in the field are saying that they can tell the difference between a soldier that has received his training from Fort Leonard Wood, and one that has not. Especially in terms of his at-

titude toward authority and his sense of self-discipline. I think that's a reflection of the standards that our engineer trainers are upholding. The officers that we're graduating are better than any I've ever seen before—in terms of platoon leader competencies, and company commander competencies. Bottom line: we're producing good, solid performers.



“we'll keep focusing on the basic...skills...”

“I think if we continue to do that, our troops can meet any mission, anywhere, anytime.”

**ENGINEER:** *You touched on the unification of Germany. About that time, there was a lot of talk about the “peace dividend,” and reducing the size of our military force. Then Iraq caused second thoughts among some quarters. How quickly can the Engineer School adapt to the training and mission needs of engineers in the field? The switch from the plains of Europe to the Gulf War was pretty rapid.*

**MG Schroeder:** The ability to adapt to different challenges—the fundamental skills, the basic skills, the foundation of being a combat

engineer—doesn't change. Doesn't change, except perhaps in some of the climatological or environmental applications like Desert Storm. Explosives are going to behave differently in a desert environment than they will in a very cold and moist environment. That notwithstanding, the nature of how you emplace them, how you employ them, things of that nature—the principles are still there. Those principles are sound, we still teach those. So you've got a vertical hierarchy, if you will, of intellectual prowess that gets brought to bear in the training. At the basic skills level, we'll keep focusing on the basic, fundamental skills, blocking and tackling, if you will, and making sure our engineers are competent in all of them. I think if we continue to do that, our troops can meet any mission, anywhere, anytime.

**ENGINEER:** *So the formula for success is teaching engineers how to be good team members, good leaders, and giving them tactical and technical competence?*

**MG Schroeder:** That's right. And I think you find a manifestation of that in the different missions that they get over time. For example, you take a battalion into Honduras, into the central part of Honduras, and tell them, “Your mission for the next 120 days is to build a C-130 airstrip.” That's not a very hospitable environment, in terms of its soil content, and its climate. And yet they've demonstrated their ability to do that time and again.

Again, good blocking and tackling. As you go up the vertical hierarchy, though, of those you train, the leader training and the leader development piece of that is what gives you the flexibility to do those kinds of disparate things. Taking engineer leaders, and building into their development the intellectual capacity to do the

right kind of a mission estimate. What does it take to pull it off, what are the resources required. And that means making them technically competent, while at the same time teaching them the leadership piece of it that says, "You're going to have to be willing to take a risk, and to be bold as you provide advice to the maneuver command."

**ENGINEER:** *I've spent a lot of time in Latin America, and I've seen engineers build airstrips, roads, basecamps, schools, sewage and water systems, wells, and the list goes on. It seems to me that there was more than just engineering competence at work. The word "ingenuity" comes to mind.*

**MG Schroeder:** They thrive on that. The only time that engineer soldiers get in trouble is when you're not challenging them with hard work. But the ingenuity piece of it is the other part of the leader development that we're after here at the Engineer School. Often times, there are no stock answers to how you get the mission done. That's the kind of encouragement you want to give leaders as they grow and develop. And that involves inherent risk-taking. Being willing to put your judgement out there and be counted. Those are the kinds of things you try to inculcate in our engineers from the beginning of their careers.

**ENGINEER:** *Going back again to the subject of change. Could you tell us a little bit about changes in force development for engineers, and the new equipment they can expect to be using?*

**MG Schroeder:** To do that, you can't take the engineer piece in isolation. The engineer piece on the battlefield is part of the combined arms team. Where is the combined arms team going? I think what

you're going to see is an azimuth that takes us to smaller, more agile—not just mentally, but structurally—agile forces. You can read that as maneuver capable forces—mobility warfare, maneuver warfare, non-linear warfare as it's described in some circles. And what that means, basically, is an increased reliance on strong command and control—make that "strong chain of command"—because command and control are really two separate things. Ingenuity and mental agility are key. We can't afford the attrition kind of fight anymore, so you've got to try to stay ahead of where he is, get inside his decision cycle. And I think you're going to see the maneuver forces going in that direction.

Now for the engineer part of that. Structurally, I think you see a greater move toward making the engineer piece a much more integral part of the combined arms team. For the first time, based on the work that we've done over the past year, we've got a good, solid analytic foundation as to what the right mix is, substantiated by good, rigorous analysis. And battle-focused on tasks. What that means, basically, is that no one organization is capable of doing all things for all people. Focusing the basic fighting element on maneuver and agility, and knowing that you have what you need to accomplish your mission. Being capable to pick that element up and move it, and apply its abilities over great distances.

For engineers, that translates into a battalion, a lean engineer battalion, a sapper battalion, per maneuver brigade. If you've got a three-brigade division, you then have an engineer regiment within the division, one battalion habitually associated, if not organic, to each maneuver brigade. Again, a lean battalion, focused on the mobility tasks. And what that means, basically, is good strong counter-

mine/counterobstacle capability and assault.

**ENGINEER:** *How does "AirLand Battle-Future" fit into that?*

**MG Schroeder:** If you look at the evolution of things, AirLand Battle is our current doctrine today. It's the doctrinal concept of how we fight today. If you look to the future, you don't want to have to make a sudden leap into the future. You would rather have a steady evolving of thought and intellectual "grappling," if you will, in terms of what the doctrine should be in the future. AirLand Battle-Future is a natural evolution from the baseline of AirLand Battle that kind of bridges between where we are now and the next 20 years. You'd look out maybe 14 years and see the doctrine of AirLand Battle-Future being what you're after. You would see it addressing itself more than we do today to things like contingency operations, how you project power, conduct nation assistance, use the Army as a strategic instrument of United States policy. How do you structure the Army to accommodate those?

So I would say that AirLand-Battle-Future is an evolutionary step, and a logical step, as we get ourselves ready for the 21st century. What it says is that you are going to have a fight that is probably going to be done over large distances, with fewer units, on a less dense battlefield. And what that leads you to is the conclusion that battle is going to be very dependent upon maneuver. The traditional box lines—or layer cake—defense of things won't be applicable because you won't have the density to do that. And that leads you to the notion of nonlinearity in terms of what the next fights are going to be like. Not focused on terrain, but focused on killing the enemy, or destroying the enemy or his ability to prosecute the fight. It means

taking advantage of technology—the ability to determine, from greater distances, where his major forces are. The ability to engage him at longer ranges with deep fires. And then using your maneuver forces in what you would look at as, I guess, the final step in completing the destruction of the enemy force. Then reconstitute and get ready to fight again.

**ENGINEER:** *Where are engineers in terms of having the equipment to be able to do that?*

**MG Schroeder:** A little bit behind. But the recognition of the requirement is being more and more strongly argued by maneuver commanders. When I say, “behind a little bit,” it’s things like the combat mobility vehicle (CMV). Super concept. It’s key to the mobility of a task force, based on what the analyses tell us. And being able to maintain the momentum, keep the initiative. You’ve got commanders, to include the CINC of the Army in Europe, the CINC of Forces Command, former commanders of the NTC, being the ones who are now arguing for the force to have the CMVs. So it’s not a parochial interest item as far as the engineers are concerned.

We’re also looking at arguments for multiple purposes for the AVLB (armored vehicle launched bridge) carrier. Right now the AVLB is a one-dimensional carrier—it only carries the assault bridge. There’s a notion out there that we ought to be able to fire the MICLIC, the mine clearing line charge, off the top of it. We ought to also be able to fire a VOLCANO (mine system) off of it, while we’re buttoned up and on the move. Those kinds of flexibilities are what we’re looking at, along with the versatility of the machines.

We’re also looking at stand-off minefield detection technologies that were demonstrated in California late last year. As we get

into the middle 90’s, we’ll make a down-select in terms of that capability. So the maneuver commander, perhaps with an unattended vehicle, can detect—from a large stand-off distance—where those minefields are in front of him. Whether they’ve been surface laid or buried, the technology can give you the outline of what they look like to help the commander



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make decisions.

We’re also looking at bi-modal explosives, to help with some of the dynamics of assaulting things. Dispersed—some call them fuel-air explosives—is one type. The other type is a line-charge within a line-charge, that gives you two pulses. The value of those is they defeat the sophisticated fuzing that you find in some of the modern mines, which are blast-resistant.

Another equipment change will be the heavy assault bridge, the Class 70 assault bridge. Depending on your METT-T, the carrier

will be able to fire either the MICLIC or VOLCANO, or haul the bridge. The bridge will have two lengths—a 24-meter span, or two 12-meter spans. Depending on what intelligence tells you is ahead, you preconfigure the machine, and you’re ready to go. It will have the same kind of a chassis as the main battle tank that the majority of maneuver forces would have, so that you’re able to keep up.

Those are some of the changes we’ll be seeing.

**ENGINEER:** *Turning the subject for just a moment—what are your thoughts on the role of the NCO in today’s Army? I’ve talked to a couple of NCOs who claim to know you pretty well, and they say you have some strong views on the subject.*

**MG Schroeder:** That’s an understatement. We’ve got the finest professional noncommissioned officer corps that we’ve ever had in our history. And I think probably in the world, when you get down to it. They are smart, they are the maintainers of the standards. When you talk about the individual competence, or the competency levels of the individual soldier, that’s the squad leader’s responsibility. The senior noncommissioned officer in a company is not only responsible for the training of his NCO’s, he’s also responsible for the individual soldier training status within that company, in terms of meeting standards and knowing their skills.

For a command sergeant major—just ratchet that up a notch. His responsibilities are to make sure those individual soldiers know their basic blocking and tackling. That means he’s got to be more competent than others, in terms of what his business is. We’re combat support guys—we support the maneuver arms. That means the challenge for that NCO

is to lead by example and know the other guy's language as well.

I mentioned standards. You talk about a professional corps of anything, and there's a right of passage, a body of knowledge, and then there's a self-policing mechanism that usually sets professionals apart. I think for the first time in our Army's history you've got that in a professional NCO corps. The noncommissioned officer education system that we have in place now has the right bodies of knowledge, skills, and attitudes—both functionally and in the common leader business. The right of passage is the successful completion of those steps. And we shouldn't blink—we need to make sure that they do that. And I think NCOs make sure they do that themselves. For example, the new senior enlisted evaluation report. The guys who are the strongest advocates of an NCO rating profile system in there to keep everybody from being perfect, are the senior noncommissioned officers. And that's a good reflection on them and their standards. In the successful accomplishment of the professional education business, the toughest guardians of the standards there, to make sure they're met, are the NCOs. But the future, with the self-development test as opposed to an SQT, means an investment of themselves in their own profession. So you're going to get a truer measure of the man, if you will, in terms of "What's he willing to invest in his own self-development?" It's going to make it very competitive, and I think, it's going to enhance their stature within the organization of things.

That's the quality that I see in the NCO corps. Their responsibilities are more functional than titular, and they are more willing to be held accountable. Squad leaders today are superb in terms of understanding their training accountability for soldiers. It

hasn't always been that way...

**ENGINEER:** *Let me get personal for a minute. How much of your success as a leader, as a person, as an officer, do you owe to NCOs that have been a part of your past and your Army career?*

**MG Schroeder:** You'd have to say, as a part of my life. Probably the majority, in terms of the voices you hear. You hear the voices of guys like Pappy Shearon and C. P. Counts, and you can get melodramatic in that context. But when you think about unselfish service, looking out for your soldiers, sharing their hardships, and providing them with good, tough, realistic training, those are the voices that call for that. They're the guys that say caring for your soldiers doesn't mean being permissive. Caring for your soldiers means making sure that, as their leader, you make them do the tough things that have to be done to protect them and guarantee their survival. One guy puts it, "They've got enough friends. They don't need you as a friend. What they need for you to be is their leader." That came from a sergeant.

**ENGINEER:** *In your own past?*

**MG Schroeder:** That's right. From my experience. Good advice. And those are the voices you hear most of the time.

**ENGINEER:** *Do you still listen to them?*

**MG Schroeder:** Oh, yeah. I try to. If I ever stop, it's time to do something else.

**ENGINEER:** *How do you see engineer forces coping with some of the projected budget cuts we're hearing about?*

**MG Schroeder:** The traditional answers aren't going to work.

Locally, I think the biggest challenge to us in the training environment is to figure out how we can exploit every dollar that we have, in order to apply it to good, meaningful training. The temptation is to hunker down and say "I can't do this, I can't do that, because I don't have the money." Wrong answer. WRONG ANSWER. We need to keep squeezing it, and being creative in terms of how you do that. Example. In a mechanized outfit, you do annual rifle qualification every year. There's another training opportunity along with that: movement to the range. Left to their own devices, what most units will do is move administratively. Load up the trucks at 0800, go out, run four firing orders, shoot their rifles, back in the trucks, and come back. WRONG ANSWER. If you have to go do that function, why not make it a movement to contact? Start in the motor pool, maybe a little earlier in the day, and go through the loading training, the outloading, uploading, and all that sort of stuff, and the movement techniques enroute. It takes a little planning and coordination. You get there—break, break—fire your rifles for qualification—break, break—back into a tactical setting and do something else. Those kinds of things.

As the branch proponent, making sure that the right things get priority for resourcing. If you looked at our battlefield deficiencies, if you will, and the analyses that you go through—what's our most glaring deficiency today? It's probably in the countermine area. So what that says is that, the standoff detection, the ability to breach, and then the ability to clear mines ought to be on the front burner. The remote minefield detection system that we're chasing right now, the combat mobility vehicle, and different techniques to do clearing of minefields, are where we're recommending that people

invest their efforts. Good payoff on all three of those areas potentially.

We also need digitized terrain analysis. On the nonlinear battlefield, the ability to visualize the terrain becomes more important. Paper maps ought to be a thing of the past. Commanders ought to have a terminal, punch a button, and a digitized map appears. You want a copy of it? Hit a button and it's printed. That's a good place to put your investment in our business.

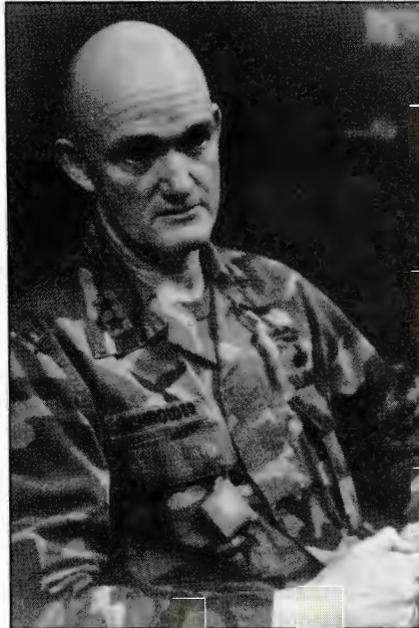
You also look at the versatility of the machines, so as we contemplate these various machines, we want greater versatility. Sooner or later, from the nation assistance point of view, and a base operations point of view, we're going to have to do something about the commercial construction equipment that we have. There's still a notion that says "I can't afford to buy as much as I need to satisfy every job." So I want these machines to have different capabilities so they can get to jobs quicker. What that says is a high-speed tractor. Maybe it doesn't have the same drawbar pull, or strength that a D-9 bulldozer does, but the fact that I can put it to work on two jobs in the same time it takes the bigger one to get to one job, to me says something. If you have a variety of attachments, that means all I have to do is buy the power unit, and attachments—and that makes sense. If it also happens to be self-deployable, which means probably not a steel track, and it means no dunnage when you pull it up on a C-130, and when it rolls off the 130 it's ready to go to work. I think, in the future context, that has greater value than some of things we see today.

**ENGINEER:** *What's the role of the Reserve Components in all this?*

**MG Schroeder:** They comprise

two-thirds of the force. I don't see that diminishing. If anything, proportionally, they'll increase. When you look at the capabilities, especially the reinforcement for contingency operations or to reinforce forward deployed forces, they take on an added importance in terms of them being competent, capable and ready to go.

What's our role in that? We pro-



"Caring for your soldiers means making sure that, as their leader, you make them do the tough things that have to be done to protect them and guarantee their survival."

vide the doctrine, we deliver the training, we provide the structure, and we provide the equipment. It's a one-Army approach in those contexts, and that works. You see demonstrations of that, I think, in Central America all the time. You look at the last deployment for training into Honduras, and it had a mix—command and control by an Ohio National Guard headquarters. It had an active battalion's company in there, and it had rotating units out of the West Virginia Guard and the Ohio Guard. And it

worked—the centerline didn't deviate, it stayed straight. That's a "good news" message.

**ENGINEER:** *What does the Engineer School do to instill the "warrior spirit" in engineer soldiers?*

**MG Schroeder:** That's a cultural-energy level question. You can talk about it—instilling the warrior spirit in people—but you can't infuse it in folks unless they can draw it from those that are around them. Field Marshall Earl Wavell says no amount of education, no amount of training or any common sense or anything else, can make up for the crucial element which is the warrior spirit. And what he's talking about, basically, is the approach to problems and to things. It's really a bias for action. And in our business, you call it the warrior spirit, because warfighting is our business. But what it means, basically, is having a bias for action. Not being passive about conditions, being in charge. Being in charge of your own destiny, whether you're in charge of your organization or yourself. It's a spirit that says find the positives. You can stand back and wring your hands over the negatives all you want, but it doesn't do any good. It's an energy level that says "you can't wear me down."

How do you instill that and infuse that in people? It's got to come from those who are around them, and it's got to be allowed to take place. That means you have got to encourage decision making at the appropriate levels, get rid of micro-management. Give someone who's in a leadership position the authority to make the decisions that are appropriate for everybody, no second guessing. Don't put them in the position of having to second guess you. The bias for action piece means, basically, in the absence of any instruction, to "do the right thing." Don't wait for someone to arrive to give

you instructions. That's bad. I wouldn't care whether you were in the Army business, or making sports coats, you don't want to just wait for someone to come and tell you which way to go, you want your subordinates and your organizations to have an enthusiasm about them—it tends to affect others as they arrive.

The particular application in our business starts out there in basic combat training. In weather like we've had this winter, where some of less fortification would say "Let's go into the gymnasium and do our training." But those who have the warrior spirit say "These conditions aren't going to grind me down. Put your rucksack on, we're going on a 12-mile march." And when you go down range road and see those kids out there in 28-degree temperatures with their rucks on, cold, damp, uncomfortable, but unbent—that's where it starts.

When you get to the noncommissioned officer and the officer training piece of it, it means keeping the small group instruction. It means making sure you have the right instructors doing the teaching, so that what they're getting doesn't get jaded—that they're getting enthusiastic training on things, not just a dull "fill the requirement" regimen.

It also means having an understanding for the history of our business, so that you can demonstrate for them what the outcomes have been in the past. If a soldier screws something up, he thinks it's the end of the world. There are plenty of examples out there of fellows who have "screwed things up" but who have persevered and gone on because they have the warrior spirit. They were indomitable, and couldn't be beaten. For example, Admiral Nimitz, who had some degree of success in World War II. In the years in between the wars, he did a very serious thing from a Naval

officer's perspective. He grounded a ship. And yet, look what he did afterwards, and the contribution he made to the nation in WWII. We could go through George Patton's history, back in his younger days, or Dwight Eisenhower's, or any number of soldiers who have the warrior spirit, and find similar examples. You just couldn't keep them down. That's where it comes from. It's an energy level, an enthusiasm, and a bias for action.

