Engineer

THE MAGAZINE FOR ARMY ENGINEERS

NUMBER 1, 1983

MODERNIZING THE ENGINEERS

HIGH-TECH MINES □ ARMY 86 ENGINEERS □ COUNTERMINE FOR THE AIRLAND BATTLE

Equipment Repair Technicians— OUR FORGOTTEN ENGINEERS?

by CW3 Curtis R. Millner

We have a serious problem with assignment and training policies for Engineer warrant officers. Noncommissioned officers coming into the engineer equipment repair field lack relevant experience and training, even though we are getting the cream of the crop.

Jumping from E-7 to WO1 is a great increase in responsibility, but because it's such a small increase in pay, few E-7s apply for warrant duty. As a result, we accept E-6s from related MOSs who show potential and a willingness to learn.

We give these inexperienced warrants a little training in the basic course (not all attend), send them to a unit and expect them to function. The Advanced and Senior Warrant Officer Courses teach a lot about being a staff officer but little in the way of technical material. Unfortunately for the warrant, commanders expect warrant officers (unlike privates and second lieutenants) to be experts, technical experts who can pass along their skills to others in the unit.

Nobody likes to be embarrassed, so what happens is that new warrant officers avoid duty in combat heavy engineer units. They get themselves assigned to support or staff jobs and stay there. There are some solutions to these problems that will help all engineer units, be they combat, combat heavy or bridging units.

First of all, the guidelines in DA Pamphlet 600-11 must be followed more closely. That's where MILPERCEN can help us. Secondly, we've got to take better advantage of training opportunities. There are numerous civilian maintenance schools that offer intense technical courses that directly relate to the duties of an engineer equipment repair technician. These courses are offered (sometimes free of charge) by most equipment manufacturers. This kind of training should be exploited to augment the Army's training programs. Whether it's Army or civilian training, getting our warrants technically qualified must be a Corps-wide priority. Maybe with the proper assignment patterns and good technical training more equipment repair technicians would stay in the Army past 20 years. Longer retention rates would give us greater expertise in maintaining our increasingly complex equipment and reduce our warrant officer procurement needs.

As MG Ellis has stated in "Clear the Way" (Summer 1982), we must consider the career development of engineer soldiers of all ranks. Let's be sure we don't forget our warrant officers. To have the best Army in the world, we need top-quality maintenance people who have had the best training available. So far, we haven't done justice to our engineer equipment repair technicians. That must change because no matter how sophisticated our equipment becomes, if it doesn't work, it doesn't fight.

CW3 Curtis R. Millner is the engineer equipment maintenance officer for HHC, 548th Engineer Bn., Ft. Bragg, N.C. He was previously assigned to the 249th Engineer Bn. in Karlsruhe, Germany. CW3 Millner has completed the Basic, Advanced and Senior Warrant Officer Courses, the Supply Management Officers Course and Maintenance Management Course. He has a B.A. degree in general studies from Columbia College, Columbia, Mo.

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On the cover:

The cover photo shows prototypes of the M9 Armored Combat Earthmover being built at a Pacific Car and Foundry Co. facility in Renton, Wash. The M9 is a key part of the Army's effort to modernize the combat engineers. (Photo courtesy of PACCAR)

FEATURES

DEPARTMENTS

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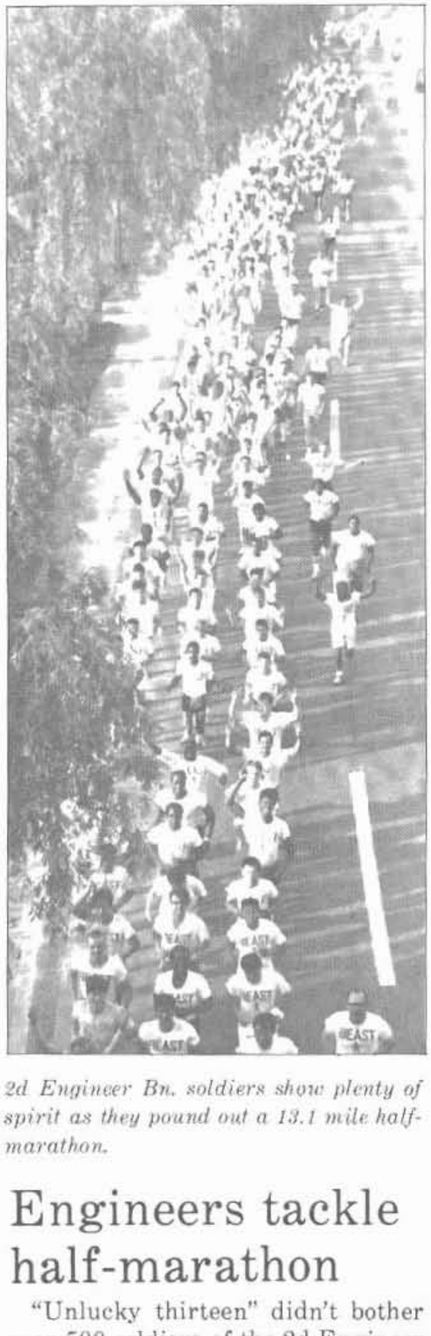
News & Notes



2d Engineer Bn. soldiers show plenty of spirit as they pound out a 13.1 mile half-marathon.

Engineers tackle half-marathon

"Unlucky thirteen" didn't bother over 500 soldiers of the 2d Engineer Bn. at Camp Casey, Korea, who ran 13.1 miles (a half-marathon) from Uijongbu, a nearby town, to Indianhead Field at Camp Casey.

LTC C. Hilton Dunn Jr., then-battalion commander, wanted the half-marathon to be as much a mental challenge as a physical one. "About 90 percent of you are physically ready now, but only about 60 percent are mentally prepared," Dunn wrote to his soldiers. (Dunn is now director, Department of Military Engineering at Fort Belvoir, Va.)

The engineers met the challenge and took two hours and two minutes to run the distance in platoon formation. They far exceeded Dunn's goal of 90 percent of all runners finishing. He had planned to award trophies to the platoons finishing without any runners dropping out. Five platoons of the 19 entered tied for the honor — S1 Section, HHC 2d Engineers; A Co.'s 1st platoon; C Co.'s 2d and 3d platoons; and E Co.'s 3d platoon. □

Ten MOSs close to women

About 140 women are in the 10 Engineer Military Occupational Specialities (MOSs) closed by the Women In The Army Policy Review Group report. The report was approved by Secretary of the Army John O. Marsh, Jr. Women currently in these MOSs will not be reassigned, according to DA spokesmen. At the end of their tours they will either re-enlist for other MOSs or leave the Army. The vacated slots will be filled by men.

Of the three Engineer Career Management Fields, CMF 51 (General Engineering) is the only one affected. CMF 12 (Combat Engineering) is already closed, and CMF 81 (Topographic Engineering) is still open.

Ten entry-level MOSs in CMF 51 have been closed to women because of the combat exclusion policy, not because of the physical strength tests conducted during the review. The closed MOSs are:

82B — Construction Surveyor
52G — Transportation and Distribution Specialist
00B — Diver
51K — Plumber
51R — Interior Electrician
51B — Carpentry and Masonry Specialist
62H — Concrete and Asphalt Operations
62E — Heavy Construction Equipment Operator

Six entry-level MOSs and four supervisory MOSs are still open to women in CMF 51. They are:

51G — Material Quality Specialist
81B — Technical Drafting Specialist
52E — Prime Power Production Specialist
51M — Firefighter
51C — Structure Specialist
62F — Lifting/Loading Equipment Operator
51T — Technical Engineer Supervisor
51H — Construction Engineer Supervisor
62N — General Engineer Supervisor
51Z — General Engineer Supervisor

Two other engineer MOSs are also open:

51N — Water Treatment Specialist (will soon transfer to Quartermaster)
53B — Industrial Gas Production Specialist (Reserve components only) □

Engineer in NATO olympics

An Army Reserve engineer officer and two teammates captured third place in a NATO military olympics at Fort Meade, Md. The competition was sponsored by the Interallied Confederation of Reserve Officers and held in conjunction with the Reserve Officers of America's annual congress.

2LT Daniel Walker, Boulder, Col., teamed with CPT Jon Nealon, San Antonio, Texas, and Marine Reserve CPT William Pospisil, Sea Girt, N.J., competed against other three-man teams from Canada, Denmark, France, Germany, Italy, the Netherlands, Norway, the United Kingdom, and America. The Norwegians took first place, but less than 50 points separated them from Walker's team.

In 1981, Walker won first place in the competition's novice division.

During the first event of the three-day olympics, the competitors fired the rifle, pistol, and submachine gun of the host army. Walker fired the M3 "greasegun" and his team placed second.

