Engineer

THE MAGAZINE FOR ARMY ENGINEERS SPRING 1986

BATTLEFIELD INITIATIVES FOR THE '90s

ALSO: USACE SUPPORT OF THE DEH □ SOVIET ENGINEERS
BRIGHT STAR '85 □ COUNTEROBSTACLE VEHICLE

Obstacles—
Engineers and Maneuver Forces Need Common Terms

Personal Viewpoints

Point

by CPT Michael D. Baehre

Terrain is the first *T* in a commander's METT-T analysis. He considers existing obstacles to determine how reinforcing obstacles can be used to shape the terrain.

AirLand Battle doctrine emphasizes early consideration of obstacles. "Preparation of the ground," states FM 100-5, *Operations*, "cannot be an afterthought."

However, once the commander's analysis is complete, terms don't exist in engineer and maneuver vocabularies to quickly convey how he wants obstacles to contribute to the objective.

If the commander properly considers terrain reinforcement as an integral part of his *concept*, how does he communicate his intentions for use of engineers? How does he focus the obstacle effort?

The need for a common language can be satisfied several ways and deserves serious consideration. For the sake of discussion, I propose two terms with a concept for their use as control measures. The terms are **obstacle zone** and **obstacle belt**.

Until we agree on these or some other official terms and control measures, the maneuver and engineer staffs will continue to discuss obstacle plans in vague, general terms at task force level, or in unrealistic detail at brigade and above.

The Problem

A review of FM 101-5-1, *Operational Terms and Graphics*, and engineer field manuals reveals no clearly documented engineer control measures short of designating specific obstacles. The result is that engineer effort is focused by the allocation of obstacle resources (engineer units and materials) to unit areas. While this constrains the engineer effort in each unit area (assuming the subordinate commander fully uses the assets), it doesn't focus the manner in which obstacles are used nor their general location.

Current engineer doctrine and common sense both dictate that individual obstacles be planned and sited at the lowest level possible to ensure they are tied into other obstacles and covered by direct and indirect fire. The normal capabilities of a division or brigade engineer staff don't allow them to conduct the reconnaissance, detailed planning or coordination required to properly site a large number of individual obstacles.

Obstacle planning from the bottom up becomes a necessity. Therefore, teams and task forces develop obstacle plans (collections of obstacles), which are then reconciled with higher maneuver plans at brigade, and finally passed to division for further integration. Until the plans filter up, the commanders at each level don't know whether subordinate units are using obstacle assets as intended or whether the obstacle plans restrict maneuver's flexibility. Instead of focusing the engineer effort, this resource allocation method merely assigns capability.

(continued on page 23)

Counterpoint

by MAJ Arthur Marubbio

The concept of obstacle zones and belts is by no means new. It pops up continually in briefings given to maneuver commanders. The concept described by CPT Baehre offers a good proposal for a standard definition of terms, but causes some immediate problems.

First and foremost is the restrictive nature of division and brigade designated obstacle areas. Predesignated zones and belts remove considerable flexibility from the battalion/task force commander. They restrict his ability to shape the battlefield based on his direct observation of the terrain—a perspective not always shared by the division level planners.

A second problem arises when constructing the unconstrained engineer estimate at the brigade and division levels. This estimate is based on the physical plotting of anticipated individual obstacles and is the primary means of allocating resources to subordinate units. How can the division and brigade planners request and allocate resources based on the general definition of zones and belts?

Finally, the physical location and status of individual obstacles are of interest to maneuver commanders at all levels. Every staff engineer must be capable of providing the status of any obstacle within their maneuver commander's area of responsibility.

Do zones and belts imply that a detailed estimate was conducted and an obstacle listing with current status is, therefore, available at division? At brigade? This does not appear to be the case!

I believe the current planning process must remain intact. The engineer estimate must be completed and the resources allocated based on that estimate. The maneuver commander at the battalion/task force level must retain the capability of shaping the battlefield.

Once this procedure is complete we might consider the use of zones and belts to ease the *graphic clutter* of the engineer obstacle overlay. But the engineer must be prepared to discuss obstacle status in detail.

MAJ Arthur Marubbio is chief of the Engineer Branch, Department of Combined Arms, USAES.

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On the Cover

Art by Nicholas Mosura captures the *warrior spirit* of Engineer Battlefield Initiatives of the '90s.

FEATURES

DEPARTMENTS

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News & Notes

WES Keeps the Army Moving

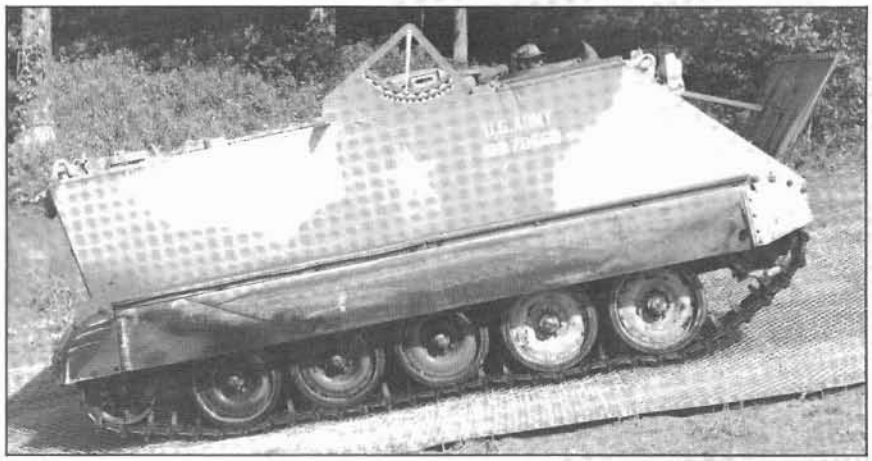
A winning Army must be highly mobile. However, crossing streams, beaches and minefields are common wartime tasks that still present problems. At the U.S. Army Engineer Waterways Experiment Station (WES) in Vicksburg, MS, engineers perform research in all of these areas.

Flexmat

River crossing operations are an integral part of land warfare. For this reason, WES engineers are studying different access/egress methods. One solution is to overlay surfacing material on marginal soils and steep riverbanks.

A promising overlay material, called flexmat, consists of woven steel fabric, neoprene-coated nylon membrane surfacing, and extruded aluminum support channels. This system comes in 50-foot sections that are 16.4 feet wide. The system rolls into a package 3 feet in diameter.

An assault vehicle such as the M113 armored personnel carrier can transport the sections. The M113 can deploy the flexmat up a slope, or the flexmat can be hand deployed down the slope. Current research includes the evaluation of a mechanism to convey and launch the flexmat system.



Using the new flexmat, an M113 APC emerges from a lake test site. Flexmat is designed for marginal soils and steep riverbanks.

Sand Grid Confinement Cells

Crossing beaches with personnel and supplies creates another set of problems. The most successful solutions to these problems are sand grid confinement roads.

Grids made of high density polyethylene are manufactured and shipped in 4-inch thick sections that are easily expanded to 20 feet during road construction. Two trucks can carry enough grid for one mile of road.

Personnel expand the grid and fill the cells with sand. A light layer of liquid asphalt can be applied to provide a more durable wearing surface for wheeled traffic.

Sand grids are also finding use in field fortifications. One study used the grids successfully as barriers and revetments to protect artillery emplacements.

Sand grids are expanded and filled with sand. The 4-inch thick sections can be expanded to 20 feet and a light layer of liquid asphalt can be applied to provide a durable surface for wheeled traffic.

Construction of a sand grid barrier for a 155mm self-propelled howitzer emplacement, using only hand labor, required 132 manhours. This is almost half the time needed to build a similar sandbag position. Using a front-end loader to place the soil would have reduced the construction time even more.

A sand grid barrier is easy to disassemble and is reusable. Future uses for grids as barriers include load-bearing walls and vehicle obstacles to counter terrorist threats.

Minefield Detection

WES is also evaluating optically aligned images that provide data simultaneously in multiple wave-length bands. An active laser source investigation is also ongoing in the area of minefield detection. One or more systems may produce images to help tomorrow's Army locate and neutralize minefields faster and more efficiently.

WES is also researching new remote methods for minefield detection in different terrains and environments. Engineers are testing several types of scanners individually and in combination. The thermal line scanner provides high resolution thermal images for daytime and nighttime photography.

Digital data processing techniques reduce terrain background clutter. Single channel image data separates mines from background terrain. Under some conditions, this system results in numerous *false* mine targets within the image.

Engineers Compete in NBC Olympics

PFC Greg Bowling hurls a dummy grenade at his target during the 18th Engineer Brigade's NBC Olympics. **Photo by Tony Adams**

Nearly 350 soldiers from the 18th Engineer Brigade squared off in NBC Olympics competition to find out who was best in MOPP gear.

CPT William Eck, the brigade chemical officer, said, "We wanted to demonstrate that NBC and military skills could be accomplished while wearing protective equipment. At the same time, we wanted to have a good time."

The brigade's five battalions and company headquarters competed in the NBC Olympics. Except for protective mask assembly, all events were performed in MOPP gear:

- Playing volleyball
- Testing driving skills
- Erecting an RC-292 antenna
- Orienteering
- Exchanging MOPP gear
- Assembling protective masks
- Firing an M16 for score
- Assembling an M16
- Setting up a GP small tent
- Using German firefighting equipment
- Throwing a grenade
- Running a relay race

Eck said the relay race was the hardest event physically. However, exchanging MOPP gear was also difficult because it's part of the new NBC training doctrine and unfamiliar to many.

The brigade NBC office plans to make the NBC Olympics an annual event.

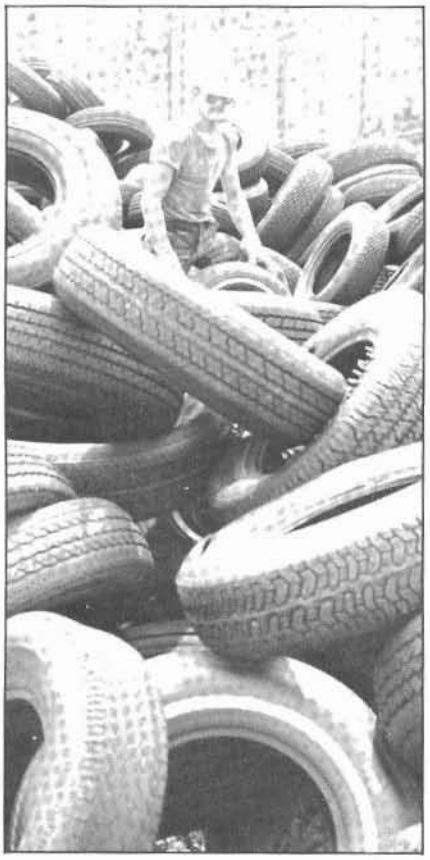
Soviet Acquisition of Military Technology

The Soviet Union has a massive, well-organized campaign to acquire Western technology for its weapons and military equipment projects. Each year Moscow receives thousands of pieces of Western equipment and thousands of unclassified, classified, and proprietary documents as part of this campaign.

Understanding the Soviet effort is a critical first step in protecting Western technology and preventing it from being turned against the West. *Soviet Acquisition of Military Significant Western Technology: An Update* reveals in detail the structure of these Soviet programs and gives examples of Soviet requirements and successes.

Copies of this 40-page publication can be obtained by sending a check or money order for $2 payable to the Superintendent of Documents, U.S. Government Printing Office, Dept. SSMC, Washington, D.C. 20402.

News & Notes



SP4 Robert Ogden, 92nd Engineer Battalion, looks through piles of tires provided at no cost by a local tire company and the property disposal offices at Fort Stewart, Fort Gordon, and Charleston Air Force Base.

Engineers Create Tire House for MOUT Training

The 92nd Engineer Battalion, Fort Stewart, GA, worked hard to turn 10,000 used tires into a house that absorbs live ammunition while soldiers practice military operations in urban terrain (MOUT). The 1st Battalion (Ranger), 75th Infantry Division, initiated the construction.

MOUT training consists mainly of room-clearing techniques. Units using the building can practice external and internal tactics. Internal tactics will consist of moving from room to room safely or clearing a closet of the enemy. External tactics will have a unit attack and enter the building from the nearby treeline. Silhouettes will be placed in the windows for targets.

Platoons from Company B, 92nd Engineer Battalion, began construction by sinking 8 x 8-inch timbers 4 feet into the ground and pouring concrete around them to stabilize them. Then, using the timbers much like pegs in a ring toss game, they dropped tires over the timbers, individually filled the tires with dirt and wired them together.

The end result was a 44 x 90-foot structure with 9-foot walls, no ceiling and a dirt floor. The tire house has six separate rooms, each with a closet. The total cost of the project is expected to be $129,082, according to 2LT Kevin Cronin, assistant construction officer.

The 35 soldiers who spent six hours a day working on the project gave several reasons for their motivation in this project.

"We support the Rangers. If they need us, we're there for them," said PFC Joseph Walsh, a carpentry and masonry specialist.

SFC Jerry Mathis, NCOIC, said the project gave them training in laying out the site and mixing and placing concrete.

Units will be able to use a variety of weapons and live fire ammunition in the house. The M16 rifle, .45 caliber pistol, 9mm submachine gun, hand grenades, shotguns, and the 7.62 sniper rifle can all be used. In addition to live ammunition, units will use blanks and do Multiple Integrated Laser Engagement System (MILES) training in the building.

Army Generates Computer Images To Plan Future Battles

Military pilots often learn their trade by *flying* aircraft simulators through computer-generated terrain scenes. Similar scenes may someday help the Army plan battles and test missiles.

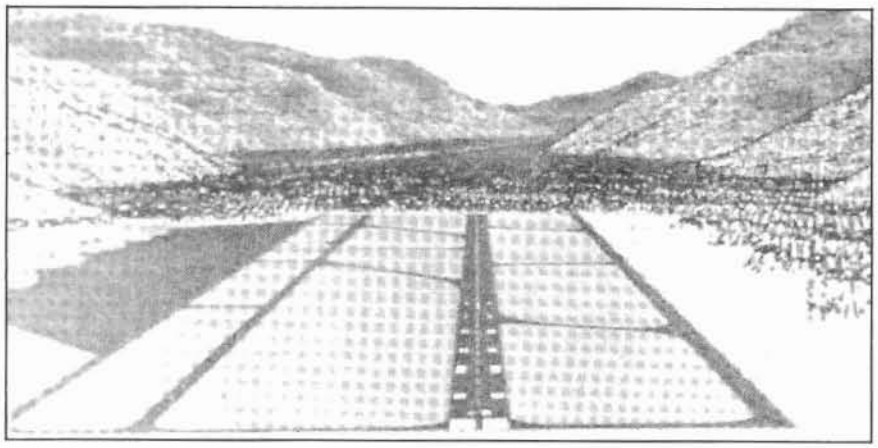
Two Army organizations—the Engineer Topographic Laboratories (ETL) and the Missile Command—have teamed with the Defense Advanced Research Projects Agency to apply computer image generation (CIG) to these tasks. Over the next three years, Boeing Aerospace Company will develop four specialized CIG systems for the Army, two for battlefield management and two for missile simulation.

The CIG system combines digital terrain elevation and feature data with information from maps, photographs, and satellite imagery. It produces shaded three-dimensional perspectives of the terrain. These scenes show natural terrain features as well as objects like bridges, buildings and roads. Clouds, fog or snow can be added for extra realism.

Computer-generated terrain scenes could help commanders study their areas of operation and plan their courses of action. Commanders could

examine the terrain from any viewpoint and location and try out different battle tactics. They could position troops, deploy smoke, blow up dams, or simulate other maneuvers and predict how these actions would affect the battlefield and the battle.

Boeing will deliver an initial software-based system to ETL in the fall of 1986. The second system, scheduled for the following fall, will transfer the image generation function from software to hardware. This shift will speed processing time from 5 minutes per frame to 30 frames per second. ETL scientists will test these systems to develop techniques that can help commanders analyze the terrain and make tactical decisions.



Computer-generated scenes—realistic pictures of the terrain similar to those used in flight simulators—may help commanders plan battlefield maneuvers someday.

Letter to the Editor

I enjoyed Captain William J. Sandbrook's article, *The Engineer Officer: Advisor or Leader, A study of the Battle of Petersburg,* which drew forth examples of good and bad use of engineer officers on the battlefield. I offer two more thoughts in extension of the author's points.

First, I agree with his conclusion that "the Army still needs engineer leaders for the front lines and engineer advisors for the headquarters." However, at some points in the chain of command these should be the same. The clout that the division engineer/battalion commander can bring to his duties as he wears both the *commander* hat and *division engineer* hat ensures that the direction of engineer forces in support of a division does not get separated from the advice given to the major general. True, the assistant division engineer (ADE) must provide a full time presence at the division CP and should be one of the more experienced engineer officers in the division. But the battalion commander is also *the* senior engineer.

Second, the engineer staff advisor (whether the platoon leader providing advice to the maneuver commander, or the brigade engineer, or the ADE) must stay close to the S-3 or G-3. As the engineers support in the areas of mobility, countermobility, survivability and other "sapper" duties, the advice must be coordinated with the principal staff advisor concerned—the S-3 or G-3. Further, engineers should be surrendered willingly to brigade and division S-3/G-3 slots, and replaced with equally competent and experienced officers. Of all the company grade officers, perhaps excluding only the armored cavalry lieutenant or captain, the engineer officer often gets the best opportunities to learn combined arms. He has been exposed to infantry, armor, and artillery real time warfighting issues, as well as providing engineer support across the battlefield. He sees the big picture early. We have in the Corps of Engineers a pretty good track record of officers who have become brigade S-3s, division G-3s and chiefs of staff, and occasionally assistant division commanders. I hope the Corps of Engineers senior officers continue to seek opportunities to provide tested engineers in those positions. The engineers of course profit, and so does the Army on the battlefield.

—LTG E. R. HEIBERG III
Chief of Engineers

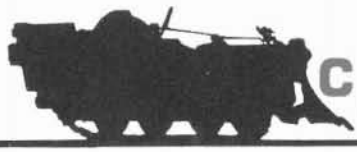
HP-41 Modules Available

A limited number of demonstration modules for the Hewlett Packard HP-41 calculator are available on a "first come, first served" basis from CERL. The read-only-memory (ROM) module for the handheld programmable calculator includes programs on:

- Demolition formulas
- Minefield logistics
- Wire obstacle logistics
- Bridge classifications
- Road crater formulas
- Network analysis
- Programming utility routines

If you want copies of the modules, you can request them in writing from USA-CERL, ATTN: CERL-FS (Mr. Deponai), P.O. Box 4005, Champaign, IL 61820.

Or you may call Mr John Deponai at (217) 373-7271, FTS 958-7271, AUTOVON through Chanute AFB, or toll free 800-USA-CERL (outside Illinois), 800-252-7122 (within Illinois).



by MG Richard S. Kem, Commandant, U.S. Army Engineer School

We Stand at the Watershed

Since I became commandant nearly two years ago, I've visited with many of you to assess how combat engineers fit into this Army. We've got a lot that needs fixing. With your help, the Engineer School has designed a master plan for improvements that I call ***Combat Engineer Battlefield Initiatives for the '90s***—a thrust to modernize engineers as part of the Army of Excellence and provide a linkage to Army 21, *the Army of the future.* I want to share highlights of this plan with you.

We stand at a watershed! At a time when the Army has fielded a new generation of combat vehicles and AirLand Battle doctrine places a premium on mobility, the engineers are viewed as a combat multiplier that adds strength, depth and flexibility. But we are often viewed as cumbersome and deliberate—equipped heavy, unprotected and slow. Engineers are handicapped by an antiquated force structure that limits our productivity and our ability to respond to maneuver commanders' needs.

Now, after two decades of research and development, we are on the verge of modernization. The technology for a new generation of combat engineer systems has been developed. Improved capability will allow us to create a more efficient organizational structure. A new breed of engineer —*the sapper*—is emerging (*story page 19*). Dynamic, comprehensive change is at hand.

Equipment

Engineers are essential on today's battlefield, but our soldiers don't have the tools they need for the jobs they are being asked to do. We cannot continue to bring new engineer equipment and materiel into the Army at a stutter step.

Despite the fact that defense budgets are decreasing, engineers need a sustained equipment modernization program. Recent Israeli experience underscores the importance of well-equipped engineers to the successful combined arms team. Consider the comments I heard from the Israeli defense force during a visit last fall:

From the Armored Division Commander who said, "In Lebanon, the real heros were our engineers . . . Without them I couldn't advance a mile. Their speed was my speed."

From the Armored Division Commander who said, "In Lebanon, the real heroes were our engineers...Without them I couldn't advance a mile. Their speed was my speed."

They were saying that success rides on responsive engineer support, but the speed of the bulldozer is too slow. If the Army is going to execute AirLand Battle doctrine . . . if the Army is going to fight the deep battle, then engineers must be truly available at the FLOT—ready to obtain freedom of maneuver—***agility***—for the ground force.

The mechanization of the forward deployed engineer corps battalions in Europe has begun. The M9 ACE is coming (*story page 26*)—fielded now to the 13th Engineer Battalion, 7th Infantry Division (Light). FASCAM capability is being introduced into the engineer force—the 9th Infantry Division and Europe are receiving their GEMMS. MICLIC will change our ability to breach complex obstacles. The technology for a host of new systems like the COV (*story page 28*), the TEXS, Volcano, and the HAB is on the horizon (*story page 20*) as our Engineer Materiel Master Plan charts our transition to the future.

Organization

Our objective is to be available at the FLOT and in the deep attack—to be capable, protected, mobile and productive—and most important, to be responsive to the maneuver commander. But new equipment alone is not the panacea. We must forge a new engineer architecture. We need:

- More compact units with a higher ratio of equipment to manpower.
- Greater integration with the Army field structure at all levels.
- A forward shift in command and control.
- Reduced overhead and greater productivity.

Battlefield Initiatives for the '90s

Today in the field you are trying valiantly to make our World War II-vintage organizational architecture work through ad hoc command and control arrangements and task forces. The missions haven't changed with AirLand Battle doctrine; the implications have.

The emphasis is on rapid tempo, greater distances, quick shifts from mode to mode, and shorter warning times. The length and depth of the battlefield extend over a greater operational area.

But the most significant challenge is time. The windows in which the combined arms team must act are very short. We no longer have the response time necessary to shift engineer units across the battlefield — to pull off bridge and mine missions in one place, reattach, move to another sector, and be ready to support an attack and breach a complex obstacle.

Yet under our current structure, the center of mass of engineer assets is back at corps. Nearly 70% of engineer combat assets are assigned to corps despite the fact that more than 60% are required in the division and brigade areas. Units are task-organized forward creating complicated command and control arrangements at platoon, company, brigade, battalion, and division.

Habitual association—the key to integrating engineers into the commander's scheme of maneuver—suffers at every echelon. The engineer platoon leader is overloaded to the point that he has difficulty juggling his many responsibilities for mission execution and staff. Logistics and maintenance — already complex — become complicated to the point of not working as the battle progresses.