**ENGINEER:** *Have you ever "grounded your ship?"*

**MG Schroeder:** Want to go back to the beginning? I've grounded a ship a couple of times, both as an enlisted man, and as an officer, and have persevered. You can't be afraid to make decisions. Everyone makes mistakes. But that's the only way to learn some things in life—and the Army. You must give your subordinates the opportunity to make decisions on their own—and the opportunity to survive their mistakes. You've got to have confidence in your training, your people, and yourself.

**ENGINEER:** *What's an Engineer?*

**MG Schroeder:** He's a lot of people. He's very diverse. You look at the different things that the engineer soldiers do for the Army and the nation, and you get a feel for the remarkable range of missions that the engineer carries. It ranges from sapper and combat heavy battalions, to district engineers. That's a range you don't find anywhere else.

Within the context of the combined arms team, engineer soldiers work hard, they persevere, they have the knack for innovation and finding creative solutions for things that may appear insurmountable. And that's from private to general—the innova-

tiveness, the creativity, no problem too difficult, "we'll find a way to fix that." You find that, I think, throughout the organization. In the direct, close combat context, you see sergeants who know how to get across gaps, and through obstacles, and over terrain, and impede the enemy's progress in ways that people haven't really considered.

In managing the nation's waterways and military construction programs, you see value engineering ideas emanating from soldiers that basically set a trend for industry.

But I think the common denominator across the board, that pervades all engineer activities, is ethical leadership. Whether it be a sergeant leading a platoon in support of a battalion task force, or the colonel trying to decide how much water to release from a dam in the upper reaches of the Missouri River. The integrity and the ethical leadership is the foundation of both of them. And I don't think that is matched anywhere else.

**ENGINEER:** *You talked about not being afraid to make tough decisions. You're an Army general who graduated from the Naval Academy. Which side of the field do you sit on during the Army-Navy Game?*

**MG Schroeder:** My allegiance to my alma-mater hasn't waned over the past 29 years. If it had not been for the opportunity to go to that institution, and graduate from it, I'd probably be a state policeman in upstate New York. I know there are those who have said that the Army would be better off if I were (chuckles).

Does that tell you which side I sit on? At that time of the year, you'll notice that neither my wife nor I will wear a button that says "Beat Army." But we do wear the button that says "Go Navy!"

**ENGINEER:** How has the Engineer Branch changed since you came in?

**MG Schroeder:** Nature of the work? No. Quality of the work and those performing it? Yes. Preparation for the work to be done has improved considerably. The integration of engineer soldiers into the combined arms team, on the battlefield, and in training, is much better today than it was "in my day," as the expression goes. And continues to get better. The degree of responsibility has increased. The scope of the authorities that engineer officers have throughout their assignments has increased. So if you get away from the equipments and that sort of stuff, the organizational structures, the natural evolutionary things, I'd say those characteristics have changed. The other part of your question should be, "Has that been for the better or the worse?"

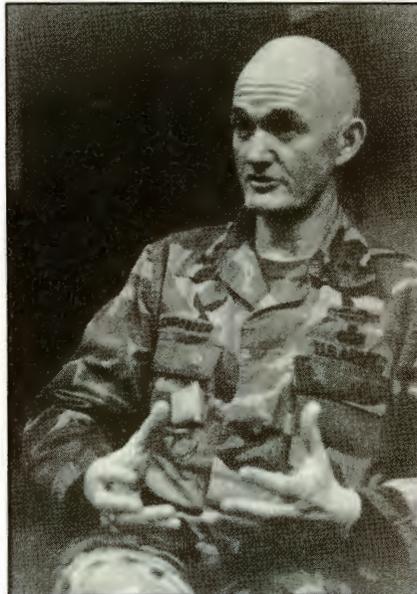
**ENGINEER:** OK, I can take a hint. Has it been for the better or the worse?

**MG Schroeder:** In my view it's been for the better. In large part because of the challenges that are inherent in those changes. And what that then allows you to attract, in terms of quality of soldiers, and the standards that the soldier is willing to meet, and the same thing in respect to the officers. I think that the intrinsic value of the work itself is what continues to attract the quality soldier.

**ENGINEER:** If there is one important lesson you could impart to young soldiers today about your combat experience, what would it be?

**MG Schroeder:** Trust. Good units trust each other. I think if you ask soldiers then and now, what is it you want out of your leaders, I think the answer they

would come back with would be, their trust. Whether we will trust them to do the right things. I want to be able to trust them to share my hardships. I want to trust them to know what to do. And what that speaks to is being technically competent, knowing what the standards are and insisting on them being met. It means being consistent. And sometimes it means



"Our soldiers deserve the best training that we can give them. Once they're on the battlefield, it's too late to go back and give that young man or woman the tools they need to get their mission done—and to come back alive."

being hard, doing the tough, right things. There's a tough caring in there, it's not a permissiveness sort of a thing. I don't think soldiers want permissiveness. What they want is to be cared for properly. They want to be able to trust you to do everything possible to protect them, and to keep them from harm's way. That doesn't mean bottle them up and put them off in a safe environment. That means train them hard to where they know the right things to do. And it

means do the hard right things. Trust in training means train me hard, to the right standards. Don't be weak-kneed about it, and don't take me to the gymnasium for physical training during the winter. It means make me overcome the adversities that are out there, but do it in a caring kind of way. I mean, when you do that, you do it because you care about them and you want them to survive the hardships—and survive battle.

**ENGINEER:** Does the Engineer School do that?

**MG Schroeder:** I think we do. And we do pretty well at it. We're not quite at the point where I'd like us to be yet, but in terms of the leader development business and the NCO Academy, and the officer courses here, that's one of the premises we try to build on. And you get at that in a number of ways. Performance-oriented training. Train to standards, don't just train to time. And keep training to standards until the standard is met. It argues for small group instruction, with the right kind of leader in the group. It argues for hands-on, performance-oriented training in a field environment, not in a classroom or a laboratory. And it means not backing away from the arduous tasks that have to be performed. And it means developing the skills that you have to demonstrate your competency in order to earn the confidence of your soldiers. And it's a confidence that you earn, you can't just walk up and insist on it.

Our soldiers deserve the best training that we can give them. Once they're on the battlefield, it's too late to go back and give that young man or woman the tools they need to get their mission done—and to come back alive.

We need to do that here, and now. And I think we're doing the right thing at the Engineer School.

# Readiness: It's Everybody's Business

By Colonel Ron Dabbieri

**U**nit readiness is defined as "the ability of a unit to perform as designed." Every commander and soldier needs to know how that ability is measured, how the resulting information is used, and the individual's role in unit readiness.

## The USR

**W**hile no single instrument completely measures unit readiness, the unit status report (USR) is designed to measure the critical status of resources and training at a given point in time. The USR is widely regarded throughout the Army as the readiness yardstick, and until 1978 was even called the unit readiness report, or URR. Therefore for the sake of this article, I'm going to address readiness in USR terms.

As a general rule, USRs are submitted monthly (with data as of the 15th of each month) by MTOE (modification table of organization and equipment) units that would likely be deployed in contingency operations like Desert Shield/Desert Storm. These units include battalions, separate companies, separate detachments, and equivalent-sized units. USRs also cover a few TDA units.

Army Regulation 220-1, *Unit*

**"Mission failure  
and needless loss  
of life could be  
the end result of  
dishonest  
reporting."**

*Status Reporting*, governs reporting procedures, and quotes in this article are taken directly from the regulation. The report itself is submitted on a DA Form 2715.

The major resource areas rated in the report are:

- Personnel
- Equipment-on-Hand
- Equipment Readiness/Mission Capable
- Training

A unit's overall rating is usually "the lowest unit status level attained in a measured performance area." However, a reporting unit commander, based on his professional judgement, can subjectively "upgrade or down-grade the unit's overall level if the calculated level is not truly representative of the status of the unit."

Each measured resource area, and the overall unit, is assigned a numerical "C" level. "A level of C-1 is the highest, levels of C-2, C-3, and C-4 are used to indicate a lesser unit status and ability to perform as designed." Units may be organized by the Army at these lesser degrees of ability.

Units are not expected to achieve C-levels above the level at which they are resourced. For instance, a unit may be organized at an authorized level of organization (ALO) 2, and have authorization for only 85 percent of the "wartime required" personnel level. This particular unit was organized at a decreased status by design, and therefore would be expected to report a C-2 status/readiness level.

## Using the USR

**W**ith an explanation of the system out of the way, let's discuss how the reports are used, and why everybody has a stake in maximizing readiness.

The USR reports your unit's status up through the chain of command. It is used to allocate resources and, often, to select a specific unit that has the capability to fulfill a contingency mission. Commanders and their soldiers have an obligation to

maintain the highest unit status possible, within the constraints of their resources and assigned ALO.

Commanders also have an obligation to report their unit's status accurately. Inaccurate reporting that portrays the unit as being more capable than it is could spell disaster. Based on a high USR, such a unit could be selected for a mission that is beyond the organization's true capability. Mission failure and needless loss of life could be the end result of dishonest reporting.

On the other hand, it is equally important not to downgrade a unit's true capabilities. A commander who dishonestly reports his unit less capable or ready than it actually is—even if it is in his misplaced zeal to err on the safe side—may have eliminated his unit from consideration for a particular mission. Then some other, less capable, unit may have to go and do that unit's fair share of the fighting and dying.

Inaccurate reporting could also result in a unit getting an unfair share—or failing to get its share—of critical resources needed to improve deficient resource areas. Reporting commanders need to understand all the reporting criteria, make every effort to achieve the highest USR level possible, and then be scrupulously accurate about reporting that level. It should be morally reprehensible to commanders of integrity to obtain undeserved resources—or avoid combat—by inaccurately downgrading their unit's capability. It would be just as reprehensible to try and avoid personal criticism by dishonestly upgrading it.

### Everybody's Business

**N**ow that we have discussed status/readiness reporting and how it's used, let's look at why readiness is everybody's

business and what we can all do to maximize it.

Units are designed to perform certain missions. A unit that is organized at ALO 1 should have 100 percent of its TOE (table of organization and equipment) design capability when:

- It has all of its required personnel and equipment.
- All its equipment is in good working condition.
- The unit is fully trained.

This unit has a status level of C-1. It possesses "the required resources and is trained to undertake the full wartime mission for which it is organized or designed." It should be obvious to everyone that a C-1 unit called into combat would have a much better chance of accomplishing its mission and surviving than a C-2, C-3, or C-4 unit.

The chain of command shouldn't be the only influence on readiness. Unit mechanics, supply clerks, fire team members, and everyone else in the unit has the ability to affect readiness. But all too often, soldiers aren't informed how they fit into the readiness equation. I now want to explain how everyone can substantially improve readiness by going "above and beyond," instead of simply doing their job. Using what I call the MELE (minimum essential level of effort), the USR resource areas, and reporting criteria, let's look at what we can do to improve readiness.

### Personnel

**T**he USR "provides indicators of a unit's personnel status by developing a C-level that is calculated by comparing available strength, available MOS-trained strength, and available senior grade strength to wartime require-

ments." Commanders and others involved in personnel assignments must ensure that soldiers are properly slotted. Unit S-1s and personnel NCOs must check to see if any of the unit's over-strength MOS personnel have a secondary (SMOS), additional MOS, or substitutable MOS that matches a vacancy required by the unit. If you have such personnel, count them, for readiness purposes, as MOS-trained against appropriate vacancies.

Adjutants also need to know that MOS "trained" and "available" is a 3-digit MOS match. This means you can't downgrade the personnel resources of your USR because your soldiers don't have a specific ASI (additional skill identifier), SQI (special qualification identifier), or LIC (language indicator code). The only exception is for certain military intelligence MOSs that require a specific language.

Additionally, "senior grade" is sergeant (E-5) and above.

If you have people who are not trained in a specific SQI, or not certified to grade, i.e., divers and watercraft operators, address this in the "training" area of the USR. Alternatively, it can be given as a reason to degrade the overall status rating of a unit. It is not a personnel issue.

Commanders, if you have a senior grade shortage, have you boarded all your qualified corporals and specialists? By doing this, you can grow some of your own NCOs. Or are you waiting for someone else to grow them and send them to you? What makes you think that another unit's specialists are better or more deserving of promotion than yours? If you've pursued these avenues, you've done your MELE duty as far as personnel are concerned.

Now, have you taken the extra effort to go to your battalion, brigade or post AG/strength

managers to verify that they are aware of your requirements? Have they checked to see if the people you need are improperly slotted or in reassignable overstrength somewhere else on post? Also, ensure that your non-available people who have lost their MOS qualification have been properly reclassified or eliminated.

In a vast majority of cases, the soldiers that you need to fix a personnel readiness problem are right on the installation.

Unfortunately, no one has made the extra effort to identify them and move them to slots where they can count toward unit readiness. If they aren't already on post, your AG can usually plug into the right place at PERSCOM (U.S. Total Army Personnel Command) to fix the problem. Remember, it's the squeaky wheel that gets the grease. Don't just accept your unready condition. Do everything in your power to fix it.

## Equipment On Hand

**T**he USR "provides indicators of a unit's equipment on hand (EOH) status by developing a C-level that is calculated by comparing the fill of selected equipment to the wartime requirements." Normally, the equipment counted in this area is indicated by an equipment readiness code (ERC) "A," or ERC-A, on the unit's MTOE. These are the primary weapons and equipment a unit needs to go to war. Just like personnel, equipment must be properly slotted. It is possible to have identical items required on both an ERC-A and ERC-B line of your MTOE. Fill up your ERC-A lines first, since these count toward readiness.

Also, an ERC-A item can be a component of an ERC-B item. A good example of this is a PRC-77 radio. The PRC-77 may be an

ERC-A line. A GRC-160, which has a PRC-77 as a component, may be an ERC-B line. Use your PRC-77s to fill your ERC-A lines before you use them as components.

Commander, S-4, supply sergeant, and supply clerk: have all missing items been properly ordered? Do you have a good status on them? When was the last time you checked on them? Did you post the status as soon as your status cards came in? If something happened to the requisition, did you research it immediately, and get it back on order the same day? If the item came in, did you pick it up immediately? Remember, every day counts for readiness. When you have answered "yes" to these questions, you have fulfilled your MELE.

But don't stop there. Have you gone to see the property book officer at division/post? Is the item sitting in a warehouse somewhere on the installation? Does another unit have one that they are not authorized? Or do they have one that is not an ERC-A item for them? What are you doing to energize the system?

All too often, leaders and key personnel are satisfied to expend their MELE and then sit back and complain about the unresponsiveness of the system. These individuals keep hoping for the perfect world where everything happens just right, and the items come in right on time. Wake up! Don't forget the wheel and the grease. Are you "squeaking" yet?

## Equipment Readiness (ER) & Equipment Mission Capable (EMC)

**T**he USR "provides indicators of a unit's equipment readiness by developing a C-level that is calculated by comparing the combined effects of fill and maintenance shortfalls on the status of selected equipment

to wartime requirements."

In simpler terms, ER is the percent of time a unit's ERC-A maintenance reportable items on hand (vehicles, weapons systems, radios, etc.) are fully mission capable. EMC is the percent of time those items are working when compared against all required items. For EMC, those items not on hand are counted as not working. The overall C-level in this area is the EMC, which will always be equal to or lower than ER.

Equipment readiness is truly everybody's business because every piece of equipment is assigned to someone. For the sake of discussion here, let's use the squad vehicle as an example. It could be an APC, a 5-ton dump truck, or any other appropriate vehicle. When a squad vehicle is down, the effect on readiness is obvious. The squad can no longer perform its mission, and can't even haul their weapons and equipment.

The first thing that's needed here is to find out what is causing the deadline. Almost every vehicle has a "dash-ten" manual that lists the PMCS (preventive maintenance checks and services). If the PMCS uncovers a deficiency, does it deadline it? Often, a deficiency that keeps a vehicle from leaving a peacetime motor-pool does not keep it from going to war. A good example is headlights. You may not want a vehicle with no headlights on the road around your home post for safety reasons, but lack of headlights is rarely a PMCS deadline item. If you're a motor sergeant, platoon leader or commander, and you're calling the vehicle down for this deficiency on your DA 2406—you're lying on your USR. Okay, now everybody has been educated and knows how to use a dash-ten.

Keeping the squad vehicle in tiptop condition is every squad member's responsibility. First, find out exactly what is wrong

with it, what echelon of maintenance is responsible for fixing it, and get it operational as quickly as possible. If it has to go to support maintenance, get it prepped and accepted immediately. Each day the vehicle sits in your motor pool is a day wasted. You should work around the clock, if need be, to get the vehicle accepted by support maintenance.

If the required maintenance is at the organizational level, make sure of the fault diagnosis and make sure all required parts are properly ordered. Platoon leaders, platoon sergeants, squad leaders and drivers should be the people most interested in getting the vehicle operational.

Have you checked to see if the parts on order are the right ones? Do you know how to read a "20P" manual to check part numbers? Have you checked the document register to verify for yourself that the parts are on order? Have you checked the PLL (prescribed load list) to see if the part is already there? Do you know how to read status cards? Have you gotten a good status back? Did the requisition even pass? If the requisition was cancelled, did you find out why and get it back on order the same day? When the part came in, did you make sure it was picked up and installed on the vehicle immediately—not tomorrow or the next day?

Remember, every day a vehicle is down counts against your readiness status. What happens if your part comes in on Friday afternoon, you decide to wait till Monday to put it in, and you get called out on a contingency mission over the weekend? Your window of opportunity to get the vehicle up has passed. Don't wait. Get the vehicle mission capable as soon as you can. If you've done these things, you reached the MELE point for ER. But keep going.

Have you gone to support maintenance to check on your vehicle's

status? Is someone working on it, and are the right parts on order? Do you know what a "30P" is? Have you been over to your sister companies and battalions to see if you can find the part on someone else's PLL?

Again, it is all too easy to complain that the "system" isn't working like it should. If everybody was doing their job properly, the part would come in promptly and the vehicle would be fixed. Unfortunately, in the real world, this attitude is a lazy man's dodge. Get the job done, even if you have to expend the effort to prime the system and push it through.

Another hint to help maximize ER goes back to my PRC-77 example. If your PRC-77 went down, did you immediately swap it out on your hand receipt for the non-reportable one in the GRC-160 so the operational one appears on your ERC-A? Also, when you have identical items listed as both ERC-A and ERC-B items, do you do a similar switch to maintain readiness? For example, assume your mess 2 1/2-ton truck is an ERC-B, and your ammo 2 1/2-ton is an ERC-A. If your ammo truck went down, did you immediately replace it on the ERC-A with the mess truck to avoid down time against your ER?

The EMC part of this resource area was addressed earlier, in the EOH section of this article.

Once more, have you done everything possible to get your downed vehicles running? Are you still squeaking?

## Training

**T**he USR "provides indicators of a unit's training status by developing a training C-level...to show the current ability of the unit to perform its assigned wartime mission..." The standard by which this is done is the mission essential task list

(METL). While this is an area that can be highly subjective, it is also an area where soldiers can make the greatest individual contribution.

In order to be proficient as a unit, each soldier must first be proficient in his individual tasks. For example, to conduct a dismounted attack, each soldier must be skilled with his individual weapon, be physically fit, know his basic infantry skills, and know his unit drills. Leaders must also know their individual skills and be tactically proficient in leader-associated METL tasks.

Because soldiers only do in combat what they have learned and practiced in training, everyone must ensure that tough, realistic training is conducted to standard. Leaders at all levels must be educated to recognize good training, and know how to perform tasks to standard. Two old sayings are appropriate: "sweat shed in training saves blood shed in combat," and "it ain't hard to meet your standards if you ain't got any."