The second day they ran a 500-meter standard NATO obstacle course, then within an hour swam a 50-meter water obstacle course. Walker's team took third.

The third day's event was a 15-kilometer obstacle course. One team member navigated while the others carried the weapons they fired the first day. Walker was team orienteer, and they placed second. □

Walker scrambles up a ladder on the standard NATO obstacle course. (Jon Fory Photo)

It's an easy trip from South Dakota to Nebraska on the first ribbon bridge to cross the Missouri River. (SDARNG Photo)

Army team bridges Missouri River

An old sea chanty sings of longing to "cross the wide Missouri." They didn't find a beautiful Indian maid, but the 200th Engineer Ribbon Bridge Co., South Dakota Army National Guard, and the 509th Engineer Ribbon Bridge Co., Fort Riley, Kan., combined resources near Jefferson, S.D., to build the first ribbon bridge across the Missouri River.

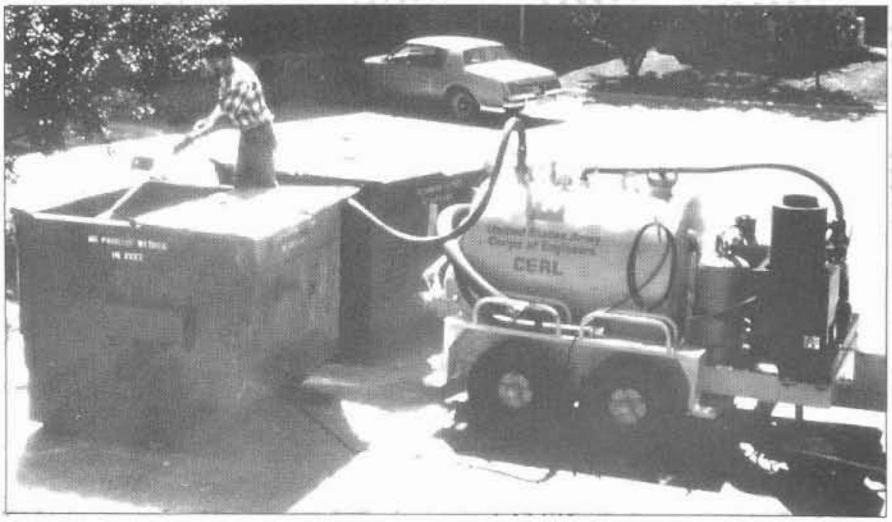
"We asked the 509th to train with us because neither of us has enough bridge sections to do it alone," explained MAJ Arthur K. O'Conner, S-3, 109th Engineer Group. "We chose the Missouri River because it's the best bridging site in the area and its water speed is about the same as the Rhine River in Germany."

The Guardsmen and active soldiers experienced few problems as they bridged the 810-foot river in about 90 minutes. They used two 15-foot towers to anchor the bridge, reinforced by a D7 bulldozer and several heavy trucks. To test the bridge, three self-propelled howitzers from the South Dakota Guard's 147th Field Artillery Bde. totalling about 65 tons were driven across the bridge.

"I was proud of the way the National Guard and regular soldiers teamed up and cooperated to accomplish the mission," said CPT Robert L. Johnson, 509th commander. "I was especially impressed with the National Guard and the job they do. They're thoroughly professional."

About 300 people gathered to watch the exercise, including the South Dakota Adjutant General MG Duane L. Corning, the U.S. Army Readiness Region VIII commander, MG Robert Riscassi, and the 937th Group commander, COL Ralph T. Rundle (now director of Training and Doctrine at Ft. Belvoir, Va.) □

News & Notes



CERL's Portawasher saves money by cleaning dumpsters in place.

CERL cleaner saves big bucks

During the first six months of 1982, Fort Leonard Wood, Mo., saved about $9,240 cleaning dumpsters using the Portawasher designed by the Army Construction Engineer Research Laboratory, Champaign, Ill. The Portawasher uses high-pressure hot water cleaning equipment and a vacuum system to retrieve dirty wash water.

Under the previous contract, Fort Leonard Wood paid $12.50 to truck each dirty dumpster out and a clean dumpster in to replace it. With the Portawasher's in-place cleaning capability, the cost was reduced to $3.26 per dumpster, a 74 percent saving. ☐

Engineers have best maintenance

Not every Army unit believes logistical readiness is just an individual responsibility. B Co., 54th Engineer Bn. Wildflecken, Germany, turned team and individual logistical readiness into a unit award winner.

B Co. was judged the best unit in the U.S. Army Europe (USAREUR) for the first Department of the Army annual Unit Maintenance Award program in the immediate category.

This award is given to a unit with an outstanding organizational maintenance program using available resources. The winning unit must also maintain an unusually high state of readiness at all times.

The competition was based on accomplishments from Oct. 1, 1981 to Sept. 30, 1982, focusing on training, management, cost and innovation.

B Co. had won the best maintenance posture in the 54th Engineer Bn. in 1982 and they were the brigade's nominee for the Medium Maintenance Company of the Quarter.

One innovation Bravo Company used is the Commander's Certification Program which identifies weak supervisors. Another is their six-month vehicle identification program which tells platoon leaders what vehicles are coming up for service and forecasts the parts needed. With this program, B Company can determine if they have everything to complete the services.

B Co.'s incentive programs include the Mechanic of the Quarter, Driver of the Quarter, and Maintenance Platoon of the Quarter. ☐

Pounding swords into plowshears

"They shall pound their swords into plowshears, and their spears into pruning hooks. . ." These words from Isaiah refer to turning combat-related military equipment to peaceful civilian uses, and C Co., 84th Engineer Bn. (Combat) (Heavy) takes the idea seriously. The engineers from Schofield Barracks, Oahu, Hawaii, built a military bridge near the finish line of the Honolulu Marathon for use by civilian and military news media who were photographing runners finishing the grueling 26.2 mile event.

The bridge was an M4T6, commonly used in field situations to span short gaps. ☐

Two win Tudor

CPTs David Bedey and Michael Biering have received the 1982 Tudor Award for Academic Achievement in Military Engineering.

The award honors Ralph A. Tudor, a 1923 West Point graduate, who distinguished himself in military and civilian engineering. It is presented annually by the Engineer School to the outstanding graduate of each Engineer Officer Advanced Course year group.

Bedey, Class 1-82, also earned the School's physical fitness award. Biering, Class 5-82, was also a full-time trainer for an Engineer Officer Basic Course platoon.

Both officers had grade averages of over 97 percent and received the Society of American Military Engineers Award of Merit as outstanding graduates of their class. Bedey, a civil engineering graduate from Montana State University, is in the 76th Engineer Battalion (Combat) (Heavy), Fort Drum, N.Y. Biering, a 1978 West Point alumnus, is a graduate student at the Georgia Institute of Technology.

Itschner, Sturgis Awards given

Chief of Engineers, LTG Joseph K. Bratton, has announced the winners of the 1982 Itschner and Sturgis Awards.

The Itschner Award, named in honor of a former Chief of Engineers LTG Emerson C. Itschner, is awarded annually to the engineer company which best symbolizes the Corps of Engineers. The Society of American Military Engineers (SAME) gives the award to units in the active Army, Reserve, and National Guard.

Company D, 249th Engineer Bn., 18th Engineer Bde., Karlsruhe, Germany was named the 1982 active Army Itschner Award winner. HHC, 458th Engineer Bn. (Combat) (Corps), Johnstown, Pa., was named as the Reserve winner; and Co. C, 153d Engineer Battalion (Combat), Parkston, S.D., was named as the National Guard winner.

The Sturgis Award, named in honor of LTG Samuel D. Sturgis, is presented annually by the SAME to an outstanding Army enlisted member. This year's award went to SFC(P) Michael L. McGuiggan, Co. D, 802d Engineer Bn., 2d Engineer Gp., Camp Humphreys, Korea.

The awards were presented by Bratton at the 116th Annual Engineer Dinner, May 13, 1983, at Fort Belvoir, Va. □

Correction

"Garbage in, garbage out," they say in the computer business. If your HP41c calculator has ordered you to submerge and launch Trident missiles at Tasmania, you've probably fed it the typographical errors in the programs on page 32 of ENGINEER Magazine, Fall 1982.

Item 69 under the "Input/Output Subroutine" should be "-=". Item 21 under the "Main Road Cratering Program" should be "SF00." □

Low-water crossings make swampy areas at Ft. Polk passable at all times.

Polk engineers fight heat to build

Bad weather, Louisiana heat and field training exercises couldn't stop the 588th Engineer Bn. from building three low-water crossings at Fort Polk.

The engineers took week-long field trips to the Peason Ridge training area to finish the project in three months. They countered the Louisiana heat with standard hot-weather techniques, such as having plenty of water at the work site. They also worked from 6:30 a.m. to 8:30 p.m. with a mid-afternoon break to avoid working during the hottest part of the day.