We are determined to solve our architectural problems—to fix the systemic base so we no longer must accept Band Aid solutions. We made important progress last year with the redesign of the engineer combat battalion (heavy) to give robustness to engineer construction and defense capability in the rear area (*story page 16*).

The Engineer School is currently developing a plan to restructure the engineer assets. It brings together the requirements of AirLand Battle, the lessons learned from field exercises like Reforger and the NTC, and the results of our worldwide engineer analyses. This aggregate plan is called E-FORCE (*story page 10*).

Missions and Challenges

AirLand Battle poses new challenges for all engineers. Change is the companion of modernization. As we rethink our organization to make better use of engineer assets, we must keep in mind the realities of AirLand Battle.

Don't fall into the trap of limiting your definition of AirLand Battle to the close or the deep operation. The engineers' contribution to the combined arms team is not exclusively in the brigade area. True, it is the focal point of ground combat—bayonet to bayonet. But this is not the way the Army describes AirLand Battle. In order to have the deep operation, all elements must be synchronized successfully throughout the depth of the battlefield.

Missions and challenges abound for all of us in AirLand Battle. Let's not overlook the fact that the combat heavy unit in the rear may be fully engaged in hostile operations at an airfield that we are desperately trying to keep open to sustain the flow of troops to continue the fight.

Remember the terrain analysis team that plays an increasingly vital role in the commander's success as new topographic systems provide information critical to his shaping of terrain and scheme of manuever.

We have a number of things we need to fix. But leadership throughout our force and the way we go at doing our jobs are not among them. These are the strengths we share.

When I think of *warrior spirit* the word that comes to mind is audacity: to execute violently, to confront the issues . . . to go at it.

I ask you to keep charging. Keep convincing that maneuver commander that engineers are valued partners in the combined arms team. But make sure he knows that your organization is antiquated and your tools are obsolete—make sure he understands when you have to put a Band Aid on a command and control arrangement to make it work. Ensure he knows what you could achieve if properly equipped and organized for battle.

Go get credit for your *drive on, can do, essayons* leadership and your warrior spirit. But make sure he knows if you were effectively organized and equipped with the proper tools you could devote your warrior spirit to being even more responsive to his needs.

by CSM Charles T. Tucker, U.S. Army Engineer Center & School

Adjusting to Change:
The Leadership Challenge

As the Army modernizes combat engineers to better support the combined arms team in the AirLand Battle, engineer noncommissioned officers face the challenge of helping troops adjust to new organizations and equipment.

During my visits, many of you have said you are pleased with the new equipment and the quality of initial training provided by new equipment training teams. However, some of you may receive no training prior to joining units undergoing changes in equipment and organization. You must prepare to deal with predictable problems like:

- Conscious or unconscious resistance to change because of uncertainty and unfamiliarity.
- The tendency for units undergoing rapid change to become unmanageable and unproductive because of the complexity of the effort.
- Hampered teamwork due to personnel changes as soldiers move to new teams and new working relationships.

While change creates opportunities to improve professionally, it also threatens the tried and true. People resist change almost instinctively because the old ways are well known and the new ways aren't yet established. Soldiers who are experts with old equipment may resist change because they feel they are not adept with the new equipment and may lose status.

NCOs and their officer counterparts must work together to overcome this natural resistance by explaining the advantages of the new equipment or organization. Information and experience are the best cures for uncertainty. As soon as you receive information or training, start familiarizing your troops. Read everything you see about the proposed force structure and equipment developments. Granted at this point information may be limited. But with a little research you can find helpful material.

This issue of *ENGINEER* makes a good beginning. You should also receive the Engineer Center Team Minutes which are published monthly by the USACE, Directorate of Combat Developments (DCD), ATTN: ATZA-CDP, Stop 281, Fort Belvoir, VA 22060-5281. Information notes and bulletins published by MACOM engineers and laboratories also contain useful information. Specific questions can be directed to the Program Management Office of DCD or the Engineer Hotline.

Don't overlook the fact that the new frequently builds upon technological advances and improvements to the old. Keys to understanding the deployment of new equipment are often found in field manuals that explain similar, existing systems. You would be wise to get together with your commander, platoon leader and subordinate NCOs to review field manuals on the utilization of like equipment.

During the transition, you must respond to the demands of both the old and new systems. The potential for conflicting priorities, unclear guidance and ambiguous situations increases. I think you will agree this is truly a leadership challenge. The attitude *"I know you've got problems, but so do I, so go out there and work it out"* isn't conducive to a smooth transition.

You must create a climate of understanding that allows soldiers to express their frustrations and apprehensions. This does not mean you should tolerate lack of discipline. But soldiers need opportunities to air their concerns.

Change, by its very nature, is disruptive. The disbandment of intact teams, the creation of new teams, and all the associated changes in procedures and reporting relationships can cause units which once functioned smoothly to lose effectiveness.

To offset this, stress the things that will stay the same. Reassure soldiers that while some things are changing, others are not. You must present a clear, time-phased plan so troops can see they will soon be through the transition and things will return to normal.

Units where officers and NCOs welcome change and the opportunity it brings will have the greatest success. Keep your soldiers informed. Let them express their frustrations, problems and apprehensions. Increase their confidence by devoting ample time to training. Give awards and incentives that recognize superior performance and reestablish the value of teamwork.

Most importantly, remember the unit is looking to you for leadership.

Career Notes

Commissioned Officers Branch

Advanced Civil School Board:

August 31, 1986 is the deadline for applications to the Advanced Civil School Board which will meet September 1, 1986. The procedure for applying to the Board is outlined in AR 621-1, *Training of Military Personnel at Civilian Institutions.* All officers who have previously sent in applications will automatically be considered unless they have withdrawn their applications.

The following fully funded quotas were available in FY 86.

USMA	27
Civil Engineering	16
Engineering Administration	4
General Engineering	5
Electrical Engineering	1
Topography/Photography	2
Geodetic Science	1
ORSA	2
Area Studies	2
Journalism	1
Robotics	1

FY 87 quotas will be similar. Additional quotas for Degree Completion, Co-op, Permissive TDY, and Training with Industry will also be available.

Officers selected to attend ACS who will *not* complete 24 months of a CONUS tour or the prescribed overseas tour by the start of school will be deferred until the next school year.

A predetermined number of officers will be identified as alternates. This alternate list will be used for two years to fill unprogrammed vacancies.

All officers applying to ACS should be branch qualified (TOE experience, advanced course completion, and successful company command). Each application should include a current photo, transcripts and GRE test scores. Selection is based on the *whole person* concept with particular emphasis on successful company command.

The results of the Advanced Civil School Board will be released in October. For additional information, contact CPT Pete Cooksey, (202) 325-7426, AV 221.

CGSC Board:

The Command and General Staff College Board will meet October 7 to November 21, 1986. Officers selected for promotion to major in 1985 plus majors in year groups '73, '74, and '75 will be considered.

LTC Promotion Board:

The FY 86 lieutenant colonel active duty promotion board will convene from July 15 to August 29, 1986. Year group '71 will be in the primary zone; year group '72 will be below the zone. To be considered for promotion, you must have completed CGSC before June 15, 1986.

Career Tips:

Make sure your ORB, phone number, address, photo, and fiche are up-to-date.

E-FORCE

by MG Richard S. Kem, MAJ J. Richard Capka and MAJ Houng Y. Soo

AirLand Battle doctrine stresses combined arms operations over large areas. Its four tenets—agility, flexibility, depth and synchronization—accentuate the role of the combat engineer on the modern battlefield.

It demands increased tempo and greater distances from all functional engineer missions—*mobility, countermobility, survivability, general engineering* and *topography*. In other words, engineers must accomplish the same tasks over a larger area in significantly less time.

This comes at a time when combat engineers are at a watershed. The Army has embraced a new *warfight* doctrine that stresses maneuverability and is equipping with more mobile and lethal fighting systems. Yet, the combat engineer—the man who converts mobility to maneuverability—finds himself supporting a rapidly modernizing battlefield with a cumbersome World War II organizational architecture and antiquated equipment. In short, today's combat engineers are the weakest link in the battlefield combined arms team.

The Engineer School is currently developing E-FORCE—a plan to restructure engineer assets throughout the depth of the battlefield. E-FORCE brings together the requirements of AirLand Battle, the lessons learned from exercises like Reforger and the National Training Center (NTC), the results of analyses of worldwide engineer requirements, and studies of new equipment productivity.

The goal is to fix systemic defects in engineer organizations... defects that until now prevented the combat engineer from providing timely, responsive support to the maneuver commander executing AirLand Battle doctrine.

E-FORCE addresses the entire spectrum of engineer organizations from the combat zone to the RCZ/COMMZ. E-FORCE consists of three components:

- Support to close combat *heavy* forces in the forward combat zone.
- Support to close combat *light* forces in the forward combat zone.
- Support for the rear combat zone/communications zone.

Two of these—support to the close combat light and for the rear combat zone—have already been approved for implementation. Engineer support to close combat light forces was reorganized to meet special requirements of air transportability to and within the theater of operations. As a result, the engineer support package to XVIII ABN Corps contains light corps engineer battalions and light equipment companies that are readily transportable to augment the light division engineers in the contingency theater.

In the RCZ/COMMZ:

- The topographic engineer battalion has been reorganized and tailored to meet theater-specific needs.
- The engineer combat battalion (heavy) has been redesigned to increase horizontal capability relative to vertical capability, reflecting battlefield requirements.
- Specialized teams and detachments were formed at echelons above corps to centralize control and decentralize execution of specialized functions such as well drilling, diving and asphalt operations.

Now our energies are focused on improving support to the close combat heavy forces—on giving the

maneuver commander the responsiveness he needs to win on the modern battlefield.

The Problem

Engineer support to the close combat heavy combined arms team is broken. Insufficient engineers are organic to maneuver forces. Attempts to overcome the deficiency by assigning ad hoc task forces forward out of corps assets overload engineers at all echelons. Command and control (C^2), communications, maintenance, and logistics become complicated to the point of not working as the battle progresses. The current structure also fosters a false sense of flexibility at the corps level.

Studies and our long term experience in Europe show that each maneuver brigade in the forward combat zone requires at least one engineer battalion. Typically, the need is met by augmenting the divisional engineer battalion with corps combat battalions. Even with the mechanization of corps combat battalions, there are significant differences between divisional and corps battalions.

For example, divisional engineers have AVLBs and CEVs; corps units do not. So, we patch together ad hoc task organizations in a vain effort to ensure sufficient engineers and equipment are available to support maneuver forces. Figure 1 shows how this task organization is deployed on the battlefield.

This complex arrangement strains towards a solution. The divisional engineer leader at each maneuver echelon is dual-hatted—serving as both commander of his unit and the maneuver commander's engineer advisor.

For example, the engineer battalion commander not only exercises command and control over his battalion which is spread throughout the division area; he is also responsible to the division commander for orchestrating the activities of all corps' engineer assets that support his maneuver echelon. His attentions are divided and his staff is overtaxed.

The divisional platoon leader who supports a battalion task force is the most overloaded engineer unit commander. He serves simultaneously as an engineer planner, executor, coordinator/integrator, and principal advisor to the lieutenant colonel maneuver commander. Yet he is one of the youngest officers in the division—typically 20 to 24 years old and probably fresh out of EOBC.

ENGINEER BATTLEFIELD LAYOUT
DEFENSE SCENARIO
CURRENT

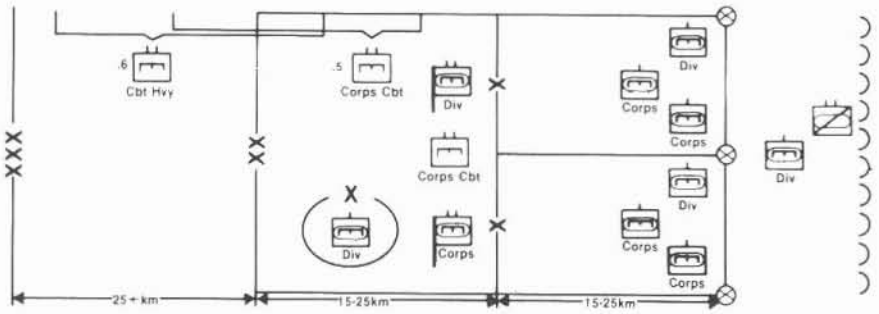


Figure 1

Consider the task force engineer's area of responsibility compared with that of his infantry counterpart (Figure 2). Experience at NTC has borne out how easily the task force engineer (platoon leader) is overcome by events. Maneuver commanders at NTC quickly recognize that their engineer platoon leaders—no matter how motivated—cannot succeed as *both* planners and executors. This limits the engineer support available to a task force!

There is also another C^2 problem. At each maneuver echelon, the level of engineer command and control is inappropriate in relation to the rest of the combined arms team. For example, at brigade level, the brigade commander works with armor, infantry, artillery, and support battalion commanders and battalion staffs (Figure 3). The disconnect is with the engineer. His engineer commander is a company commander who must overcome the difference in level of experience between himself and battalion commanders to get into the inner circle.

Ad hoc engineer task force organizations also play havoc with communications. Units compelled to operate at extended ranges require AM as well as FM communications. Multiple nets must be used to establish command and control with engineer task forces, supported units and parent units. The differences in assigned frequencies, CEOIs and

ENGINEER PLATOON LEADER'S RESPONSIBILITIES

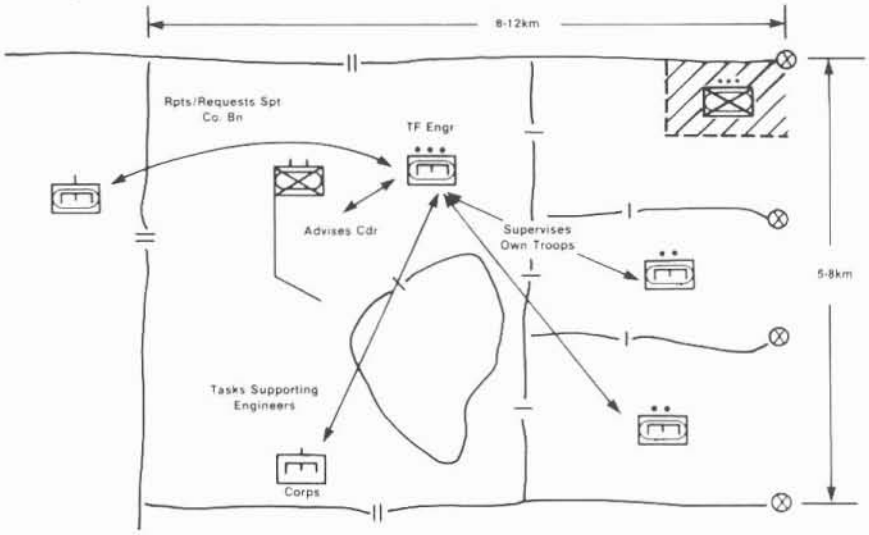


Figure 2

COMSEC keying equipment exacerbate the problems. Engineer responsiveness is hindered.

Similiar problems arise in the maintenance and supply arenas. Divisional units are supported by DISCOM; however, corps units operating in the division area are still tied to their COSCOM umbilical cord. The issue is further complicated because maintenance and supply relationships change as command support relationships shift. The result? Corps units operating forward put unresourced burdens on an already overloaded DISCOM and must work with an external logistical tail.

Habitual association—a close, continuous relationship between all elements—is vital to successful integration of the combined arms team. It enables the maneuver commander to mold the team he will go to war with—to put them through grueling drills that instill confidence and cohesion. Yet, stationing and our current architecture deny corps units opportunities to train in habitual association with their *go to war* divisions. They become pick-up units rather than well drilled combined arms partners capable of anticipating the commander's intent and acting with mission type orders.

Perhaps the most serious pitfall inherent in our current structure is a false impression of flexibility at the corps level. The original intent of the current structure was to provide the corps commander with the assets and the flexibility to provide engineer support over a broad area and still weigh the main effort. When subjected to the rapid tempo of AirLand Battle, this apparent flexibility dwindles to illusion.

For example, consider the scenario in Figure 4. The corps commander is required to control the FLOT, contain the penetration from the center, and conduct a counterattack in the south. Engineers are shown committed to the forces holding the FLOT and assisting in containing the penetration.

Although the corps commander would like to reinforce his attacking division with additional engineers (dotted lines), his mechanized engineers are committed forward. This means the best he can do is provide wheeled engineers to support the attacking division. Due to the time required to disengage and link up, the attacking division would go on the offensive with only its divisional engineers forward—with assistance from corps engineers limited to facilitating movement behind the FLOT and following to keep the LOC open for CCS elements.

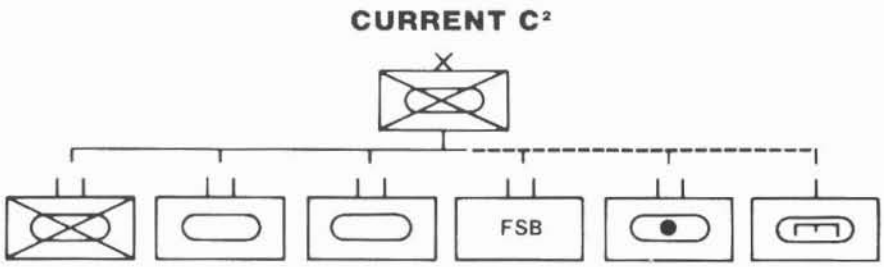


Figure 3

The Solution

E-FORCE solves the problems inherent in our current structure by providing sufficient engineer assets organic to the division and simplifying command and control, communications, maintenance and supply. It gives engineer units the advantages of habitual association with their *go to war* units.

The close combat heavy E-FORCE divisional organization (Figure 5) consists of three 493-man divisional combat engineer battalions and one ribbon bridge company. These battalions have three armored combat engineer companies comprised of two sapper platoons and one assault and barrier platoon. With an end strength of 1,684, it is formed by combining the 893-man divisional engineer battalion with a 790-man corps combat engineer battalion.
gineer battalion.

Figure 6 shows how this organization can be deployed on the battlefield. The division engineer orchestrates the engineer effort throughout

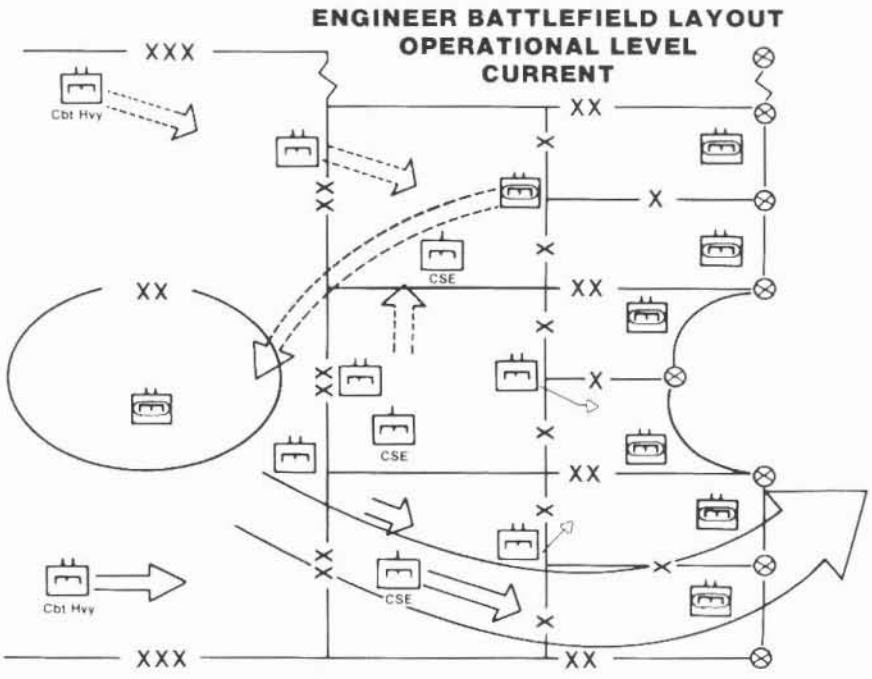


Figure 4

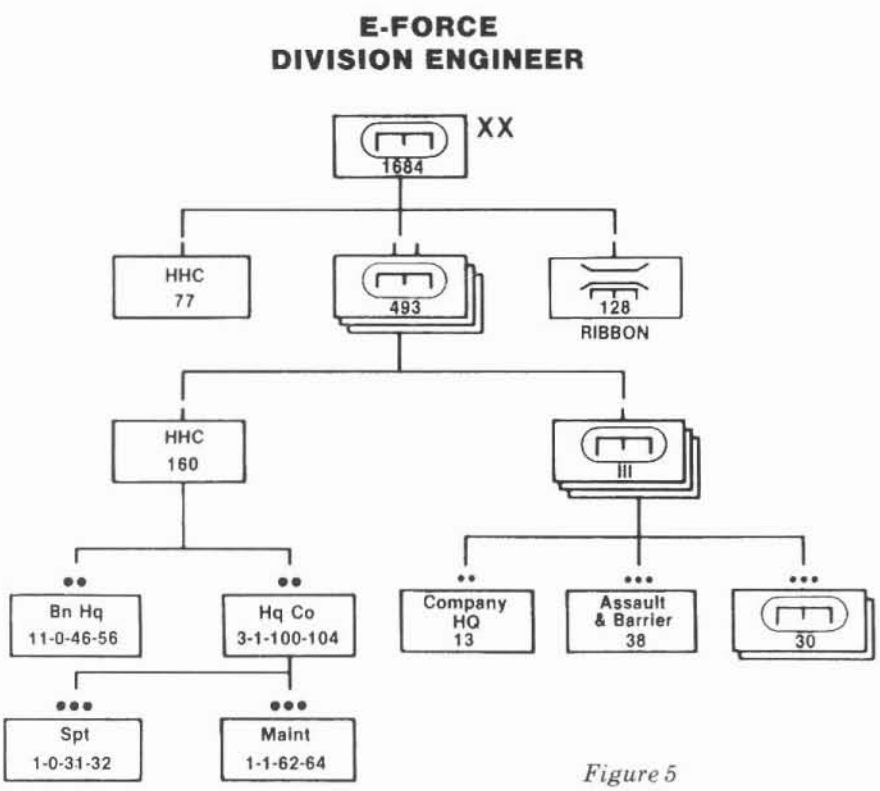


Figure 5

the division area—controlling both organic and corps assets. An engineer battalion is forward with each of the forward deployed brigades. The third divisional engineer battalion provides general support of the entire division rear and moves with the reserve brigade upon commitment.

At task force level, today's overloaded platoon leader is replaced as task force engineer by a company commander. The company commander brings the maneuver task force commander the additional knowledge, expertise, personnel, and equipment necessary to responsively and adequately support the task force. And the engineer platoon leader is given the opportunity to learn his trade under the tutelage of an experienced engineer commander.

The E-FORCE company organizational diagram is shown in Figure 7. The company is organized into two sapper platoons of 30 men each (similiar to today's sapper platoon) and one equipment intensive assault and barrier platoon. This organization provides flexibility for task organizations in support of both offensive and defensive situations.