It is in the evaluation of training that all leaders need the highest degree of integrity. First, they must know all the tasks that are to be evaluated. Next, they must demand that soldiers perform those tasks up to established standards. It is a misplaced compassion to be soft on soldiers and allow them to do less-than-acceptable training. In combat, it is the properly trained soldier who will survive. True compassion is making soldiers do the tough, realistic things in training that will give him greatest chance of survival.

## What It All Means

**N**ow that you have your 2715 made out, who looks at it? This form gets looked at

*(Continued on page 58)*



# Engineer Problem

## **DELIBERATE BREACH**

*This is the second of four Engineer Problem/Solution articles dealing with breaching operations; the remaining two will appear in future issues of ENGINEER Professional Bulletin. The articles reflect concepts outlined in FM 90-13-1, Combined Arms Breaching Operations, which was distributed in February 1991. This problem focuses on the deliberate breach.*

*The scenario in this problem illustrates teaching points on the deliberate breach. The enemy scenario and obstacle depicted represent what you may expect to encounter in a desert environment, either in southwest Asia or when fighting the Samarans at the National Training Center. An excerpt from FM 90-13-1 describes the characteristics of a deliberate breach and when it will be used.*

*The problem-solving process is presented using the engineer estimate process and includes some key discussion points. For more information about the engineer estimate process, refer to Lessons Learned, page 52 of this issue.*

**Problem:** As the task force (TF) Engineer and engineer company commander, you are to recommend a task organization of mobility assets to the TF Armor commander for the task force's deliberate attack. TF Armor is conducting the supporting attack for the brigade. Their mission is to penetrate the enemy's forward defense and secure the left flank of the brigade's main effort.

**Situation:** You are the commander of Company C, 52nd Engineer Battalion (C/52d EN Bn), a divisional mechanized sapper company. Your unit is attached to TF Armor for their deliberate attack. TF Armor is task organized with three tank companies, two mechanized infantry companies, and your engineer company. The brigade (-) will attack along Axis Punch, penetrate the enemy forward defense, and continue the attack along Axis Hook to destroy the Regimental Artillery Group (RAG) on objective (Obj) Gun. TF Armor's mission is to attack along Axis Jab, breach the enemy's complex obstacle, secure Obj Pit, and occupy battle position (BP) 10, as shown in Figure 1, page 33.

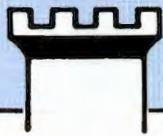
The TF commander focuses his planning on four phases:

- Phase 1— Rapid movement from the line of departure/line of contact (LD/LC) to the complex obstacle
- Phase 2— Breach of the complex obstacle
- Phase 3— Assault and secure the enemy trench line
- Phase 4— Rapid movement of forces through the breach to establish a hasty defense near BP 10.

As a result of the intelligence preparation of the battlefield (IPB) process, you and the intelligence officer (S2) have developed the enemy situation template shown in Figure 2, page 34.

The TF commander has selected the maneuver plan shown in Figure 3, page 35. A scout platoon leads the TF formation. The support force is task organized with two tank heavy teams (each team: 2 tank and 1 mech platoon); the assault force is organized with one mechanized infantry heavy team (2 mech and 1 tank platoon) and one mechanized infantry company (-) (2 mech platoons). The TF commander plans on a tank company(-) (2 tank platoons) as the TF reserve.

The maneuver plan is designed around rapid movement along Axis Jab, with the task force in a modified VEE formation. Artillery preparation of Obj Pit begins when the task force crosses PL Hammer. The lead element, which is the support force, maneuvers into attack by fire (ABF) positions 1 and 2. They begin direct fire suppression of the enemy trench line and adjust indirect fire and smoke.



# Engineer Problem

The TF commander will first determine that direct and indirect fire suppression and artillery smoke obscuration on the trench line are effective. Then he will order the breach force forward to begin breaching lanes through the complex obstacle. When the breach is complete and the breach force gains a foothold on the far side of the obstacle, the assault force will assault and secure the trench line. The support force will pass through the breach lanes and move on Axis Lead to occupy BP 10. The assault force will consolidate, reorganize, and occupy BP 25 (Figure 3, page 35).

Based on information gained through the IPB process, the TF commander does not expect to encounter any tactical obstacles or strong enemy resistance in the enemy security zone along Axis Jab. Reconnaissance will confirm this. He has chosen to conduct a deliberate breach of the complex obstacle.

The TF commander has identified you as the breach force commander. He has given you guidance to mass most of the engineers and breaching assets in the breach force, and to provide sufficient engineer support to the assault force. He wants you to provide at least two lanes through the complex obstacle.

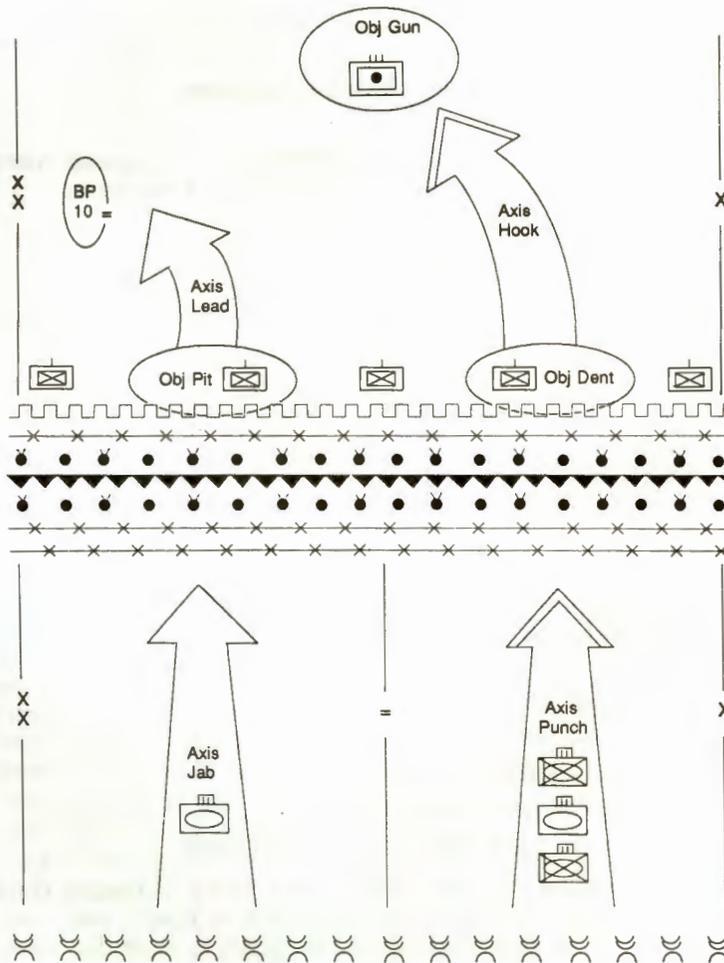
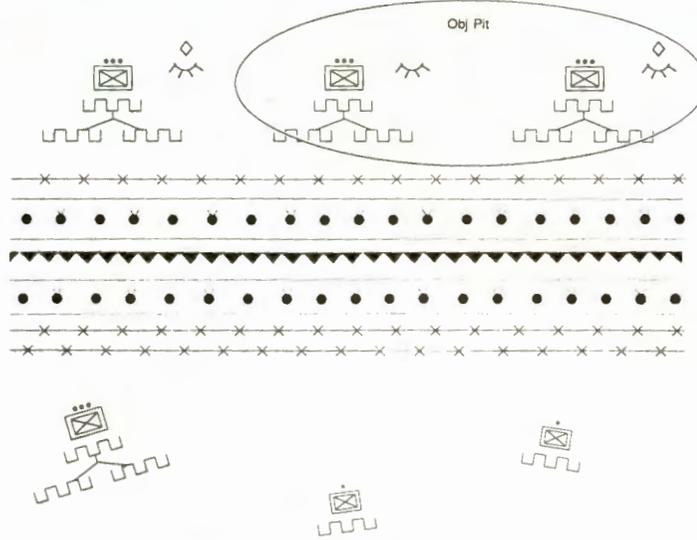


Figure 1. Brigade/Task Force Operations Overlay



# Engineer Problem



**Figure 2. Situation Template**

**Problem-solving Process.** The engineer estimate, an integrated extension of the command estimate, is conducted concurrently with other staff estimates.

**Command Estimates**

- Mission
- Facts and assumptions
- Mission analysis
- Commander's guidance
- Develop courses of action
- Analyze courses of action
- Decision
- Action and orders

**Engineer Estimate**

- Engineer mission
- IPB and engineer battlefield assessment (EBA)
- Engineer mission analysis
- 
- Develop a scheme of engineer operations
- War-game and refine engineer plan
- Recommend a course of action
- Prepare final engineer plan and issue orders

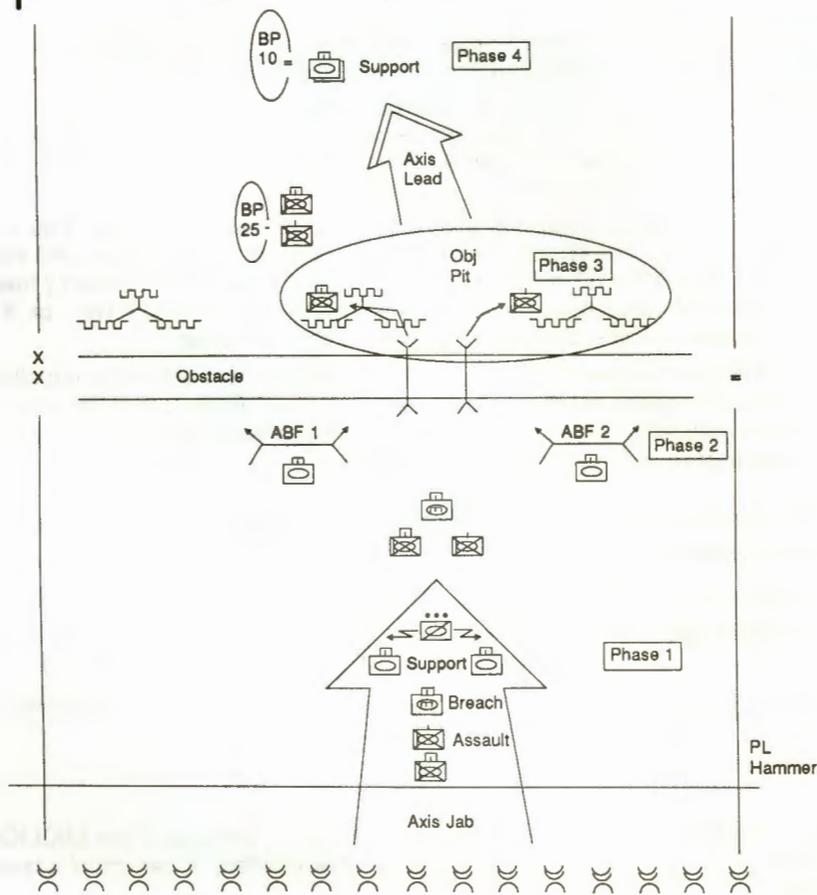
You have enough information to start developing a scheme of engineer operations. Use essentially the same steps (in the order presented) the command used for developing courses of action to develop the scheme of engineer operations:

1. Analyze relative combat power
2. Identify engineer battlefield missions and allocate forces
3. Develop scheme of engineer operations
4. Balance force allocation with assets available
5. Integrate decisions into maneuver course of action sketch

**Step 1. Analyze Relative Combat Power.** The analysis of relative combat power is based on the situation template and an assessment of enemy and friendly engineer capabilities. Use an engineer battlefield assessment (EBA) to determine these capabilities.

Enemy engineer capability: From an IPB, you determine that the enemy brigade security zone, from the LD/LC to the complex obstacle, does not contain any tactical or protective obstacles. The security zone consists of enemy squad- and platoon-sized trenches, which

# Engineer Problem



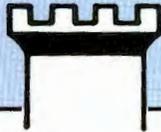
**Figure 3. Task Force Operations Overlay**

are supported by three or four BRDMs with AT-3/SAGGER antitank guided missiles. The first obstacle the task force will encounter will be the complex obstacle that supports the enemy main defense.

Based on the IPB process, you know that the enemy infantry brigade is defending with platoons and companies on line. The platoons are entrenched with two squads up and one back. Squad positions are connected with a communications trench. Platoon positions contain antitank grenade launcher (RPG-7) and recoilless antitank gun (SPG-9) positions. Two or three tanks, in revetments behind platoon trench lines, support each company. The brigade has a company-sized tank reserve that is located in the brigade sector to the west. It is used to block penetrations. There are no second echelon enemy units in the zone the brigade is attacking, or no known obstacles to the rear of the main defensive line.

You have also determined that the enemy has a multiple rocket launcher (MRL) battery supporting their division. It can range the enemy brigade's main defensive line and employ scatterable mines. Refer again to Figure 2, *Situation Template*, page 34.

The following information is known about the complex obstacle: The first obstacle you will encounter is a triple-standard concertina fence. Behind it is an open area of about 50 meters and a single strand of concertina, which probably serves as a minefield marking fence. A 20-meter open area behind this concertina is followed by a 60-70 meter deep antitank (AT) and antipersonnel (AP) minefield. This is followed by approximately 50 meters of open area and a tank ditch with no berm that is 4 meters wide and 3 meters deep.



## Engineer Problem

Behind the tank ditch is a 20-meter open area, another AT and AP minefield that is 60-70 meters deep, a 20-meter open area and, finally, a single strand of concertina.

Total depth of the obstacle is approximately 300 meters. The trench line is approximately 150 meters from the last single strand of concertina wire. The minefields consist of three double rows of buried AT mines, with mines spaced 4 to 5.5 meters apart, and rows spaced 20 meters apart.

Doctrinally, the enemy emplaces three AP mines for each AT mine. You do not know how the AP mines are emplaced. They may be emplaced as clusters around the AT mines or as rows forward of the AT mine rows. Also, you do not know if the enemy has emplaced any protective AP minefields immediately in front of the trench line, or if there are minefields between gaps in the platoon or company trench lines.

**Friendly Engineer Capability:** For this problem, assessment of friendly capability focuses on the available mobility assets. The following list of TF Armor's mobility assets is based on its task organization (three armor and two mechanized infantry companies) and the mobility assets organic to C/52d Engineer Battalion.

### **TF Armor Breaching Assets (Organic)**

3 Mine rollers  
9 Mine plows  
6 Infantry platoons

### **C/52d En Bn Breaching Assets**

9 Sapper squads  
2 CEVs (1 with mine rake)  
1 AVLM (Note 1) w/2 MICLICs  
and 1 Fascine (Note 2)  
2 MICLICs (trailer mounted)  
6 M9-ACEs  
3 AVLBs

**Note 1:** AVLM - (Armored Vehicle Launched MICLIC) consists of two MICLICs mounted on the back deck of the AVLB launcher (bridge downloaded). It can carry a fascine on the front deck.

**Note 2:** Fascine - a bundle of 75 pipes (maxi fascine) linked with chains. It is hauled by an AVLM or CEV. When dropped in the tank ditch, a fascine provides a rapid means of crossing a ditch up to 3 meters deep and 4 meters wide. Launch time is less than one-half that for an AVLB.

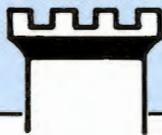
**Step 2. Identify Missions And Allocate Forces:** In this step, use the reverse planning process to identify engineer missions, working from the objective back to the LD/LC. Each time an engineer mission is identified, you must allocate the forces needed to accomplish it. Do not constrain the forces you allocate by the assets in your task organization.

A good technique is to write the engineer tasks and required force allocations on your copy of the course of action sketch or operations overlay. This will identify the engineer tasks and force allocations required for each mission. You will use this information later to develop an engineer task organization and the scheme of engineer operations.

Refer to page 47 for characteristics of a deliberate breach. Note that you should allocate 50 percent more breaching assets than those required for the breach force. A sample engineer worksheet is shown in Figure 4, page 37.

**Step 3. Develop A Scheme Of Engineer Operations:** The goal of this step is to integrate force allocation, execute engineer tasks, and set engineer priorities into the TF scheme of maneuver and task organization. The scheme of engineer operations is developed by working the maneuver plan from LD/LC through the breach to BP 10.

As you wargame the maneuver plan, note which engineer tasks must be accomplished and the forces required to do them. Task organize these forces to your breach team or to



# Engineer Problem

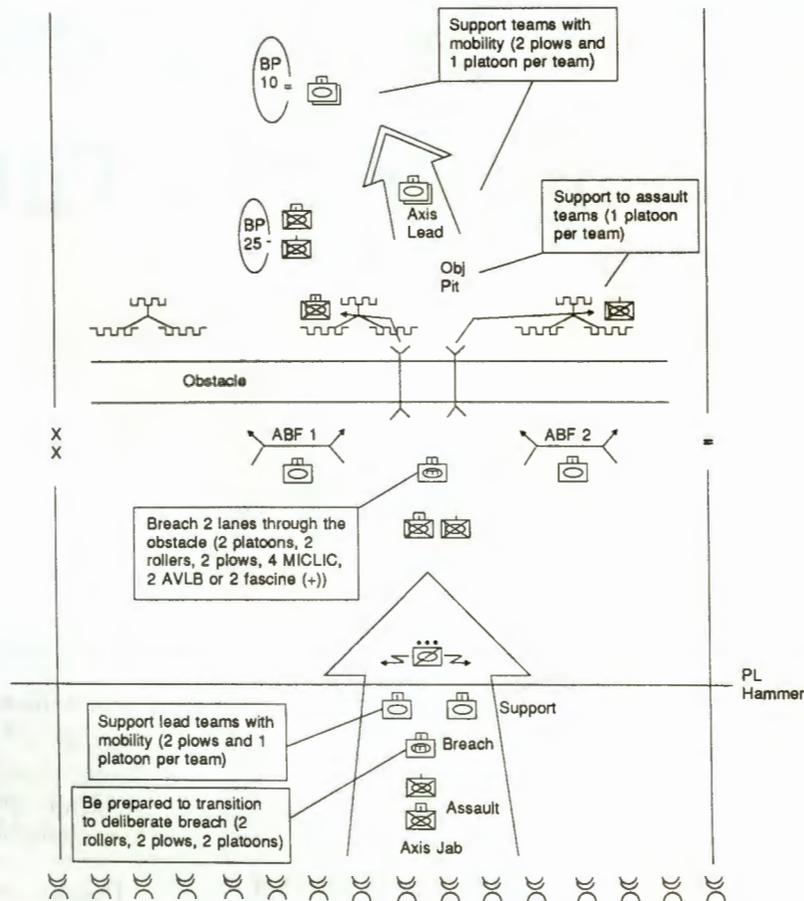


Figure 4. Engineer Working Overlay

the appropriate maneuver sub-unit.

While the deliberate breach ranks as your priority task, do not forget the mobility assets you must provide to the assault and support forces. Remember to allocate mobility assets that are organic to armor companies: As the TF Engineer, you must consider all TF mobility assets, not just those from your engineer company.

**Step 4. Balance Force Allocation With Assets Available:** As assets become scarce, determine where mobility assets can reasonably be expected to accomplish several tasks. Note all shortfalls. Refine the plan by shifting assets to the main effort, shifting priorities as battle phases change, and requesting additional assets.