The low-water crossings they built are concrete roads constructed over culverts in low-lying areas. The culverts drain water that would normally make the areas impassable during rainy weather.

The three crossings in the Peason Ridge training area required 165 soldiers to build. The troops were from all five of the battalion's companies, plus C Co., 34th Engineers, a company permanently assigned to the 588th. The crossings should last 20 years, according to Battalion Commander LTC Philip R. Harris. □

One of "John Henry's Men" helps pull MAB sections. (Betty Bell Photo)

Hell on Water

"Hell on Wheels" raised "Hell on Water" as the soldiers of Co. E, 17th Engineer Bn., 2d Armored Div., launched their Mobile Assault Bridges (MABs) into the Arkansas River.

The ARTEP (Army Training and Evaluation Program) was the final phase of a month-long mission to give the soldiers experience operating MABs in fast rivers like those in Germany.

The ARTEP followed three weeks of intensive training at Fort Chaffee, Ark. During the ARTEP, "John Henry's Men" conducted tactical maneuvers which included operating their amphibious vehicles at night. (The battalion is nicknamed after John Henry, the legendary "steel drivin' man".) □

by MG James N. Ellis, Commandant, U.S. Army Engineer School

MODERNIZING THE COMBAT ENGINEER

As we discussed in the last issue, each ENGINEER will have a specific theme of topical interest to all Army engineers. This issue features "Modernizing the Combat Engineers." I think it's a very appropriate topic because the American combat engineer is entering a new era, a time when we will truly have the means to "clear the way" for the maneuver units of Army 86.

We are aggressively addressing engineer force development on all fronts. As you read our theme articles contributed by the School's Directorate of Combat Developments (pages 10 through 24), you will see we are on a clear azimuth toward making engineers an important and integral part of the AirLand Battle force. To keep ahead, we are writing new concepts which lead to doctrine changes. New doctrinal manuals (FM 5-100 *Engineer Combat Operations* series) are already on their way to you, the user. Fielding the M9 Armored Combat Earthmover, the new Ribbon Bridge Erection Boat and the Small Emplacement Excavator are just the beginnings of engineer equipment modernization that will take place in the next 10 years. To keep pace with the equipment modernization we are changing our TOEs.

New Emphasis

Emphasizing the need for engineer modernization to senior Department of the Army personnel has contributed to this engineer resurgence. This highlighting began with the Systems Program Review (SPR) in April, 1981. It developed an "Action Plan" focused on combined arms mobility - countermobility - survivability capabilities and deficiencies on the AirLand and contingency battlefield.

Future combat developments are building upon SPR results, which provide the foundation for the engineer Mission Area Analysis (MAA). The Engineer School has MAA proponency for combat support, engineering and mine warfare. The MAA is becoming the definitive statement of the engineer support the Army needs for the AirLand Battle.

Top Priority

Finishing the analysis has been our top priority, and we completed it early this year. Follow-on publications are in progress. Virtually the entire engineer community was involved in portions of the analysis—the Corps' laboratories, the chief's office, the Engineer Studies Center, all of the School at Fort Belvoir—plus elements of DARCOM and TRADOC.

We believe the analysis will be the basis of our road map for future engineer combat developments and will provide the Army with a pegging point to measure engineer contributions to the total force.

Finally, I emphasize that the thrust of our effort is to enhance total force effectiveness. Our words and actions must demonstrate unity. Our thoughts, plans, and modernization process must focus on ensuring engineer readiness on the future battlefield. We need your assistance and advice as we . . .

CLEAR THE WAY

by CSM O.W. Troesch, U.S. Army Engineer Center & School

NEW CHALLENGES FACE NCOs

We noncommissioned officers play a critically important role in the reception, introduction and training required to support the modernization of engineers.

MG Ellis's "Clear The Way" article notes that there will be new equipment, new doctrine, and new mine warfare techniques introduced in the next few years. Whenever a force modernization effort takes place, it places a great training burden on us NCOs.

The impact is felt immediately when the new equipment arrives. Doctrinal changes have less effect on the NCO and soldier, except in how we train and provide support for maneuver units. So our mission as NCOs and trainers is to "bridge the gap" so our soldiers fully accept new equipment, rapidly learn to use it, and clearly understand its purpose.

Getting Ready

The reception phase normally begins when the S4 informs battalion/company commanders the new equipment is scheduled to arrive. Commanders should then brief the NCOs about the equipment, so we can prepare ourselves and our soldiers for the coming changes.

Concurrently, we must start our own training, or participate with the chain-of-command training, in the use and maintenance the new equipment requires.

We have a large responsibility, not only to train our soldiers to operate and maintain new equipment, but to make sure they understand personnel changes it may cause. In our training effort, we must clearly define the new equipment's benefit to the company, platoon and squad missions. If we don't, soldiers will never understand why the equipment is there and will be reluctant to accept and use it. Fear of the unknown is an area we NCOs must overcome with our training programs. We must ensure the engineer family speaks with one voice.

Dirty Hands

Last but not least, we NCOs must make sure we fully comprehend how to maintain our new equipment. We must be willing to get our hands dirty in the unit maintenance section learning everything that must be tightened, cleaned, and serviced. Then we must train our soldiers to perform this vital function.

As we modernize the Army and the Corps of Engineers, we NCOs have a key mission as both users of new equipment, and trainers of those who use it. I ask all of you to accept the challenges as we move toward the Army of the 1990's. We must prepare ourselves and our soldiers for the AirLand Battle concept. Between equipment developers and the soldiers who use the equipment, we NCOs must . . .

BRIDGE THE GAP

School News

Directorate of Combat Developments

DCD and the Future: The Directorate of Combat Developments (DCD) is helping improve engineer organization and equipment to meet modern battlefield requirements. This thrust is on track due to improved intra-Army communications, top management recognition of engineer needs and a highly dedicated work force.

Featuring DCD activities in this edition of ENGINEER Magazine is a welcome opportunity. Although the feature homes-in on mobility, countermobility and, to some extent, survivability, DCD is actively addressing engineering and topography functions as well. More on these in future editions.

Directorate of Training and Doctrine

ENCOA and EOBC Changes: The Engineer NCO Advanced Course is now 14 weeks and is taught as two courses (CMF 12 and CMF 51). Each has a six-week common phase, an eight-week MOS phase, and small-group practical exercises, including the critical path method, communications and NBC, T/O constructions, and a tactical exercise without troops at Manassas Battlefield. A final two-day engineer stakes problem tests all ENCOA skills.

The Engineer Officer Basic Course now has 77 more training hours. The largest is part of a three-week field phase at Fort A.P. Hill where students learn tactics, mine/countermine warfare, demolitions and weapons, and other subjects. They return to Fort A.P. Hill for one week at the course's end to practice ARTEP tasks.

Directorate of Training Developments

SQT Changes: In February, a comprehensive testing program replaced the three-component SQT. It has a hands-on common task test, a unit hands-on MOS evaluation, and a refined written test.

The hands-on common task SQT is administered to soldiers E-7 and below, and as directed to the Guard and Reserve. The answers are available to commanders for mutual scoring, but results are not used for personnel management. The common task SQT is administered using checklists in the *Soldier's Manual of Common Tasks.* HQDA annually selects tasks for the common task SQT, which can be administered anytime during the year.

The MOS-specific hands-on evaluation contains critical tasks recommended by proponent schools. These hands-on evaluations are administered by the unit using checklists found in the *Soldier's Manual.* Results are not reported to TRADOC or HQDA, so the MOS-specific hands-on evaluation is not part of the soldier's SQT score.

An MOS-specific written test for each MOS skill level determines individual proficiency. It tests representative combat and/or mission-essential tasks, and takes about two hours. The written SQT test period has been shortened

Directorate of Training Developments, cont.

from six to three months. Printed FOUO answers are provided to commanders for all written tests. They permit local scoring for immediate feedback so commanders can correct training weaknesses.

This written test is the SQT score used by promotion selection boards.

Directorate of Engineer Force Management

Enlisted Actions: The Directorate of Engineer Force Management (Provisional) (DEFM) is involved in several actions affecting engineers.

For results of the Women in the Army study and how it affects engineers, see "News & Notes," page 2.

Analysis of enlisted selection board results are going to the field. Command awareness briefings are also being given to EOBC, EOAC, Precommand Course, and ENCOA.

12B NCO Course: A Basic Technical Course is being developed for 51H and 62N.

Combat eligible personnel in MOS 51H, 51B, 51C, 51K and 51R can attend 12B Basic NCO Course.

Physical Profiles: Physical profiles in CMF 51 and 81 have been upgraded. Personnel must meet fitness and weight standards, provide a current photo, and review and update records before the selection boards meet.