Each E-FORCE engineer battalion has three of these companies. The battalion organizational diagram is included in Figure 5. The battalion organizational structure parallels that of the combat arms battalions. Maintenance is colocated at battalion level with company teams to support the engineer companies. A support platoon within the HHC will support the engineer companies with POL and Class V (ammunition) resupply—reducing the size of company trains and paralleling armor and mechanized infantry organizations.

The fact that the battalion will operate within a brigade rather than a division area makes these organizational changes possible. By centralizing support assets, we focus the effort of deployed squads, platoons and companies forward. This allows units more time on-site to support the maneuver commander. It is a flexible organization that integrates sufficient assault breaching equipment forward with the maneuver forces—allowing units to deploy rapidly, cross obstacles in stride and maintain the momentum of the attack.

Each maneuver echelon has an engineer element of the commensurate level to support the maneuver commander:

- An engineer company commander supports the task force.
- An engineer battalion commander supports a maneuver brigade.
- A division engineer directs the total engineer effort within the division area and performs advance planning for future operations.

The maneuver commander can expect and receive the same level of

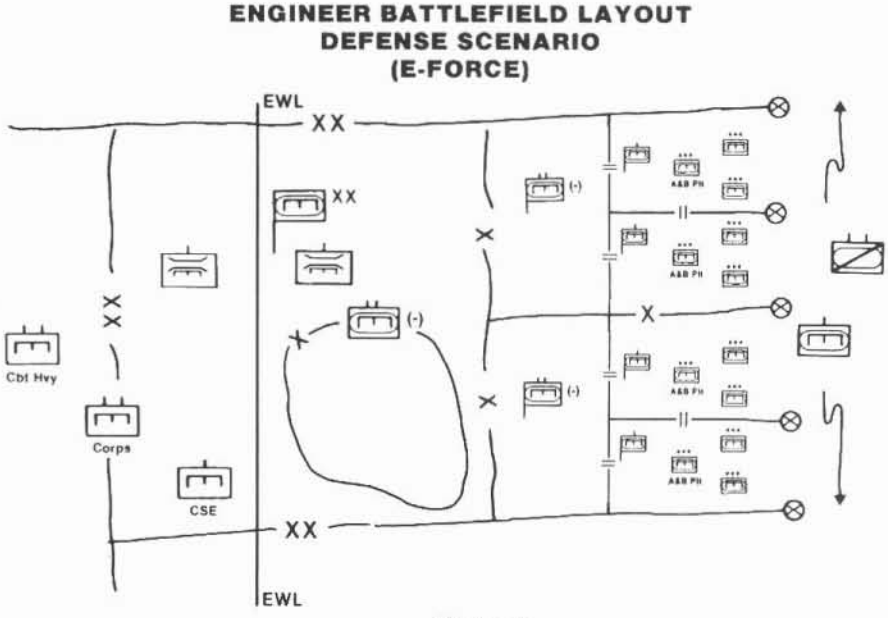


Figure 6

responsiveness throughout his organization.

Communications requirements are simplified. As organic members of the division, engineer units are assured access to CEOIs and COMSEC keying materials. The area of responsibility for each engineer battalion is reduced to a manageable level. DISCOM can be resourced to support the additional engineer assets in the division area. Most important, engineer units can habitually train with their fellow members of the combined arms team.

E-FORCE provides the maneuver commander at corps and division level with dynamic, flexible, responsive engineer support to influence the battle. Figure 8 depicts the Figure 4 scenario under E-FORCE.

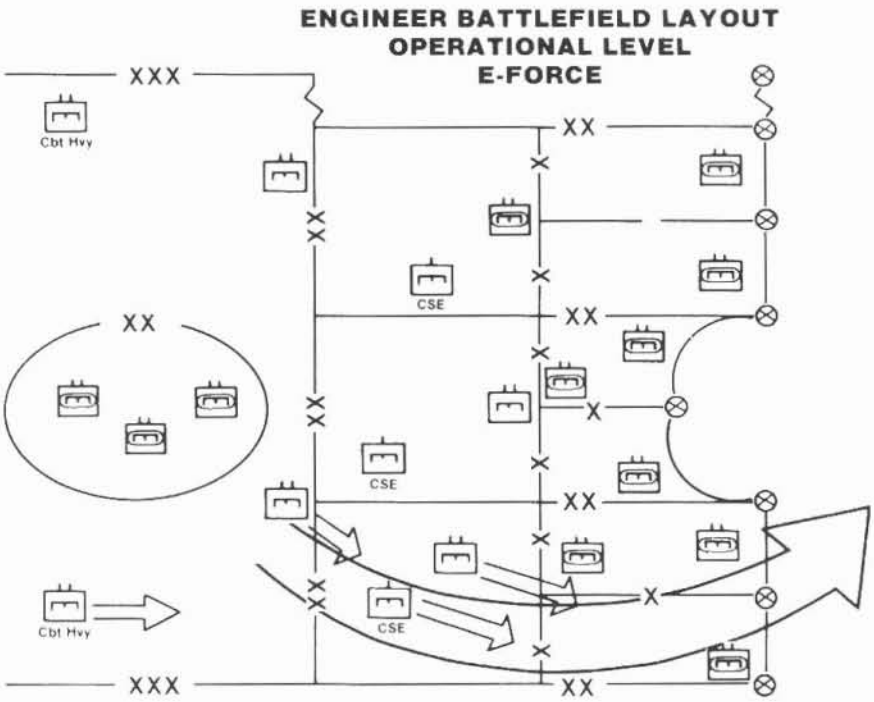


Figure 8

Again, the corps commander must control the FLOT, contain the penetration in the center, and conduct a counterattack in the south. Engineers are again committed to assist in controlling the FLOT and containing the penetration. But this time the attacking division has sufficient engineer assets to support its offensive.

Corps units can still assist in preparing the route of advance to the FLOT, but each attacking brigade has at least one battalion of mechanized combat engineers—soldiers they habitually trained with—who are ready to accompany them into battle.

Concurrent with the reorganization of the divisional engineer support structure, engineer capability in the corps' area will be restructured. Corps capability and flexibility is retained because over 52% of the engineer structure remains at corps.

Figure 9 is an organizational line diagram of the corps sapper battalion. This three-company battalion will replace today's corps combat engineer battalion. Blade-type earthmoving equipment is being added to carry out the rubble clearance and route maintenance tasks expected from high intensity combat in built up areas such as central Europe.

The combat support equipment (CSE) company will also be reorganized to focus on LOC maintenance-type missions and to augment corps sapper battalions with heavy engineer equipment. Figure 10

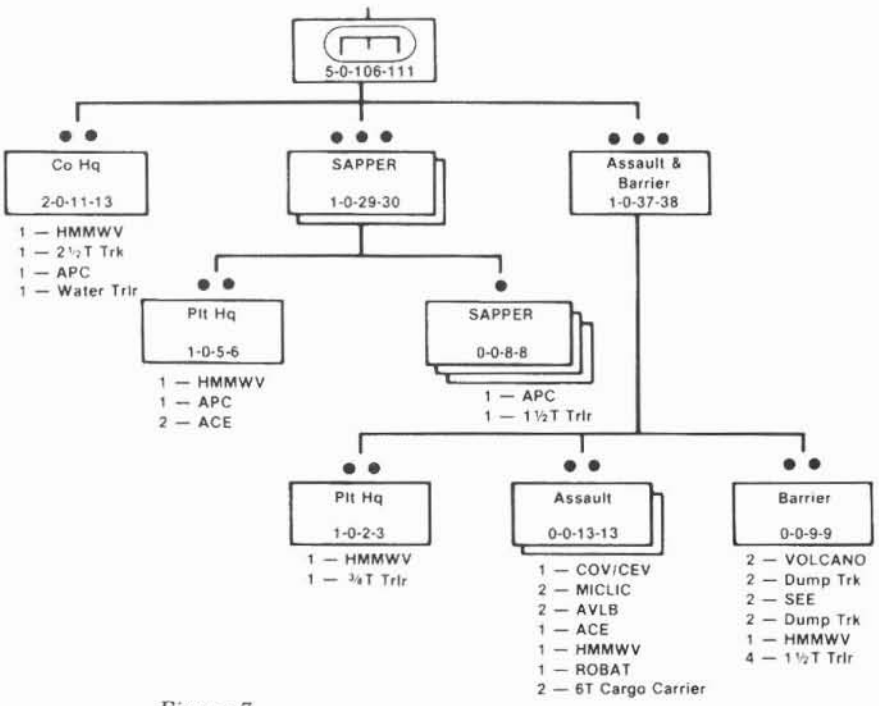


Figure 7

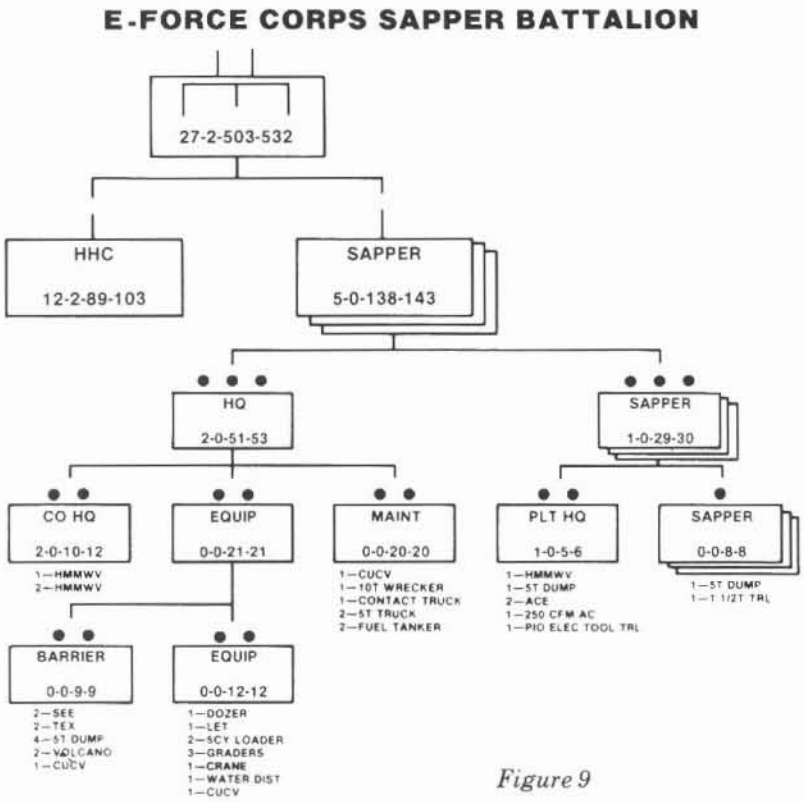


Figure 9

shows the proposed CSE company organization.

The emphasis on LOC maintenance and rubble clearance acknowledges the importance of keeping the corps' lifeline to resupply open and preserving ability to maneuver behind the FLOT. The heavy equipment is also readily available to move forward and supplement the divisional engineers in creating survivability positions and constructing obstacles.

Conclusion

While AirLand Battle doctrine doesn't change the basic combat engineer missions, it places additional emphasis on the dimension of time. To contribute as a combat multiplier and true members of the combined arms team, combat engineers must be able to provide timely, responsive support to the maneuver commander. If, on the other hand, the maneuver commander must wait for his engineers, *fleeting windows of opportunity* on the battlefield are lost.

The current engineer structure is unresponsive to the demands of AirLand Battle. The deficiencies defy genuine efforts to overcome the problems through ad hoc command and control arrangments and task forces. E-FORCE attacks and corrects the deficiencies. Under E-FORCE, the combat engineer is truly an integral member of the combined arms team.

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MAJ Houng Y. Soo is assigned to the Engineer School Directorate of Combat Developments. He has a bachelor's degree from the Polytechnic Institute of Brooklyn, a master's degree in nuclear engineering from the University of Washington, and is a graduate of the Command and General Staff College. He is a registered professional engineer in Washington.

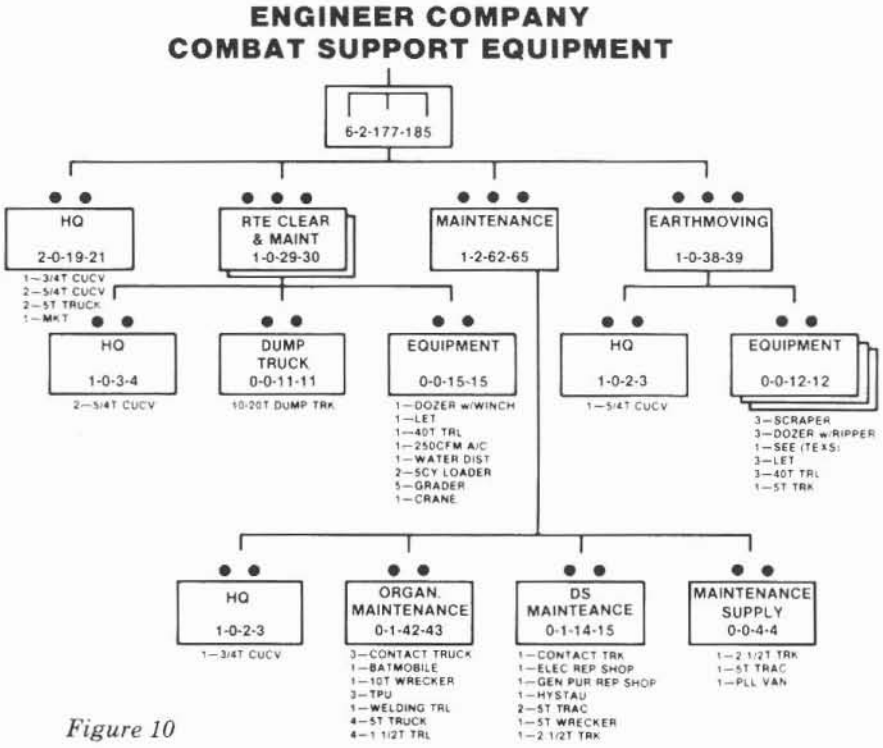


Figure 10

Combat Heavy Redesign

by LTC Robert L. Herndon

A leaner, more productive, better led, more rationally designed, modern engineer combat battalion (heavy) will soon be fielded. The first unit (not yet selected) will convert in FY 87. New ARTEPs and revised soldier's manuals will be available when the new TOE takes effect.

The redesigned combat heavy will focus on general engineering tasks to the rear of the brigade boundary. The advent of efficient, modern combat engineer equipment such as the ACE, Volcano, TEXS, and COV will enhance the capabilities of divisional and corps battalions and obviate the need for the combat heavy in the brigade area.

However, the battalion will retain limited combat engineering and infantry capabilities and, thus, retains ***combat*** as a descriptor in its title.

Because the *reoriented* combat heavy battalion generally will be located to the rear of the brigade boundary, it is defined by AR 310-25 as a Category II unit. By definition, this opens the entire battalion to women.

Historical Perspective

The Department of the Army approved the new TOE 5-115 in response to concerns that the existing battalion is overloaded.

In 1974, the engineer construction battalion was converted to the combat heavy. The main thrust of this conversion was to put more *tooth* into the Army's general purpose force structure as required by the Nunn Amendment. Studies of the early 1970s engineer slice of the force structure typically referred to the engineer combat battalion as part of the *tail*.

The conversion added combat engineering missions and "infantry operations, when required" to the repertoire of the battalion and changed its name to the engineer combat battalion (heavy). As a result, the battalion was added to the *tooth* portion of the force structure and the Army's *tooth-to-tail* ratio was enhanced.

> "The engineer combat battalion (heavy) is overloaded. Due to its greater flexibility and utility, planners have committed it to missions from the FCZ to the COMMZ which call for it to perform all combat and general engineering tasks."
>
> **—Functional Area Assessment Issue 5-7, August 1984**

While the change appeared superficial to some observers, the impact was significant within the battalion. The post-Vietnam soldiers in CMF 51, general engineer, who comprised most of the battalion, were required to learn not only technical constructions skills (carpentry-masonry, structures, plumbing, electrical, and construction equipment operations), but also to master all combat engineering and most light infantry skills.

In support of the installation or MACOM, the battalion performed *construction* tasks during most of the year, but was then evaluated in a field environment, primarily on its *combat* skills. Over the next several years, the CMF 51 NCOs scored lower than their contemporaries on the SQT and performance evaluations, and the combat heavy battalions *appeared* less trained during field evaluations to ARTEP standards.

The combat heavy had become the decathlete of battalions. It was required to perform all general engineer tasks of the old construction battalion, plus all combat engineering tasks of the combat engineer battalion, and to be prepared to conduct all light infantry operations of an infantry battalion. It was everything to everybody. It was overloaded!

Redesign Process

In 1984, through *Functional Area Assessment Issue 5-7*, the Army leadership recognized the problem and tasked the Engineer School to evaluate the employment of the combat heavy and to consider redesign, if appropriate.

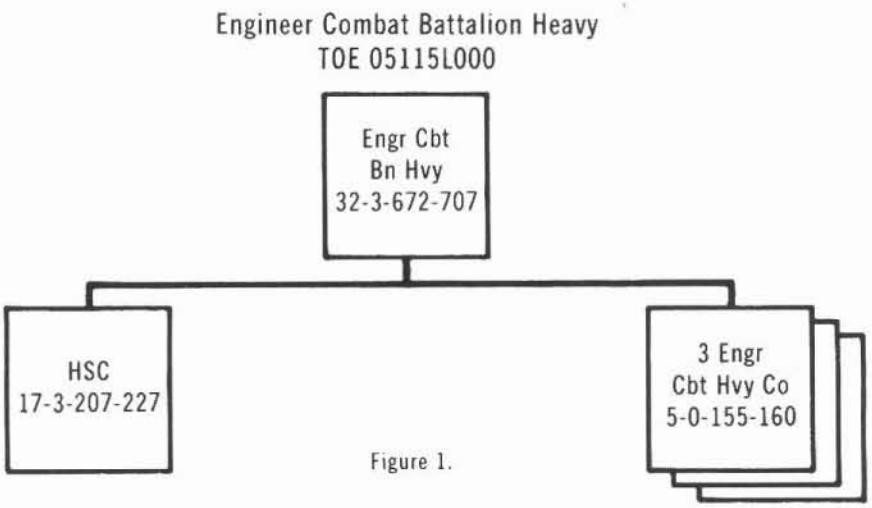


Figure 1.

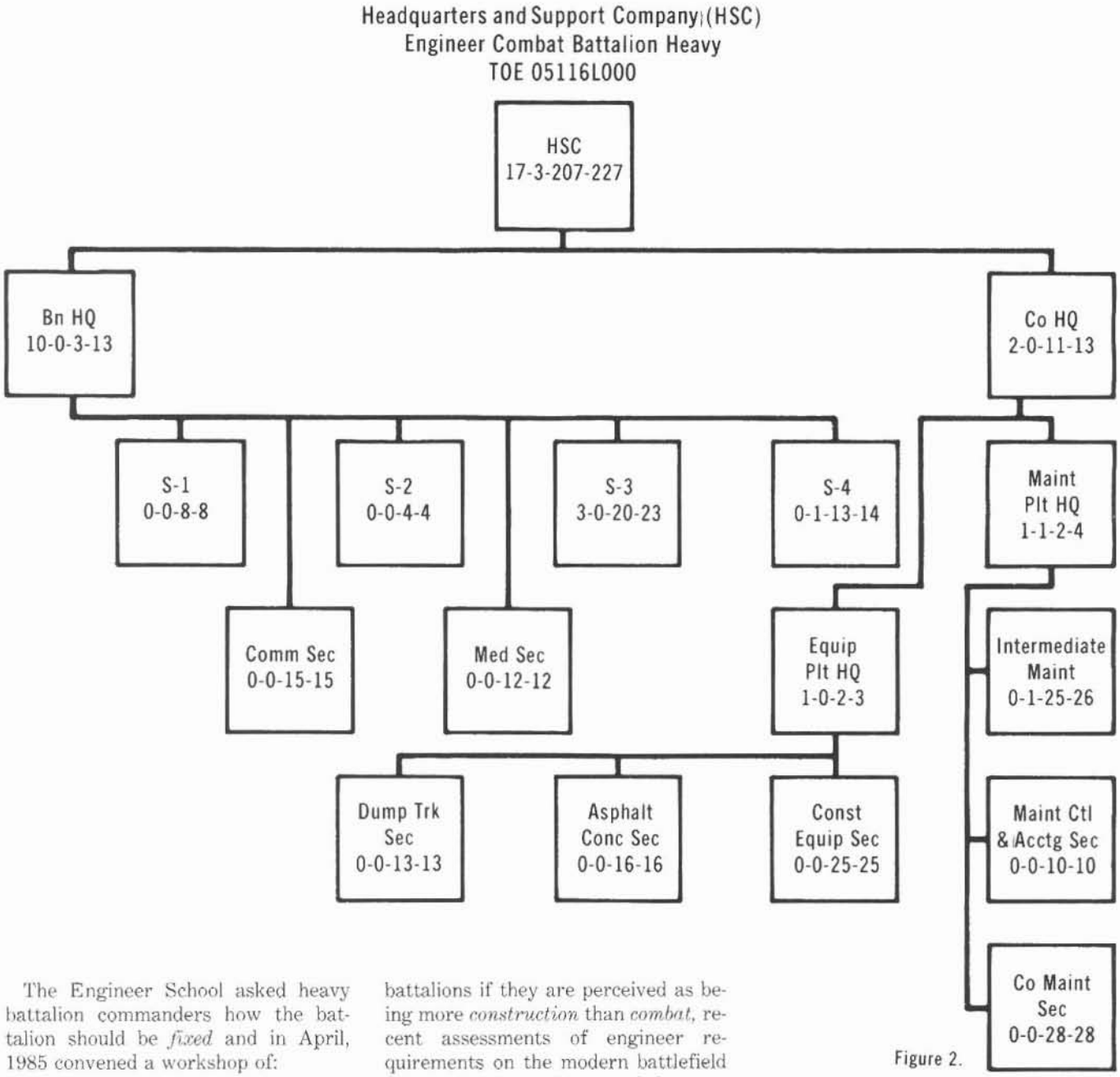


Figure 2.

The Engineer School asked heavy battalion commanders how the battalion should be *fixed* and in April, 1985 convened a workshop of:

- Active Army and reserve component group and battalion commanders,
- Command sergeants major, including the Corps of Engineers Command Sergeant Major,
- Corps and MACOM engineers,
- Corps of Engineers staff officers,
- Engineer School representatives.

The result was a major reorientation of the battalion's mission and capabilities statements and a redesign of the battalion. The changes were not developed in a vacuum.

The mission of the combat heavy was rationalized considering all engineering requirements on the AirLand battlefield. Although many engineers feel a visceral fear of losing combat heavy battalions if they are perceived as being more *construction* than *combat*, recent assessments of engineer requirements on the modern battlefield fully justify the existence of the combat heavy to execute general engineering in the RCZ and COMMZ.

The necessity within the force structure for combat heavy engineer battalions to perform construction tasks is now accepted. Therefore, the mission was rationalized without constraints or fears that a more realistic mission statement might result in eliminating the combat heavy battalions from the force.

Revised Mission and Capabilities

The revised mission and capabilities statements greatly relieve the battalion overload and provide a more rational approach to the vast engineer requirements on the battlefield. The redesigned combat heavy will operate from the division rear through the COMMZ.