**Step 5. Integrate Into Maneuver Course Of Action Sketch:** Prepare a statement describing the scheme of engineer operations. This statement must address:

- How engineer assets support the maneuver course of action
- Engineer mission priorities for each phase
- Critical engineer events and activities
- Task organization for the missions

*Engineer Solution begins on page 45.*

# Force Structure and AirLand Battle-Future

By Major Joseph M. Seerley

**T**he Army is facing significant changes in both its organization and the way it will fight future battles. The thawing of our relationship with the Soviet Union and the resulting shift away from a European war scenario has underscored the need to modernize our force structure. And the war with Iraq has served to give that process increased emphasis. This article outlines how the Army will conduct future combat and noncombat operations throughout the spectrum of conflict.

First, a few words about the Soviets. Not surprisingly, the Soviet Army is going through a similar period of change. They are currently undergoing considerable force reductions as their doctrine changes from a primarily offensive posture to a more defensive orientation at the strategic level.

## The Soviets

**C**hanges in force structure, doctrine, and the size of the Soviet military may change the priority of their engineer missions and the structure of engineer units. However, much like our own Army, engineers will continue to play a critical role in Soviet offensive and defensive operations. The importance of mobility, countermobility, and survivability operations will

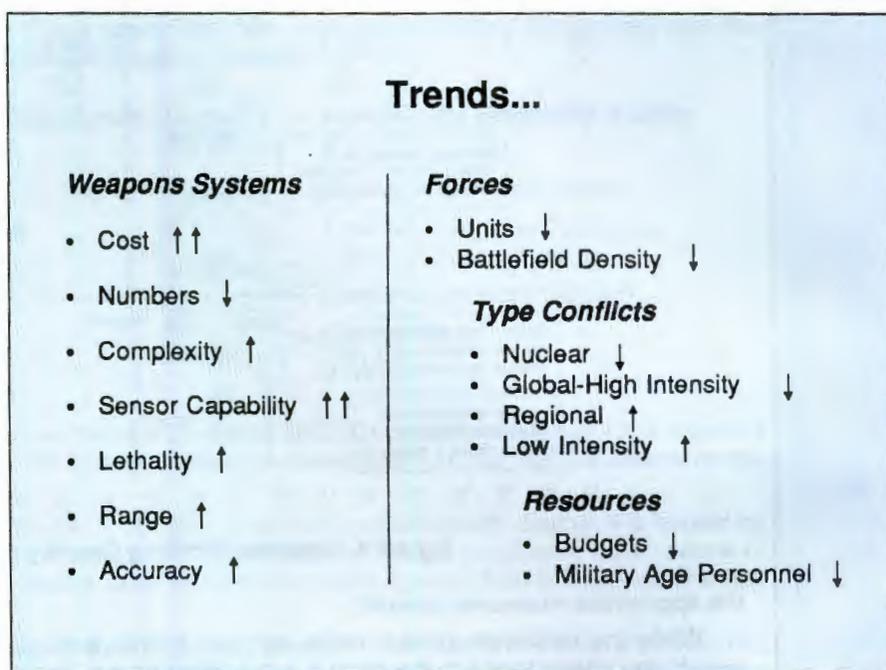


Figure 1

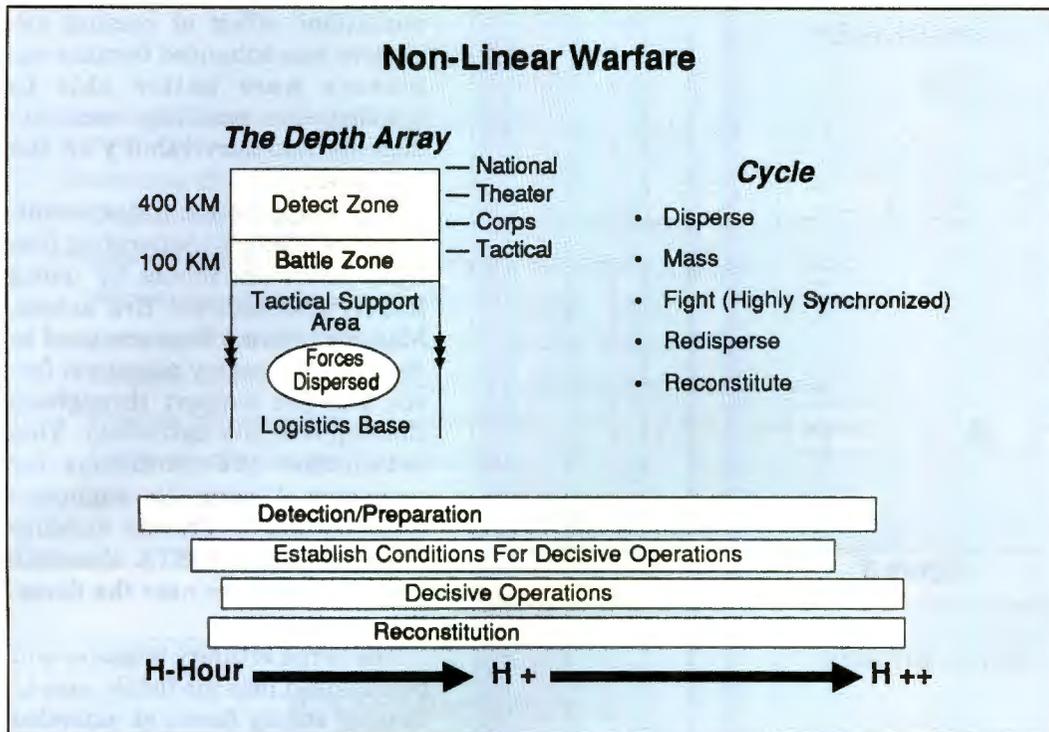
only increase.

The Soviets have long realized that engineer operations play a vital role in successful combat operations. They have manned and equipped their engineer units to support combat operations on a high-intensity battlefield. The Soviets have the best equipped engineer force in the world, and their engineer assets include a tremendous mine warfare capability. That capability is provided by mechanical and scatterable mine emplacement systems, which permit them to affect our operations

throughout the depth and breadth of the battlefield.

Organic to both engineer and combat units are highly capable engineer systems that support mobility, countermobility, and survivability missions. The ability of their engineer forces to keep up with maneuver units, and to survive on the modern battlefield, is excellent.

The importance of engineers, as vital force multipliers, is expected to increase as Soviet forces are reduced to parity or near-parity with Western forces, and are compelled to fight on a non-linear battlefield.



**Figure 2**

### U.S. Trends

**T**rends within our own Army are shown in Figure 1. The implications of these trends are greater fidelity for intelligence and target acquisition systems, fewer weapons systems due to complexity and cost, and a corresponding increase in lethality based on the accuracy of precision munitions. In addition, battlefield density will decrease due to reductions in force structure.

The conclusions based on these trends are:

- ▶ The battlefield will become non-linear.
- ▶ Most of the time, we will have the capability to know where the enemy is located.
- ▶ We will have the capability to engage the enemy at longer ranges with very accurate and lethal weapons.

In addition, non-linear warfare is considered a condition—not a choice.

Future battlefields will be ar-

rayed as shown in Figure 2. The corps commander will be assigned an area of operations with the mission to destroy, not defeat, the enemy forces. This area of operation, much larger than those in current doctrine, may be up to 300 kilometers (km) wide. It will have a depth of 100 km from the back edge of the detection zone to the front edge of the tactical support area. Based on METT-T (mission, enemy, terrain, troops and time available), the corps commander will determine where in the battle zone he will destroy the enemy force. He will also establish a detection zone, where he will focus his RISTA (reconnaissance, intelligence, surveillance, and target acquisition) assets. These assets will detect, track, and acquire enemy formations moving into his area of operation.

Initially, national and theater-surveillance assets will determine the disposition of enemy forces. As intelligence and warning indicators cause the level of readiness to increase, additional intelligence collection measures will be

implemented. These additional assets may include armed aerial reconnaissance, armored cavalry, light cavalry, motorized scouts, and engineers. Maneuver forces will initially be located in the tactical support area, which will allow them to disperse and remain outside the threat's indirect fire range.

During a typical engagement, the maneuver force will occupy dispersed assembly areas outside the threat's indirect fire, then mass at a place and time chosen by the corps commander. The force will fight a highly

synchronized battle, re-disperse, and reconstitute if necessary.

The corps will be comprised of several maneuver brigades and division headquarters. The corps commander will task organize the brigades to a division headquarters based on METT-T (Figure 3, page 40). For example, one division could have two brigades and another division could have four brigades. Each brigade will have three maneuver battalions, each with three maneuver companies (Figure 4, page 40). In addition, the brigades will have an artillery battalion and a forward support battalion. The support assets in the support platoon of today's maneuver battalion will be located in the forward support battalion.

The intent of reducing the maneuver battalions from four to three companies and removing support assets from the maneuver battalion is to construct a more agile maneuver unit. Such an organization would be more capable of conducting the offensive operations required of the non-linear battlefield.

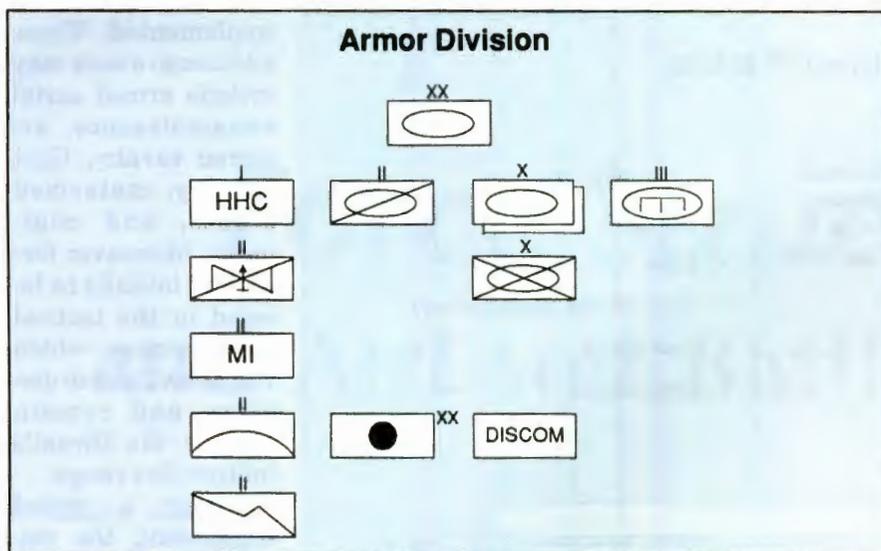


Figure 3

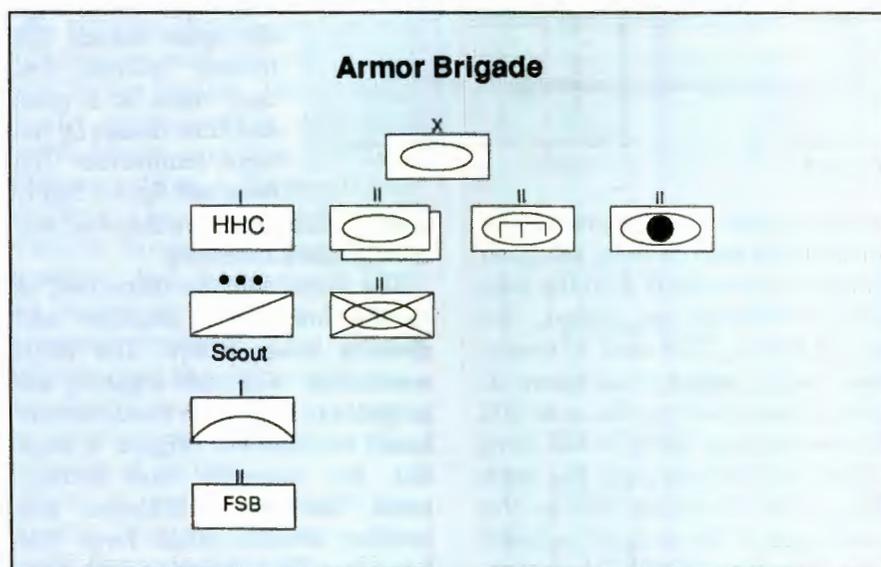


Figure 4

The challenge to engineers, then, is how to construct this type of unit. The necessary characteristics of such a unit are shown at Figure 5, page 41.

To meet the requirement necessitates a lean engineer battalion organic to the maneuver brigade (Figure 6). It is constructed to be 80 percent offense-oriented, with the remaining 20 percent geared toward countermobility.

An engineer platoon supports the maneuver company. This platoon consists of three squads and an assault section. This section has the capability to provide one in-stride breach. A company

obstacle section has the capability to provide dynamic obstacles on the flanks, or reinforcing engagement areas with Volcano mines.

The battalion consists of three companies: one company in support of each maneuver battalion. The concept of an engineer battalion in support of a maneuver brigade was evaluated during REFORGER 90 by Training and Doctrine Command's Test and Experimentation Command. Results of that evaluation have shown that such support allowed greater flexibility to divisions and the corps, and served to increase their combat effectiveness. The combat

multiplier effect of combat engineers was enhanced because engineers were better able to synchronize mobility, countermobility and survivability on the battlefield.

The corps commander conditions the enemy by separating him from follow-on forces by using RISTA and indirect fire assets. Massive indirect fires are used to destroy both enemy maneuver forces and fire support throughout the depth of the battlefield. This establishes the conditions for maneuver. At corps, the engineers must be able to provide mobility support to the RISTA elements that operate in or near the detection zone.

The corps artillery brigades will be deployed into the battle zone to destroy enemy forces at extended ranges. The key to the field artillery's survivability resides with their ability to be mobile. Hence, corps engineers will need to provide mobility support.

During the IPB process, topographic engineer support will provide the maneuver commander with the capability of "visualizing" the terrain. The IPB must be continually updated to indicate those areas that must be monitored to provide current target information for the attack systems. Terrain analysis will play a vital role in determining where those critical assets should be located on the battlefield. Shaping of the engagement areas—where decisive maneuver will take place—will be a corps engineer mission. These areas will be shaped by using dynamic and conventional obstacles.

A recap of the engineer capability available to corps includes mechanized and wheeled combat engineer battalions, combat support equipment companies, assault and fixed bridging companies, and a topographic engineer company. This capable mix of engineer assets, then, provides

## ENGINEER

**Challenge:** Construct an agile engineer organization that assures freedom to maneuver.

**Operational Characteristics:**

- **Enhance force lethality:** Minimum of 2 in-stride breaches per task force.
- **Enhance combined arms offensive operations:** Shape engagement areas.
- **Maintain force momentum:** In-stride assault gap crossings.
- **Agile organization:** Offensively oriented; focused forward.
- **Versatile:** Rapidly reduce threat obstacles; dynamically emplace obstacles.
- **Enhance maneuver:** Timely analysis and dissemination of terrain data.
- **Assure synchronization:** C2 is centerpiece.
- **Fight as infantry.**

Figure 5

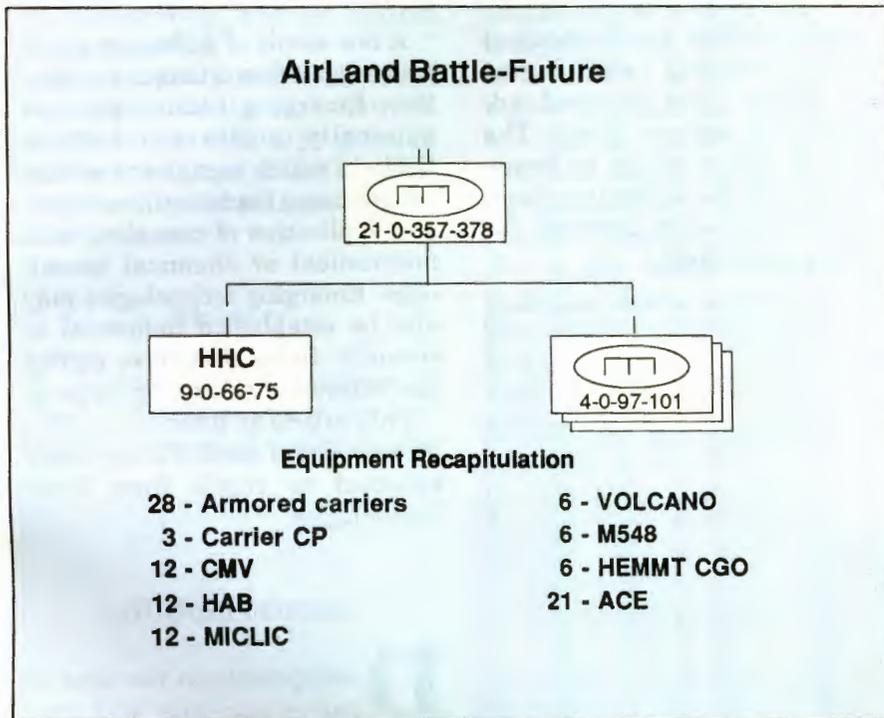


Figure 6

the corps with significant flexibility to task organize on METT-T. It also provides the Army with an engineer force structure that will meet the tenants of AirLand Battle doctrine and the demands of any future battlefield.



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*School's Directorate of Combat Developments. He previously served as 1st Brigade engineer in the 2nd Infantry Division. He has also served on the Engineer Branch Assistance Team, Readiness Group, Denver. He holds a degree in civil engineering from the University of Southern California at Santa Barbara.*

## BOOK REVIEW

*(Beginning with this issue, book reviews will be a regular feature in ENGINEER.)*

*Vietnam Studies, U.S. Army Engineers 1965-70, by Major General Robert R. Ploger, 240 pages, Department of Army, U.S. Government Printing Office, Washington, D.C. 1974.*

This historic monograph is a tribute to the ingenuity and resourcefulness of engineer soldiers in overcoming difficult conditions to support the "man with the rifle." MG Ploger writes to capture lessons learned, help develop future concepts, and provide an historical record of the Corps of Engineers (COE) performance in South Vietnam (SVN) from 1965 through 1970.

Starting with troop buildup, the author cites early decisions made at the Executive level not to expand the Army by calling up reserves. This resulted in immediate active duty shortages in combat support and technical skills for the COE, stripped engineer equipment from reserves, and reduced CONUS and overseas tours to fill manpower and equipment needs in SVN.

MG Ploger chronicles the preparation for engineer operations in SVN with a common theme: too much to do with too few engineers. Engineer advisors played an important role early on by identifying construction needs and training SVN engineers. U.S. civilian contractors were successful during the period 1962-65 but, with the troop buildup, could only provide a stop-gap measure. In the author's opinion, "Army engineers were introduced at the latest possible moment that could permit success."

Challenges facing engineers dealt with building logistical facilities, ports, and base camps for follow-on divisions. They faced a new and difficult environment: heat, rainy seasons, lack of adequate roads, and aggregate needs. There are many stories of how engineers overcame the enemy and environment through innovative techniques.

The book concludes with an evaluation about dual staff and command responsibilities of the USARV Engineer, the value of engineer tasks, the engineer support system, and geographic area of responsibility. He leaves the reader with a challenge—to apply new developments to future conflicts and not to enter the next conflict prepared to fight the one before.

Early reports from Desert Shield indicate that today's military planners should have read Ploger's study. The implications of recent Desert Shield deployments to an inhospitable environment with little infrastructure has the makings of the initial deployment of forces to SVN. For the most part, however, Army engineers in SVN prepared logistical and support facilities prior to the arrival of combat forces.