Proponency Question Line: Call the Proponency Question Line, (703) 664-4172, AUTOVON 354-4172, with suggestions, questions or comments.

Defense Mapping School

Topo Support Teams: The Army has revised topographic doctrine from scientific terrain studies to quick, combat-oriented analyses. Engineer terrain teams in division, corps and army HQs provide rapid overlays and terrain information for planners.

Direct support division teams, led by a warrant officer (MOS 841A), have five men with a van of equipment. Direct support teams (35 men) and general support theater army teams (27 men) are commanded by majors and provide broader support.

New MOS: In March 1983, new MOS 81Q (terrain analyst) replaced MOS 81CE5. A Basic Terrain Analysis Course (BTAC) will begin in FY84 to train them. An Advanced Terrain Analysis Course (ATAC) began in June 1983 for NCOs.

Warrant Training: In 1979, warrant officer training opened for topographers with the Terrain Analysis Course. Terrain analysis technicians must be terrain analysts, complete the BTAC and ATAC, and apply for warrant officer and MOS 841A.

THE STATE OF THE COMBAT ENGINEER

by COL P.R. Hoge & LTC P. Stevens III

Measuring the state of the American sapper—the combat engineer—requires not just taking his pulse, but measuring his whole system, his job on the battlefield, and the team he supports.

Our most likely battle has two probable characteristics: It will be far away where we are least prepared to go, and it will be much less intense than a battle in Europe. The least likely battle—but the worse case—will be against Warsaw Pact forces in Central Europe. We must be ready for both battles. Their requirements, however, are not only different, but in part mutually exclusive.

The combat engineers' role on these battlefields is precisely what it's always been—altering the ground to our advantage and to the enemy's disadvantage. However, that has new and ominious importance. The Warsaw Pact is organized and trained to overwhelm their foe with massed forces supported by enormous firepower. If we can't use the terrain, we lose a key factor the commander could use to influence the battle's outcome.

Combined Arms Tasks

To describe the combined arms tasks as they relate to the ground, we use the terms mobility, countermobility and survivability. These are not just engineer tasks; they are the business of the whole combined arms team.

Mobility is clearing the way for movement and maneuver. It is breaching minefields, reducing obstacles, and crossing dry and wet gaps.

Countermobility is the reverse—delaying, impeding, or blocking the enemy's movement. Obstacles are created with mechanical or explosive earthworks or minefields.

Survivability is digging in for protection—preparing fighting or protective positions for the maneuver and artillery elements, or for logistic and command activities.

Why are these battle tasks more critical today than in the past? Because the Warsaw Pact's tactics and capabilities are well known. To defeat them, or others using their tactics, requires the total integration of time, troops and equipment through the doctrine called the AirLand Battle. Striking quickly and deeply, seeing the battlefield and slowing the foe to create windows of opportunity are absolutely key to AirLand Battle doctrine. Failing in any one of those areas could result in total mission failure.

Our freedom to maneuver, to delay and block the enemy, and to dig in to survive the first blow and keep fighting are more important to the AirLand doctrine than to any other fighting concept ever practiced by our forces. While the combat engineer is the principal planner and actor in the mobility—countermobility—survivability arena, they must be practiced by the entire combined arms team because there will simply never be enough engineers to do the job alone. In light of this urgent need, what is the state of the engineer and the team he supports?

Army Modernization

We are experiencing unparalleled hardware modernization. The bow wave of post-Vietnam research, development and acquisition is reaching the field. Foremost among our new weapons stands the M1 Abrams tank. Its cross-country speed is so great it literally leaves the rest of our forces behind. Using the Abrams' mobility while not forcing it to fight out front alone is an enormous challenge. It is a particularly vexing problem to the sapper who must clear the way for the task force.

For example, the Warsaw Pact will make vast use of mines. Add to that our own scatterable mines and we find the most insidious problem on the battlefield—countermine operations. We don't have a countermine detection or breaching capability adequate to support armor mobility. Mines do not merely destroy armor; they paralyze the entire attacking force. They require breaching, by-passing or bulling through.

This countermine deficiency is viewed by many as our most serious, but it's not the only one. Consider gap crossing—in highly mobile warfare a simple gap can render our speed useless. The combat force engineer is better equipped here than for countermine but our combined arms hardware is increasingly heavy and appears to have gone away from organic fording or swimming ability.

Breaching obstacles under fire requires equipment suited to the task. The venerable D7 bulldozer on its lowbed transporter is a capable tool for many jobs, but isn't suited to clearing the way in stride and under fire.

Those are just a few areas in which we need to improve. Other problems include obstacle construction, explosives, and digging capability.

Bangalore & Probe

The combat engineer is equipped today much as he was in World War II. Major technological advances are visible in armor, infantry, artillery and aviation, but the sapper still fights with his dump truck, 'dozer, grader, or D-handled shovel. For countermine operations, we still use the probe or bangalore torpedo-type line charges of World War II vintage. This is simply too slow and ineffective for combat breaching under fire.

The Warsaw Pact recognizes the importance of countermine operations and has fielded rollers, plows and rocket propelled line charges mounted on tanks. They have an impressive counterobstacle vehicle—a tank with a moveable blade on the front and an articulated arm on the turret ring to lift and remove obstacles while under fire.

Surprisingly, the U.S. engineer was better off in many respects during World War II than he is today. Then we had rollers, plows, and even rocket-propelled line charges to clear minefields. Obviously, there was a clear need. Why not today?

Engineers lacking the ability to move, operate and to survive on the battlefield results primarily from a lack of priority for these capabilities. Our Army has not fought on a battlefield since the Korean War where extensive countermine, counterobstacle and gap crossing operations were required. Because we haven't *fought* this way, we haven't *trained* this way.

No Gut Feeling

The lack of training in mobility, countermobility and survivability within the combined arms team is more insidious than simple ignorance. An entire generation of maneuver arms officers and NCOs lack the gut feeling for the requirement to do these tasks. As they have advanced in grade, this deficiency in their tactical sense has encouraged ignoring the problem. They don't ignore it maliciously, it's just that they don't understand. So, in the Pentagon's budget drills, the engineer has been a frequent loser. We, the Army, simply haven't funded the research and development or procurement to solve the problem.

Our engineer hardware deficiencies are not totally the result of the Army not appreciating the problem. The engineer has had trouble articulating those needs. For example, countermine operations consist of detection, breaching, proofing and marking. When we argue for building hardware which solves only one aspect of the problem, we've not only failed to meet the need, but also failed to describe the battlefield concept.

To solve the complex problems of mobility, countermobility and survivability, certain combat engineer needs are paramount. He must be quick to keep up with the combined arms team and to do his job in stride and under fire. He must survive to get the job done at all. And he must be strategically deployable to support the light force.

While the picture isn't completely bleak, it needs improvement. One thing is obvious: The combined arms team must train together. Realistic training is fundamental to building a successful team. We can't ignore rivers and assume them away in training. We must place and breach minefields using realistic training mines and battle drills to penetrate them. We must accept such exercise delays because the delays on the battlefield will be more serious. We must build and breach obstacles and not simulate them with tape. And we must dig protective positions and show their benefits to the battle team.

Getting Better & Smarter

On the hardware side, we must be smart and build concept-based equipment fitted to a clear and well-defined need and it must be simple and programmable in the budget.

What, then, is the pulse of the combat engineer? Pretty strong and lively. There's a lot going on; the combined arms team has begun thinking of its mobility, countermobility and survivability needs. This has an impact on both field training and Pentagon budget priorities. So it's a good pulse and the sapper must keep it strong by integrating himself into the combined arms team. The whole team needs to continue to look to its engineers for advice and action. Only then can we be ready to fight and win.

COL P.R. Hoge is the director, Directorate of Combat Developments (DCD), U.S. Army Engineer School. LTC P. Stevens III is a student at the Army War College and served previously as chief, Development Division, DCD.

ENGINEER HOTLINE

Problems, questions, and comments relating to engineer doctrine, training, organization, and equipment can be addressed telephonically to the U.S. Army Engineer School's "Engineer Hotline." The Hotline's auto-answer recorder operates 24 hours a day, seven days a week. Callers should state their name, address and telephone number, followed by a concise question or comment. You'll receive a reply within three to 15 days. The Hotline is not a receiving agency for formal requests.

Call commercial (703) 664-3646; WATTS 800-336-3095, extension 3646; or AV 354-3646.

Determining engineer requirements for the AirLand Battle

THE COMBAT ENGINEER MISSION AREA ANALYSIS

"The analysis will serve as the cornerstone for combat engineering during the next decade."

By MAJ Don A. Shuey

As part of the TRADOC Mission Area Analysis Program, the Engineer School recently conducted a Mission Area Analysis (MAA) examining the combat engineer support required for AirLand Battle operations.