Because the battalion will be conducting operations to the rear of the brigade boundary, the requirement "*to perform infantry combat missions, when required*" was revised to read "*to perform rear area security operations to include fighting as infantry, when required.*" This change deletes many light infantry tasks from the battalion's ARTEP.

A major deletion from the capabilities of the battalion was the elimination of minefield emplacement and clearing tasks. Mine detection

equipment has been retained in the battalion, and routine minesweeps remain an integral part of construction and reconnaissance operations.

The hasty protective mine task also remains in the battalion's repertoire as it is a common soldier task. However, emplacement of deliberate and point minefields and breaching of minefields are brigade area tasks and, therefore, out of the work area of the combat heavy.

When minefields are found to the rear of the brigade boundary (opposing forces' FASCAM or bypassed minefields), it is postulated that the timing of the removal will not be so urgent and frequent allowing combat engineer battalions to be tasked from corps assets to execute these missions.

Reorientation of the combat heavy's mission greatly relieves *overloading* of the battalion. It also provides a rational architectural approach to support the vast engineer requirements of the AirLand battlefield.

Organization Redesign

The internal organization of the combat heavy was scrutinized. Every position and item of equipment was examined under the microscope of mission essentiality, doctrine, proper skill utilization and rank structure, and modern construction practices. Again, there were no *sacred cows*. The result was a lean, modern, more productive battalion designed for wartime missions, not peacetime construction.

Substantive changes—

- Reduced the battalion level 1 TOE strength from 796 to 707, a savings of 89 spaces per battalion.
- Established requirements for modern engineer construction equipment such as interchangeable drum vibratory rollers and extending boom excavators.
- Deleted the engineer equipment and maintenance company (TOE 5-117; A Company) and rolled the unique engineer equipment and engineer direct support maintenance into a redesigned headquarters and *support* company (TOE 5-116), increasing the size from 116 to 227; large, but within the command capability of a captain.
- Reduced the size of the general construction squad from 12 to 10.
- Modified the 20-person embankment and excavation section of the three engineer companies (TOE 5-118) into one 12-person embankment section and one 14-person excavation section.
- Deleted the battalion power distribution section.
- Deleted all MOS 51C, structures specialists, from the battalion. (The Engineer School is reviewing the validity of retaining this MOS in the force structure.)
- Consolidated the concrete mobiles into the asphalt-concrete section of the headquarters and support company.
- Consolidated the medium equipment transporters and 20-ton dump trucks requiring 64C, heavy vehicle drivers, into a separate *dump truck section* in the headquarters and support company.
- Deleted obsolete and unnecessary equipment such as ditching machines, telephone maintenance trucks, chemical and biological shelter systems, and all hot-mix asphalt equipment (two bituminous distributors remain).

Organizational diagrams of the redesigned battalion, headquarters and support company, and engineer company are shown in Figures 1, 2 and 3. Figure 4 compares the redesigned battalion to the existing battalion.

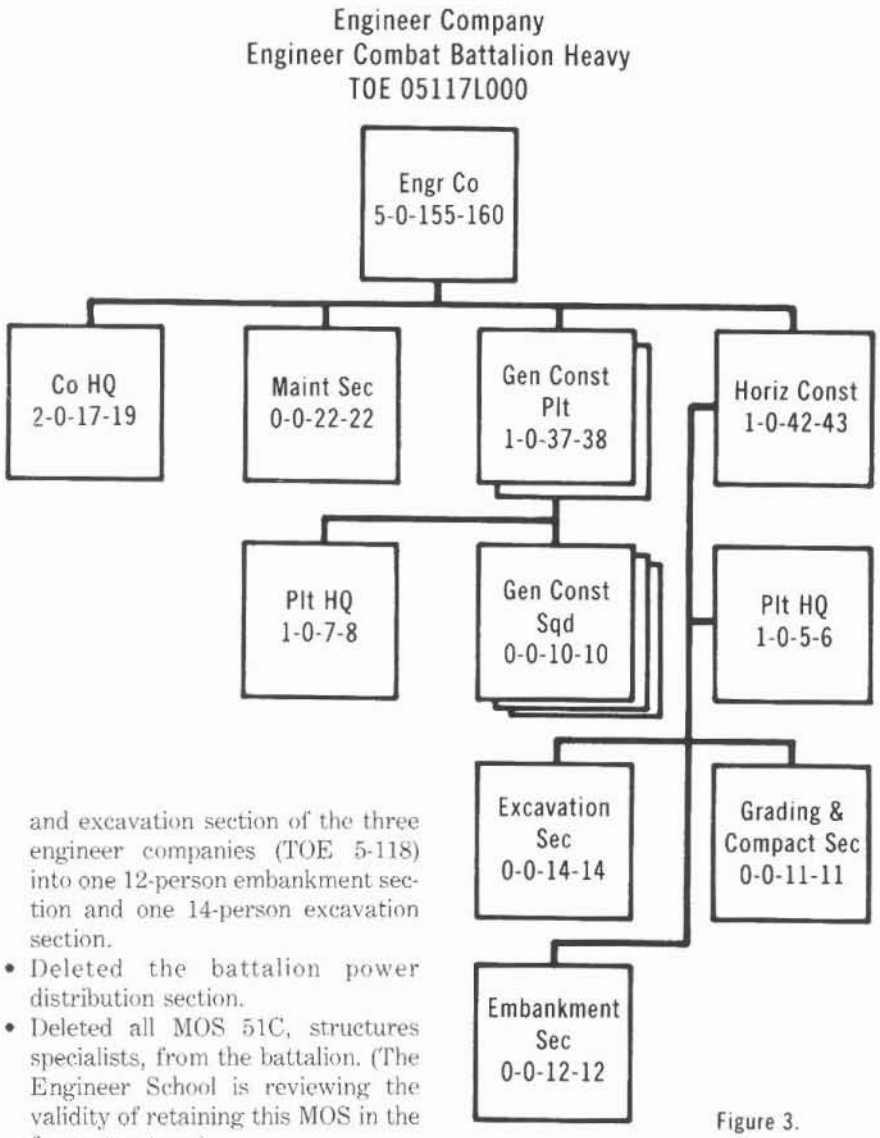


Figure 3.

Conclusion

Some confusion is inevitable whenever a new TOE is fielded. Temporary modifications will be made until new equipment is procured. As the Army embarks on this shakedown, keep in mind that this redesign grew out of a detailed evaluation by experienced field and staff engineer officers and NCOs. The goal was a lean, modernized, more productive battalion. The redesigned engineer combat battalion (heavy) meets that goal.

The new combat heavy is not a compromise based on politically expedient *tooth-to-tail* decisions, nor is it change for the sake of change, nor a manpower savings drill. The combat heavy redesign reflects a realistic look at wartime engineer requirements. The combination of the redesigned combat

Comparison:	Current ECB(H)	Redesigned ECB(H)
Strength	796	707
Officers	32	32
Warrant officers	9	3
Enlisted	757	672
General construction	62%	53%
Earthmoving	38%	46%
Leader/led	.199	.209

Figure 4.

heavy, corps combat engineer, and divisional engineer battalions provides a coherent package of engineer support to the AirLand battlefield.

LTC Robert L. Herndon commanded the 802d Engineer Battalion (CBT)(HVY) in Korea plus construction and divisional engineer companies in Vietnam. He has also served in Germany, Panama, and CONUS. He served in HQDA, ODCSOPS Training Directorate from 1978 to 1982 where he guided the National Training Center from concept formulation to establishment.

He is currently attending Harvard University as a senior fellow in national security. He has a bachelor's degree in civil engineering from the University of Texas at Austin, a master's degree in construction management from Texas A&M University, and a master's degree in management from MIT. He is a registered professional engineer in Texas.

Introducing: The Sapper

An entirely new breed of soldier is emerging within the light and heavy divisions—*the combat engineer sapper.* Equipped with unique skills and abilities critical to AirLand Battle, he is a creation of Division '86, the Army of Excellence and the restructuring of the divisional engineer battalion.

Today's sapper is a soldier trained to attack engineer problems with the speed necessary to support AirLand Battle and mobile armor warfare . . . to get the job done with whatever is immediately at hand . . . to seek quick and dirty rather than elegant solutions . . . to operate and survive under fire. Initiative, ingenuity and agility are his stock in trade.

Traditionally, the combat engineer built field fortifications and deliberately breached routes through complex obstacles and minefields. He worked under fire, relying on manual labor, and occasionally aided by unprotected heavy equipment. The engineer missions remain virtually the same. But tactics and doctrine have changed—rendering slow, deliberate methods obsolete. AirLand Battle puts speed and ingenuity at a premium.

Who is a Sapper?

The sapper's hallmark isn't his organization or his equipment; it's his frame of mind. A sapper is an engineer who survives on his wits and his grit . . . an innovator who turns terrain and time to advantage by exploiting his situation and surroundings with the quick and dirty solution to whatever problem is at hand. His *can do, essayons* ingenuity are what make him essential in support of both the light and heavy force.

The Light Sapper

The light sapper supports the light infantry team in deep thrust operations behind enemy lines and in defense of mountains, jungles, urban environments and other terrain that demand his unique talents. He relies on airmobile insertions, stealth and night movements on foot to achieve mobility. Equipped only with what he can carry, his single greatest assest is his *sapper spirit*—his ability to improvise.

The Heavy Sapper

The heavy sapper has more equipment to do his job—not enough . . . never enough . . . but more than the light. An APC is his conveyance, workroom, bunker and fighting platform. He is armed with an array of demolition materials and mines. But his focus is not on his equipment—it's on the mission: *How to get it done with what he's got!* Like the light sapper, he depends upon his own resourcefulness—his *sapper spirit*—to sustain the momentum of the attack.

The modern 12B engineer assigned to a corps or divisional battalion resembles his 11B infantry counterpart in many ways—handling many of the same basic tasks. The difference is a matter of emphasis—the 12B specializes in the engineer-unique; the 11B in the infantry-unique. While sappers do not usually fight as infantry in the macro sense as a battalion or a company, they fight as platoons within their task forces when the tactical situation requires. But the sapper is audacity personified—a new breed of combat engineer honed for the demands of AirLand Battle, a true combat multiplier.

The Shape of Things to Come

Equipment Roundup

by CPT Jeff Engbrecht

The Volcano

The Volcano—a scatterable mine delivery system—rapidly dispenses 960 antitank and antipersonnel mines from the UH-60 helicopter and a variety of ground vehicles. Responsiveness is limited only by the crew's ability to load the dispenser (about 15 minutes) and vehicle speed. Air Volcano dispenses its payload in 15 seconds at 120 knots.

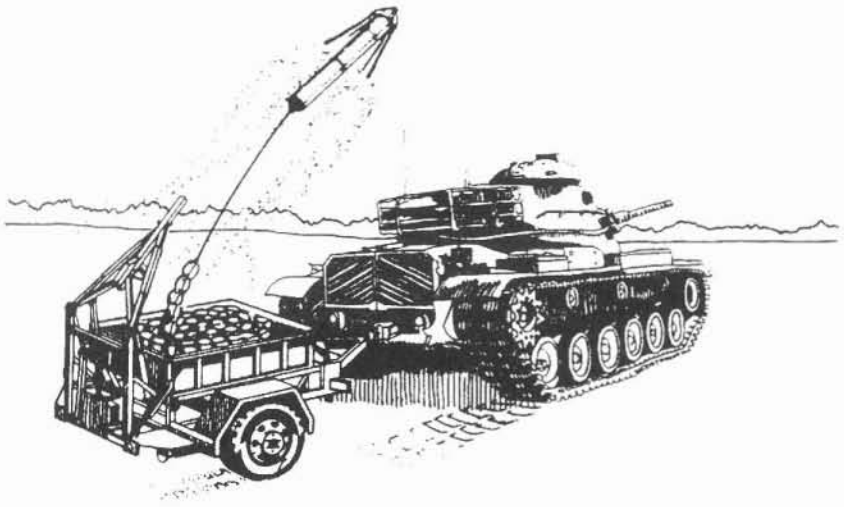
Volcano delays the enemy, isolates the battlefield, and reinforces friendly fires in both the offense and defense. It will replace the M56 as the standard helicopter mine dispensing system and GEMSS as the ground delivery system for heavy and light forces.

The Volcano system was type classified for procurement in fall FY 86. Helicopter capability will be available to the 7th and 9th Infantry Divisions in FY 87. Volcano will be available to other aviation and engineer units in 1992.

The M58A1 Mine Clearing Line Charge (MICLIC)

The MICLIC – a rocket-projected explosive line charge – provides close-in breaching capability. When detonated, the MICLIC clears a lane 5 × 100 meters from a stand-off distance of 50 meters. A second MICLIC can be fired from the breached lane if a longer breach is required.

MICLIC will be used in response to minefield breaching requirements identified by the maneuver unit. A combat prime mover tows the trailer to the point of the breach where the line charge is prepared by an engineer firing squad. The trailer is reusable and can be dropped off at a preselected location firing for recovery by support elements.

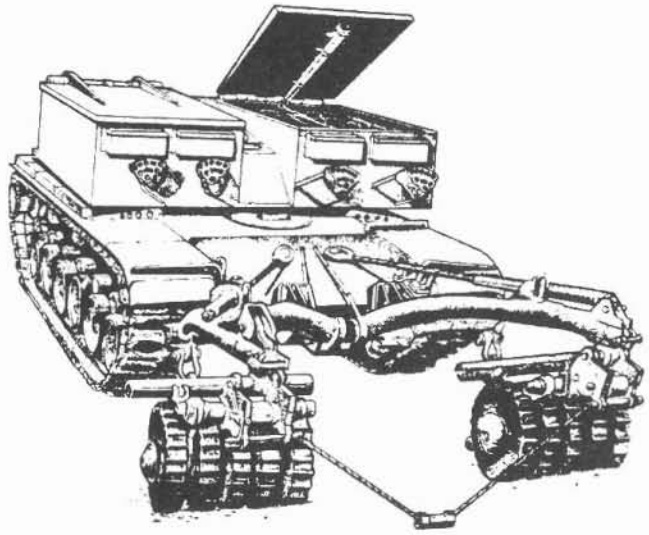


Fielding is scheduled for fall FY 86. Three MICLIC trailers will be issued to each engineer company in airborne, air assault, high tech light division, and corps support roles. Two MICLIC trailers will be allocated to heavy division engineer companies equipped with the ROBAT.

The Robotic Obstacle Breaching Assault Tank (ROBAT)

ROBAT breaches minefields by remote control. An operator outside the vehicle directs ROBAT into the minefield where it fires a line charge and marks the cleared lane. Depending upon the tactical situation, ROBAT can also be operated manually from inside. Eventually, computer technology will fully automate ROBAT's breaching capability.

Engineers will operate ROBAT in support of the combined arms team. ROBAT consists of an improved M60 chassis, a track-width mine roller or plow, two mine clearing line charges, and a marking system. When a minefield is detected, ROBAT will move forward from approximately one terrain feature behind maneuver forces to breach.



An accelerated development program is proceeding and a prototype has been produced. However, a fielding date has not been set because of budget constraints.

The Tactical Explosive System (TEXS)

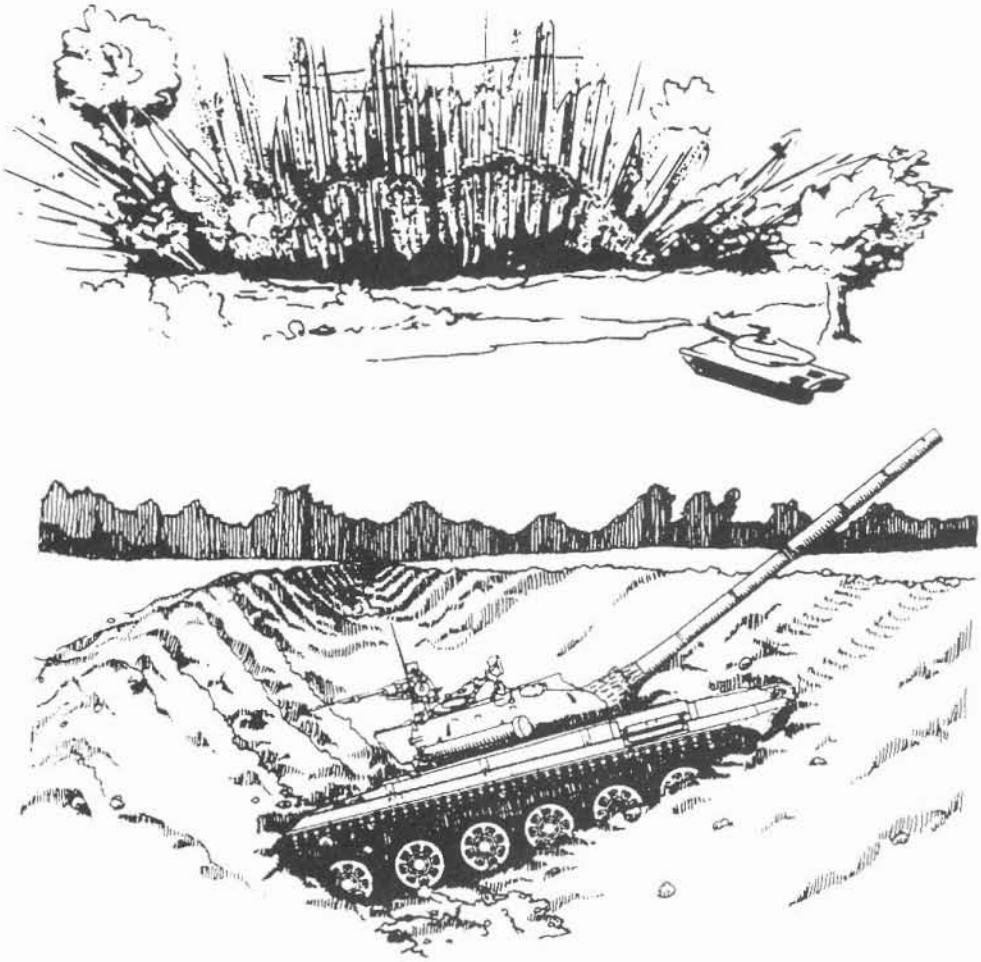
TEXS will consist of a liquid blasting agent, mixing and pumping equipment, and an entrenching attachment mounted on a small emplacement excavator (SEE).

Engineers will employ the TEXS in covering force, main battle and rear areas. TEXS will:

- Create long antitank ditches or crater roads using pre-emplaced or rapidly emplaced pipe.
- Destroy bridges.
- Create rubble obstacles in urban areas.
- Reduce obstacles to increase mobility.
- Create defilade positions.
- Perform general demolition tasks.

First developed as an antitank ditching explosive, TEXS is now finding other uses such as deliberate breaching of minefields. The lower detonation velocity of the TEXS explosive produces blast pressures that last longer than such high explosives as C-4 or TNT. This allows the mechanical spring systems of pressure-activated mines more time to respond to an applied blast pressure.

Because the TEXS blasting agent is nonexplosive until it is mixed, it offers a tremendous advantage over conventional explosives in terms of handling and storage, especially in zones subject to enemy fire.



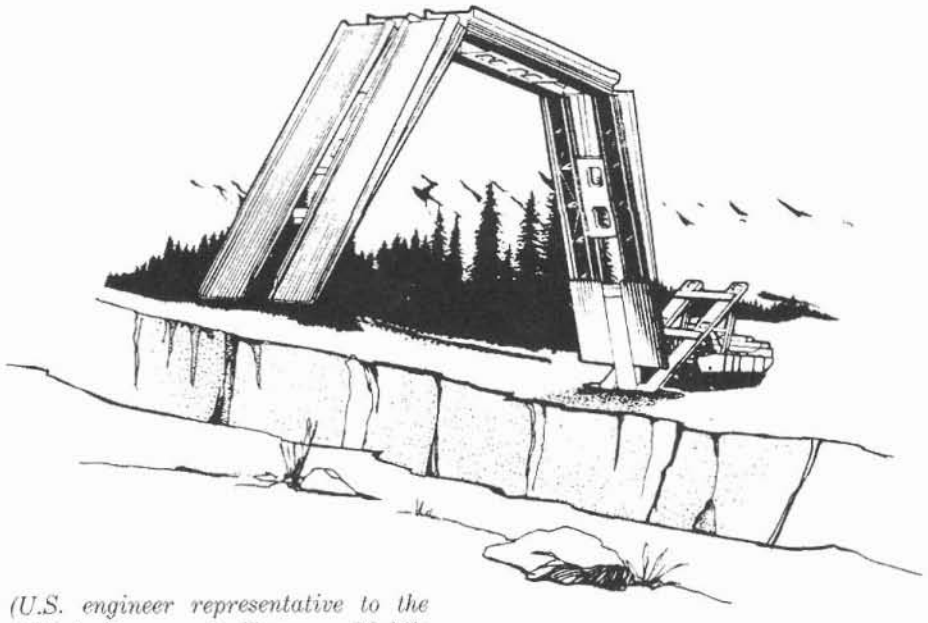
Development is underway. The Waterways Experiment Station (WES) is testing the liquid blasting agent and the mixing, pumping and emplacement hardware.

The Heavy Assault Bridge (HAB)

The HAB will be a standard tank chassis modified to transport, launch, and retrieve a military load class (MLC) 70 bridge that spans 32 meters. It will also launch the current 60-foot armored vehicle launched bridge (AVLB).

The HAB will be used by heavy division forward elements and emplaced similarly to the AVLB. The assault carrier can launch the bridge without exposing the crew to enemy fire and retrieve the bridge at either end.

The HAB is in advanced development. Fielding is slated for FY 92. It will be distributed among heavy division engineer units.



CPT Jeff Engbrecht is assigned to the Force Design Branch of the Directorate of Combat Developments, USAES. He has served as platoon leader of C Company of the 78th Engineer Battalion (U.S. engineer representative to the Allied Command Europe, Mobile Force) and assistant S-3 of the 78th Engineer Battalion in Ettlingen, Germany. He is an EOAC graduate and has a degree in industrial engineering from Rochester Institute of Technology.

Recent ETL Publications

Current Engineer Topographic Laboratories projects involve terrain analysis, mapping, automated cartography, image processing, surveying, weapon guidance, and robotics.

Copies of the following ETL technical reports are available at a nominal cost from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA, 22161, or through the Defense Technical Information Center, Cameron Station, Alexandria, VA, 22314-6145. When ordering publications from these organizations, please use the AD numbers listed.

Development of Electronic Control for the Superconducting Gravity Gradiometer, September 1985, AD-A160 641.

Electronic Feedback Control of Mass-Spring Systems, September 1985, AD-A160 691.

Extended Area Exit Pupil Viewer, August 1985, AD-A159 364.

Third-Order Co-occurence Texture Analysis Applied to Samples of High Resolution Synthetic Aperture Radar Imagery, August 1985, AD-A160 640.

Software Conversion of DMA Standard Linear Format (SLF) to Intergraph Corporation Standard Interchange Format (SIF), July 1985, AD-A161 086.

Bibliography of In-House and Contract Reports, Supplement 11, May 1985, AD-A160 607.