*LTC Ralph Grieco, Fort Leonard Wood.*

# Engineer Materiel Support for AirLand Battle-Future

By Charles Manning

**A**irLand Battle-Future (ALB-F) has emerged as the Army's basis for conducting combat operations into the 21st century. As ALB-F evolves, so does the Army's need to support the new doctrine by capitalizing on technology. To that end, the

Engineer School has been identifying emerging technologies that might give tactical advantages to engineer forces. The school is also working to translate those technologies into functional, "real-world" systems for soldiers in the field.

A few words of definition are in order to put this article in perspective. Emerging technologies are generally military-industrial fields in which significant advances are being made in the research and application of new electronic, mechanical or chemical knowledge. Emerging technologies may also be established industrial or scientific fields that have gained new relevance to Army operations.

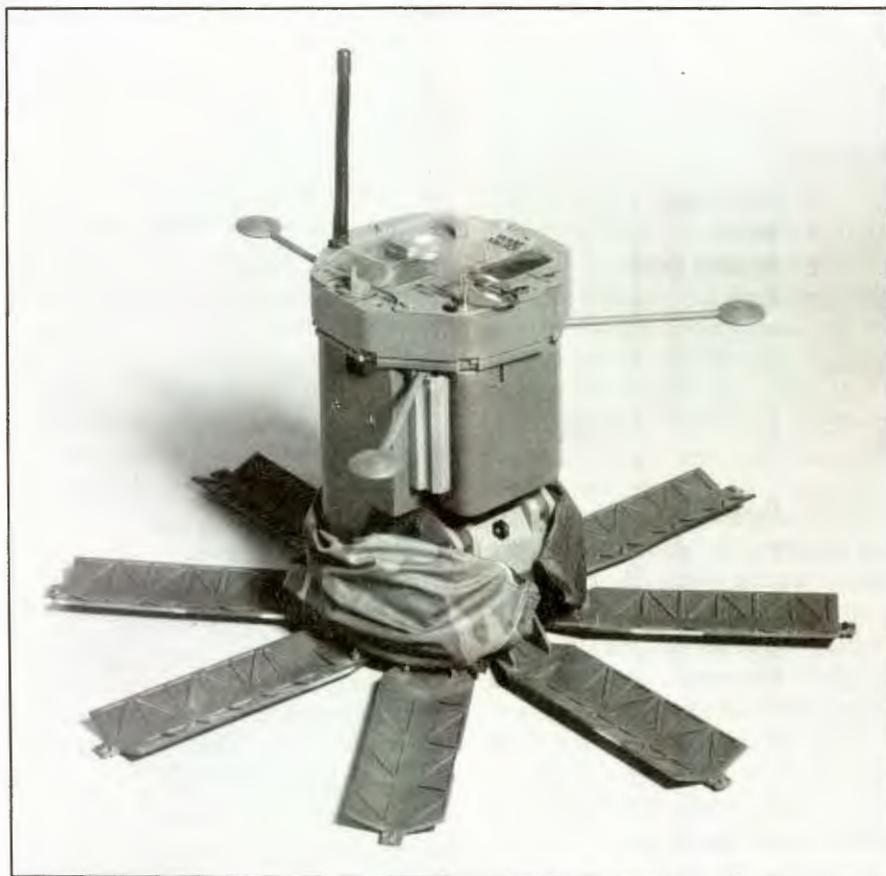
This article is intended to give an overview of some of the systems expected to result from these technologies.

## Counter mobility

**D**evelopments in the area of microelectronics will provide the basis for advances in signal processing through the 21st century. And high speed circuits will play an especially important role in the development of counter mobility systems for the Army.

The development of "very smart" processors has resulted in

## Wide-area Mine



the ability of these processors to simultaneously handle two or more signals. These highly capable processors, which can also be programmed with artificial intelligence, are now being incorporated into small, autonomous systems like mines.

These "smart mines" will dramatically increase the complexity and lethality of land warfare. They will be able to detect, track, classify, select and engage targets from distances as great as 100 meters. This family of mines will utilize a variety of sensors to attack selected vehicles, helicopters, and even low-flying, fixed-wing aircraft. The mines will have a remote control capability for arming/disarming, and for system status reporting.

Binary agents and modernized initiators, while not new in civilian use, will also provide military engineers with safer, faster, and more efficient demolitions systems.

### Mobility

**C**omplementing progress in microelectronics is the continuing success of material and

material-processing research, which holds great promise for the development of new structural systems.

Gap-crossing missions, in particular, stand to benefit from the development of new composite materials. Coupled with new manufacturing techniques, these composites will allow the development of more capable portable bridging systems. These bridges will have a greater load capability than current systems, and will need fewer personnel and transportation assets.

One composite bridge now in the works will be the heavy dry support bridge (HDSB), intended to replace medium girder bridges (MGB), Bailey bridges, and M4T6 bridging at corps. The HDSB will be a tactical bridge, capable of replacing assault bridging in forward areas and supplementing fixed and float bridging. It can be used as a follow up to the armored assault bridge, or as an alternative to the assault bridge when armor protection is not necessary. The rapid construction characteristics and wet gap span capacity (46 meters) of the HDSB will provide tactical commanders

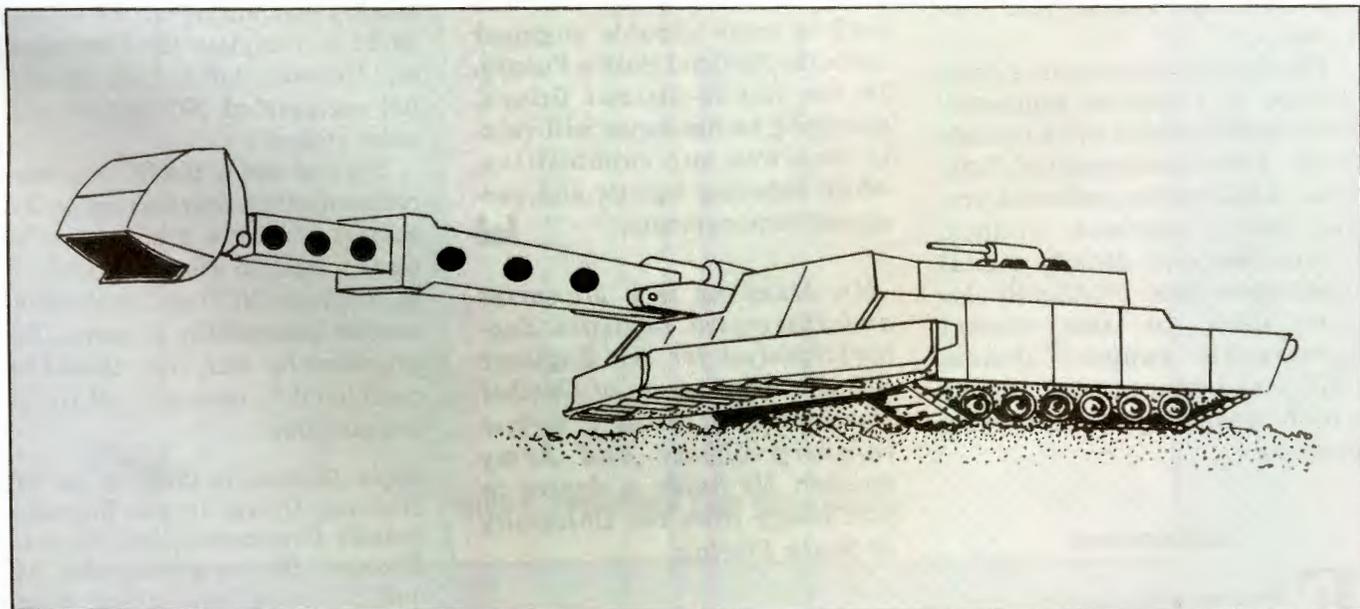
with a valuable asset well forward in the main battle area.

### Countermine & Counterobstacle

**T**he centerpiece of the Army's countermine/counterobstacle program will be the combat mobility vehicle (CMV). The CMV will provide the combined arms team with a dedicated complex obstacle breacher that is as mobile and survivable as the supported force.

Another countermine program calls for replacement of the AN/PSS 11 mine detector. After years of frustration, this program is well along in the procurement process. The sapper squad set is now being fielded, along with a mine rake for the combat engineer vehicle (CEV). The rake saw its debut during the Gulf War.

Advancements in ballistics and warhead design have led to a development program for a small, man-portable "bunker buster" weapon. This weapon would be available to sappers for reducing obstacles and defeating fortifications.



CMV Conceptual Design

## Topography

**F**or the Army, the use of space technology to support military operations is an old endeavor with new promise.

The Terra Geode program, sponsored by the U.S. Army Engineer School, will evaluate the potential value of an Army astronaut. With expertise in geology and military tactics, the engineer astronaut would observe important maneuver areas while his spacecraft was in low earth orbit. His observations would make a significant contribution to mobility planning for tactical forces.

The Military Man in Space (MMIS) program was initiated in 1986 as a Department of Defense project. The objective of MMIS is to provide an opportunity for the armed services to study the usefulness of having military astronauts support combat operations.

Other topography programs included the maneuver control system-engineer (MCS-ENG), which will provide automated command and control for engineer commanders and staffs. It will also provide engineers with access to maneuver unit data, and vice versa.

The digital cartographic system (DCAS) is a tactical computer-based system which will automate many Army cartographic functions. It will receive, reformat, create, store, retrieve, update, manipulate and densify digital topographic data. DCAS will also give data to the digital topographic support system (DTSS) and other tactical systems which need digital data and products.

## Sustainment

**E**ngineer sustainment capabilities will be improved

through advances in commercial construction equipment. New Army systems include the hydraulic excavator (HYEX) and the interchangeable pad compactor (IPC).

The HYEX will be a diesel-driven, tracked vehicle, with a hydraulically operated extendable boom—or knuckle boom—with an excavating ripper bucket. Attachments for the HYEX will include a hydraulic slide angle or versa-link quick-change coupler system for a hydraulic impact hammer, vibratory plate compactor, multi-purpose jaw, or a finger bucket. The HYEX will be capable of mass excavation, lifting, mass loading, grappling, compacting, and breaking or shearing concrete, rubble and rock.

The IPC is a self-propelled compactor with removable pad feet that provide greater flexibility and compaction capabilities. Because of its interchangeable feet, the IPC will be capable of smooth-drum rolling, and compacting both cohesive (clays) and non-cohesive (sands and gravel) materials.

These are just a few of the many technological developments on the horizon that will lead to more capable engineer units for AirLand Battle-Future. In the not-so-distant future, emerging technologies will vastly improve our capabilities, while reducing logistic and personnel requirements. 

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*(Personal Viewpoint continued)*

various assets for a particular course only when needed.

Can soldiers learn a new MOS, to the standards of resident instruction, in only two weeks? Yes, when the POIs are very intensive! In his article "MOS Qualification in the Pacific," (pages 17-19), Captain Bowers explains how it can be done. He describes how AC and RC units and the Engineer School combined efforts to conduct reclassification training for 51B, 62E and 62J MOS. Significant cost savings resulted from reduced travel expenses and a condensed training period: two weeks, plus weekend classes and correspondence courses.

Some MOS reclassification courses may require 135 hours of training in the two weeks; a 10-12 hour day is the norm. The training day is all MOS specific, with emphasis on hands-on, equipment-intensive training. To be successful, soldiers must arrive ready to train, with appropriate equipment, within weight standards, and be physically fit.

The caveat of this article is that we should debate how to best reclassify NCOs into the engineer MOS. There is precedence of AC officers commuting to the closest RCTI to complete the Command and General Staff College. Should AC reclassified NCOs have the same option?

The real test of the RC engineer reclassification courses may be the success of course graduates who participated in Desert Storm. If RC engineer NCO reclassification courses successfully prepared RC engineers for war, they should be considered to reclassify all NCOs in peacetime.

*Major Davison is Chief of the RC Training Office, in the Engineer School's Directorate of Training and Doctrine. He has commanded AC and RC units, and served in engineer staff positions and as an ROTC instructor.*



# Engineer Solution

## POSSIBLE SCHEME OF ENGINEER OPERATIONS

This possible scheme of engineer operations supports the maneuver plan.

**Phase 1.** Mine plows in the support force will provide mobility assets for a TF in-stride breach if that is required. The breach force is prepared to transition to a deliberate breach.

**Phase 2.** The priority of engineer effort is to the deliberate breach of the complex obstacle. The breach force provides two lanes, seizes a foothold on Obj Pit, and tactically marks the lanes.

**Phase 3.** The priority of effort is first to provide engineer support for the assault force as they assault to secure the trench line (Obj Pit). Then, the engineers' effort shifts to completing tactical lane marking.

**Phase 4.** Priority of support is first to assure passage of the support force through the lanes. Then the engineers provide mobility along Axis Lead to BP 10. The allocation of mobility assets is shown below, in Figure 5.

When planning engineer support for this deliberate attack, you must first consider engineer support to reconnaissance efforts. Reconnaissance is an essential engineer task, but it will not be covered in detail in this situation. Even though the task force was given hard intelligence on the enemy, you must conduct reconnaissance to confirm or deny the information provided.

At a minimum, the task force will conduct reconnaissance and surveillance of Axis Jab, part of the complex obstacle (into the first minefield), and enemy positions and weapon systems in the trench line (Obj Pit). One or more sapper squads will work with the scouts, concentrating on the complex obstacle.

Other major considerations should become apparent as you develop a scheme of engineer operations, working from the LD/LC to BP 10:

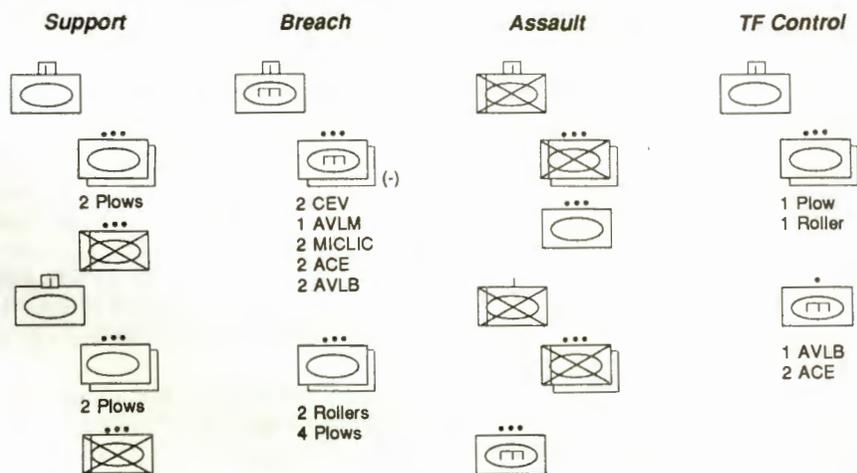
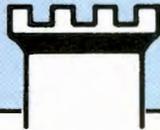


Figure 5. Task Force Task Organization



## Engineer Solution

**Support to movement along Axis Jab.** Even though the task force does not expect to encounter obstacles along Axis Jab, you should provide sufficient mobility assets to the support force so they can conduct in-stride breaches. These breaches will maintain the attack's momentum.

Because the task force will attack in a modified VEE formation, the two tank teams in the support force must maintain control of the mobility assets. Each team has two mine plows, which should provide the assets needed to breach any weak or lightly defended obstacles. Obstacles are not expected, so it is reasonable to assume these plows will be available to provide mobility for the support force in phase 4.

Although the breach force has the assets needed for a deliberate breach, you do not want to launch into one before reaching the complex obstacle. The assets provided the lead element should preclude this.

**Support to the Breach.** The breach force must provide two lanes through the complex obstacle and mark the lanes. Consider the following requirements when determining the assets needed for *each lane*:

- ▶ Mobility assets required to reduce the complex obstacle, plus 50 percent more for redundancy
- ▶ One engineer platoon leader to provide control
- ▶ At least one sapper squad to mark the lane

The breach force is a combined arms force that is tasked to reduce the obstacle and provide local suppression and security. Maneuver forces task organized to the breach force are the first to assault through the lanes to gain a foothold on Obj Pit. The following mobility assets are required for each lane to reduce the complex obstacle:

- Two MICLICs
- Two proofing vehicles (CEV with mine rake, roller, or plow to proof the MICLIC paths)
- One AVLM or two prime movers to pull the MICLICs. If an AVLM is not available, use a CEV
- One fascine or one AVLB

An engineer platoon leader controls the assets for each lane; one sapper squad is required to mark each lane. The 50 percent redundancy per lane is provided by one plow, one ACE, one AVLB, and one sapper squad. Review Figure 5 for task organization of the breach force.

The maneuver assets provide local suppression and security when they are not committed to breaching. They are organized to secure the far side of each breach lane when the obstacle is reduced.

**Support to the assault force.** The assault force must secure two enemy platoon



## Engineer Solution

trench lines. Infantry platoons are capable of conducting assault breaches, but you can increase the assault breach and bunker destruction capabilities by task organizing sappers to the assault force. Thus, you will task organize one engineer platoon to the assault force.

**Support on Axis Lead to BP 10.** Although obstacles are not expected, the enemy has scatterable mine capability which he can employ on Axis Lead. The support force has a total of four plows for independent breaching operations. And the TF reserve, not yet committed, has mobility assets that can supply this support: one roller, one plow, one sapper squad, one AVLB, and two ACEs. It is unreasonable to expect a change in task organization after phase 3 to provide sappers from the breach force to the support force.

-----

### ***The Deliberate Breach***

***Definition:*** A unit conducts a deliberate breach when the force allocation ratios for support, breach, and assault forces are beyond the capability of a task-organized subordinate unit.

The commander uses a deliberate breach when...

- The unit fails an attempted in-stride breach of enemy tactical obstacles.
- Force allocation ratios indicate that a confirmed enemy situation (strong defense and/or complex obstacles) is beyond the capability of a subordinate unit.

### ***Some Characteristics:***

- A deliberate breach requires detailed reconnaissance, exhaustive combined arms rehearsals, and overwhelming suppression of the enemy's overwatching direct fire weapons and indirect fire systems before beginning obstacle reduction.
- A deliberate breach is centrally planned and executed.
- One or more subordinate units are specifically tasked to perform the role of support, breach, and assault forces.
- The breaching tenet of mass drives task organization. For example, the breach force has the bulk of mobility assets and is tailored to counter a specific type of obstacle(s). Direct and indirect fire systems are massed in the support force in order to provide necessary suppression. Forces required are massed into the assault force to secure the far side of the obstacle or the objective.
- The breach force is organized and equipped to use several different reduction techniques in case the primary technique fails. Additional reduction assets are allocated to handle the unexpected. Normally, 50 percent more assets than those required are positioned with the breach force.

-----

*This Engineer Problem was submitted by Captain Tom Kula, currently serving as an instructor/writer at the U.S. Army Engineer School, Department of Combined Arms. He is a graduate of the U.S. Military Academy and the Infantry Advanced Course, and has served as an observer/controller at the Joint Readiness Training Center.*



## Engineer Brigade Initiatives for Desert Shield

**T**he 20th Engineer Brigade (Airborne) was approaching the end of a corps field training exercise last summer, when the brigade S-2 walked into the TOC (tactical operations center) and handed the commander a message.

Up to that point, all such messages were simulated world situation updates, based on the exercise scenario. But this message was real.

The document read in part: "Iraqi forces are threatening to invade the oil-rich emirate of Kuwait." While the brigade went through its normal redeployment, the strained situation in the Persian Gulf worsened. On arrival at home station, soldiers of the brigade offloaded vehicles, topped off fuel tanks, and secured their

weapons and equipment. At the same time, though, unit leaders were being informed that they would soon be turning their attention from field recovery to preparation for deployment to war.