The concept for the MAA originated from Office of Management and Budget (OMB) concerns over the manner in which the defense establishment conducted the materiel acquisition process. Directives from OMB, through the Defense Department, established general guidelines for conducting such analyses. Department of the Army established a set of mission areas and delegated certain areas to TRADOC. Then TRADOC translated these generic DA categories into twelve separate mission areas to be studied by various schools and centers.

The objective of the analyses is to identify what must be done on the 1990 battlefield (missions, functions, and tasks), examine the projected capability to perform these tasks, uncover deficiencies in that capability, and propose corrective actions. Corrective actions are categorized into doctrine, organization, training, and materiel, focusing on the least costly approach.

The Engineer School has responsibility for the Combat Support, Engineering and Mine Warfare (CSEMW) MAA. This title caused some confusion; therefore, the first analysis task developed a clearer understanding of the CSEMW mission area. The CSEMW MAA addresses these actions:

- Mobility operations
- Countermobility operations
- Survivability enhancements
- General engineering
- Topographical services

The topic "Engineers as Infantry" was added because fighting as infantry is the engineer's secondary mission. When exercised, it affects completion of their primary missions. The original scope was to include only corps and below. That was extended to include echelons above corps because of the engineer interrelationships required from corps level and above to support the forward battlefield.

The battlefield missions were examined regarding command and control, communications, training, logistics and an area called human dimensions. The MAA also examined opportunities to use technological breakthroughs. The final product will be the most comprehensive analysis of combat engineering to date. It will include rank-ordered deficiencies and recommended solutions supporting a development plan. The analysis will serve as a cornerstone for the combat engineers for the next decade.

The USAES Directorate of Combat Developments coordinated information from not only the Engineer School, but also from TRADOC, DARCOM, OCE, the Defense Nuclear Agency, the Defense Mapping Agency, selected MACOM engineers, and outside experts.

Analytical tools were utilized throughout the analysis. Computerized force-on-force combat models and wargames such as *Battle* and *Carmonette* became important methods to evaluate combat operations. Combat simulations highlighted deficiencies and compared proposed alternative corrective actions. Tactical exercises without troops provided useful planning information, as did tests at Army schools. Additionally, questionnaires were sent to engineer units, major commands and to general officers to further assist in the results. Specific analyses for CSEWM MAA were conducted at the TRADOC Systems Analysis Agency, Construction Engineer Research Laboratory, Waterways Experimentation Station, and in conjunction with the Close Combat Heavy MAA at Fort Knox. A map exercise at Fort Belvoir with USAES, 9th Infantry Division, and 20th Engineer Brigade (Combat) (Airborne) personnel was also used to enhance and supplement other analyses.

A coordinating draft of the main report (plus an executive summary) was submitted to TRADOC and other interested agencies in January 1983. The draft development plan for implementing MAA initiatives was submitted to TRADOC in March; general distribution of the final report was in May.

"The final product will be the most comprehensive analysis to date of combat engineering."

The Combat Support, Engineering and Mine Warfare MAA provides a coordinated, logical and consistent direction for future engineer planning and programming. It emphasizes which resources must be applied so the Army can fight effectively on the AirLand Battlefield.

Together with the other 11 MAAs, TRADOC will prepare a battlefield development plan to assist the Army in materiel acquisition actions and to influence DA long-range research and development objectives.

MAJ Dan A. Shuey is chief, Evaluation Branch, Evaluation and Analysis Div., Directorate of Combat Developments, U.S. Army Engineer School. He has served as commander of E Co., 10th Engineers, and as S1 of the 2d Engineers in Korea. He has a bachelor's degree in business administration from Park College and is a graduate of the Engineer Officer Advanced Course and Airborne School.

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Nina Foster *Administration*
Betty Walsh *Assistant LT Assignments*
Roxanne Smith *Assitant CPT Assignments*
CPT Meredith Temple *LT Assignments*
(Rear), MAJ Charles Rust *MAJ Assignments*
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ARMY 86 COMBAT ENGINEERS

Army 86 organizes the Army to fight the AirLand Battle. Here is how the engineers fit in.

by MAJ Richard Kanda & CPT Thomas P. Swaim

The Army 86 study is intended to give the Army an improved organizational structure, one tailored to execute AirLand Battle tactical doctrine with advanced weapons and equipment. The study encompasses the entire Army, from the foxhole through theater level.

Such modernization is long overdue. The last major Army reorganization was in the early 1960s when we went from the PENTOMIC to the ROAD organizations. Army 86 organizations are designed to win on the 1990s battlefield.

Army 86 Combat Engineers

After extensive study, including review of previous studies and field reports, some general building blocks have emerged for combat engineer actions in Army 86:

- Take advantage of new technology and integrate new equipment.
- Improve command, control and communications.
- Orient on combat tasks—mobility, countermobility, and survivability—to support maneuver forces.
- Support independent operations forward-orientation, and self-sufficiency.
- Improve our deployability.

When all these factors are combined, we see an Army 86 combat engineer who needs speed, survivability and deployability to support the combined arms team.

Heavy Division 86

Heavy Division 86 was the first Army 86 study and set the stage for all that followed. Heavy Division 86 will replace the current armored and mechanized divisions. Force designs for the organic combat engineer battalion and its line companies are shown in Figures 1 and 2.

The design's highlights are:

- Equipment systems:
  - Mobility: M9, ROBAT, AVLB, CEV.
  - Countermobility: GEMSS, M9, CEV.
  - Survivability: SEE, M9, CEV.
- Organizational changes:
  - Brigade engineer staff sections.
  - Water points to DISCOM.

HEAVY DIVISION 86, ENGINEER BATTALION

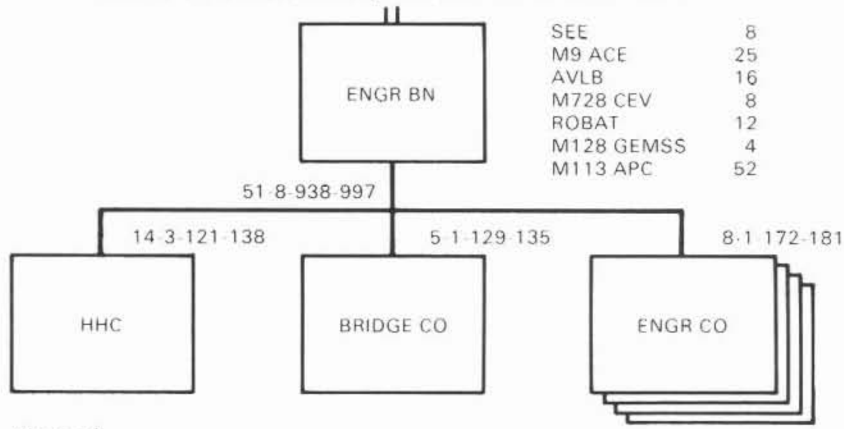

Figure 1

*PROPOSED

- Equipment from HHC to line companies.
- Mobility/countermobility platoon with new equipment.
- Support platoon provides a maintenance warrant officer.

This new combat engineer organization is a significant improvement because most combat capability and self-sufficiency are forward in the line companies.

The M9 can cut combat trails (mobility), bulldoze an antitank ditch (countermobility), and dig hull-down positions (survivability). It allows us to move and to survive with the force we support.

The new Robotic Obstacle Breaching Assault Tank (ROBAT) and consolidating all divisional AVLBs in the battalion will give us unprecedented capability to breach obstacles. ROBAT allows us to conduct assault breaches of minefields under fire without breaking stride. It can sense a minefield then breach, proof, and mark a path through without operators aboard.

Developmental work is complete on SLUFAE, a standoff minefield breaching system. Current plans are to hold it in a production-ready status, available if war occurs.

Our ability to lay mines with GEMSS makes us much more responsive and productive than with current methods. Also improved is controlling and coordinating combat engineer activities where the battle is being fought.

The Army chief-of-staff approved implementation of this new organization beginning in Fiscal Year 1983. The transition will be phased, based on availability of equipment like the M9 and ROBAT.

Army 86 studies show the need for more host nation support.

Light Division 86

Light Division 86 examines the infantry, airborne and air assault divisions and is still in progress. In December 1981, the Army chief-of-staff ordered a new organization fielded by Fiscal Year 1985 called the High Technology Light Division (HTLD).

The significant features are:

- Mobility: M9, MICLIC, LAB, light equipment package.
- Countermobility: GEMSS, M9, VOLCANO, light equipment package.
- Survivability: SEE, M9, light equipment package.
- Organizational changes: Same as Heavy Division 86, plus:
  - Brigade engineer staff section in maneuver brigade HHC.
  - Bridge company deleted.
  - Light assault company with light equipment package added.
  - Entire battalion C141 transportable.