A New Large-Scale, High-Resolution Multicolor Software Display Concept, March 1985, AD-A155 404.

Alternative Theories of Inference in Expert Systems for Image Analysis, February 1985, AD-A153 649.

Further Study of Digital Matching of Dissimilar Images, February 1985, AD-A153 112.

System Analysis of a Field Army Topographic Support System, February 1985, AD-A153 318.

Evidential Reasoning in Expert Systems for Image Analysis, February 1985, AD-A153 379.

Video Discs for Map Displays, June 1984, AD-A149 646.

Application of Artificial Intelligence to Radar Image Understanding, February 1985, AD-A152 519.

Analysis of Edge Detection Algorithms on DIAL, January 1985, AD-A156 735.

Defense Mapping Agency Raster-to-Vector Benchmark Testing, December 1984, AD-A154 152.

Defense Mapping Agency Raster-to-Vector Analysis, November 1984, AD-A154 153.

Application of Hierarchical Data Structures to Geographical Information Systems, Phase III, October 1984, AD-A152 169.

Cultural Data Base Implementation Study and Computer-Aided Scene Modeling Users Manual, October 1984, AD-A154 232.

Hexagonal Data Base Study, Phase II, October 1984, AD-A150 176.

Feature Extraction Assessment Study, Final Report, October 1984, AD-A150 189.

Interactive Digital Image Processing for Terrain Data Extraction, Phase 5, September 1984, AD-A148 580.

Terrain Analysis Procedural Guide for Built-Up Areas, April 1984, AD-A142 918.

Terrain Analysis Procedural Guide for Surface Configuration, March 1984, AD-A147 637.

Obstacles—

Engineers and Maneuver Forces Need Common Terms

Point

(continued from inside front cover)

The Proposal

Clearly, a set of obstacle control measures is needed to allow the commander at each level to concentrate the obstacle effort and provide onetime guidance that accurately conveys his intent. The terms obstacle zone and obstacle belt, defined as follows and illustrated in Figure 1, satisfy the need:

- ***Obstacle Zone***—An area in which obstacles are to be placed. It may be restrictive (for example, limiting obstacles to an area of difficult terrain along a river). It could be nonrestrictive, encompassing most of the area of operations. Used in a restrictive manner, designation of obstacle zones would leave other areas obstacle free to facilitate support operations and maneuver. It focuses the obstacle effort (a limited resource) in areas where reinforcement of the terrain plays a definite role in the commander's concept of the operation.
- ***Obstacle Belt***—A grouping of existing and reinforcing obstacles that serve a common purpose (such as to block an avenue of approach, seal a flank or channelize an enemy unit into an engagement area). At brigade and task force level, the designation of obstacle belts would serve the same purpose as obstacle zones.

The method for using the terms to control the engineer effort would allow appropriate input at each level:

- A division would designate obstacle zones. No obstacles could be emplaced outside the zones other than hasty protective minefields and division-controlled FASCAM.
- A brigade would, in turn, designate obstacle belts (normally oriented on company-sized avenues of approach). These belts would be placed to allow for support operations and maneuver. No obstacles could be placed outside the belts other than hasty protective minefields and brigade-controlled FASCAM.

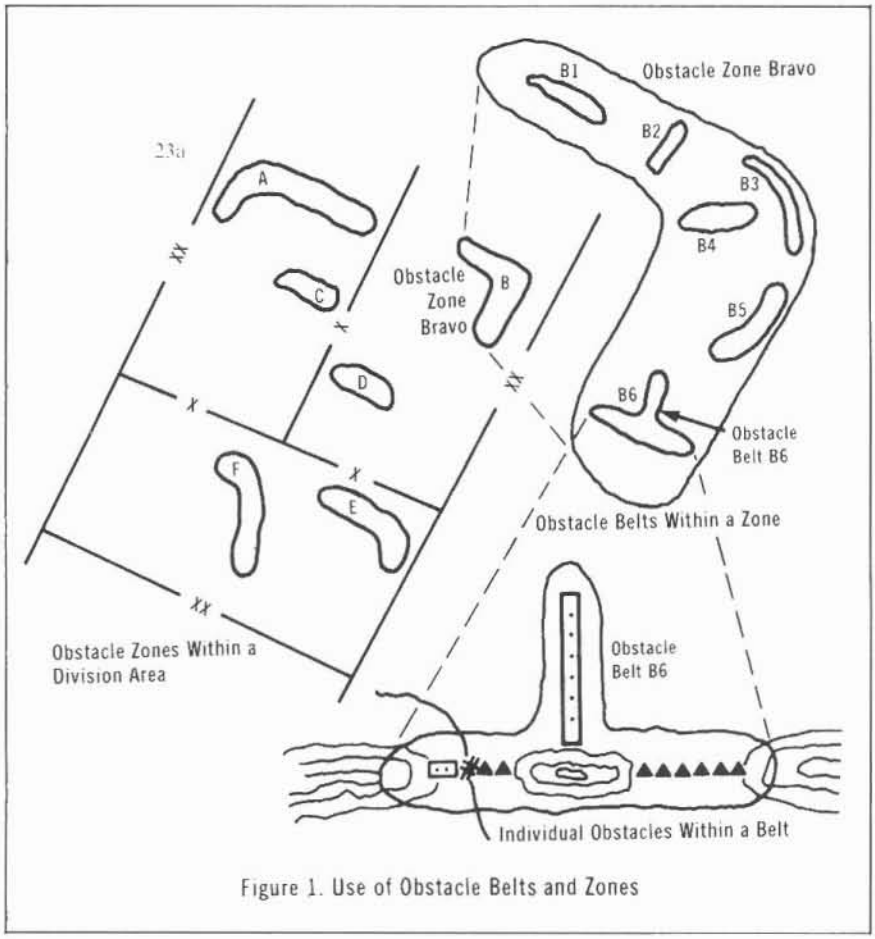


Figure 1. Use of Obstacle Belts and Zones

- At task force level, individual obstacles would be planned and emplaced within the belts. Specific obstacle sitings would be determined by the task force or overwatch team as appropriate.

Commanders at any level could request that belts or zones be added or extended to more closely support their plans. They could also direct that specific obstacles be emplaced and/or that execution authority be retained at any level.

This would allow the division commander to focus the engineer effort within his area of operations with onetime guidance and retain flexibility in his maneuver planning. He and his division engineer could discuss the location of obstacle zones rather than that of numerous individual obstacles. Any specific obstacles discussed would be limited to those that were critical to the division's mission and would, therefore, become directed targets.

At brigade level, the use of belts not only would focus the countermobility effort; it would direct attention to:

- Areas where the commander wants to defeat the enemy,
- An exposed flank,
- An economy of force sector.

The brigade engineer would plot targets in the belts he had developed with the S-3 in order to make generalized logistics plans. The selection and location of the actual targets would be up to the task force and team commanders.

At the task force level, the S-3 and the engineer would have clear constraints within which to implement the brigade commander's concept. Time would not be wasted on target reconnaissance, planning and resources for obstacles outside the belts. The task force engineer's already difficult job would be simplified.

Conclusion

My intention is not to add two esoteric engineer terms to a cumbersome military vocabulary. We need a common language that allows the maneuver commander to convey his engineer concerns to subordinate commanders. The proposed concept would let the

(continued on page 43)

Bright

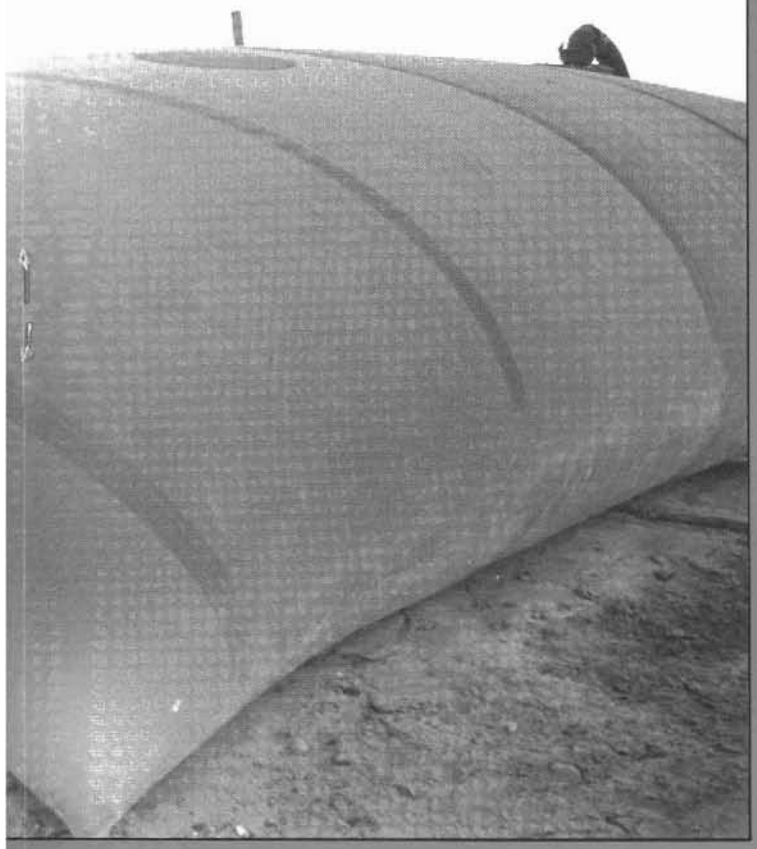
Photo essay by CPT John Florence

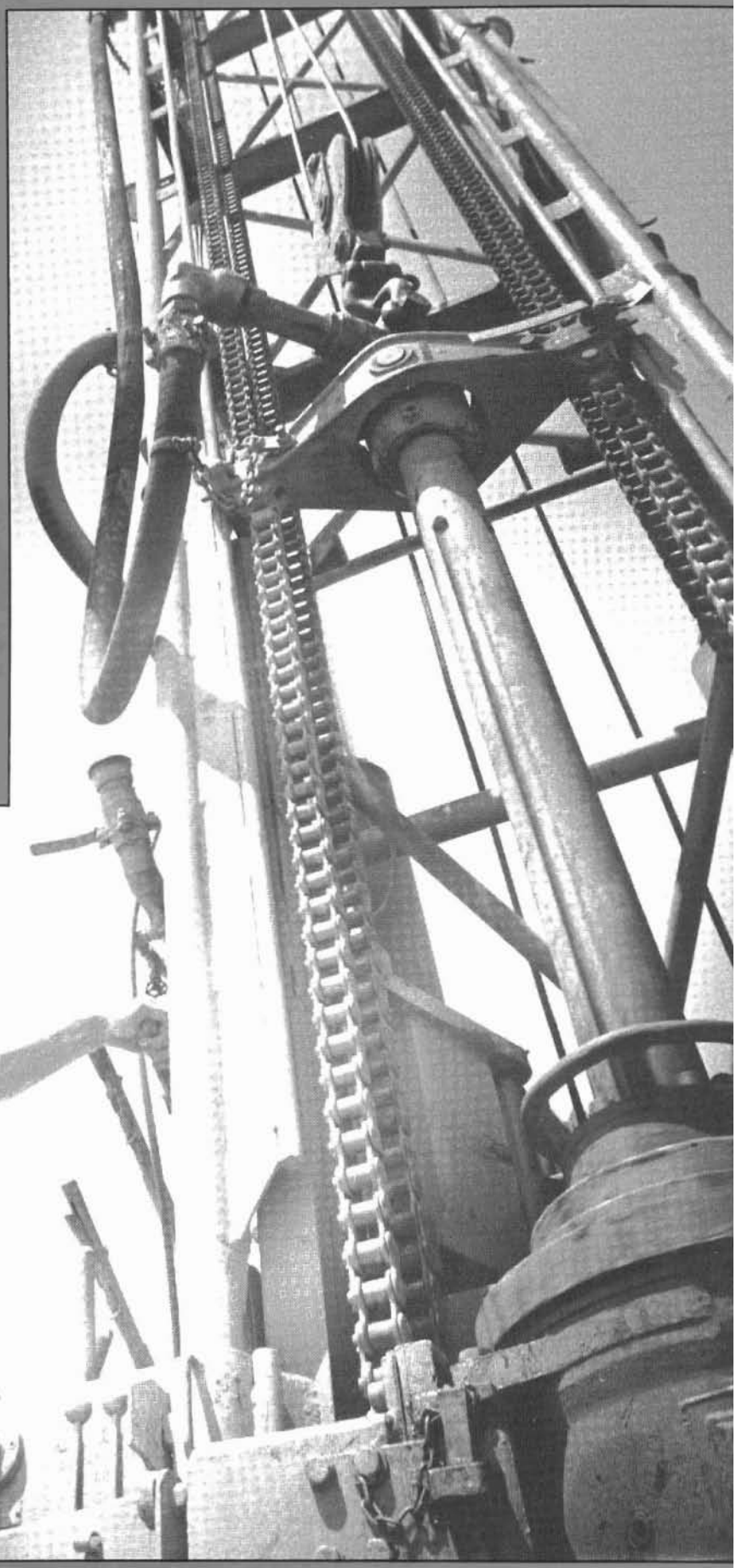
Engineers built targets for live-fire ranges, purified water, drilled exploratory water wells, and conducted surveying operations in the debilitating desert heat and blowing sands of Bright Star '85.

Headquartered at Cairo West, Egypt, the engineers worked under the umbrella of the 416th Engineer Command. All elements were commanded by the Third U.S. Army which becomes U.S. Army Central Command when deployed.

Left, A surveyor from the 82nd Engineer Company, Fort Belvoir, places equipment. Top, SSG Martin Martinez, NCOIC of the 26th Engineer Detachment, Fort Campbell, checks a 20,000-gallon bladder of purified drinking water. Right, SP4 Gary Edwards, 38th Engineer Well Drilling Detachment, Fort Bragg, operates a drilling rig at Gabel Homza. Bottom, an engineer from the 82nd takes readings during surveying operations.

Star '85





the M9 ACE

Rugged, Responsive and Ready for AirLand Battle

by Victoria McAllister

This summer the Army will accept bids to begin production of the M9 Armored Combat Earthmover (ACE) — a $45.7 million congressional authorization to begin buying 22 M9s in FY 86. The Army Systems Acquisition Review Council chaired by the Vice Chief of Staff and the Under Secretary of the Army has agreed to procure 580 M9s over the next 6 years.

The 14 initial production models that were used during strategic and tactical mobility evaluations in 1985 will be fielded this year:

- Seven to the 7th Infantry Division for light infantry use,
- Four to TRADOC to develop instructional programs and train training teams,
- Three to AMC for ongoing tests.

In 1988, the 9th Infantry Division (motorized) is scheduled to receive 18 of the 22 M9s that will be built under the FY 86 contract. The remainder will go to TRADOC and AMC.

As production proceeds through 1991, the priority for distribution will be first to forward deployed division engineer battalions and armored cavalry regiments and to TRADOC, and finally to selected light forces and the remainder of the forward deployed heavy force.

The M9 gives combat engineers an earthmoving system that keeps pace with lead elements at a time when AirLand Battle challenges engineers to be responsive over greater distances in less time.

The M9 is far more versatile than the bulldozer tractor/trailor system it replaces. Functionally, it is a rugged combat vehicle that brings protected earthmoving capability to the forward brigade area. In addition to digging at a rate comparable to the D7, the M9 can haul and place fill, transport up to 200 cubic feet of cargo, winch, and tow. It is able to negotiate slopes up to 60% and side slopes up to 40%.

Its mobility improvements over the D7 are significant. It moves cross-country and can achieve road speeds of up to 30 miles per hour. It swims at 3 miles per hour in a current of 1.5 meters per second. The M9 can be air transported by a C-130, C-141 or C-5A cargo plane compared with the D7 which requires a C-5A. This strategic mobility improvement is especially important for our light forces.

The M9 is equipped with a smoke grenade launch system; and its armor protects its driver from chemical and biological agents, small arms fire, and artillery fragments. A radio makes it easy to dispatch the M9 to new positions by allowing contact with an engineer platoon or supported manuever force's communications net.

On the offense the M9 prepares crossing sites, breaches antitank ditches and clears rubble from attack routes to sustain the momentum. In the defense, it digs fighting positions for weapons systems and assists in shaping terrain to meet the commander's intent by digging antitank ditches and helping construct obstacles.

How valuable is the M9 ACE to the combined arms team?

While performing on a par with the D7 in work productivity (90% digging capability) and reliability, the M9 during Fort Hood tests demonstrated it exceeds the D7 in mobility, responsiveness and survivability.

During the FTX phase of the evaluations conducted at Fort Hood in 1985, an M9-supported platoon performed with a D7 tractor/trailer system-supported platoon in head-to-head competition.

At the Engineer Commanders' Training Conference in November 1985, MG Kem described the results:

"For example, during a deliberate attack — a run of the western corridor on the second of the 5-day FTX — the tank-mechanized infantry task force conducted a forward passage through two points along Elijah Road, continued north across Cowhouse Creek, then attacked to seize the objective on

Manning Mountain. There were two teams, each with its own engineer platoon . . . one supported by M9s; the other by D7 dozer systems.

"Crossing the line of departure, they immediately met complex obstacles. The M9 breached the antitank ditch in 3 to 7 minutes and moved on to the next obstacle line at Cowhouse Creek. Meanwhile, the D7 system didn't get there for 1½ to 2 hours. Consequently, the D7-supported task force moved over to use the M9 breaches and moved on to the next phase line. Because of their inability to follow the tank-infantry force cross-country, the D7s were sent over a nearby (out of the maneuver box) asphalt road so they could continue to move.

"At Cowhouse Creek . . . the M9 got its task force through the obstacle system. Once again the D7 was unable to close with the obstacle system; and its task force crossed using AVLBs, CEVs and borrowed M9s.

"The task force moved on up to Manning Mountain — the objective! The roads were cut so the M1s could not get up the mountain. The M9s backed around and filled in; the M1s went on up and achieved the objective. The D7 system never completed the mission and the team it supported never completed its assault on the objective . . . mission failure due to the D7.

"There were six different tasks on the way up. The M9 accomplished six out of six; the D7 accomplished one out of six."

The results come at a time when National Training Center experience — where the combined arms team performs together rather than simulates — is again teaching the Army the value of the combat engineer on the battlefield. In deep battle, the onus is on the combat engineers to maintain the ground forces' ability to maneuver — to get them to the right place at the right time. But equipped with the D7, the engineers are too slow and cumbersome to be counted upon.

The missions haven't changed:

- *Mobility* — remove obstacles, breach minefields, cross gaps in stride and under fire.
- *Countermobility* — construct more fighting and protective positions faster.
- *Survivability* — emplace obstacles and minefields rapidly.

However, the windows of opportunity when the manuever commander must act decisively have narrowed. Engineers are challenged to perform the same tasks over greater distances in less time. The M9 met the challenge.

A maneuver commander at the Fort Hood FTX summed up the improvement. *"The engineers,"* he said, *"are finally going to get rid of their ball and chain."*

Victoria McAllister is Features Editor of ENGINEER Magazine.

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Hotline Q & A

Q. When will Army National Guard engineers be allowed to participate with combined arms at the National Training Center?
A. National Guard engineers are already allowed to participate with combined arms at the National Training Center. National Guard units can submit a request through command channels to FORSCOM. Funds are available. Rotation dates are not optional, and units must accept the date assigned by FORSCOM. Participation by National Guard units would take a heavy load off active units now being overtasked with maneuver and OPFOR requirements.

Q. What method is used to obtain water for troops when the well-drilling rig isn't available?
A. The new well-drilling rig has the same maneuverability as a 5-ton truck. However, in rare situations when the well-drilling rig is not available, use the tactical water distribution system (TWDS).

Q. When probing a minefield using nonmetallic probes, does the prober carry his weapon with him?
A. When breaching a minefield with a nonmetallic probe, the soldier should strap the weapon securely on his back.

Q. What is the NSN for screw-type pickets?
A. Screw-type pickets (NSN 5660-01-072-2977) are not available at the depot. They have been replaced by U-shaped pickets which are easier to use, transport, and store. Also, U-shaped pickets are commercially used while screw-type pickets are not. The NSN for U-shaped pickets are 5660-00-270-1587 and 5660-00-270-1589.

Q. In a combat heavy engineer battalion, the alpha company direct-support shop is authorized a maintenance supply section. Is the mission of this section to support only the direct-support shop Class IX requirement or does it support the entire battalion of engineer Class IX repair parts?
A. The support battalion with Class IX repair parts is only for engineer equipment and power generation equipment. See MTOE 0511SHFC10.

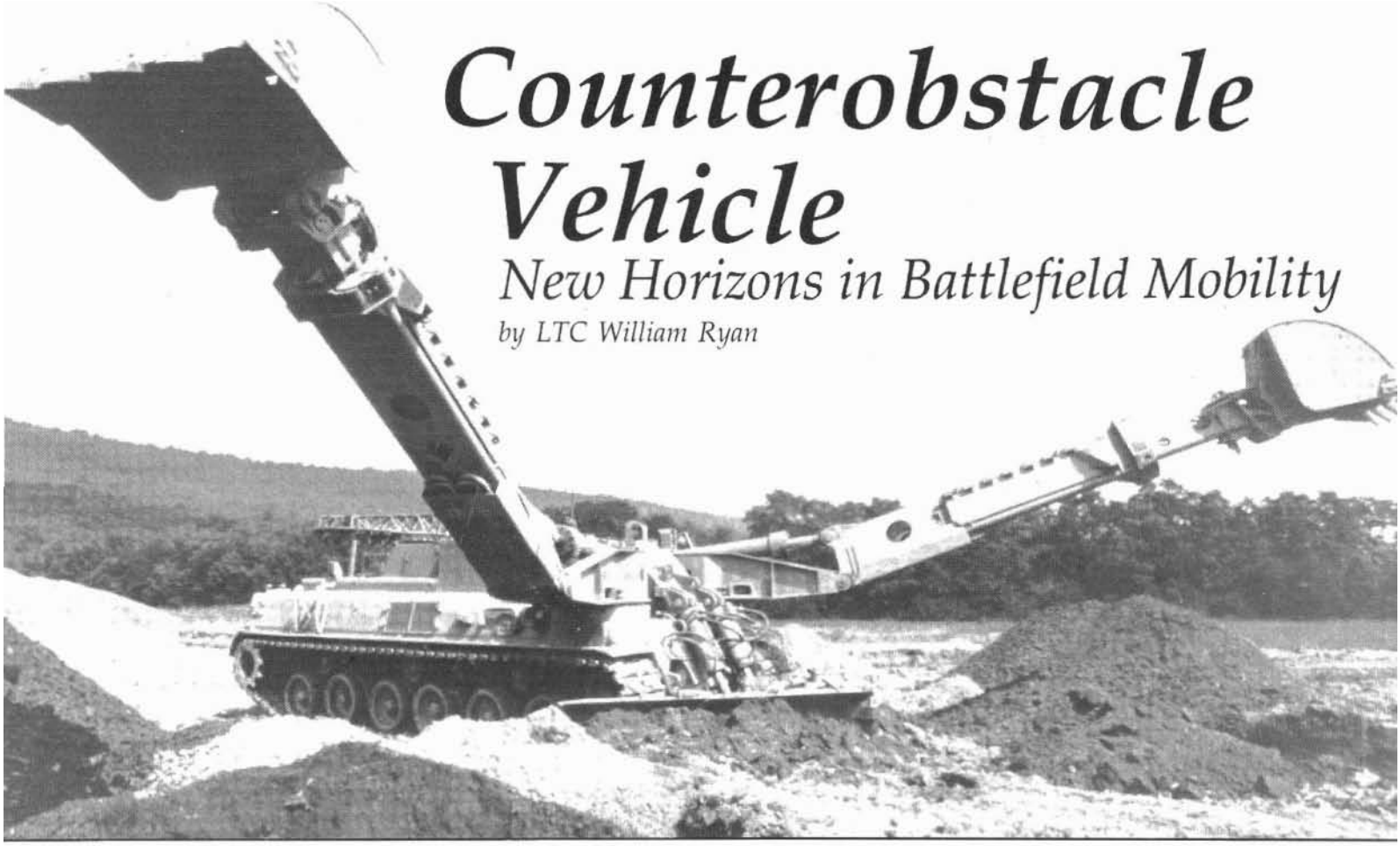
Do you have problems, questions, or comments relating to engineer doctrine, training, organization, and equipment? Call the US Army Engineer School's Hotline. You'll receive a reply within 3 to 15 days. The Hotline is not a receiving agency for formal requests.