Within days Iraq invaded Kuwait, and threatened to continue advancing into Saudi Arabia. As political powers began maneuvering to neutralize further aggression and seek a peaceful solution to the problem, the Army initiated preparations for war.

After a series of daily corps update briefings on the current situation in the Gulf, the brigade was given an on-order mission to deploy by both sea and air to Southwest Asia. On arrival, it would be responsible for the five

engineer battlefield missions: mobility, countermobility, survivability, sustainment, and topographic engineering. The gravity of the developing situation spurred the brigade staff as they developed their mission analysis and engineer estimate.

Simultaneously, the brigade reviewed its concept of how to best support maneuver commanders once the unit was in theater. We thought it might be useful to share some of the initiatives taken by the brigade to make sure that it was prepared to meet that mission. These included personnel and equipment augmentation; updated training on engineer doctrine, tactics, techniques, and procedures; and coordination meetings with downtrace units

*By Colonel Robert B. Flowers & Lieutenant Colonel James E. Meredith*

to quickly disseminate needed information.

The brigade called on other organizations for assistance in gearing up for the deployment, including the Engineer School, the Belvoir Research, Development and Engineering Center, the Civil Engineer Research Laboratory, and the Defense Mapping Agency. All these agencies were extremely helpful in providing support for the unit.

### Personnel

**I**n preparing for deployment, our first move was to request personnel augmentation. Many engineer units were to be task organized under the brigade headquarters, increasing its size up to five times normal strength. Such a drastic increase in personnel necessitated a similar increase in the size of the staff. Specific augmentations included personnel and administration specialists, intelligence analysts, construction supervisors, soil analysts, and Class IV construction material management specialists. Additionally, facility specialists were needed to augment the Corps Engineer section. This section would be responsible for managing real estate actions and overseeing fire protection throughout the theater of operations.

### Equipment

**O**ur request for equipment augmentation emphasized mobility and countermobility in desert operations. This meant additional ground emplaced mine scattering systems (GEMSS), and armored combat earthmovers (ACE). The GEMSS, a towed mechanical mine dispenser, is used by engineers in the main and rear battle areas to

**“With a few  
pre-deployment  
and in-theater  
initiatives...  
engineers can  
maximize their  
value to maneuver  
forces...”**

emplace large tactical minefields. The ACE is a highly mobile, armored, amphibious combat earthmover capable of speeds up to 30 miles per hour. The Engineer School offered their 13 ACEs, and coordinated the use of eight more from the National Training Center. The Engineer School also initiated coordination for getting 16 additional GEMSS from Europe-based units.

### MTTs

**O**ur next step was to request the assistance of a Mobile Training Team (MTT). Training was to be conducted in two phases—predeployment and post-deployment. Prior to our deployment, the Engineer School sent an MTT to update our units on tactical and other engineer subjects. The tactics portion was designed to “train the trainer” on threat, AirLand Battle, engineer estimates, offense, breaching, defense, obstacle synchronization, and lessons learned during light and heavy desert operations. Also included was combat engineer instruction on demolitions, survivability positions, and

emplacing/breaching minefields. Construction tips on drainage, dust palliatives, and airfield and main supply route maintenance were also part of the instruction.

### Mines

**W**e also wanted to give our soldiers better knowledge of the type of mines they would encounter in Southwest Asia. A subject matter expert (SME) on Iraqi mines was provided by the Belvoir Research, Development, and Engineering Center. His instruction was extremely valuable. Many mines currently in use by the Iraqi army were purchased from Italy, and the familiarization with these mines was sorely needed by most of our soldiers. The SME also deployed to Saudi Arabia with us, and continued to be available for advice and assistance to all in-country engineer units.

### Construction Management

**M**assive requirements for combat construction support were anticipated early in the deployment. To help manage these projects, the Civil Engineering Research Laboratory assisted us by providing a Theater Construction Management System (TCMS). This included a current state-of-the-art personal computer system designed around the AUTOCAD software system. The TCMS allowed the brigade to maintain accountability for construction materials, and personnel and equipment hours. It also helped us track project status for about 1,000 newly cleared miles of desert roads, more than 1,000 helicopter pads, and untold tons on bulldozed soil used for protective berms.



## Topography

**A**t the start of Desert Shield, significant portions of the expected area of operations had not been mapped. To help alleviate this problem, a tactical terrain exploitation cell (TTEC) was developed by the brigade in close coordination with the Defense Mapping Agency. This system linked real-time imagery to the map production process. The advent of TTEC allowed topographic production specialists to provide the most up-to-date map products available. Given to the maneuver units, the maps allowed commanders to make the best possible use of the desert terrain.

## Construction

**W**ith heavily competing priorities for cargo shipments, the brigade anticipated significant delays in receiving Class IV material once in theater. To satisfy maneuver



**Top and above:** One of the 20th Brigade's initiatives included building access trails and protective berms for maneuver units.

When time and manpower permitted, these projects were sandwiched in between a tremendous list of higher-priority missions.

commanders' initial demands for base camps, the brigade ordered one million sand bags for rudimentary construction. Next, the brigade requisitioned six 2,500-man base camp packages

using the Army Facilities Components System (AFCS). AFCS provides construction units with the plans, bills of material, standards for construction, labor and equipment, and material

shipping estimates. Requirements for airfield construction and repair also prompted us to order M2, M18, and M19 airfield matting, geotextile, and sandgrid.

## Deployment

**W**ith initial preparation initiatives completed or well under way, our units began deploying to the Gulf theater on 21 August 1990, in accordance with the time phased force deployment list. Once on the ground, they were faced with the immense task of identifying unit beddown sites. This was a monumental task, considering that the area of operations equated to an area the size of Missouri and half of Iowa.

Initially, engineers were given limited combat engineer missions because of political sensitivities. Consequently, engineers received a large number of construction missions.

Before launching into construction projects, the brigade took some advice from Field Marshal Erwin Rommel. During World War II, he said, in essence, that before you can defeat the enemy, you must defeat the desert. Extensive leader reconnaissance was conducted in the area of operations.

The brigade then coordinated with the Mideast Africa Project Office (MEAPO) of the Corps of Engineers. MEAPO arranged for us to work with host nation support engineers and observe construction practices commonly used in Saudi Arabia. Among these practices were the use of sprayed diesel fuel as a dust palliative on compacted sand roadways; using marl, a chalky material similar to concrete; and placing a 1.5 percent slope on roads to prevent the buildup of drifting sand.

It wasn't long before we realized

that we had more combat construction missions than we could handle, given limited equipment, personnel, and time constraints.

One solution chosen by the brigade was the use of host nation support contract construction equipment. Specific equipment shortages included compactors, water distributors, and dump trucks.

Setting priorities also helped. Construction priority went, in order, to M19 matting for helicopter pads; construction and maintenance of main and alternate supply routes, construction of ammunition supply points and tactical petroleum terminals; force protection, and life support areas (base camps). To help maneuver units as much as possible, "good neighbor" projects like access trails and protective berms were completed when time and manpower permitted.

## Combat Engineering

**W**hile the greatest engineer effort was initially construction, combat engineers needed to train for expected hostilities. The primary focus of this training was mine and counter-mine warfare. Our personnel participated in combined arms breaching exercises with their respective maneuver units, with emphasis on synchronization of support forces, breach forces, and assault forces.

Brigade engineers also trained alongside Saudi engineers, with the help of translators, again with an emphasis on mine warfare.

A decade ago, military planners were frustrated with the multitude of challenges facing them in a potential Mideast military confrontation. The region's austere landscape and climate poses unique challenges, including sand and dust, logistical resupply over great distances, and force protec-

tion in largely open and barren terrain.

The National Training Center had been a great help in familiarizing soldiers with some aspects of desert warfare. The California desert also helped to precision-tune improvements in engineer doctrine, force structure, and force modernization.

Today, Desert Shield and Desert Storm have validated engineers as key players in the synchronization of battlefield operating systems. With a few pre-deployment and in-theater initiatives like those practiced by the 20th Brigade, engineers can maximize their value to maneuver forces even further.



*Colonel Flowers is commander of the 20th Engineer Brigade, now deployed in Saudi Arabia. He previously served as commander of the 307th Engineer Battalion (Airborne) at Fort Bragg. Other assignments include battalion XO and S-3, project manager for the Portland Engineer District, and various command and staff positions with the 94th Engineer Battalion. He is a graduate of Virginia Military Institute, and holds a masters degree in civil engineering from the University of Virginia. He is a registered professional engineer in Virginia.*

*Lieutenant Colonel Meredith is deputy brigade commander of the 20th. He previously served as assistant corps engineer for XVIII Airborne Corps. Other assignments include battalion XO and assistant division engineer with the 101st Airborne Division (Air Assault), and various command and staff positions with the 54th and 317th Engineer Battalions. He is a graduate of the University of Kansas, and holds a masters degree in military art and science.*

# LESSONS LEARNED

## The Engineer Estimate

*The following Lessons Learned applies to the engineer estimate process. It is derived from after action reports (AAR) submitted by the National Training Center (NTC) and Joint Readiness Training Center (JRTC), and is in the engineer lessons learned data base. For more information, write to Commandant, U.S. Army Engineer School, ATTN: ATSE-ESA-L, Fort Leonard Wood, Mo. 65473-6630. Or, call (314) 563-5321/5317, Autovon 676-5321/5317.*

**ISSUE:** Lessons learned from NTC and JRTC show that the engineer estimate process is often employed poorly or is so highly abbreviated that it is ineffective. Comments from training units state that soldiers think the process is "too hard" to use.

**DISCUSSION:** Evaluation of this problem reveals the need for a sound doctrinal approach to the engineer estimate process. Comments from AARs focus on the failure of engineers to coordinate planning within the combined arms team decision-making cycle.

Analysis of AARs and comments from the field suggest there is a problem with synchronization between the brigade and task force engineer, and between the maneuver brigade and task force staff and commander. Specifically, the following disconnects occur:

- Engineers often are not included with scout reconnaissance patrols to gather obstacle intelligence (OBSINTEL) data.
- Engineer input to the S-2 for the intelligence preparation of the battlefield (IPB) is poor when engineers are not included in this reconnaissance.
- Terrain analysis, vital to the IPB and wargaming of alternative courses of action, is weak when "engineer" eyes are missing from the battlefield.
- Engineers often do not play an active role in wargaming courses of action with the brigade and task force staff. Thus, the critical coordination required to put engineers in the right place at the right time with the right resources is reduced, making it difficult to execute the scheme of maneuver and effect the commanders' intent.

The Engineer School's Department of Combined Arms suggests that this deficiency also occurs

because—

- The engineer estimate described in FM 5-100, Appendix B, only addresses the written estimate product, not how it integrates with the command estimate.
- The engineer estimate, in relation to the command estimate, was not reinforced with practical exercises in the Engineer Officer Basic and Advanced Courses (EOBC and EOAC).
- The command estimate and the engineer estimate were not integrated until January 1990, when they were incorporated into the EOBC and EOAC program of instruction.
- Observers and controllers at NTC and JRTC have received doctrinal updates from the Engineer School faster than units in the field. This results in a training "void" for engineers when units arrive to train.

**RECOMMENDATION:** The Engineer School proposes two related strategies to fix the synchronization problem and enhance the estimate process. The first is a focused approach to the estimate process, and the second is a strategy to integrate the engineer staff officer into the brigade and task force staff planning process. We call them **What to Do** and **When to be There**.

On the surface, the engineer estimate is a complex but workable process. When the process is evaluated using METT-T (mission, enemy, terrain, troops, and time available), the complexity varies as a function of mission and time available. Missions may be complex (i.e., river crossing operations) or fairly simple (i.e., dig a vehicle fighting position). Having more time available for estimating allows the development of more detailed and complex plans.

We do not propose changing the process; it is effective and thorough. Every engineer officer must know it. Our strategies for "What to Do" and "When to be There" provide a clear focus and a clean snapshot of the essentials.

### **WHAT TO DO.**

The estimate is built around two related perspectives: How the battlefield will affect engineer forces, and how engineers can influence the battlefield for each proposed maneuver course of action.

Engineers must provide the maneuver staff and

commander with at least the following information, which should be analyzed in the order given:

*a. Engineer Battlefield Assessment*

1. How terrain and weather will influence proposed operations. Can you move your equipment (roads); expected weather impacts (trafficability); expected terrain impacts (use OCOKA—will it force your hand or can you influence terrain to your advantage?).
2. Enemy engineer capability and how you expect that capability to be used (countermine/counterobstacle, tactics, and techniques).
3. What resources (equipment, personnel, supplies) you have, what you can do with them, and what you require for those options that exceed your capabilities.
4. Quantity, type, and location of available engineer class IV and V supplies. Also, the number and type of engineer units and equipment available in the area, and the number and type of combat support units available to assist.

*b. Analysis of Maneuver Courses of Action*

1. Propose an engineer plan for each maneuver course of action (SPEAK UP!), note your needs, resources, priorities, and forces employed.
2. Compare your courses of action, choose and recommend the best one to the maneuver staff.

These are the basic essentials of an engineer estimate.

The next step is to wargame your engineer courses of action with the maneuver staff. Eventually the staff will brief the commander on two or three courses of action and will recommend one.

Your role, as the engineer, is to influence that decision-making process during wargaming. For example, the staff may favor (in order), plans A, B, and then C, while the engineer preference is B, C, and then A. In that case, you must tell the maneuver commander—

- How the engineers will support his choice
- Why you prefer the other choice
- What limitations you face
- What resources you need to make his plan work
- What actions you recommend to eliminate or reduce any deficiencies

Engineer execution matrices are helpful when you prepare an estimate (an example is shown on page 32, in the July 1990 issue of *ENGINEER Professional Bulletin*). Matrices assist the engineer when setting priorities for missions, determining task organizations, and getting supplies.

In a very small nutshell, the "What to Do" will enable you to synchronize the engineer estimate with

the combined arms team.

**When to be There.** The best plan is worthless if it is delivered too late. Your role in supporting the maneuver commander demands that you be present at critical times, i.e. for—

- Receipt of the brigade or task force warning order
- Initial leader's reconnaissance
- Face-to-face discussions with brigade or task force S-3 during wargaming
- Commander's guidance and decision
- Commander's final reconnaissance (i.e. siting obstacles, defense)
- Preparation of the brigade or task force operations order
- Preparation of the company team operations order, when they are in the attack

This is a minimum list of critical times. The bottom line is, you must be there—to hear and be heard. Being there, personally, may be logistically difficult and will certainly require that sub-units receive appropriate warning and guidance to prepare for operations.

Your unit's standing operating procedure (SOP) must anticipate task organization and instructions for delegating critical tasks. Because you cannot be everywhere at once, squad leaders, platoon sergeants, platoon leaders, and first sergeants must know their tasks and task deadlines in advance. This will allow you time to be with the maneuver staff engineer.

You may sometimes feel unwelcome or be overtly neglected by maneuver unit leaders. Such problems can prevent the engineer process from happening. Your job is to work through these problems to ensure engineer issues are raised and acted upon in time to influence mission success.

Current force structure initiatives should resolve most of these integration difficulties because they allow habitual association between maneuver and supporting engineer forces. Until these changes occur in your unit, stay with the team. Know your maneuver commander's intent and know the enemy. Tell the maneuver commander what you can and will do to support his plan. Tell him what the enemy can be expected to do and what you will do to counter that threat and enhance the scheme of maneuver.

The engineer estimate process is now reinforced at the Engineer School in every tactical exercise without troops, practical exercise, and classroom tactical instruction. It provides the best framework for effective staff planning. For maximum efficiency and effectiveness, the process must be trained, practiced, and become "rote" to all engineers. Use it with success.

# Can You Hear Me, Lieutenant?

*By Lieutenant Colonel Herb Harback*

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**“As a platoon leader, you are the caretaker of those sons and daughters of America. It is the most awesome of responsibilities...”**

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**T**he Army War College has provided me too much time to think about Desert Storm. I wish I was there instead of on the side lines. Sure, I want to be there in the desert with “my team,” but there is another reason. I trained many of those combat engineers. They were my responsibility and now they are there and I am here. I wish I had the chance to just check them out one more time; double check the gear, the plans and a quick rehearsal. To sit down with the junior leaders and have them brief back to me all we have discussed over the years; to sit down with the newest of the leaders and go over essential leadership traits. I want to talk with each of these warriors.

Most of all I need to share my thoughts with the platoon leader. But the best I can do now is to send him a note.

Can you hear me, Lieutenant? I know you're saying to yourself “why should I read this?” And that's a legitimate question. Your time is very valuable. You have a whole platoon of challenges awaiting. You have things to do, places to go and people to see. As a lieutenant in the United States

Army you have been trained and tested; it's time to take charge. I ask of you to read these words and capture the spirit within them.

First, what I have to say concerns soldiers. As a platoon leader, you are the caretaker of those sons and daughters of America. It is the most awesome of responsibilities; far greater than anything you have done before now. Hear my words so you will do better than I.

A young officer once came up to a great soldier and asked that proven warrior how he became such a great leader. The general looked at the soldier and replied, “That is easy. Two words sum it all up—right decisions.” The soldier thought about that and then asked, “How do you make right decisions?” The leader replied, “Easy. One word sums it up quite nicely—experience.” The young soldier thought about that and then asked, “But how does one get that type of experience?” The general smiled and said, “Two words—wrong decisions.”

I will tell you, though, that there is not enough time for you to personally experience it all. If you are to be the leader we expect of you, then the experience—the “wrong decisions” the general was talking about—

must come from others as well as yourself. Listen and learn from my mistakes and experiences.

The other reason why you should read on is more pragmatic. The Army is entering into a major reduction of force. The majority of ROTC cadets, even those with scholarships, will not be allowed to enter into the active service. Many young officers on active duty, and with positive mission accomplishments to their credit, will be asked to leave. The cut line between who stays and who goes will be tough. It pays to listen and learn from an officer who experienced four such troop reductions.