Many aspects of the HTLD combat engineer battalion were tested by the 9th Infantry Division High Technology Test Bed at Fort Lewis and Yakima, Wash. These tests validated the Small Emplacement Excavator and M9 and provided impetus to accepting the brigade engineer concept. (See page 31 for an in-depth look at the 9th Infantry Division's 15th Engineers.)

VOLCANO, an accelerated development program, provides a lightweight, helicopter or truck-mounted mine emplacement capability.

Combat engineer battalions organic to the Airborne/Air Assault Divsions 86 are just emerging from the conceptual stage; extensive coordination with field commanders is still in progress. These engineer organizations will be standardized as much as possible. Current force designs contain light equipment for assault airstrip work, incorporate developmental equipment for light forces, have staff engineer sections in maneuver brigade HHCs, and consist of four line companies. There is a design constraint of 625 personnel per engineer battalion.

Corps 86

Corps 86 coordinates and sustains the AirLand Battle while the divisions fight it. Heavy Corps 86 organization and structure was based on a European scenario. A Southwest Asia scenario was used in the initial force development for Contingency Corps 86. Four other contingency scenarios will develop a light corps for worldwide deployment.

Army 86 studies and previous analyses support the requirement for five combat engineer battalions per division in a corps. Table of Organization and Equipment 5-45, Combat Engineer Battalion, Corps (Mechanized), was recently approved.

The requirement for this new organization has been long recognized. When fielded, it will improve

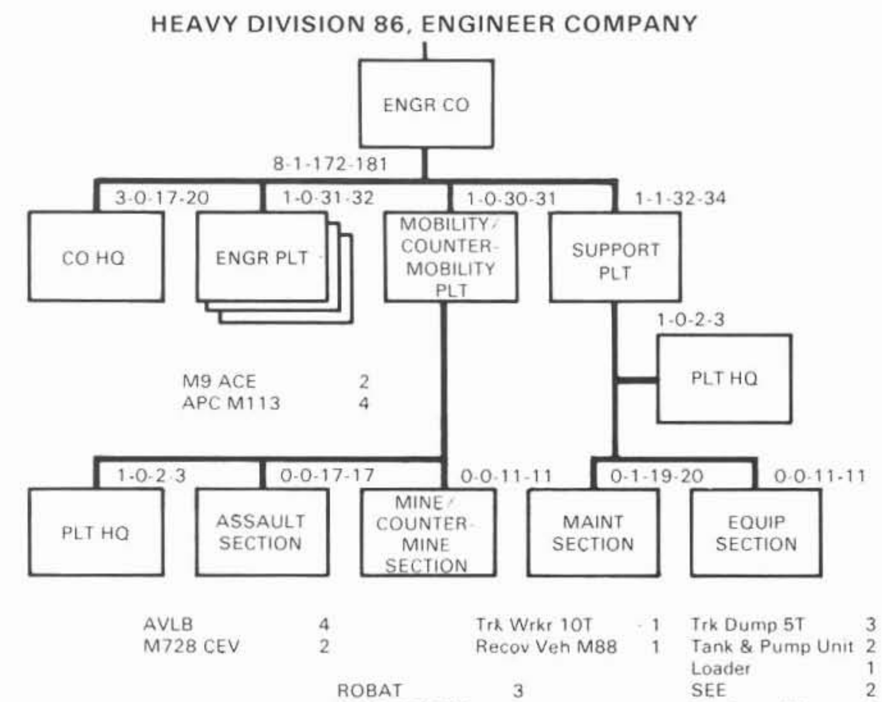

Figure 2

our combat power. Actual fielding is tied to availability of APCs and other equipment. The unit looks very much like the heavy division engineer battalion minus the bridge company.

When considering a five division corps in the European theater, the required engineer force in Figure 3 results. In contingency situations, there are requirements for critical specialized support, which for forward-deployed forces would be provided by theater army or host nation support.

Deployability constraints dictate an austere force. Trading heavy combat engineer battalions for corps combat battalions plus combat support equipment companies, and introducing an airborne light-equipment company, was dictated by these constraints.

The corps design for engineer support to three light divisions employed in Southeast Asia is shown in Figure 4. Refinement of this force design is continuing with analysis of contingency corps employment in other scenarios.

Echelons Above Corps 86

The Echelons Above Corps (EAC) 86 study examines combat and combat service support at the theater army level. The primary goal is to permit Corps 86 to orient forward to conduct combat operations.

EAC combat engineers support the corps with general engineering in the communications zone (COMMZ) and provide mobility-countermobility-survivability support in the combat zone for maneuver forces. Specialized support required by the logistics support base in the COMMZ is also handled by the EAC engineer force.

Topographic support from division to theater army level is provided by engineers from the EAC 86 engineer topographic battalion.

Results of the EAC 86 study for Europe and emerging results in the contingency corps study, indicate significant engineer shortfalls. Increased use of host nation support and developing contractor support is required. Contract procurement and management by the Corps of Engineers could reduce some shortfalls.

Host nation support is dependent on detailed advance planning and coordination in peacetime to ensure that critical engineering services, equipment, and materials are provided at the right time and place. (Engineer operations at the theater army level are detailed in FM 100-6, *Support Operations (Coordinating Draft)*, November, 1981.)