The Hotline telephone number is (703) 664-3646; WATTS 800-336-3095, extension 3646; or AV 354-3646.

Counterobstacle Vehicle

New Horizons in Battlefield Mobility

by LTC William Ryan



Do combat engineers need the counterobstacle vehicle (COV)? I say *yes*. The need has been documented by AirLand Battle mission area analysis and Army 21 requirements.

Based upon extensive Soviet use of mines and obstacles in both offensive and defensive operations, combat engineers require a survivable system for countermine and counterobstacle tasks to support heavy forces.

Today's Army relies on a number of special-purpose combat engineer and construction equipment vehicles to marginally counter the mobility threat faced by the combined arms team.

But imagine one engineer vehicle that covers the spectrum of AirLand Battle mobility, countermobility and survivability missions. That's the COV.

Mobility Enhancement

The COV excels at minefield breaching. The best way to counter any minefield is to bypass it. However, restrictive terrain or manmade obstacles blocking the avenue can make this impossible. When forced to breach, engineers have two options—attack the fuze or the mine itself.

It used to be that most mines were pressure-rod or tilt-rod activated and vulnerable to pressure rollers. Today, mines are increasingly more sophisticated. They may have magnetic or multiple fuzes capable of defeating rollers and overpressure explosive systems. These mines must be removed or destroyed.

The Army currently uses a track-width mine plow on the M1 tank to remove mines from the tank's path. While effective, this doesn't provide a safe lane for following armor forces. The COV's full-vehicle-width mineplow corrects this deficiency.

Counterobstacle mobility tasks handled by the COV range from overcoming antitank ditches at the far end of minefields to clearing urban rubble in front of the combined arms team. For its counterobstacle role, the COV has two telescopic arms and a mine plow/dozer (configured as a bulldozer blade or V plow). In the bulldozer mode, the COV's earthmoving capacity equals the D8 tractor.

The two telescopic arms (each with a lifting capacity of 14,000 pounds and a 32-foot reach) accommodate a variety of attachments. Currently under evaluation are the:

- Lifting hook
- Hydraulic hammer and pavement breaker
- Grapple
- Auger
- 1.25-cubic-yard bucket

Quick change adapters allow engineers to change attachments in three to five minutes. All attachments can be used alone or in combination, depending upon the obstacle being breached.

Designed to replace the aging Combat Engineer Vehicle (CEV), the COV excels at battlefield mobility. But countermobility and survivability missions also come standard in the COV repertoire. During tests, the COV prepared hull defilade tank fighting positions in less than 10 minutes and an antitank ditch (5 meters wide, 120 meters long) in less than two hours.

Technology Integration

The COV prototype uses the basic hull and chassis design of the armored recovery vehicle. By modifying the upper hull so the crew sits in tandem, designers made room for telescopic arms on both sides. The standard four-man crew required for the CEV was reduced to three. An escape hatch, accessible to all the crew, was added in the floor.

A standard 908-horsepower, turbocharged, air-cooled diesel engine powers the COV. A standard Detroit Diesel Allison transmission provides

The COV's two telescopic arms (left) overcome obstacles and dig tank traps. A full vehicle-width mine plow/dozer blade (below) provides a safe lane for following armor forces.

the high torque required for heavy earthmoving. A remote suspension lockout adds chassis stability for plowing, dozing and digging. The lockout blocks are positioned by hydraulic cylinders controlled inside by the crew.

External hydraulic outlets on the chassis allow engineers to use a variety of hydraulic tools as the tactical situation permits. Tools carried on board include a wrench, hammer and saw. The rear compartment contains a slave receptacle for external electrical power, a remote telephone and a searchlight.

On board, an individual, microclimatic environmental control system provides NBC protection to improve crew efficiency while reducing stress under all environmental conditions.

The combination mine plow/bulldozer blade is driven by a 400-horsepower takeoff unit that provides up to 4,000 psi of operating pressure. The bulldozer blade is controlled manually by either the driver or center seat operator using a three-axis joystick to control the blade's roll, pitch, raise and lower functions.

The mine plow normally operates automatically through a computer integrated with three ultrasonic sensors suspended 10 feet in front of the plow.

When using the automatic depth control, the driver or operator simply selects the desired plowing depth depending on the types of mines encountered. The crew observes all plow movement through a set of passive fiber-optic viewers located on each side of the vehicle. The viewers allow perfect depth control if manual plowing becomes necessary.

The mine plow system has several configurations. In the full-width plow mode, two extensions (each 1 meter long) attach at each end to clear a mine-free lane more than 12 feet wide. With extensions removed, the V plow opens a path through battlefield debris and urban rubble.

The mine plow collapses to create a full-width dozer for earthmoving requirements. On-site, the conversion takes less than an hour.

Testing

To accelerate fielding, the COV has two development phases instead of the usual three. Production of fully operational technology demonstrators in the first phase made this possible. The second phase—production prototype testing and evaluation—will begin in March 1987.

Engineer design tests were just finished at the Belvoir Engineer Proving Ground, and troop demonstrations sponsored by the Engineer School are now underway at Fort Knox. Combat engineers there are evaluating crew-training requirements and the functional utility of the mineplow, bulldozer and telescopic arms. The US Marine Corps will evaluate the COV's force-integration requirements at Quantico, VA in June.

The COV is scheduled for initial production in fall 1989.

The Engineer School is the COV user proponent. The Army Materiel Command and TRADOC designated the Troop Support Command (TROSCOM) as the COV materiel developer and the Tank Automotive Command (TACOM) as the readiness activity. TROSCOM's COV project office is at the Combat Engineering Directorate of Belvoir R&D Center to allow close cooperation between TROSCOM developers and engineer users.

An aggressive preplanned product improvement program (P^3I) covers:

- Development of improved automatic depth control;
- Robotic applications for the telescopic arms to reduce crew workload and increase operational efficiency;
- An autonomous COV when the technology matures.

As a *force multiplier*, the COV greatly enhances the mobility, countermobility and survivability of the combined arms team. It gives combat engineers and their maneuver partners a decisive edge—both on the AirLand battlefield today and the Army 21 battlefield of the future.

LTC William Ryan is the COV project officer for the Belvoir R&D Center. He holds a research and development specialty code 51 and is in the materiel acquisition manager program. He has attended the Command and General Staff College at Fort Leavenworth and the Program Managers Course at the Defense Systems Management College.

His infantry assignments include: platoon leader, 82nd Airborne Division; company commander, 173d Airborne Brigade (Vietnam); battalion S-3; and XO in the 1st Infantry Division Forward in Germany. He has also served as a ranger school instructor and a test and evaluation officer.

He has an undergraduate degree from Henderson State University in biology and an advanced degree in management from Central Michigan University.

Combat Heavy Deployment Checklist

by CPT Samuel W. Burkett

It's been a hectic week for the combat heavy engineer battalion. As commander of Company B, you are pushing to complete road construction ahead of winter rains. You are ready for the weekend when the message comes down late Friday — the battalion commander has called a meeting for 1600. It's not the first late meeting... probably more problems with trash at the motor pool.

You arrive hoping to finish quickly. But the battalion commander's announcement catches everyone by surprise. You deploy to Honduras in two weeks. Duration is unknown, but the mission is construction—roads, airfields, and temporary base camps.

Friday just became a new Monday, but you are too busy to worry about the weekend you'll miss.

With increasing frequency, Army engineers are deploying on short notice to foreign countries to build roads, airfields and base camps. Recently much of the action has been in Central America, but company commanders must be prepared for a late Friday call that could send them anywhere in the world.

When units arrive, they must be able to operate, maintain security, and complete a variety of engineer missions for extended periods of time. If important equipment or material is left behind, it may be months before the deployed unit sees it again.

This checklist offers guidelines for company commanders who must make quick decisions about what to take and what to leave behind. It is by no means complete, but provides the combat heavy battalion a basis for planning on a moment's notice. Deploying units should add and delete items depending upon the mission, shipping space, known security threat, and the commanders' preferences.

S-1. Personnel.

Material and equipment to take.

1. Typewriters and field files.
2. A field 201 file on each soldier.
3. Publications.
4. Each soldier should bring (in addition to TA-50 and uniforms):
   a. Running gear.
   b. Extra shaving and shower supplies.
   c. Stationery and stamps.
   d. Books and magazines.
   e. Other items depending on space, mission and geographical area.

Actions to accomplish before deployment.

1. Ensure each soldier has prepared a will and assigned power of attorney.
2. Secure and store privately owned vehicles (POVs).
3. Arrange storage and security of soldiers' household goods and personal items.
4. Brief dependents on:
   a. Mission (if possible).
   b. Where help can be found (Army Emergency Relief, Red Cross, chaplain).
   c. How to contact soldiers in an emergency.
   d. Information necessary for each family to conduct daily activities in spouse's absense.

Questions to ask.

1. What will mail procedures be?
2. What will the mailing address be?
3. What financial support will be provided?
4. Can personal and government checks be cashed?
5. What is the local currency exchange rate?
6. What channels will handle all types of personnel actions?
7. Will replacements be provided after the unit deploys?
8. How will replacements be processed?
9. How will emergency leave be processed?
10. How will soldiers be returned to their home station?

S-2. Intelligence.

Material and equipment to take.

1. Maps.
2. Publications.
3. Overlay material.
4. Camera.

Actions to accomplish before deployment.

1. Request and distribute maps.
2. Brief commanders and staff on weather, enemy situation and local population.

Questions to ask.

1. Where is the nearest U.S. Embassy?
2. What is the condition and capability of the road network?
3. Are there any local sources of construction material?
4. What are the dangerous animals and insects in the area?
5. Where are local water sources located?
6. Who are the host nation points of contact and coordination?
7. What is the overall situation including:
   a. Any terrorist threat?
   b. Recommended level of security?
   c. Friendly factions?
   d. Anti-U.S. groups?
   e. Attitude of host nation to U.S.?

8. What is the weather including:
   a. Average temperatures?
   b. Rainfall?
   c. Stormy/rainy season?
9. What is the terrain like including:
   a. Vegetation?
   b. Trafficability?
   c. Major features such as rivers and mountains?
   d. Types of terrain (mountainous, flat, rolling, swamp)?

S-3. Operations and Training.

Material and equipment to take.

1. Applicable publications.
2. Adequate drafting and surveying supplies.

Actions to accomplish before deployment.

1. Conduct special classes on:
   a. Radio procedures.
   b. Medical hygiene and disease prevention.
   c. Climate (cold/hot weather).
   d. Perimeter security.
2. Complete a thorough inspection of TA-50.
3. Inspect and fire all weapons.
4. Give special training to complete a specific mission.
5. Find out as much about the mission as possible.
6. Identify all soldiers that speak the language of the country.

Questions to ask.

1. What relationship will our unit have with other units (attached, direct support, general support, OPLAN)?
2. What headquarters is responsible for giving missions to engineers?
3. What types of reports will be required?
4. Are there any convoy restrictions or special procedures?
5. What is the expected mode of deployment (air, land, sea)?
6. What are the dates of deployment?

S-4. Supply.

Material and equipment to take.

1. Trash cans.
2. Cots.
3. Tables and chairs.
4. Additional tents.
5. Water cans (potable).
6. Water purification supplies.
7. Extra tools and repair parts (based on mission).
8. Construction materials (for initial construction and based on mission).
9. Sandbags.
10. Concertina.
11. Barbed wire.
12. Pickets.
13. Basic load (ammo).
14. Barber kit.
15. Toilet paper.
16. Laundry soap.
17. Athletic gear.
18. Cleaning supplies.
19. Medical supplies.
20. Pens and paper.

Actions to accomplish before deployment.

1. Complete an accurate inventory.
2. Issue each soldier supplemental TA-50 based on geographical area.

Questions to ask.

1. Are express containers and military owned containers (CONEXs and MILVANs) available for storage, shipping and security?
2. Can the priority of supply requests be upgraded?
3. What headquarters will process supply requests after deployment?
4. Who will supply fuel?
5. How will it be stored?
6. What is the location of the troop issue subsistence activity (TISA)?
7. What ration cycle will be used?
8. Who will supply laundry/shower support?
9. Who will supply water purification support?
10. Is an impress fund available for limited local purchase?

S-4. Maintenance.

Material and equipment to take.

1. Prescribed load list and authorized stockage list (PLL/ASL).
2. Extra tires.
3. Extra batteries.
4. All tools and repair equipment.
5. As many additional parts as the commander will authorize with the shipping and storage available.

Actions to accomplish before deployment.

1. Ensure all tools are on-hand and in good condition.
2. Replenish bench stock for organizational shop vans.
3. Have preventive medicine personnel inspect mess equipment and water buffalo.
4. Secure on-vehicle material in a CONEX. (It may be lost or stolen if left on the vehicle.)
5. Complete inspection and repair of all vehicles and equipment.

Questions to ask.

1. Can the priority of parts requests be upgraded?
2. Who will provide higher level support maintenance?
3. How will it be provided?
4. Are there any commercial construction equipment dealers in the development area (local sources for repair parts)?

CPT Samuel W. Burkett is working on the Carswell AFB Hospital renovation and expansion project with the Fort Worth District. He graduated from the U.S. Military Academy and completed EOBC and EOAC. He served as a platoon leader, S-1, S-2, and company XO, with the 46th Engineer Battalion (CBT)(HVY), Fort Rucker, AL. CPT Burkett deployed with the 46th on REFORGER in 1982 and to Honduras for AHUAS TARA II from September 1983 to February 1984.

Soviet Engineers in Combat

The Objective is Rapid Advance

by CPT Charles R. Boyer

The guiding Soviet principle of land warfare is violent, sustained, deep offensive action. Mechanized and armored formations, supported by aviation and artillery, are to seize the initiative at the outset, penetrate enemy defenses, and drive deeply into the rear.

To accomplish this, highly mobile, armor heavy Soviet forces will attack in successive echelons hoping to overwhelm enemy defenses—an operation that relies heavily on engineers.

The Offense

The Soviet engineers' primary mission is to clear and maintain routes to sustain rapid advance. They remove mines and obstacles, cross water obstacles, protect the flank, and aid against counterattack.

Engineers are included in all reconnaissance elements of tank and motorized rifle units. They report the condition of advance routes, providing the main body with information on assembly areas, detours around obstacles, and warnings of minefields and craters. The engineer reconnaissance patrol is equipped with portable mine detectors and route-marking flags.

The Soviets stress that water obstacles must be crossed from the march to preclude major halts in the offense. Their doctrine dictates crossings at multiple points along a broad front to overwhelm the enemy. Smoke is used extensively to mask assault crossings during daylight.

Engineers reconnoiter water obstacles to find fording sites and suitable entry and exit points for combat vehicles. Detailed terrain analysis is required for bridge and ferry sites. Reconnaissance of tank-fording sites requires divers and a tracked amphibian with river-reconnaissance devices.

Engineer river-crossing capability is found in the regimental engineer company organic to motorized rifle and tank regiments; the division engineer battalion; and special engineer battalions, regiments and brigades at army and *front* level.

Movement Support Detachments

During marches, movement support detachments (MSDs) travel ahead of

the main body, clearing obstacles reported by reconnaissance teams. They fill craters, clear mines and prepare bypasses around major obstacles.

The MSDs are task organized from divisional or regimental engineer assets based on mission and availability. They can be from platoon to company strength and are equipped with route and mine clearing vehicles and equipment. An MSD's bridging capability is normally limited to equipment required for its own movement.

A division engineer battalion can form two to three MSDs. They are employed on main routes and travel under the protection of an advance guard or forward security element whenever possible.

On other routes, the leading regiments provide MSDs from their own resources. A typical MSD at this level might consist of an engineer platoon with one or two dozers and up to three tanks fitted with dozer blades. These MSDs are protected by up to a platoon of infantry or tanks and are often accompanied by chemical reconnaissance personnel.

Breaching Minefields

Normally during an assault or rapid advance, the Soviets breach minefields using mine plows and rollers fitted to the lead tanks. Although engineers reconnoiter the minefield, the initial breaching is not primarily an engineer task.

Engineers assist in fitting the plows and rollers which are commonly used for minefield reconnaissance. These are usually employed on the scale of one per platoon of three to four tanks. The Soviets estimate clearing speeds of about 10 kilometers per hour (kmph) for plow-fitted tanks, and up to 22 kmph for roller-fitted tanks.

Combat vehicles that aren't on tank chassis must wait until the full width of the lane is cleared. This is often done by tanks with plows or rollers that tow line charges across the minefield, then detonate the charges.

The Soviets also use a mine-clearing device mounted on the BTR-50PK APC (two to each divisional engineer battalion). An explosive line charge is fired across the minefield and detonated. This clears a lane six- to eight-meters wide.

The BTR-50PK is particularly useful during assault river crossings when there are minefields on the far bank, and amphibious APCs may have to operate initially without tank support in the bridgehead. An average of four to six lanes can be expected. Of these, at least two will be developed into permanent lanes for artillery and logistics vehicles.

Mobile Obstacle Detachments

Special teams called mobile obstacle detachments (MODs) are formed from regimental and divisional engineer assets. Their mission is to rapidly mine the most likely avenues of enemy attack or counterattack. The MODs travel on the flanks of a march column or formation where they can deploy rapidly. They are normally near the antitank reserve.

Minefields are most rapidly laid using armored, tracked mine layers (three to each divisional engineer battalion). Hand emplacement and towed mine layers are also used.

Both the tracked mine layers and mine-laying trailers dispense mines at predetermined spacings of 4.0 or 5.5 meters. On suitable ground, a division's three armored, tracked mine layers can surface lay a three-row, 1,000-meter-long minefield in a half hour. In the same time, a regimental MOD's three mine-laying trailers could lay about 500 meters of minefield.

The Defense

The Soviets consider the offense the only means to decisive victory. Defense is a temporary posture leading to resumption of the offensive. The engineers implement obstacle plans (particularly antitank obstacles) to block enemy penetrations. A MOD may join antitank reserves to counter enemy tank threats. They also repair existing routes and create new routes to support maneuver forces. They respond to enemy nuclear strikes with fire fighting, structure repair and debris removal.

Mechanized earthmoving equipment is used in survivability missions to dig trenches and build revetments or shelters in areas not exposed to direct enemy observation or fire. Because self-entrenching blades are standard on many tracked vehicles (tanks, self-propelled artillery), a Soviet division could probably dig in all of its combat vehicles within three hours.

To some extent, all troops construct fortifications, shelters and vehicle revetments. However, the engineers construct the more complex fortifications.

Countermobility

During countermobility operations, engineer troops normally construct barrier systems which are coordinated with the overall system of fire. The first priority is antitank obstacles. Mechanized diggers can dig up to 400 meters of antitank ditch per hour depending on the dimensions of the ditch, soil conditions and terrain.

Defensive minefields are laid in much the same manner as flank-protection minefields. The quality and specific structure of the minefield depends upon time and terrain. However, the doctrinal guidance describes three rows of mines per belt, up to 100 meters between rows, and three belts per field, with the field covered by fire whenever possible. Additional countermobility capabilities include road cratering, wire barriers and abatis.

Conclusion

Engineers play a vital role in maintaining maneuver mobility in land warfare. The Soviet army's emphasis on rapid advance directly reflects their desire to fight and win. Their engineers are well trained, well equipped and ready.

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The Army Occupational Surveys for MOS 12B and MOS 12C will be distributed to selected engineer units in May. These surveys will gather task performance and training information from a large sampling of soldiers, E-1 through E-7, and use the data to improve combat engineer training.

Please answer each item of the survey carefully, since this is a unique opportunity for *you* to influence training.

One Year After The Green Ribbon Panel

USACE Support Of Army Installations

by Col Stephen F. Rutz and Victoria Mc Allister

"The activities managed by the installation commander's Director of Engineering and Housing (DEH) are on the critical path of nearly everything that happens on Army installations. Readiness, recruitment, retention, force structure, modernization, training, mobilization, the Army Family, quality of life — all these important elements of today's Army depend upon effective, efficient facilities engineering and housing support."

—Green Ribbon Panel Report on U.S. Army Corps of Engineers (USACE) Support to Army Installation Commanders, March 1985

In October 1984, the Chief of Engineers, LTG E.R. Heiberg III, appointed a Green Ribbon Panel of senior officers and civilians to evaluate USACE support to Army installation commanders and recommend areas for improvement.

The panel found that *"the job of providing quality, timely support is a tough one . . . one that requires excellence and teamwork on the part of both the DEH and supporting district engineer."*

Installation support is a complex, $5-billion-a-year business, aggravated by numerous regulatory and statutory restrictions. Seven areas were identified where improvement would significantly enhance support to soldiers and their families:

- USACE installation support priority
- Responsiveness and efficiency
- Policies and procedures
- The cost of doing business
- Procurement support and commercial activities
- Education, training and career development
- The scope of USACE support

What changes have been made in the year since the report? While there have been few easy solutions, there has been significant progress. Here is a status report on the major initiatives underway.

USACE Installation Support Priority

At the heart of the Green Ribbon study was the panel's finding that despite the importance of USACE's role in assisting the DEH with installation support, the mission was not adequately described in Army regulations. This left Corps districts to take a makeshift approach to installation support in comparison to their traditional military construction and civil works responsibilities. Successful installation support generally reflected the personal efforts of the staff involved rather than a clear mission definition. However, even the best DEHs and districts had difficulty communicating because the support role was poorly defined.

Echoes of this problem are present in many of the issues identified by the panel. The report concluded that *"USACE must demonstrate dedicated support and flexibility in response to DEH mission needs in equal measure to its more traditional military construction (MCA) and civil works missions. The top priority of the installation support mission must be apparent to all."*

As a result, major changes are being made to key Corps policies and Army regulations.