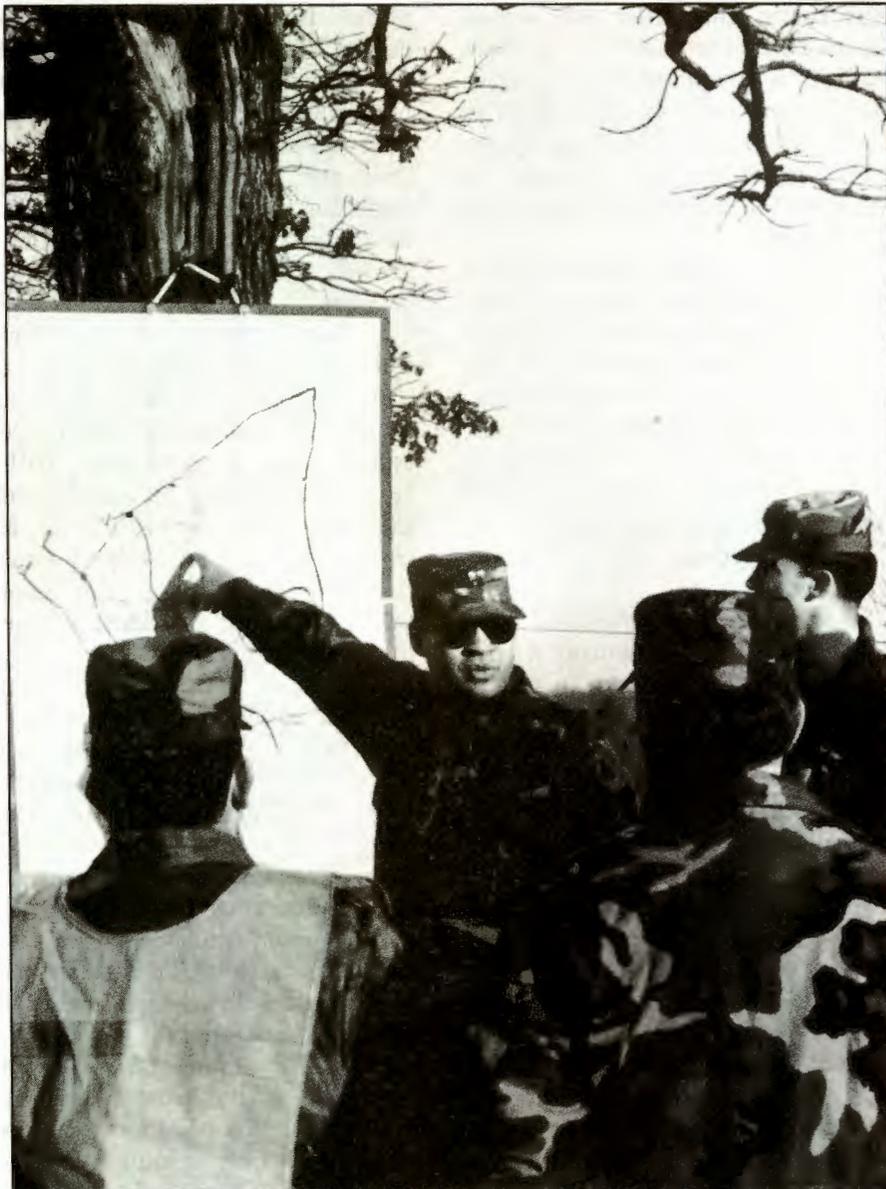
I would like to talk with you about what I expect from you as an officer, platoon leader, and fellow soldier. What I say are simple words of advice from a soldier who has taken a number of wrong turns, had some great luck, all kinds of bosses, and learned from myself and others.

There are ten soldier traits you must internalize. They must be a part of your being, each and every day. You are about to enter into a profession like no other calling. You will be given the responsibility of protecting our nation, and, on a daily basis, the well being of a priceless team of young warriors.

**1. Soldier Concern**—Your soldiers are your 24-hours-a-day responsibility. This is not an 8-to-5 job; it is a calling in the purest of senses; total commitment to your men and women and their families is your purpose.

**2. Sustainment**—The green machine is not a perpetual one; it is fleeting in its vision and strength. You must constantly work at sustaining the excellence of your soldiers and their equipment; keeping it all together and focused for the long haul. Sustainment means dedication and selflessness, each and every day.

**3. Fitness**—Physical, mental and moral strength is what I'm



talking about. Your body, mind and spirit will be asked to perform when your senses tell you to drop out, to quit. You must have the physical strength to go the extra mile, and the moral fiber to maintain the battle vision. You must have the mental clarity and agility to put it all together, day and night; not only for yourself, but for the soldiers whom you lead. "Hanging tough" is what I expect of you, and it all starts with a physically fit body. If you don't have it now, you probably won't have it later, and it is during combat that you will be asked to do the

near impossible. If you don't have what it takes now, I can't risk waiting too much longer for you to obtain that special spirit.

**4. Training**—It is a mindset. When Juma Ikangaa of Tanzania, the great marathon runner, was asked about his world record in the New York Marathon, he said, "The will to win is nothing without the will to train." Soloflex Corporation prints it on their T-shirts—"No Pain, No Gain." You must live, eat and breathe a training experience mentality. All you do must be training related. You must have that focus. When we

are called, the nation will expect us to be trained, and our soldiers will have worked hard doing those things you have ordered them to do in the name of training opportunities. There will no longer be any time to train. It will be a time to execute.

**5. Safety**—Goes hand-in-glove with training. All actions involving your soldiers must consider safety. It is the essence of true soldier concern. You must understand and practice risk analysis, which leads to the reduction of the inherent dangers found within realistic training. Do not assume anything when it comes to safety.

**6. Soldier Recognition And Retention**—Are essential within our calling. We must always be in tune with our soldiers and recognize them for their actions—both the good and the bad. A hand-written note performs miracles. It shows that you really do care by walking the extra distance to give a “thanks” or a “get with it,” not only to the soldier, but to the spouse or parents. Give them the self-worth and feedback they deserve and seek.

That leads to soldier retention. Retention is your duty and it starts on day one, when you welcome the troop into the unit. We recruit the individual, but we retain the soldier and his family. Remember that.

**7. Responsibility, Authority And Accountability**—It is, in leadership terms, the “powering down” to the lowest level which can successfully accomplish the mission. If it’s a squad’s job, then give the torch to the squad leader. You power down to the mission, giving that soldier the responsibility and authority to do it; don’t forget the third part of this tenet—accountability. Make sure all know that along with powering down comes accountability for one’s actions.

**8. Professional Develop-**

**ment**—Is expected of you from the get-go. You are in the profession of arms and must maintain proficiency and competency in your calling. This does not mean that you immediately enroll in night classes for an MBA, rather it means you focus on your military growth and the growth of your soldiers.

**9. Battle Focus**—It is critical that you understand and maintain a clear and present battle focus in all you do. Successful deterrence comes from a persistent, full-court-press type of battlefield awareness. That is hard to do. It means that you understand what this calling is about, you have taken your oath seriously, and no matter what external factors may impact upon you, you will keep yourself and your soldiers locked-in on target, every single day.

**10. Finally, there is Leadership**—Leaders are made, not born. They are developed through themselves and others. Operation Desert Storm will be seen as a success or a failure depending on the actions of front line, troop level, leaders. Proper leadership is done in three phases: you listen, learn and then lead. Listen, learn and lead—in that order. Change it around and you have a mess. You must listen before you can learn, and you must learn before you can lead.

“Leaders follow” is a simple, yet complex, old saying. It means that leaders follow-up, follow-through, and follow the lead. When I came into the Army, “manager” was a bad word. The Army only had leaders, not managers. Of course, that was one of the major problems with the Army since, in reality, each officer must be both manager and leader.

A manager focuses on sustainment; he is concerned with the efficient running of the organization. The leader, though, is more focused on the forward movement of the organization; he is con-

cerned with mission accomplishment. Leadership, true leadership, demands both.

These ten tenets are your foundations. Each one is critical in itself. But all can be rolled up for you, the professional soldier, into three basic traits—*caring, standards, and readiness*.

When it comes to caring, there are three questions one must ask oneself about each of his soldiers: Who is he? How is he? Where is he? Caring is not being soft; it’s being firm.

The first soldier to die during Operation Just Cause was one of mine. He was a great soldier who I cared for very much but maybe not enough. The Panama crisis was developing when this soldier asked for time off. We were totally wrapped up in getting the division and ourselves ready for anything and no one was allowed to go on leave, but we said “yes” to this fine soldier.

Then Just Cause started. Our initial mission was to outload the division, and we forgot about the soldier; we stopped caring for him for a few days. This first soldier to die was shot in the head with a .357 magnum; the bullet entered and never exited his skull. They say it was a lover’s quarrel. It was just outside our post.

Caring is a full time mission for each of us. “Who is he?” His background, desires, needs, loved ones, are more than just a name, he is a soldier you have been entrusted to train, lead and care for. It is a simple question but carries an enormous responsibility in its execution.

“How is he?” His feelings, emotions, his health, fitness—physical, moral and mental, and his family are part of him. How is he now? Today. Not last week or last month when you sat down with him or quizzed him in passing. “How is he?” is a thermostat type of question, requiring constant checking on the part of the leader.

And then there is the question of "Where is he?" Not just his physical presence, but his mental whereabouts, his outlook, as well as his education—military and civilian—proficiency. Where does he stand in his life goals and expectations? Has he placed himself in a "no win" box as many young people do? You are the leader; care for that soldier.

It is important to ask these three questions about each of your soldiers. Soldiers make up the fighting team, and it is the team that accomplishes the mission. If any soldier is not focused on the mission, has mentally drifted off, does not understand the job or is incapable of performing it, the whole team is placed at risk.

Caring is why I kicked soldiers out of the Army for taking drugs. Caring is why I called up parents; visited sick children; dug deep into my pocket; and was a hard ass when we trained.

The second trait is that of standards. Without standards, one has a mob. My thoughts are very simple and clear on this point. Standards must be stated, understood and enforced. No breaks. If a soldier, moreover a leader, walks by a substandard act and does not correct that act, that soldier, that leader, has lowered his standards. It is very important to understand that standards apply both to the individual and to others at the same time.

My first unit assignment was that of 1st Platoon, B Company, 10th Engineer Battalion, 3rd Infantry Division, in Bad Kissingen, Germany. My introduction was by way of the company commander, who wished me luck. The platoon had decided to quit. There had been an incident in which a squad APC had rolled over, killing three soldiers. The situation I was placed into was not really one of a platoon sitting down, although

that is exactly what was going on. Rather, it was a case there the leadership had quit.

They failed to maintain standards. They failed to enforce safety and discipline. The leadership in that company was substandard and we now had mob rule on our hands. We changed it through the reintroduction of standards—clear, fair, and enforced at all levels, standards.

The other part of standards involves competition. Positive competition, the striving to be within that band of excellence, means competing against a standard and not one another. Standards, whether goal setting or hard competition, are the base line we all must operate from.

The third, and final, trait is that of readiness—total combat readiness brought about through the inculcation of all ten platoon leader tenets and the other two capstone traits. Readiness is what it is all about.



As I explain to soldiers, picture two gunfighters going towards each other in the main town called "Earth." When is the probability highest, the risk the greatest, that armed conflict will start between these two gunfighters? It is when the bad guy believes that he can beat the good guy. It is when, in the mind of the aggressor, it is felt that the other person, nation, Army, or soldiers you lead, do not look like they can cut it; that they are not ready. Not physically nor mentally capable of hanging in; not prepared, show no focus nor desire, or are simply not trained. The history of our world contains numerous examples of the "gunfighter theory."

What, then, provides for our nation's peace? It is the total readiness of our Army. History also tells us that peace comes through strong deterrence. Your mission will be to ensure that strength, commitment, steel-like moral fiber and exacting warrior excellence are present. Readiness, on a daily basis, gives us peace. Have no doubt that you and your soldiers are evaluated every day. It is no accident that there is a Soviet satellite stationed permanently over the National Training Center; that the Soviet Embassy in Washington has more directional antennas than any other building in that area, and that third-world countries read more about us than we read about ourselves and them combined.

Commitment to total readiness is needed every day, in everything we do. It must be a positive type of vigilance and concentration—a "can do" spirit. In 1978, tight-rope artist Karl Wallenda prepared for months to do his most difficult act. His whole life focused on walking the tight rope across two buildings in downtown San Juan, Puerto Rico. But his entire focus was on preventing his fall. Not on success.

Management books now talk about the "Wallenda Theory." You see, Karl

Wallenda fell to his death because he failed to have a positive focus. Although he was great, his vision was negative. Readiness must include a positive warrior spirit which you instill in your soldiers through confidence and proficiency.

In closing, I urge you do to your best. When a platoon leader, be a platoon leader—not a little general, a staff whiny, an executive manager or a Rambo. Be a true leader of a platoon of America's finest professional peacemakers. Get totally involved with the platoon; focus on creating a team oneness without any superstars—they cost too much. Ingrain the three concepts—caring, standards, and readiness—into all you do. Focus on today; maintain that bold, spirited, battle vision.

There is a saying you should never forget as you start your calling: "Home is where the Army sends you." If you believe that, if you feel at home wherever you are with your soldiers, then you will be able to accomplish, with your troops, any mission—on time and on target.

The Army can be seen as a massive rock in front of your path. You have the choice of deciding what the rock will be to you. It is either a frustrating blockage, preventing you from getting to the other side, or it is a stepping stone, allowing you—and your soldiers—to move up. Move up to a higher plain of accomplishments, satisfaction and service to your nation.

Carry on, warrior! 

*Lieutenant Colonel Harback is attending the Army War College. He previously served as commander of the 14th Engineer Battalion (Corps), Fort Ord. He has served in various command and staff positions, including executive officer, Bayonet Combat Support Brigade, 7th Infantry Division (Light); deputy commander, 7th Engineer Brigade, VII Corps; S-3, 7th Engineer Brigade, and aide-de-camp to the commanding general, U.S. Army Western Command.*

(Continued from page 31)

very closely at all levels of command. Almost all division and installation commanders have a monthly formal readiness meeting to review USRs. This is repeated in some form or other at every higher level of command. Even the Army chief of staff (CSA) chairs a formal monthly readiness review. At the CSA review, individual units down to detachment level that are experiencing chronic readiness difficulties are tracked, and steps are taken to correct the problem.

In conclusion, I want to recap some points made earlier. Every soldier has a stake in unit readiness. Combat readiness and survival depend on it. The system doesn't always help us with that readiness as much as we would like. We live in an imperfect world, and everyone has to expend more than the MELE to get the job done, get it right, and get it done on time. Don't be afraid to be the "squeaky wheel." Report accurately. To do otherwise is only hurting yourself and the Army.

My suggestions here are not "tricks" to make you look good on paper. They are real-world ways to improve your readiness and ability to "hit the ground running" if your unit is deployed to combat. Make the system work for you and your unit. Your mission success and battlefield survival will depend on it. 

*Colonel Dabbieri is chief of Combat Support Career Division, Enlisted Personnel Management Directorate, PERSCOM. Commissioned from Engineer OCS, he served in Vietnam and has commanded four companies. He also served as executive officer of the 19th Engineer Battalion, and commanded the 2nd Engineer Battalion in Korea. He is a graduate of Command and General Staff College and the National War College.*

# Engineer MOS Consolidation

By Dr. Sue Mettlen

One of the stark realities facing today's Army planners is the need to create a smaller, less diverse, but still tactically capable force. One avenue for accomplishing this goal is reducing the number of engineer military occupational specialties (MOSs) by consolidating skill groups.

The most immediate result of this move toward MOS consolidation will be in the 12 career management field (CMF). Beginning in September 1992, the 12B combat engineer and 12C combat bridge crewman will consolidate into one MOS, the 12A sapper.

At skill level (SL) 1, this soldier will be known as an apprentice sapper; at SL2, sapper; SL3, sapper supervisor, and SL4, senior sapper. The 12F engineer tracked vehicle crewman will remain a separate MOS from 12A at SLs 1, 2, and 3, and will be renamed engineer combat vehicle crewman. However, once 12F soldiers are promoted to sergeant first class and awarded SL4, they will become 12A senior sappers. This merges the entire CMF at SL4.

To support the consolidation, several changes will occur in the Army education system. After September 1992, 12B and 12C advanced individual training (AIT) and basic noncommissioned officer (BNCOC) courses will be combined under 12A AIT and

**The 12CMF consolidation... will go a long way toward yielding a leaner, less specialized, and more flexible engineer force.**

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BNCOC. Separate AIT and BNCOC courses will be maintained for 12F soldiers, as will the current consolidated advanced noncommissioned officer course (ANCOC) for all 12CMF/SL4 soldiers.

New products are being developed to support these dramatic changes in the combat engineer field. In mid-1992, the Engineer School will field soldier's manuals and trainer's guides for MOSs 12A and 12F. This summer, the school will also publish the task lists upon which the soldier's manuals are based. While some of the tasks in this list will be new, they will largely be an update and recombination of existing 12B, 12C, and 12F tasks. To assist soldiers in making the transition, there will be no self development test (SDT) for these MOSs in FY 93.

One of the most important factors leading to the 12CMF consolidation was the amount of overlap between 12B and 12C tasks. The 12C soldier was responsible for virtually every task of 12B personnel, plus those tasks specific to bridging operations.

The change will be demanding on soldiers. After September 1992, former 12Bs and 12Cs must be prepared to fulfill all missions assigned to the current 12B/C fields. The same is true for 12F/SL4s, who must function as 12A/SL4s after the implementation date.

These changes place great cross-training responsibilities on soldiers and leaders alike. Soldiers will have to invest a lot of individual time and effort in learning their new skills. Commanders and other leaders will have to ensure that the transition is implemented smoothly and without a loss of readiness.

The 12CMF consolidation, however, will go a long way toward yielding a leaner, less specialized, and more flexible engineer force. Such a force will be ready to meet the competing demands of ever-tightening budgets and the continuing need for combat readiness. 

*Dr. Mettlen is chief of the Engineer School's Individual Training Branch, Directorate of Training and Doctrine.*

# The CEV M970

## Subcaliber Training Device

By Sergeant First Class Dennis L. Fulton

**G**etting "more bang for the buck" is on the minds of most military planners these days. But balancing the Army's budget, while maintaining soldier proficiency, is not always an easy task. The Engineer School, though, has come up with a way to save big money on combat engineer vehicle (CEV) gunnery training without losing critical soldier skills.

The school recently fielded the CEV subcaliber training device, also known as the M970. The device, which uses a relatively inexpensive 40 millimeter (mm) round, will be used to train engineers on proper loading, arming, aiming and firing procedures for the CEV's 165mm demolition gun.

Current CEV training uses the standard M123 high explosive plastic (HEP) round for gunnery qualification, and the M623 target practice (TP) round for pre-qualification gunnery practice. Both of these rounds are expensive, and must be limited to ranges which can accommodate such large munitions.

### Cost Savings

**E**ach 165mm TP round costs \$450, while the 40mm round costs about \$10. The annual ammunition requirement for the CEV in a combat engineer unit is 60 TP rounds. Using the 40mm round, each battalion can save more than \$26,000 a year. In 1990, Training and Doctrine Command (TRADOC) used 247 TP rounds, costing more than \$111,000. By using the M970, such training would have cost just under \$2,500.