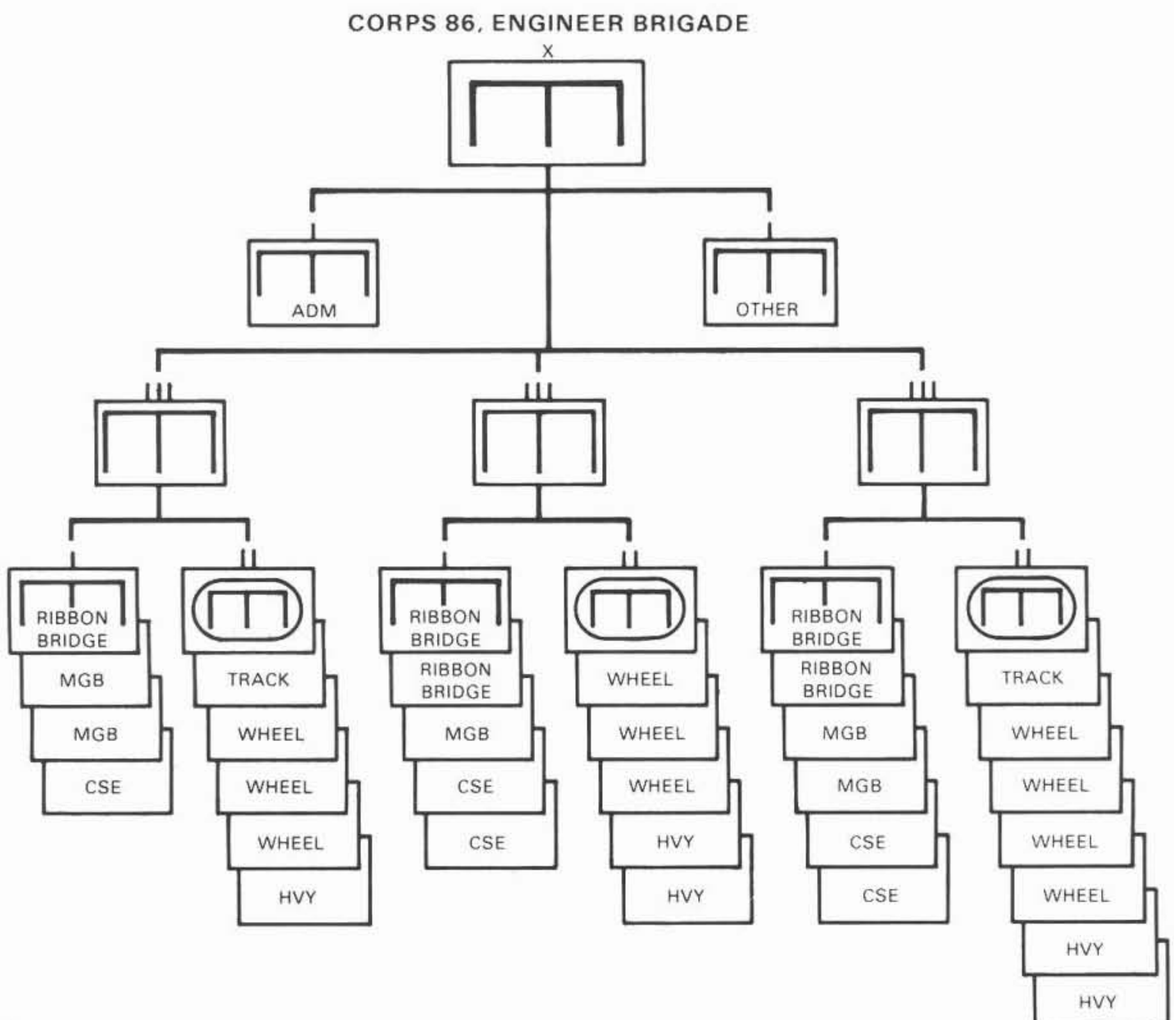

Figure 3

CONTINGENCY CORPS 86, ENGINEER BRIGADE

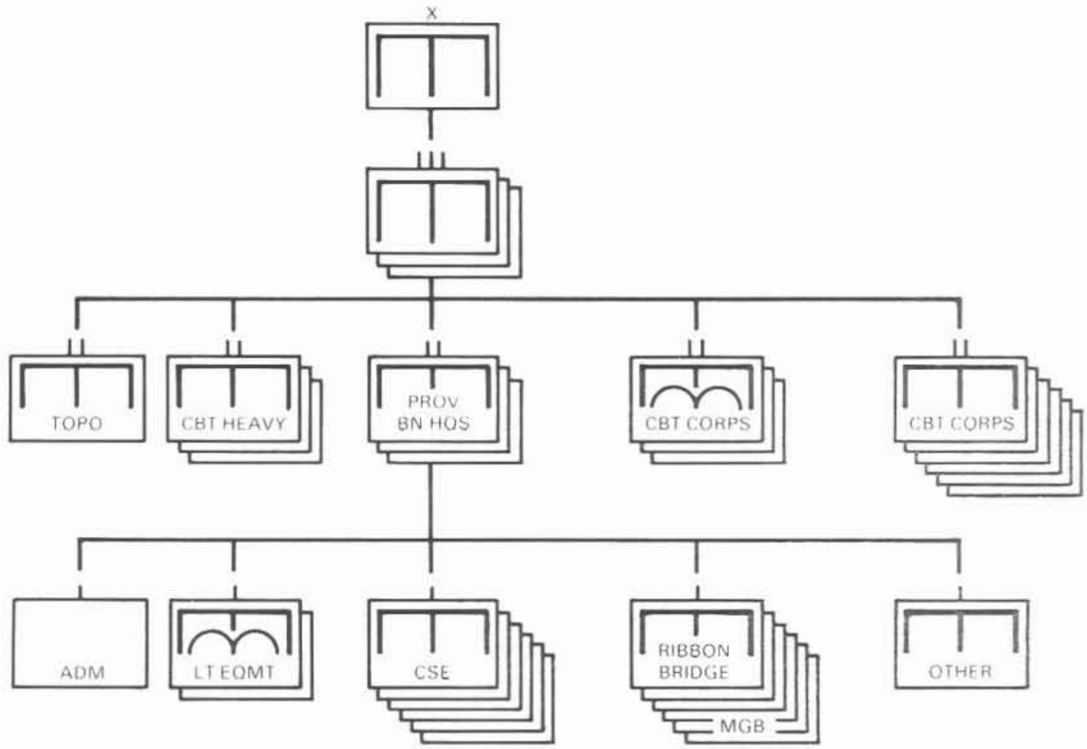

Figure 4

Combat, 1990

Army 86 combat engineer organizations are being designed to meet the challenges of combat in 1990. New equipment will allow us to orient on the critical mobility-survivability tasks. Command and control and self-sufficiency have been improved. As Army 86 engineers, we will be able to keep up with, survive with, and best support the combined arms team.

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Writer's Guidelines

In response to queries from prospective authors, we pass along the following ENGINEER writer's guidelines:

TOPIC—Although our focus is upon combat engineering, any subject of professional interest to the Corps is welcome. It is always best to query first since an article similar to yours may have appeared already or may be scheduled for a future issue. Please title your article.

LENGTH—Length is not as important as content. Let your subject matter dictate length. Most ENGINEER articles range from 1,000 to 3,000 words.

PHOTOGRAPHS AND ARTWORK—Photos and drawings strengthen your article, and in some cases are vital graphic aids to conveying your message. Photos should be black and white, glossy, and, preferably, at least 5" x 7". We can also work from good quality color slides. Drawings must be legible but need not be "camera ready."

COVER LETTER—Please include a cover letter with your name, address and a phone number at which you can be contacted.

NEWS & NOTES—We're always looking for contributions here, especially those with photographs. Your TASO or public affairs officer will be able to provide photographic support.

Finally, we'll work with you on polishing your writing skills. The most important criteria for an ENGINEER article is the story it tells and the professional growth it stimulates in your fellow engineers.

We look forward to seeing your article in a future issue of ENGINEER.

MINES AS A COMBAT MULTIPLIER

A new generation of remotely delivered mines is revolutionizing land-mine warfare.

By MAJ John D. Pawulak
&
CPT James C. Loo

Mine warfare is in a major transition. New high-technology (high-tech) mines have added new dimensions to mine warfare and to the battlefield.

Traditional doctrine of placing large linear minefields between opposing forces at the forward edge of the battle has been replaced by concepts to use mines against enemy units *anywhere* on the battlefield. Remotely delivered high-tech mines could revolutionize land-mine warfare by their on-the-spot capability. These technological advances will complement existing conventional mines and provide commanders greater ability to restrict enemy movement without impeding friendly mobility.

Before Vietnam, our mining capability consisted of antitank (AT) and antipersonnel (AP) mines developed for World War II. These mines still compose most of our land mine inventory. Their size, weight and the time required to emplace them cause logistical and operational burdens. Great tonnage is required for placement, and the manpower and time requirements they demand would be a serious liability during the swift AirLand Battle.

This doesn't mean hand-emplaced mines don't have a place on the battlefield. They are still required during prehostilities in demilitarized zones, and in protective barriers around installations and fighting positions. However, to meet the objectives of land-mine warfare—to fix, delay, disrupt and channelize enemy first-echelon and follow-on forces—more dynamic, rapidly emplaced mines are required.

The M56

During the Vietnam War, more than 40 new mines were developed, but only the M56 Antitank Helicopter Mine Dispensing System was fielded.

The M56 is a unique concept: A mine randomly emplaced and surface exposed. It consists of a control panel, wiring harness and two externally mounted SUU-13 mine dispensers. Each dispenser has 80 antitank mines. The entire system is mounted on a utility helicopter. The mines are ejected and arm on ground impact. Minefield density is determined by the dispensing rate and aircraft speed.

While there are advantages to this mine, it does have serious limitations. There is no self-destruct option and no antipersonnel capability. M56 mines are pressure fuzed only so they lack full-width kill capability.

A helicopter delivered system is also limited by aircraft availability, weather and ground fire. No further M56 procurement is scheduled, making the system obsolete. These drawbacks limit the commander's flexibility and do little to reduce the logistical and operational problems of mine warfare.

New doctrine in the AirLand Battle and AirLand Battle 2000 greatly reduces the feasibility of traditional mine warfare, including use of the M56. On tomorrow's battlefields, we must fight deep and close-in, rapidly emplacing mines anywhere they enhance favorable engagements. Improved remotely delivered mines can serve as a key combat multiplier. A number of new high-tech mine systems capitalize on the M56's emplacement capability and reduced logistical requirements, while adding several improvements.

Mines now being fielded or developed have short self-destruct times (under 24 hours) and AP capabilities. Antitank mines have magnetic influence fuzes, making them full-width killers. The battlefield commander can have these mines applied by artillery, hand emplacement, helicopters and high performance aircraft. He will no longer be restricted to the M56 for a remotely emplaced mine.

Here is a look at the high-tech mines being fielded, in production or under development.