In February 1986, the Chief of Engineers issued new policy that makes installation support a factor in the job descriptions, performance standards and officer efficiency reports of many USACE personnel. The goal is to ensure the same attention is given to installation support that is given to other critical missions. The USACE support role to DEHs will also be described in updates to DA Pamphlets 420-6 and 420-8 and AR 420-10.

The awards program to publicize superior district support performance is in place. The first winner is being presented the award at the USACE Commanders' Conference in May.

The issue of which district should provide installation support is being evaluated for some installations. In many cases, the Corps' *direct service support* military construction district for a particular installation is distant while another civil works district has offices virtually across the street. DEHs and installation commanders frequently feel they would receive more responsive service from the closer district.

The Chief of Engineers has directed that the *direct support* responsibility be shifted to the closest district where it makes sense within Corps divisions and can be done without increasing division manpower. Manpower availability is one of the sensitive issues that will govern the extent to which changes can be made in the years ahead. The Corps is also considering possibilities for interdivisional workload shifts. The emphasis will be on making efficient use of the Corps' *brokerage system* to assign work from geographically distant *direct service districts* to *general support district* offices.

Responsiveness and Efficiency

The Green Ribbon Panel found that design, construction and operations procedures that govern district services for repair and maintenance projects must be streamlined and simplified.

The support a DEH needs to carry out a maintenance and repair project paid for by installation (OMA) funds differs significantly from the support required for major military construction (MCA) projects funded by Congress. Management control procedures do not adequately describe how the installation support relationship is supposed to work, so districts have improvised based upon conservative MCA models.

To tackle this problem, USACE is implementing a simplified set of model contract provisions for maintenance and repair contracts to be awarded this summer. Congress is also considering simplified competitive acquisition techniques that would streamline contracting procedures for projects in the $25,000 to $5 million range.

Job Order Contracting—a quick way to contract small repair jobs or *new work* projects—is being tested at five sites: Fort Ord, Fort Sill, Fort Bragg, Fort Monroe and Aberdeen Proving Ground.

An effort is also being made to improve communication and accountability on architect-engineer contracts that districts administer for the DEH. A test is under way to send architect-engineer design teams to job sites during construction to discuss problems with customers. Results are due this summer. DEHs are also being educated on options to extend one-year contracts with reliable architect-engineer firms for a second year to capitalize on experience.

USACE must demonstrate dedicated support and flexibility in response to the DEH in equal measure to more traditional military construction and civil works missions.

Policies and Procedures

The Green Ribbon Panel recognized that responsiveness is largely an attitude—a dedication to communication and teamwork on the part of the DEH, the district engineer and their staffs. Attitudes cannot be regulated, but they can be fostered by policies that encourage initiative and make the DEH/district engineer team more effective. The panel recommended several policies that are now being implemented to enhance smooth operations:

- Policy is being revised to improve flexibility in the use of K and L account money to modernize aged facilities that need major renovation or repair. The panel found the work classification criteria so restrictive that newly renovated facilities frequently fell short of modern standards in essential areas such as utilities and electrical systems, user requirements and space utilization. The new policy is being sent to major commands for staffing.
- Provisions are being made that will provide a *warranty* for qualifying maintenance and repair projects accomplished by USACE districts—similar to guarantees for MCA projects. The USACE is establishing a procedure to correct problems due to design error, construction deficiency or contractor warranty disputes that cannot be resolved by the district, the DEH and the major command. This means an installation can correct facility problems without waiting until negotiations between the district and the contractor (or ligitation) are complete. Details on the new procedure will be published this year.
- Several Army agencies such as AAFES, NAF and TSA have their own construction funds. The Green Ribbon Panel recommended that the Corps ensure that these agencies use the normal DEH master planning process to obtain new facilities. A command letter will be sent to these agencies that directs compliance with the new master planning regulation AR 210-20 and the programming procedures in AR 415-19.

The Cost of Doing Business

The panel found DEHs believe that district services for professional engineering and contract management are more expensive than in-house costs. DEHs and district engineers have different accounting methods which distort a comparison of costs for similar services. For example, the DEH in-house cost for a project does not include overhead which is carried in the overall installation account. Districts, on the other hand, must add overhead to project costs.

To clarify the cost breakdowns applied to installation support services, Engineer Pamphlet 37-1-4, *Cost of Doing Business*, is being published for distribution to major commands and divisions this fiscal year. It will help DEHs understand how districts charge for services provided as part of a reimbursable project.

A new 7.5% supervision and administration rate for maintenance and repair projects established in April 1985 is being evaluated this year to determine if it adequately covers construction management costs. If not, the rate will be adjusted.

The Green Ribbon Panel also found that procedures used to transfer funds between DEHs and districts for operations and maintenance (OMA-funded) projects are too complex. Federal statutes preclude much simplification. However, Europe Division has been using direct fund cite procedures for contracts. The Installations Finance and Accounting Office is cited for progress payments. These procedures have always been authorized. Other districts may consider this if it simplifies local administration

Procurement Support and Commercial Activities

One of the most difficult issues explored by the panel involves contract authority. The Commercial Activities Program (A-76) and DEH manpower constraints have increased the DEH's reliance on contracting without giving him contract administration authority. The Green Ribbon Panel recognized the DEH needs authority to start, stop and change a contractor's operation, and to alter the scope and dollar amount of the contract. Without it, he has difficulty responding to emergencies and unforeseen developments.

The Corps is asking to decentralize contracting control to a degree that will give the DEH authority with teeth at a time when the Army is trying to streamline, tighten and consolidate the procurement business. The new standard installation organization is consolidating contract management under a contracting officer who will report directly to the installation's chief of staff. Until the new system has been tested with the DEH's full, professional support, it will be difficult to justify further decentralization.

The Facilities Engineering Support Agency (FESA) has improved DEH training on the commercial activities program by preparing model performance work statements and sharing *lessons learned* at conferences and site visits.

Education, Training and Career Development

Professional development of the DEH work force and cross-training with district engineer staffs were major concerns of the Green Ribbon Panel. The panel found that while DEH workloads have increased and become more complicated, the size and average grade of the DEH work force has declined. The panel said the disparity in grades between the DEH and district engineer professional staffs is a deep-rooted problem that hinders successful recruitment and retention of qualified DEH personnel. Several initiatives to tackle these problems are underway.

A critical first step is to see that installation commanders and their key personnel better understand the complexity of DEH management. The *Installation Commander's Guide* has been revised to better explain and publicize the objectives, capabilities and procedures that govern installation support. Draft copies are now available. The new version will be published as DA Pam 420-XX in FY 86.

Responsiveness is largely an attitude — a dedication to communication and teamwork. Attitudes cannot be regulated but they can be fostered by policies that encourage initiative.

The disparity in job classification—the perception that civilian grade structure for key DEH management positions is lower than for their district counterparts—is being reviewed by the Army's Deputy Chief of Staff, Personnel. A review of key DEH positions at several installations will be completed this summer to determine whether changes based on managerial responsibility and work complexity are justified.

The engineer intern program is also being revitalized to add cross-training between district and DEH personnel. DEH interns will spend four weeks at the supporting district. District interns will spend two weeks with the DEH.

The entire issue of DEH training is being reviewed by a task force. Currently, training responsibility is fragmented among FESA, USAES, the USACE Training Management Division (Huntsville), ALMC, AMETA, 7th Army Training Center and others. In the meantime, the number of training spaces allotted to DEH personnel at Huntsville has been raised from 12% to 20% of the total. A pilot test of television satellite transmissions to remote classrooms to expand training opportunities is planned.

Finally, the Green Ribbon Panel recommended that career progression patterns for engineer officers be modified to give more junior officers DEH experience. The Corps needs a bigger base of experienced, knowledgeable senior officers for critical DEH assignments.

The Scope of USACE Support

The last area of the panel's report discussed the need to improve support for other types of DEH activities such as automated master planning, preparation of construction project approval documents (DD Form 1391), and support to upgrade Army Reserve Center facilities. A separate Green Ribbon Panel report on USACE support to the reserve component was recently submitted to the Chief of Engineers.

The entire issue of improved support of installation master planning and construction programming is being studied based upon the results of the *Engineer Inspector General Report on the Military Construction Design Release Process, 26 July 1985.*

Efforts are also underway to promote the research and development services and the technology transfer information available through the Corps laboratories. *One Stop* support calls to the labs have steadily increased. The Engineer Circular 70-1-13, *Research and Development*

One-Stop Service, lists more than 50 areas in which help is available along with phone numbers and points for contact.

Conclusions

Substantial improvements to Corps support of the DEH and installation commander have been made in the year since the Green Ribbon Panel report. We will be better able to measure the effects of these changes in the year ahead.

largely upon making the engineer family a family that truly cares.

The experience of the Fort Sill DEH and the Tulsa District Engineer working together in the Model Installation Program bears this out. Although the program allows ample opportunity to experiment with changes to regulation and policy, they found they were able to resolve 80-85% of the issues between them without special exemptions.

Many of the solutions being implemented in response to the Green Ribbon Panel are also the result of programs already worked out by a DEH and a district that could be shared as models for the rest of the Corps. The key to our progress is the communication and spirit of cooperation that initiatives like the Model Installation Program and Green Ribbon Panel stimulate.

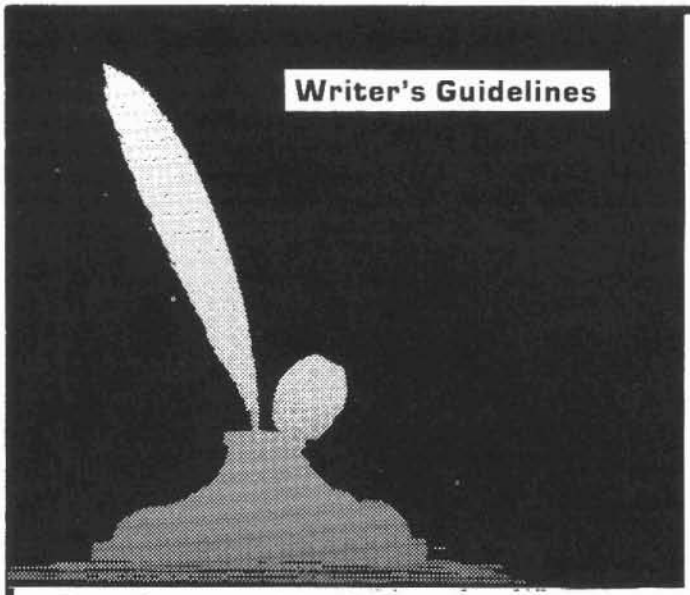
. . . the Fort Sill DEH and the Tulsa District Engineer found they had authority to resolve 80-85% of the issues between them without special exemptions to regulations and policy.

However, the most fundamental observation of the Green Ribbon Panel goes beyond changes to regulations, policy and programs. Support is an attitude—a spirit of cooperation and teamwork. Success will always depend

The Chief of Engineers has established *Leaders in Customer Care* as the theme for the engineer family. The Green Ribbon Panel initiatives are a good beginning. Your comments and observations are invited.

COL Stephen F. Rutz is chief of the Installation Planning Division for the Assistant Chief of Engineers (ACE). He served as the deputy district engineer for the New Orleans District from 1983-85. He was chief of the Facility Programs Branch for the U.S. Army, Europe (USAREUR) Deputy Chief of Staff, Engineer (DCSENGR) in 1982-83. He also analyzed the DEH organization and mission workload in Europe in 1981 as special assistant to the USAREUR DCSENGR.

Victoria McAllister is features editor for ENGINEER. She was the engineer information officer and editor of THE SCOOP for the USAREUR DCSENGR and Installation Support Activity, Europe, from 1980-85.



Do you have any articles, photographs, or artwork to submit to ENGINEER? Here are some tips.

TOPIC: We focus on combat engineering; however, any articles of interest to engineers are welcome. Write in active voice and be as concise as possible. Please give your article a title, too.

LENGTH: Let your subject dictate length; generally, articles should be two to six pages, double spaced.

PHOTOGRAPHS AND ARTWORK: Besides photographs and artwork which supplement articles, photographers and artists should submit any work that may be of interest to engineers. Your photos should be 5 x 7 black and white, glossy. (We can also use good quality color slides.) Please include a caption and photo credit. Drawings should be legible, but do not have to be camera ready.

DEPARTMENTS: We are always looking for items for our departments:

- Letters to the Editor.
- Engineer Ingenuity.
- Engineer People.
- News and Notes.
- Personal Viewpoint.

ENGINEER PROBLEM: Please submit your challenging—but not too hard—Engineer Problems. Problems should be referenced to a manual, but must be original. They should be checked for accuracy and should strengthen combat engineer skills as well.

COVER LETTER: When submitting material to ENGINEER, enclose a cover letter with your name, address, and phone number. Also, please include biographical information such as military and civilian education and past and present assignments.

If you have any questions, please call us.

(703) 664-3082, AV 354.

The Cross-FLOT Raid

Engineers in the Deep Battle

by LTC Larry Izzo

One of our Army's goals is to train as we intend to fight. AirLand Battle doctrine tells us how we think we are going to fight. It postulates a battlefield on which disruption of enemy activities in depth will be a routine feature of both offensive and defensive operations.

Unfortunately, little attention has been devoted to the use of engineer strike operations to support the main battle. In an effort to revitalize this capability, the 307th Engineer Battalion, 82nd Airborne, stages monthly night raids to destroy targets behind enemy lines. They provide tough, realistic professional development opportunities for platoon leaders and exciting training for soldiers. These raids capture the essence of the four tenets of AirLand Battle doctrine:

- ***Initiative***—setting or changing the terms of the battle.
- ***Agility***—reading the battlefield and acting faster than the enemy.
- ***Synchronization***—arranging combat activities in time and space to maximize combat power.
- ***Depth***—extension of the battlefield; planning for rear and deep operations that support the close battle.

Training Scenarios

The battalion has developed several Cross-FLOT scenarios including some in cooperation with the Corps of Engineer District in Wilmington, NC, and civilian industries: Targets include:

- The Philpott and John H. Kerr Dams—raid the power station and deny electrical generating capability to the enemy without destroying the dam.
- The AMOCO oil storage facility at Greensboro—attack the enemy POL distribution point without destroying the fuel that friendly forces plan to capture at a later date.
- Bridges and communications bunkers at Fort A.P. Hill and Camp LeJeune—demolish a native timber bridge or other structures constructed for the exercise.

Each month the battalion rotates a new platoon through one of the scenarios, giving the platoon leader a chance to plan and lead an air assault engineer raid. Time fuzes and blasting caps add realism to simulated demolitions at civilian facilities. Actual demolitions are used at Fort A.P. Hill and Camp LeJeune. An aggressor detail from the battalion is at the target to provide realism, control and cleanup assistance.

Combined Arms Team

Although the engineer battalion plans the exercise, the training is a division combined arms operation. The 33-man patrol is a representative slice of the division's combat power. Three UH-60 Blackhawk helicopters from the aviation battlion provide transportation for the patrol which typically consists of:

- An air defense artillery stinger team.
- A tactical satellite (TACSAT) communications radio team from the signal battalion to communicate with home station.
- An infantry squad for security.

SP4 Donald Wayne and SP4 Richard Whitke, 307th Engineer Battalion, storm the John H. Kerr Dam control room.

Photo by 1LT Peter F. Taylor

- Engineer elements to carry out the demolitions missions.

Pathfinders and teams from the division reconnaissance platoon are inserted near the objective a few hours to a day early. Pathfinders mark the landing zone (LZ) for the night landing and orient the patrol leader towards the objective. The reconnaissance team maneuvers close to the objective and keeps it under surveillance. They send intelligence back to home station for the patrol leader, both before and after he reaches the LZ. When available, Cobra helicopters provide fire support.

Planning Considerations

As simple as the Cross-FLOT concept sounds, the raid is challenging and complicated. As with all air assault operations, the engineer raid has four basic steps:

- The ground tactical phase.
- The landing phase.
- The enroute phase.
- The loading phase.

Planning considerations are shown in Figure 1.[1] The patrol leader also plans the engineer portion of the mission. The Cross-FLOT aspect adds to the difficulty:

- How can the patrol survive getting through the FLOT?
- What fire support can it rely on?
- What are the escape and evasion plans if aircraft are lost across the FLOT?[2]

The Mission

The exercise begins when the platoon leader and his company commander receive the battalion operations order.

Although Cross-FLOT is primarily a platoon leader's training exercise, the company commander plays an essential role. He selects the platoon and times the operation so it is compatible with the company training plan. When the operations order arrives, he coaches the platoon leader through the planning phase. During the exercise, he may accompany the patrol as an observer or evaluator. Thorough evaluation is essential to get maximum benefit from the exercise.

The decision on how much time the patrol leader will have to plan the operation is a compromise between two competing factors. On the one hand, the platoon needs time to plan and rehearse; on the other, it must be realistic in terms of what the unit would experience in battle.

The battalion found that 24 to 36 hours allows time to assemble the team, plan, rehearse, hold the air mission conference, backbrief, and insert the reconnaissance elements. It also places realistic pressure on the patrol leader and patrol. Of course, the battalion staff must coordinate use of the target facility and participation by division assets in advance.

The mission consists of:

- Pickup at a friendly pickup zone (PZ).
- Night aerial navigation to a LZ that is 20 to 100 miles off post.
- Linkup with the pathfinders on the LZ.
- Navigation to the objective.
- Reconnaissance and the assault.
- Demolition of the target.
- Movement to a nearby PZ for extraction.

The helicopters either laager in the vicinity or refuel at a nearby airport. A tactical arming and refueling point (FARP) is sometimes used. While this adds realism, it demands a great deal more planning, coordination and aviation assets.

Lessons Learned

Cross-FLOT proves Clausewitz was correct: "Everything in war is very simple, but the simplest thing is difficult."[3]

In every raid, Clauswitz's concept of *friction*—those countless, unforeseen, minor incidents which make the real battlefield so different from war on paper—is clearly demonstrated. Sure enough, patrol leaders are continually surprised by unexpected difficulties associated with air assault operations attempted at night in unfamiliar terrain.

Important lessons learned during Cross-FLOT raids include:

- Despite the use of the UH-60's Doppler system and night vision goggles, pilots frequently experienced difficulty navigating at night when traveling long distances over unknown terrain. Carefully selected routes are essential to find the correct LZ.
- Maintaining communications between the patrol on the ground and the UH-60's is difficult but imperative to correctly time the extraction.
- Detailed rehearsals are mandatory for a night operation. Without them, coordinated patrol action is impossible.
- Land navigation at night in enemy territory always takes longer than planned.
- Intelligence preparation is critical. The patrol needs reliable information regarding enemy strength at the target, nearby relief forces, and the locations of air defense enroute to and at the objective.
- Use of pathfinders and reconnaissance teams is beneficial, but they must be carefully briefed to avoid compromising the patrol early.
- Planning must be meticulous and comprehensive. It must cover aspects such as:
  - actions upon encountering enemy or civilian personnel enroute to the objective;

307th Engineers Blow Up Dam

by 1LT Peter F. Taylor

Company A of the 307th Engineer Battalion blew-up the John H. Kerr Dam on the North Carolina and Virginia border last fall during a Cross-Forward Line of Own Troops (Cross-FLOT) engineer raid.

Cross-FLOT raids train and test engineers for operations behind enemy lines.

The dam raid began when airborne engineers were inserted on a landing zone (LZ) several miles from their target by Blackhawk helicopters from the 1st Battalion, 17th Air Cavalry. From the LZ they maneuvered with reconnaissance and pathfinder support to the dam. Friendly partisans left an access door open into the guarded power station.

The engineers entered the facility and moved undetected to their objective—the dam's control room. Using simulated demolitions, they rigged and blew up the facility. They were picked up at a prearranged time by Blackhawk helicopters at a pick-up zone adjacent to the dam.

1LT Peter F. Taylor is the S-2 for the 307th Engineer Battalion.

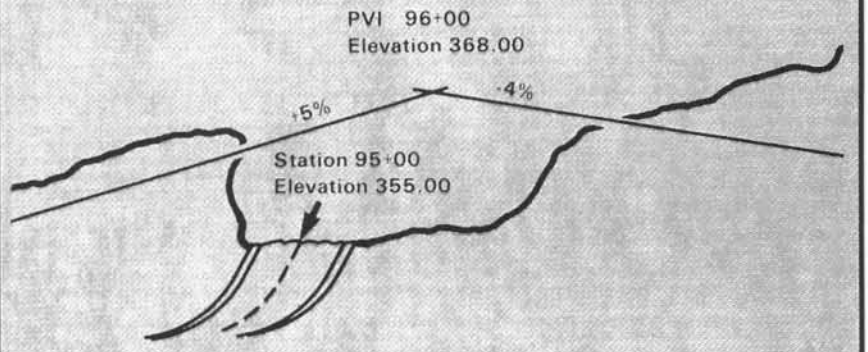
RAID PHASES

Ground Tactical Phase	How many troops will be going in? What deception plans are part of the operation (CAS, joint air attack team, feints or demonstrations elsewhere)? What time of day (or night) will the landing occur? How long will the force be on the ground? What are the contingency plans if aircraft are lost en route or at the objective?
Landing Phase	Will landing be on or away from the objective? Does the commander want to use one or multiple landing zones (LZs)? Do you want to use attack helicopters or Air Force assets to prepare the LZs? Do you want to use pathfinders to assist in landing? How many aircraft can be diverted to make false insertions, or do you want to make a series of false insertions en route?
En Route Phase	What flight corridors will be established? Can you arrange for escort aircraft (Air Force or attack helicopters)? What are the refueling and rearming requirements en route or at the objective? How are smoke and chaff used to assist in deception? Where will passage points, pilot pickup points and air control points be established?
Loading Phase	How many pickup zones (PZs) are requested? Are the air movement tables (to include the bump plan) complete? If the flight is larger than the PZ will permit at one time, where will the aircraft meet for the initial point?

Figure 1.

Engineer Problem

A new road with a PVI (point of vertical intersection) at station 96+00 and elevation 368.00 feet is to intersect an existing road whose centerline crosses the new road at station 95+00 and elevation 355.00 feet as shown below. The vertical curve of the new road must be selected to pass through the centerline elevation of the existing road.



Determine the length of vertical curve required to pass through the fixed point.

Problem/Solution submitted by Robert D. Baldwin, P.E., Roads and Airfields Branch, Department of Military Engineering.

— what to do with prisoners;
— extraction of wounded;
— fire support crossing the FLOT and at the objective.

- A thorough air mission conference is critical to success. The patrol leader should not view the helicopters as taxis, but as an integral part of the patrol. He should rely heavily on the air mission commander's expertise.

Conclusion

The 307th Engineer Battalion's Cross-FLOT raids are excellent professional development exercises for the platoon leaders who lead the patrols and great training for patrol soldiers. Combat engineers will be called upon to execute such missions as part of a total combined arms team on the AirLand battlefield. The projection of this combat power deep across the FLOT on a well-timed operation in support of the main battle ties together all four tenets of AirLand Battle doctrine.