### Fielding

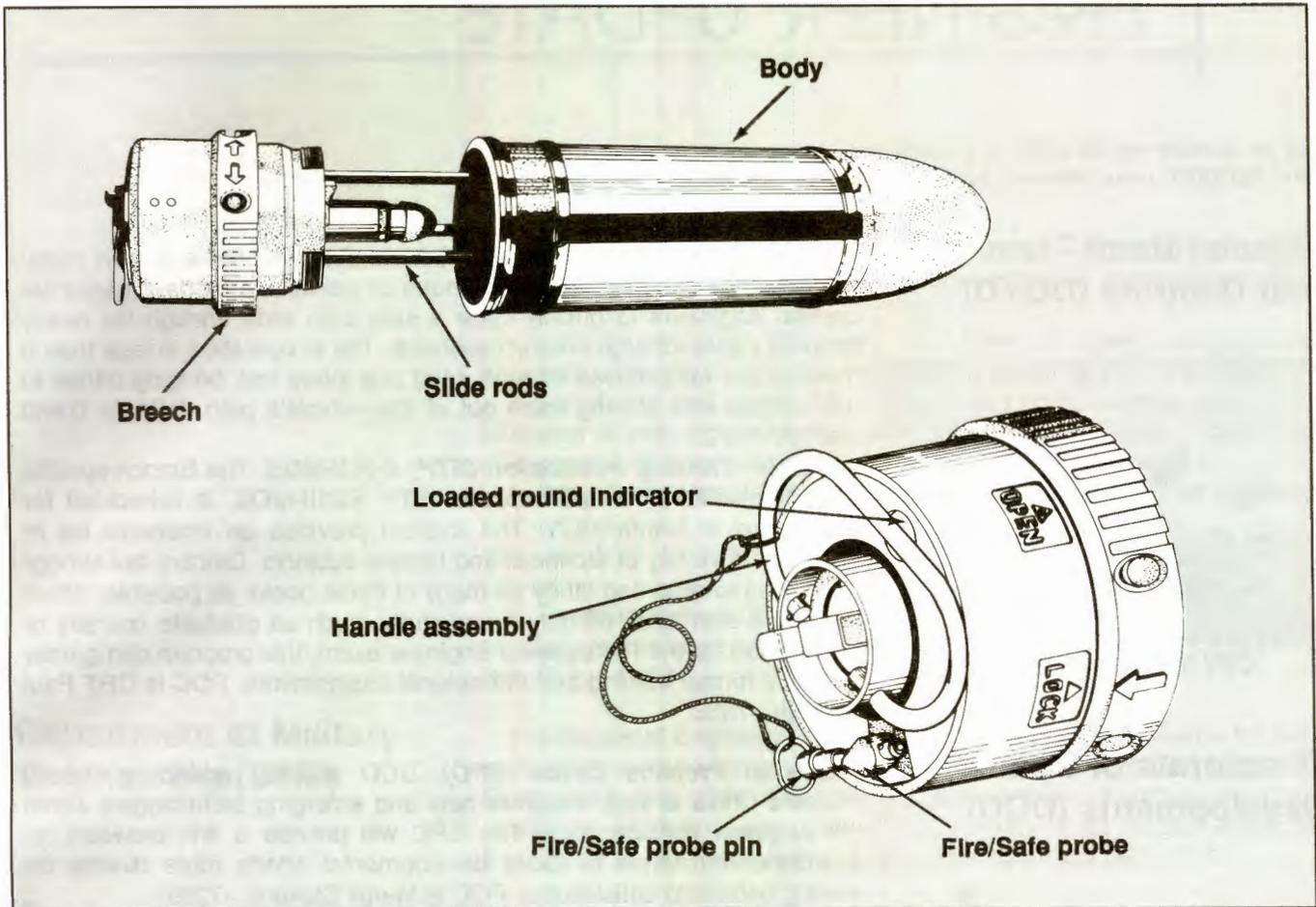
**T**he M970 was fielded at the Engineer School in December 1990. Units in Europe will begin receiving the device in July 1991, while Forces Command (FORSCOM) units will start getting it in August 1991. Engineer units in Korea will get the M970 in December 1991. Reserve and National Guard units will begin

receiving the new device in July 1991.

### Characteristics

**T**he M970 approximates the size, shape and weight of actual M123 HEP and M623 TP rounds, and is reusable. Unlinked M918 40mm rounds are used as the projectile. The device, illustrated on page 61, consists of three main parts: the body, the breech, and the slide rod support system. The body portion contains the 40mm gun barrel. The breech separates from the body of the device to allow loading and unloading of the 40mm rounds. The breech also houses a solenoid that converts the CEV's electrical firing impulse into the mechanical energy needed to fire the 40mm round. The breech and body are attached by three slide rods.

A fire/safe probe, a built-in safety feature, prevents accidental firing of the M970. This probe protrudes from the closed breech



of the device, and must be depressed to permit firing of the 40mm round. As an additional safety feature, a visual indicator is located on the breech. A red visual signal indicates the presence of a chambered round. A white signal shows that the device is unloaded. To facilitate handling of the M970, a "D" handle is attached to the rear of the device, similar to an actual 165mm round.

### Trajectory

To compensate for the slight trajectory difference between the 40mm and 165mm rounds, a range comparator card has been produced for use with the M970. The card allows the CEV commander to estimate range to his target, determine

the corresponding comparator reading for 40mm ammunition, and announce the modified range to his gunner. The gunner then operates under the same conditions as if firing an actual 165mm round.

### Tech Assistance

At least 30 days prior to receipt of the subcaliber device, field units will receive an exportable training packet from the Engineer School. The packet will contain a program of instruction (POI), and lesson plans on the operation and maintenance of the device.

The M970 requires engineers to follow the same procedures used to supply, prepare, load, and fire the 165mm ammunition. While

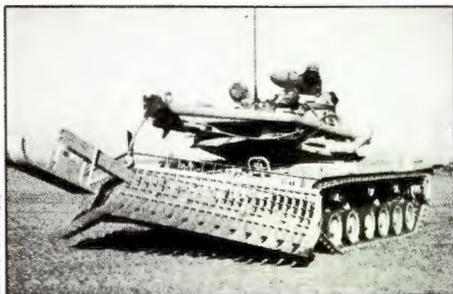
not developed as a full replacement for the 165mm round (it will not be used for boresighting, for instance), the device provides excellent training at substantially lower cost. Simple, easy to use, and effective, the M970 will be a valuable addition to engineer training programs. 

*Sergeant First Class Fulton is a combat engineer training analyst for the Engineer School's New Equipment Systems Division. Previous assignments include company first sergeant, senior instructor, drill sergeant and platoon sergeant. He holds an associate degree from Columbia College, and is a graduate of the Advanced Noncommissioned Officers Course.*



Autovon numbers are 676-XXXX, and commercial numbers are (314) 563-XXXX, unless otherwise noted.

## Directorate of Training and Doctrine (DOTD)



Steve Bennett

CEV Mine Clearing Rake

**Combat Engineer Vehicle (CEV) Mine Clearing Rake.** A new mine-clearing rake used in the Saudi theater of operations made it easier for combat engineers to quickly clear a safe path wide enough for heavy tanks to move through enemy minefields. Put in operation in less than 4 months, the rake moves through sand and loose soil, bringing mines to the surface and moving them out of the vehicle's path. POC is David Carroll, -5020.

**Soldier Training Publication (STP) 5-21II-MQS.** The Branch-specific guide for lieutenants and captains, STP 5-21II-MQS, is scheduled for publication in March 1991. The manual provides an extensive list of books on a variety of technical and tactical subjects. Officers are strongly advised to read and study as many of these books as possible. When combined with other off-duty hours study, such as graduate courses or preparation for the Professional Engineer exam, this program can greatly enhance formal training and operational assignments. POC is CPT Paul Schroth, -7553.

## Directorate of Combat Developments (DCD)

**Special Projects Office (SPO).** DCD recently added a Special Projects Office to help integrate new and emerging technologies within the engineer mission area. The SPO will provide a link between researchers and users to focus developmental efforts more directly on solving battlefield deficiencies. POC is Merrill Stevens, -7209.

**Antipersonnel Obstacle Breaching System (APOBS).** U.S. Marine Corps' breaching device program, APOBS, is continuing in development. APOBS is a man-pack explosive line change capable of destroying antipersonnel (AP) mines and wire obstacles for foot soldiers. The Army has accepted the Marine Corps' requirements document; upon completion, APOBS will be available to Army and Marine units for breaching operations. POC is Jim Smith, -7218.

## Department of Combined Arms (DCA)

**Critical Elements for Combined Arms Breaching.** Combat Training Center results show that successful combined arms breaching rehearsals require five critical elements:

**1. Key Player Involvement.** Rehearsals must receive command emphasis. All subordinate leaders, company FISTs, battalion FSO, ADO, engineer leaders, S4/S1, battalion XO, battalion S3, and battalion commander are key players. The battalion commander and S3 must enforce attendance and personally lead rehearsals.

**2. Rehearsal Progression.** Unless a unit is highly trained, jumping straight into a full-scale rehearsal is impractical. Rehearsals progress from a rock drill to a full-scale rehearsal, as described below:

- *Rock drill.* Key players move their rock (unit) on a sand table, discussing actions during each movement. Key staff members describe significant actions as appropriate.

- *Leader walk-through.* Similar to the rock drill except the sand table is a large box. Leaders walk to positions in the box. The walk-through helps players appreciate adjacent units' actions and maneuver, and see how the operation is synchronized.

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- *Leader-mounted walk-through.* The scale gets larger, with radio transmission added as the basis for communication and vehicle movement.

- *Full-scale rehearsal.* The entire force uses the scheme of maneuver on terrain similar to that for the mission and conducts required drills.

**3. Standards and goals.** All standards and goals must be set prior to rehearsal to ensure the objective and intent are understood. Subordinate units conduct their rehearsals prior to the task force rehearsal.

**4. Breach rehearsal lane.** A lane is constructed on terrain similar to that for the mission; it reflects the situational template. Separate lanes may be built to simulate in-stride/deliberate versus assault breach operations.

**5. Resource allocation.** As in any training event, units must allocate needed resources (time, space, materials, and personnel). POC is CPT Bob Wray, -5456.

## Department of Military Engineering (DME)

**Professional Engineer Application Deadline.** The deadline for submitting applications for the 25 October 1991 Professional Engineer (PE) Exam is 27 June 1991. This deadline applies to most states. The Commonwealth of Virginia allows the PE exam to be taken in other locations. If you wish to receive a Virginia application, call (804) 367-8512.

## Engineer Branch Safety Office (EBSO)

**Army Motor Vehicle (AMV) Accidents.** Ten fatalities resulting from AMV accidents have occurred in engineer units so far in FY 91, including five in Operation Desert Shield/Storm. Failure to perform to standards was the common denominator. Specific causes: Two fatalities occurred when drivers backed up vehicles without ground guides; two resulted from brake failure; in one case both the driver and assistant fell asleep; in at least one case soldiers failed to use seatbelts.

Soldiers must follow procedures before, during, and after operating AMVs. They must perform proper preventive checks to detect deficiencies, follow traffic rules, and drive defensively. Additional guidance is in AR 385-55. POC is Paul Rusinko, -5002.

## Reserve Component (RC)

**Engineer Officer Basic Course (EOBC-RC).** Starting in FY 92, soldiers must complete the correspondence phase of EOBC-RC prior to attending the 8-week resident phase (OCS graduates). This is a change! POC is LTC Charles Doll, -7742.

## 1st Brigade

**Engineers Adopt British Pipe Fascine System (PFS).** A fascine system developed by Royal Engineers and used in Operation Desert Storm enabled U.S. Army engineers to maintain speed in attack, thus enhancing mobility operations. The PFS is a narrow gap-crossing system consisting of bundles of high-density polyethylene pipe fitted with launching and recovery chains. Procurement of the British system is being studied. POC is 1LT Cary Canter, AV 581-1581/8847 or (314) 596-1581/8847.

Officers Mess, Willets Point, New York



## Beginning at Willets Point

Since the Army's first Engineer School was founded at Willets Point, New York, in 1867, the Army has trained engineer officers in practical engineering subjects. Many changes in curriculum and several changes in location have occurred during the school's 130-year history. This article describes the school from its founding through the move to Washington Barracks (now Fort McNair) in 1901. In some ways today's Engineer School mimics that earlier one: The curriculum is continually modernized to keep it relevant to Army doctrine, and the school recently changed location to improve training opportunities.

After the Civil War, the Battalion of Engineers was ordered to Willets Point to construct a new post and establish a depot for engineer equipment left in Virginia. In 1866 Brigadier General Andrew A. Humphreys, Chief of Engineers, determined that the battalion needed a large detail of officers to command and instruct engineer companies. He believed that all engineer officers should be exposed to troop command, and that young officers should extend their West Point training with theoretical and practical engineer subjects.

Humphreys envisioned a practical school of application, as opposed to strictly classroom work. He instructed Colonel Henry L. Abbot, the battalion commander,

to establish a training program for new officers, non-commissioned officers, and the battalion's enlisted men.

Instruction began in the summer of 1867, with students working on sextants and the construction of model "fronts" of forts, at a scale of 1 to 12. During the first 18 years growth was piecemeal. Training in meteorological observations, reconnaissance, and surveys were added in 1868. Meteorological observations included hourly listings of barometric pressure, temperature, and humidity. Students performed reconnaissances and surveys to develop information for military maps. Later, each officer carefully surveyed and prepared contours for one square mile of territory using ordinary surveying equipment.

A field astronomical laboratory added in 1869 enabled officers to use an astronomical transit, zenith telescope, a telescope for occultations, sextants, and chronometers. Weather permitting, officers in the battalion devoted the hours of sunset to midnight to regular observations. Results of these observations were published annually in Battalion Orders.

A modern observatory replaced the old one in 1879. Using updated equipment, students learned how to determine latitude and longitude, and registered unusual astronomical events such as sun

spots. As a result of the school's latitude records, scientists discovered a new oscillating motion of the earth on its axis.

Study also included hypothetical enemy invasions. In the summer of 1872, all commissioned officers prepared a detailed line of field works that stretched from Willets Point to Jamaica Bay. The field works were to protect Brooklyn against a hypothetical invasion of 100,000 men along the east end of Long Island. Forces available for defense consisted of 30,000 militia infantry, three companies of engineers, a full regiment of artillery, plus field artillery.

Practical instruction in submarine mining began in 1872, when responsibility for seacoast defense was assigned to the Corps of Engineers. By 1874, the Corps had acquired 600 miles of torpedo cable and 300 mines. To accommodate this training, the school added a Torpedo Laboratory for officers and a building for the instruction of enlisted men. Students worked with torpedoes that were steered by electricity from shore—electrical transmission of power was new technology at that time.

The name "School of Application" was officially applied in 1875. The school continued to expand, and in 1884 Secretary of War Robert Todd Lincoln increased the enlisted men in the battalion to 400. The next year the school reorganized into five

departments: Military Engineering, Submarine Mining, Civil Engineering, Practical Astronomy, and Military Photography. The academic staff included the battalion's field officers, senior staff officers, and company captains. As part of their training, officer students were assigned to instruct enlisted students in military and engineering subjects.

During this period, officer students arrived at the battalion from West Point in the October following graduation. The first two months were spent becoming familiar with routine military duties. Then they began a program lasting two and one-half years, with the school year divided into winter and summer courses.

Starting in 1880, the school conducted a 6-month course in submarine mining for engineers plus two artillery officers. Ten years later, infantry and cavalry officers, in addition to artillery officers, began attending a new 9-month submarine mining course for non-engineer officers.

When the War Department reorganized the school again in

1898, they officially designated it the United States Engineer School. Its objective was to increase the professional qualifications of officers assigned to the Corps of Engineers. Under this reorganization, the program was shortened to two years and the departments of instruction were reduced to three: Military Engineering, Electrical Engineering, and Civil Engineering.

The program of instruction for Military Engineering included reconnaissances of routes and positions; maps, plans, and military photography; explosives; military bridges; campaigns; and land and coast defenses. Electrical engineering included the application of electricity to seacoast and land defenses, power transmission, and torpedo instruction. Civil engineering included surveying and practical astronomy, preliminary examinations of navigable waterways, river and harbor improvements, detailed studies of building materials and methods of construction, and river and harbor works. Lectures by Army and Navy officers and

civilians, and visits to military and manufacturing establishments supplemented the course work.

The school suspended operations from April to November 1898 due to our war with Spain. This was the only time the school closed except for the period 1917-1919, in World War I.

When the school moved to Washington Barracks (now Fort McNair) in 1901, the name changed again—this time to the Engineer School of Application, United States Army. Instruction methods used in the two-year program included lectures; readings, with the students taking notes that were graded; and student theses and projects. Instructors examined the students at the end of each course and rated them "proficient with honor," "proficient," or "deficient."

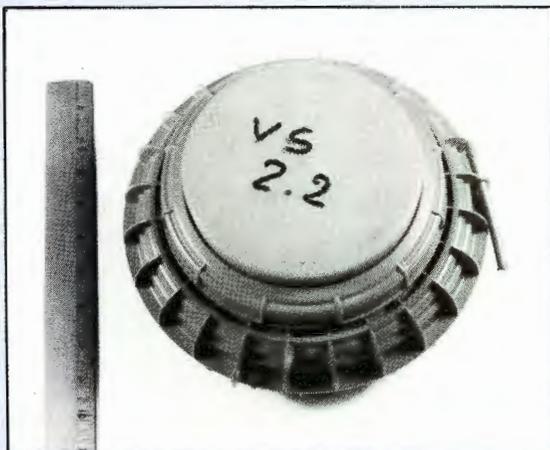
One part of the school did not move to Washington Barracks. By an act of Congress, the care and operation of torpedo defense reverted to the artillery, and all torpedo materiel transferred to them in 1902.

Throughout its history, the United States Engineer School has expanded and reorganized to maintain a highly trained force of Army engineers. The Engineer School of the 1870s and 80s proved to be a stepping stone for the establishment of a modern school for training engineers through the 1890s and into the 20th century. Today, at the threshold of the 21st century, we continue to build on this tradition.

*Dr. Barry Fowle is an historian, Office of History, U.S. Army Corps of Engineers, Fort Belvoir, VA. He earned a Ph.D in history from the University of Maryland.*

**Torpedo Laboratory, Willets Point, New York.**





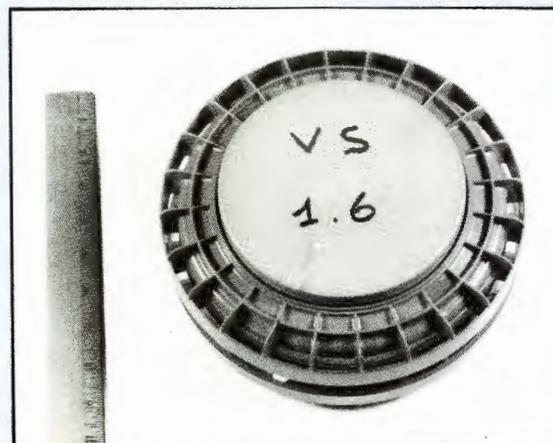
**VS - 2.2**, Italian conventional anti-tank (AT) mine, blast-resistant, pressure activated.  
Weight: 7.7 lbs. Diameter: 9.4 in.



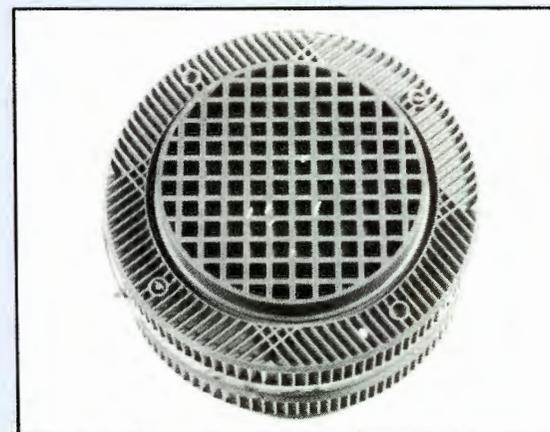
**VALMARA 69**, Italian conventional anti-personnel (AP) mine, trip wire or pressure initiated.  
Weight: 7.3 lbs. Height: 8.1 in.



**VS - 50 or TS - 50**, Italian scatterable AP mine, blast-resistant, pressure activated.  
Weight: 6.6 oz. Diameter: 3.5 in.



**VS - 1.6**, Italian scatterable AT mine, blast-resistant, pressure activated.  
Weight: 6.6 lbs. Diameter: 8.7 in.



**TC/2.4**, Italian scatterable AT mine, blast-resistant, pressure activated.  
Weight: 7.3 lbs. Diameter: 8.0 in.



**TC - 6**, Italian conventional AT mine, blast-resistant, pressure activated.  
Weight: 21.2 lbs Diameter: 10.6 in.