LTC Larry Izzo is in the U.S. Army War College Advanced Operational Studies Fellowship Program associated with the School of Advanced Military Studies at Fort Leavenworth, KS. He previously commanded the 307th Engineer Battalion at Fort Bragg, NC. LTC Izzo, a 1967 USMA graduate, has a master's degree in Nuclear Engineering from MIT and an MBA from Long Island University. He is a registered professional engineer in Virginia.

Notes:

[1]CPT Ron Klein, "Aviation Employment in Special Purpose Operations," *U.S. Army Aviation Digest*, September 1984, p. 6.

[2]MAJ Charles L. Berry, "Planning Aviation Cross-FLOT Operations," *Military Review*, January 1984, pp. 34-45. This article provides an excellent introduction to planning considerations for cross-FLOT attacks.

[3]Carl von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret, Princeton, 1984, p. 119.

Command Update:
130th Engineer Battalion
Vega Baja, Puerto Rico
LTC Luis M. Carrillo-Rivera
CSM Angel Birriel-DeJesus

Awards

How do you measure professional achievement?

by MAJ Jefferson J. Irvin

When I was ten and my father was stationed in France, I recall him telling a story about General DeGaulle.

One day, while reviewing the French militia, General DeGaulle entered a village. A squad-sized town force formed up for inspection. The senior officer was a heavily beribboned colonel; the second-in-command was a colorfully decorated lieutenant colonel. They were followed by a gaudy array of majors and captains—all bedecked in military finery. Last in line was a private in a plain uniform. "What's the matter with you!" DeGaulle glowered down at him. "Can't you sew?"

A unit can easily lose control of awards. I once attended a battalion ceremony where the post's championship basketball team received the same certificate of achievement as the departing NCOs. Several of the players were under indictment for drug abuse. Not surprisingly, people tittered.

If a unit is too free with awards, soldiers dismiss them. On the other hand, there is no substitute for awards that are based on objective, measurable, professional competition. They provide a highly visible tool for documenting the achievements of those who deserve early promotion, plum professional schooling, and special end-of-tour recognition.

I became a believer the hard way. While I was a platoon leader, my best squad leader left my unit without an Army-level award. The brigade staff rejected the ARCOM citation I wrote. It read something like this:

SSG Jones was the best squad leader in Second Platoon, B Company, during the period. . . . He enforced within his squad the highest standards of barracks and personal appearance. His supervision of the Darmstadt maintenance facility, the Schweinfurt dependent school, and the Wildflecken tank turning pad construction projects resulted

in the completion of these high dollar projects on time and to a high quality. He is a great credit to B Company and the United States Army.

To me, it was a failure of personal leadership. I truly believed the man was my best squad leader. The citation, however, lacked objective evidence of achievement. My opinion alone was not sufficient to move the decision makers. I felt the rejection intensely—especially when, instead of the ARCOM, my squad leader received the same battalion certificate of achievement as the indicted basketball players that day.

How can you take care of your soldiers? How can you make sure the promotions and awards you influence don't go disproportionately to those who are adept at self-promotion, irrespective of actual performance of duty?

You can institute a command-monitored set of competitions for the company, platoon or squad that allows individuals to compete several times over a range of skills. The wider the range, the greater the probability that every individual will find a niche where he excels. Soldiers gain a sense of accomplishment. Their enthusiasm transfers to other areas, and they are more likely to reenlist. It's good for the soldier, good for the unit, good for the Army. Competitions which touch all soldiers include:

- Army Physical Readiness Test (APRT)
- NBC defense
- Land navigation/orienteering
- Marksmanship
- Weapons employment

Some competitions should test athletic skills (APRT); some should be written tests (map readings); some should be based on simple continuous expenditure of effort (personal equipment maintenance); and some should be shrewdly chosen combinations of skills (orienteering, SQT level 1 company level competitions). If the same people win every time, they may be superhuman; however, it is more likely that your competitions don't yet cover an adequate range.

By now you are saying, "Wait, this sounds administratively oppressive." But actually a routine system of competitive evaluation simplifies company supervision. It is manageable because the SQT procedure has defined objective criteria for MOS proficiency that are easily adapted for competitive testing. Tangible records on soldier performance reduce the inevitable headaches surrounding efficiency reports, promotions, selections for schooling and other contentious decisions.

Make sure everyone competes in a way that connects directly to their work (the traditional Mechanic-of-the-Month competition, for example). This is tough to accomplish considering the variety of MOSs in a company headquarters. How do you set up professional competition for the three individuals in the communications section or the two PLL clerks?

You can try one of two tacks. You can encourage the battalion to set up intercompany competitions for low density MOSs, or you can set goals the soldiers compete against. For example, have the communications personnel compete against brigade radio readiness norms that are incremented upwards to increase the challenge. When the norms are exceeded, individuals receive written recognition.

The criteria must be uniform and objective. Everyone competing must be tested under the same conditions. The evaluation criteria must be as devoid of subjective judgment as possible, as it is in the Go, No-Go SQT. Objectivity is crucial; you want competition to identify the talented, quiet and dedicated soldier who might otherwise go unnoticed among more gregarious personal favorites.

Competition may be based on announced or unannounced tests or inspections, but the award itself should not be a random event. A routine schedule of awards allows those who are competing to prepare rationally. You lose legitimacy if the Mechanic-of-the-Month award is given out sporadically in January, May and July.

Once you have competition, make sure that awards are made promptly, results are widely disseminated, and, most important, that you maintain good records.

While I was a first lieutenant, I asked my platoon sergeant, whom I admired greatly, who his best platoon leader had been. He did not, to my chagrin, flatter me but immediately named his platoon leader in Vietnam—a man who carried six notebooks into combat, hanging like medals all over him.

Why the notebooks? When soldiers performed well, he wrote on-the-spot notes that documented their achievements and won his men the recognition they deserved.

That message hit home the day my outstanding squad leader didn't receive the ARCOM I knew he deserved.

When I became a company commander I was determined not to repeat past mistakes. I established an imperfect version of the awards system described here (imperfect, in that things always become clearer in hindsight). I may have been sporadic, giving the Mechanic-of-the-Month award in January, July and September; but I kept records religiously and it paid off.

When I left, the new commander received my record of individual and unit awards, filed by individual in the company. A newly promoted staff sergeant had been the best marksman in the unit, had repeatedly bested the other NCOs in PT tests, had the best squad in ARTEP testing, and had worked on construction projects that won brigade awards. In his company file were 12 awards and letters—all from intracompany competitions or endorsements to larger unit awards. He was a quiet individual who knew his business, set high standards and made his men perform. When I met him 6 months later at Fort Belvoir, he was wearing a new Meritorious Service Medal.

MAJ Jefferson J. Irvin was an assistant professor of geography and computer science at the U.S. Military Academy in 1985. He served as a platoon leader and company commander in the 94th Engineer Battalion is Germany. MAJ Irvin has a bachelor's degree from the U.S. Military Academy and a master's degree from Stanford University. He is now a civil engineer and a major in the Army Reserve.

Engineers Join Regimental System

The Corps of Engineers will join other combat arms branches as a full participant in the Army's regimental system. The engineer regiment will be known as the Corps of Engineers.

The whole branch regiment means that all engineer officers and enlisted soldiers will be affiliated with the Corps of Engineers as their regiment regardless of their assignment.

MG Richard S. Kem, Commandant of the Engineer School, believes that the regimental plan captures and strengthens the dual sense of affiliation that engineers feel both to the Corps and to their battalion, the basic working and fighting element.

"To enhance soldier affiliation at the battalion and separate company levels, the Corps will initiate a program to highlight unit histories and accomplishments," said LTC Charles E. Olson, Chief of the Engineer Proponency Office.

Engineer officers and enlisted soldiers will wear the branch insignia. They will wear the numerical designation of their current engineer battalion above the insignia. When engineers serve in other assignments, they may elect to wear the numerical designation of one of their former engineering battalions.

The Corps' regimental home will be Fort Belvoir. When the Engineer School moves to Fort Leonard Wood in 1989, the regimental home will move with it.

The Corps is working with the Army Institute of Heraldry to develop colors and a coat of arms, or crest, that will symbolize the Corps as a regiment. The colors will be of a standard design for combat arms regiments. The crest will be worn above the right pocket on the Army green, white or blue uniform.

To symbolize membership in the Corps of Engineers, the crest will be presented to each member of the regiment, either at the Engineer Officer Basic Course graduation, Warrant Officer appointment ceremony, or Advanced Individual Training graduation. Soldiers who reclassify into an engineer specialty will receive the crest after completing an on-the-job training program or attending an appropriate military school.

The Corps regimental plan will also include designating and selecting an Honorary Colonel of the Corps and Distinguished Members of the Corps. The plan will be implemented by June 16, the Corps' 211th birthday.

Engineer Solution

A. Given: PVI at station 96+00
$EL_{PVI} = 368.00$
Fixed point at station 95+00
$EL_{FP} = 355.00$

B. Procedure: The fixed point is offset from the PVI; therefore, use the fixed point formula.

1. $\Delta G = G_1 - G_2 = 5 - 4 = 9\%$
2. $A = 96{+}00 - 95{+}00 = 1{+}00 = 1$ station
3. $GLE_{95+00} = EL_{PVI} - G_1 A$
   $= 368' - (5)(1)$
   $= 363'$

4. $Off_{95+00} = 363' - 355' = 8'$

$$L = 2\left[\frac{A + 2(Off)}{\Delta G}\right] + 4\sqrt{\frac{A(Off)}{\Delta G} + \left(\frac{Off}{\Delta G}\right)^2}$$

5. Direct substitution gives the equation:

$$L = 2\left[\frac{1 + 2(8)}{9}\right] + 4\sqrt{\frac{1(8)}{9} + \left(\frac{8}{9}\right)^2}$$

$L = 5.56 + 5.18$
$L = 10.74$ stations

Obstacles—

Engineers and Maneuver Forces Need Common Terms

Point

(continued from page 23)

engineer staff at each level provide appropriately detailed input as the maneuver plan evolves into a set of orders and control measures. If we agree on terms that let commanders clearly communicate their intent, obstacle plans will be more responsive and engineer participation early in the planning process will be guaranteed.

CPT Michael D. Baehre is attending graduate school at Rensselaer Polytechnic Institute. He has served with the 10th Engineer Battalion, 3rd Infantry Division, Kitzingen, Germany, as a platoon leader, battalion maintenance officer, company commander, and assistant division engineer. CPT Baehre received a bachelor's degree from the U.S. Military Academy and is a graduate of CAS³ and EOAC.

School News

Directorate of Combat Developments (DCD)

Thermal Sight Minefield Detection:

Testing of thermal sights on the M1, M2/3, and M60A3 tanks and the improved TOW vehicle (ITV) was conducted at Fort Knox, KY, November 18-20, 1985. Testing determined whether existing thermal sights can detect friendly and threat mines, both surface laid and buried. Evaluation results are expected by early May 1986.

M870 Semitrailer Upgrade:

Planning is underway to upgrade the M870 for transport of the T11 dozer. TRADOC is assessing operational requirements to ensure that all M870 deficiencies are considered. This list is based on an M870 system assessment and on contact with three combat heavy engineer battalions as representative users of the vehicle. Deficiencies associated with the M870 are also being identified and will be considered for repair and/or upgrade.

Ground Emplaced Mine Scattering System (GEMSS):

The GEMSS program was approved for fielding in FORSCOM and USAREUR. A total of 55 systems will be fielded in USAREUR according to a materiel fielding plan published October 1985. Initial deployment of 22 systems began in January 1986.

The M74 AP mine will not be available until fourth quarter, FY 86.

Cleared Lane Marking System (CLAMS):

The CLAMS and mounting kit for M60 tanks were type classified *standard* on September 30, 1985. The first unit equipped is scheduled for third quarter, FY 87.

The mounting kit for the M1 Abrams tank is being worked as a product improvement to the CLAMS and is scheduled for introduction into the force by third quarter, FY 88. The separate adapter is required to deflect high exhaust temperatures from the M1 turbine and to provide a unique interface with the Abrams odometer/speedometer system.

Engineer Force Structure:

Several important engineer force structure changes were approved by the Chief of Staff of the Army on November 5, 1985. Engineer initiatives in this review include the redesign of engineer combat heavy battalions and engineer topographic battalions, restructure of the 20th Engineer Brigade (Airborne), and recovery of ten roundout companies to the active component. An NTC engineer company with 200 spaces was resourced during the force structure review.

Minefield Reconnaissance and Detector (MIRADOR):

Prototypes of MIRADOR will be tested side-by-side at Fort Knox in late FY 87. This will define the state of the art in mine detection and capitalize on multisensor systems to improve accuracy, reliability and speed. Although initiated as a concept exploration, MIRADOR is the first engineer program that fits AMC's *Proof of Principle* streamlined acquisition cycle. If successful, close-in detection of mines will improve.

Reserve Component Advisory Staff (RCS)

USAR School EOAC Program:

The Winter 1985 issue described the 14-week EOAC-RC course and its two-week modules. Both of these options are still available, but there is a new USAR school version.

The USAR school EOAC program started October 1, 1985. The new course is divided into four phases. Phase 1 consists of common subjects. Phases 2, 3, and 4 consist of engineer-particular subjects.

Phase 1 can be taken at a USAR school, inactive duty training (IDT), or by correspondence. Phases 2 and 4 must be taken on active duty at Fort Belvoir. These two phases cannot be taken by correspondence. Phase 3 is available by correspondence.

The new USAR school EOAC-RC is now the only EOAC-RC taught by the USAR schools. The new EOAC-RC phases equate to the old phases as follows:

New EOAC-RC Phase	Old EOAC-RC Phase
1	I, III
2	VI
3	IV, II
4	V, IA

For more information, contact your USAR school, your Personnel Management Officer at ARPERCEN (800) 325-4987, or the RC Advisory Staff at Fort Belvior (800) 336-3095, extension 4166.

ARPERCEN:

A new organization, ARPERCEN, was created when RCPAC and ARPERCEN combined on November 5, 1985. ARPERCEN is a field operating agency of the Office of the Chief, Army Reserve (OCAR).

School News

Defense Mapping School (DMS)

Cartography Courses:

A redesigned Basic Cartography Course (BCART) for MOS 81C places greater emphasis on map revision techniques using the Zoom Transfer Scopes (ZTS). The course, implemented last fall, retains instruction in map base construction and color separation. The course has been shortened from 56 to 53 academic days, and the number of classes has changed from 10 to 5 per year.

The Advanced Cartography Course (ACART) has also been redesigned. Implemented in January, this course is 41 academic days.

Department of Military Logistics (DML)

CMF 63 Subfield Restructure:

A revision of the special purpose equipment repair subfield in CMF 63 has been approved. The revision will improve the overall maintenance of power generation, engineer construction, utilities, quartermaster, and chemical equipment. It will also enhance the utilization, supervision, promotion opportunities, career progression, professional development, and retention of soldiers in the affected MOS.

The revised subfield establishes a new "capper MOS" of 52X (special purpose equipment repairer) for use only at skill level 4 (E-7). It will be the capper MOS for 52C (utilities equipment repairer), 52D (power generation equipment repairer), 52F (turbine engine driven generator repairer), and 63J (quartermaster and chemical equipment repairer).

The revision realigns the career progression of:

- MOS 62B—construction equipment repairer. At skill level 4, 62B presently is fed by 52C, 52D, 52F, and 62B. The revision eliminates the feeder MOS progression for the 52 series. 62B will progress from skill level 1 through 4.
- MOS 63J—quartermaster and chemical equipment repairer. 63J presently progresses from skill level 3 (E-6) into 63H (track vehicle repairer) at skill level 4. The revision redesignates all 63J skill level 3 positions as MOS 52C. Skill level 3 for 63J will be eliminated after TAADS documentation and personnel reclassification are complete.

The new MOS data for 52X reflects in the October 1985 update to AR 611-201, *Enlisted Career Management Fields and Military Occupational Specialties*. Personnel reclassification guidance can be obtained from Commander: USAMILPERCEN, ATTN: DAPC-EPL-O, 200 Stovall Street, Alexandria, VA 22332-0400.

Directorate of Training and Doctrine (DOTD)

Doctrine and Tactics Training (DTT):

The New Equipment Systems Division coordinated Doctrine and Tactics Training (DTT) to coincide with the mid-February fielding of the M9 armored combat earthmover. The training teaches the combat capabilities of the M9 and gives doctrine for employing the equipment.

The DTT provides guidance to the first unit equipped with the M9, the 13th Engineer Battalion, 7th Infantry Division, at Fort Ord, CA.

Formerly called New Organization Training, DTTs are a vital part of the TRADOC/AMC systems support strategy for fielding new equipment.

Department of Military Engineering (DME)

Construction Management Training:

Mobile training teams (MTTs) in construction management are available from the Engineer School. These teams consist of subject matter experts who will instruct, observe and evaluate both active and reserve component engineer units. Primary services offered are assessment of construction management proficiency and presentation of training to acceptable standards.

Units desiring MTT assistance should contact SFC Richard Brown, Nonresident Training Division, DOTD, (703) 664-3008, AV 354.

Units that conduct their own training on construction management can obtain exportable training packages (ETPs) from the Engineer School. The ETPs consist of student workbooks, lesson plans and student practical exercises. Lessons are also available on video cassette or a 33mm slide/cassette recorder combination.

For more information on these construction management ETPs, contact CPT Chuck Horn or CPT Tim Devens, DME, (703) 664-3272, AV 354.

The Engineer School has purchased several software packages in project management. The purchases were based on extensive evaluation of software on the market today and information from the Construction Engineering Research Laboratory (CERL).

For more information on these software packages, contact CPT Chuck Horn, DME, (703) 664-3272, AV 354.

School News

Directorate of Evaluation and Standardization (DOES)

Lessons Learned:

Two Lessons Learned products are available from the Engineer School.

- *Task Force Engineer, Combined Arms Integration Package*—designed to assist the engineer unit in combined arms training. It offers some train up ideas for units preparing for an exercise and a sample briefing to assist in starting an early working relationship with maneuver commanders and staff. Units identified to attend an NTC rotation have already been sent a copy of this package.
- *NTC Lessons Learned Quarterly Newsletter*—offers a condensation of combined arms lessons learned from observation at NTC.

Requests for Lessons Learned products should be sent to Commandant, USAES, ATTN: ATZA-ES, Stop 271, Fort Belvoir, VA 22060-5271. POC is CPT Craig Tavani, AV 354-4172.

TRADOC USAR Schools Affiliation Program:

The Engineer School and five USAR schools became formally affiliated October 1, 1985. The affiliation program ensures TRADOC and FORSCOM that USAR school instruction is of excellent quality and conducted by competent instructors using the best and most current instructional materials.

The Engineer School is affiliated with:

- 1155th USAR School, Edison, NJ
- 2059th USAR School, Bethlehem, PA
- 2070th USAR School, Fort Belvoir, VA
- 2071st USAR School, Owings Mills, MD
- 2072nd USAR School, Philadelphia, PA

New Directions for EOT:

The Engineer Orientation Team (EOT) has taken steps to provide even better service to engineer field units. When preparing for a visit, the team asks the unit commander and his staff for ideas, issues and concerns. The EOT staff then tailors the team to the unit's needs by gathering subject matter experts from the directorates and training departments of the Engineer School.

The EOT visits units—battalion and above— every two years, but commanders may request a visit from the team at any time. The Engineer School encourages reserve component engineer units to submit requests for an EOT visit.

Requests should be addressed to the Director, Directorate of Evaluation and Standardization, Stop 271, Fort Belvoir, VA 22060-5271 or call SFC David M. Rexrode, AV 354-3668.

Correction:

EOBC/EOBC-RC Class Schedule FY 86

The report date for class 7-86 is 10 August 86.

Past in Review

by Dr. William C. Baldwin
Historical Division, OCE

The 58th Engineer Treadway Bridge Company experimented with airdrop techniques to span this 22-foot gap during the retreat from the Chosin Reservoir, December, 1950. Photo: U.S. Marine Corps

Engineers in the Korean War: The Bridge at Koto-ri

When the North Korean army attacked South Korea in late June 1950, it quickly pushed the surprised South Korean and American forces into the southern tip of the Korean peninsula around Pusan. The Inchon Landing behind North Korean lines in September launched a United Nations counteroffensive which drove North Korean forces toward the Yalu River, the border with Communist China.

As part of this counteroffensive, American troops landed on the eastern coast of North Korea in October and moved north to the 4,000-foot plateau around the Chosin Reservoir. In late November, Chinese troops launched a massive counterattack which forced United Nations units to withdraw from the frozen, rugged terrain of North Korea. U.S. Army engineers played an important part in this withdrawal.

Surrounded by Chinese troops, the 1st Marine Division and elements of the 7th Infantry Division fought their way south from the Chosin Reservoir to the village of Koto-ri. Fourteen thousand troops, including 2,000 from the Army, had to withdraw over a narrow road which dropped over 3,000 feet through a treacherous pass.

About three miles from Koto-ri, the road ran along the side of a steep cliff and crossed a bridge next to a gatehouse. The gatehouse covered four steel pipes which carried water from the reservoir to the turbines of a power plant in the valley below. Because the gatehouse had no floor, the bridge was the only means for crossing the steel pipes.

Recognizing the importance of the bridge, Chinese troops had destroyed the original bridge and two replacements built by Army engineers, leaving a gap of 22 feet. Withdrawal of American vehicles, tanks and guns required spanning this gap.

Marine and Army engineers concluded that bypassing was impossible and that the small assembly and launching space, in addition to enemy fire, ruled out the use of a Bailey bridge. Although they had never tried the technique before, Army engineers decided to experiment with parachuting sections of a treadway bridge from the air.

The 58th Engineer Treadway Bridge Company was in Koto-ri, and two of its bridge trucks were operational. Only two days were available for experimenting with the airdrop techniques. On the first day, the tests failed when the bridge sections crashed to the earth. An Air Force expert on airdrops had larger parachutes flown in from Japan during the night, and the airdrops on the second day were successful.

On December 7, Air Force C-119s released eight treadway sections—twice as many as needed—over Koto-ri. Only one section was damaged when its parachute failed to open. Engineers loaded the sections onto the 58th Bridge Company's trucks and on December 9, rebuilt the abutments and laid the treadways in three hours. Throughout the night, a steady stream of troops and vehicles crossed the span, headed for the port of Hungnam and evacuation to the south.

Rumors about the bridge near Koto-ri brought American journalists to the site, and their dramatic reports made the span, according to the Marine Corps account of the campaign, "the world's most famous bridge for the moment." Some stories were fanciful, implying that the treadways had parachuted into position on the abutments. Yet the reality was still impressive. Engineers devised an innovative solution to a tactical problem, tested it in a short period of time, and applied it under difficult circumstances. The bridge at Koto-ri played an important part in the legendary Marine withdrawal from the Chosin Reservoir.

Suggestions for further reading:

E. L. Rowny, "Engineers in the Hungnam Evacuation," *The Military Engineer* 43 (Sept.-Oct. 1951): 315-19.

Lynn Montross and Nicholas A. Canzona, *The Chosin Reservoir Campaign, U.S. Marine Operations in Korea, 1950-1953* (Washington, D.C.: Government Printing Office, 1957).

ENGINEERS AT VALOGNES
by John Scott

U.S. Army Center of Military History