RAAM and ADAM

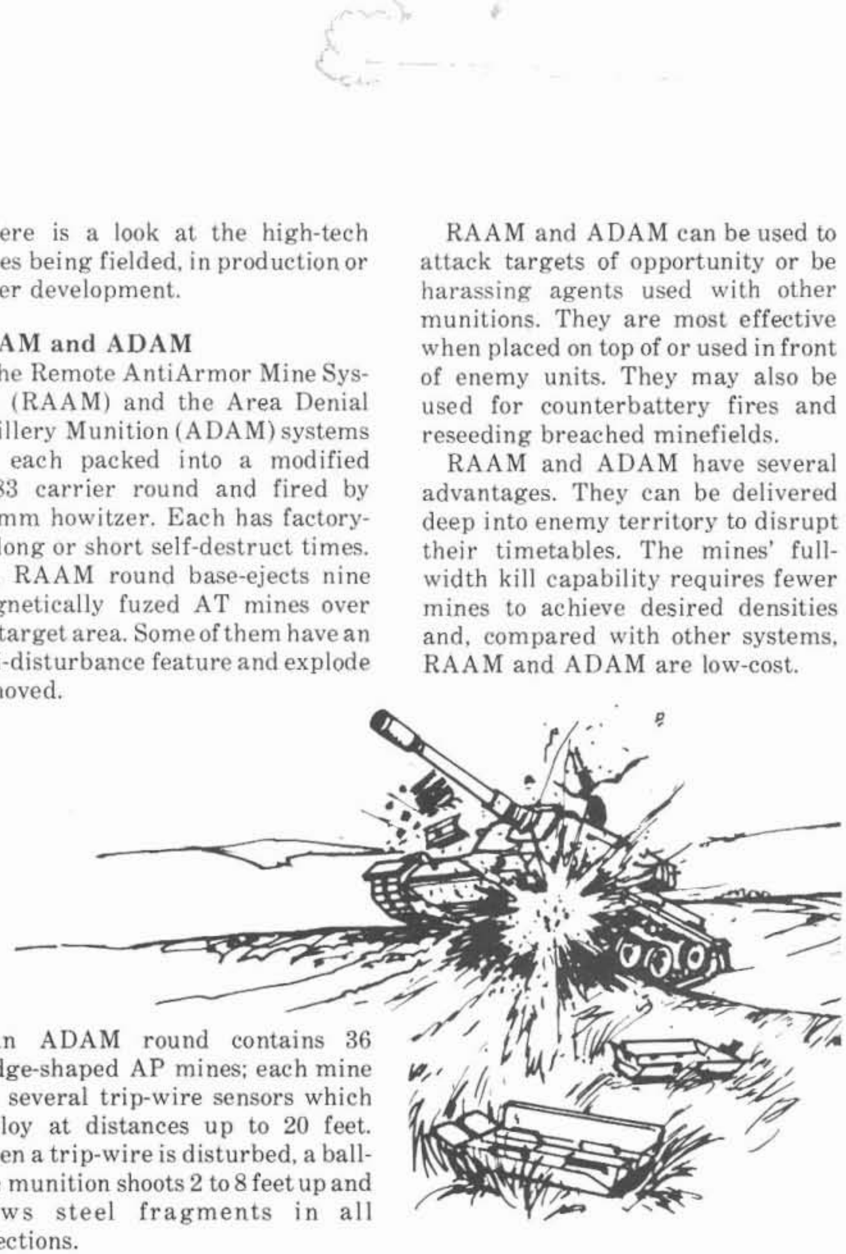
The Remote AntiArmor Mine System (RAAM) and the Area Denial Artillery Munition (ADAM) systems are each packed into a modified M483 carrier round and fired by 155mm howitzer. Each has factory-set long or short self-destruct times.

A RAAM round base-ejects nine magnetically fuzed AT mines over the target area. Some of them have an anti-disturbance feature and explode if moved.

An ADAM round contains 36 wedge-shaped AP mines; each mine has several trip-wire sensors which deploy at distances up to 20 feet. When a trip-wire is disturbed, a ball-like munition shoots 2 to 8 feet up and blows steel fragments in all directions.

RAAM and ADAM can be used to attack targets of opportunity or be harassing agents used with other munitions. They are most effective when placed on top of or used in front of enemy units. They may also be used for counterbattery fires and reseeding breached minefields.

RAAM and ADAM have several advantages. They can be delivered deep into enemy territory to disrupt their timetables. The mines' full-width kill capability requires fewer mines to achieve desired densities and, compared with other systems, RAAM and ADAM are low-cost.



Some disadvantages include command and control problems created by using remotely delivered mines. Extensive coordination is required between maneuver elements, engineers and fire support personnel. Also, the mines' short emplacement time and brief self-destruct interval requires rapid reporting to ensure we don't impede our own maneuverability. Competition for artillery will pose a problem, as will logistics.

However, the need to remotely deliver mines significantly outweighs these disadvantages. RAAM and ADAM will provide commanders with a rapid, flexible and effective means of paralyzing enemy forces. Both systems are in the developmental stage.


ADAM

GEMSS and FLIPPER

The M128 Ground Emplaced Mine Scattering System (GEMSS) is in production and will be fielded in Fiscal Year 1984. FLIPPER, an auxiliary GEMSS mine dispenser, is under development.

GEMSS is a trailer-mounted device which arms and dispenses up to 800 mines in 15 minutes. A typical GEMSS mine field consists of three 30 meter wide strips spaced about 500 to 100 meters apart. GEMSS can be used to emplace flank minefields, reinforce existing obstacles or to close gaps or lanes. The system will be issued to corps, heavy and light divisions, armored cavalry regiments and to separate brigade engineer line companies. The unit weighs 7.5 tons (loaded) and can be towed by a 5-ton truck, CEV, M113 APC, M9 ACE or M548 cargo carrier.

FLIPPER is being developed to provide a lightweight, easily operated device to spin-arm, select the self-destruct time, and to dispense M74 and M75 mines. The system will be primarily an auxiliary dispenser for GEMSS mines; four will be issued to each engineer unit authorized a GEMSS dispenser. FLIPPER will be mounted on combat and combat support vehicles.

The M75 and M74 mines each measure 2½ inches high by 4 inches in diameter and weigh about four pounds. Both have operator selected short or long self-destruct times. The AT mines use a magnetic fuze for full-width kill. Antipersonnel mines use four trip-wires for activation. The mine kills by both ground blast and fragmentation.

GEMSS offers rapid, large volume metered mining. The M74 and M75 are smaller than conventional mines, reducing logistical burdens. The most significant disadvantage is GEMSS' size and weight. With the unit weighing 7.5 tons, poor soil conditions could greatly hamper a wheeled prime mover.

GEMSS, however, gives commanders the ability to rapidly emplace large minefields, forcing the enemy to alter his battle plans.

GATOR

GATOR is an air-delivered mine system that dispenses AP and AT mines from tactical and strategic aircraft. It is being developed for either the Air Force CBU-89/B or Navy SUU-66/B dispensers. The Air Force dispenser carries 72 BLU-91/B AT and 22 BLU-92/B AP mines. The Navy dispenser can carry 45 AT and 15 AP mines.

Three self-destruct times are available with each mine. The BLU-91/B AT mine has a magnetic fuze making it a full-width killer. The BLU-92/B AP mine has a blast fragmentary kill mechanism and uses trip-wire sensors.

Both AT and AP mines are about the same weight and shape as a GEMSS mine. They are aerodynamically dispensed when a linear line charge cuts the dispenser's skin. Arming and self-destruct times are automatically set when the dispenser opens. Adapters on the mines aid dispersion and reduce ground impact force.

The system is designed for rapid delivery of interdiction and counter ADA minefields. Denying key terrain, disrupting and paralyzing the enemy are its primary uses. It will be vital in stalling follow-on echelons, and will be most effective when used at night.

GATOR is scheduled for fielding in Fiscal Year 1985.

MOPMS

The Modular Pack Mine System (MOPMS) is a compact, easily portable unit which discharges 21 AT or AP mines in a 35 meter semicircle.

The rectangular, 32x23x13 inch unit weighs 150 pounds and can be carried by as few as two men. The M131 version contains 21 AP mines. Each mine deploys four trip-wires which if disturbed, detonates a fragmentary kill mechanism. The M132 module contains 21 AT mines with magnetic fuzes for full-width kill. Future development may include a


GEMSS

mixed module containing both AT and AP mines.

Mines can be dispensed from either module by remote control or standard hardwire. The remote control unit dispenses mines from the

MOPMS

module, recycles self-destruct times or destroys dispensed mines. Hardwire activation only dispenses mines. Self-destruct, recycle and command destruction are not hardwire options.

MOPMS will close gaps and lanes in minefields, reinforce obstacles, and set protective and point minefields. It will be a Class V item for infantry, armor, artillery and engineer units.

MOPMS

The system offers many advantages. Its mines do not have to be dispensed until the last moment and nonactivated units are easily recovered. The mine's recycle capability extends minefield life and reduces logistical burdens. The remote control feature enhances MOPMS as a combat multiplier since several MOPMS can be controlled by a single operator.

MOPMS is currently under development with fielding expected in 1986-87.

VOLCANO

VOLCANO

VOLCANO is an interchangeable system which can operate from aircraft or on the ground. It consists of a mine module, dispenser and control unit. GATOR AT and AP mines are being considered for use with VOLCANO. Mine modules will contain AT and AP mines plus a propulsion device.

Air VOLCANO is for combat support aviation companies of all divisions, separate brigades and regiments. Ground VOLCANO will be organic to all division engineer battalions and to the engineer companies of separate brigades and regiments.

When used by aircraft, it will emplace tactical minefields, reinforce obstacles, close lanes and gaps, create mine defiles, protect flanks and deny the enemy key terrain. When used by combat engineer units, VOLCANO will support in the same manner as GEMSS and MOPMS.

VOLCANO's fielding is projected for 1987 (helicopter) and 1990 (ground).

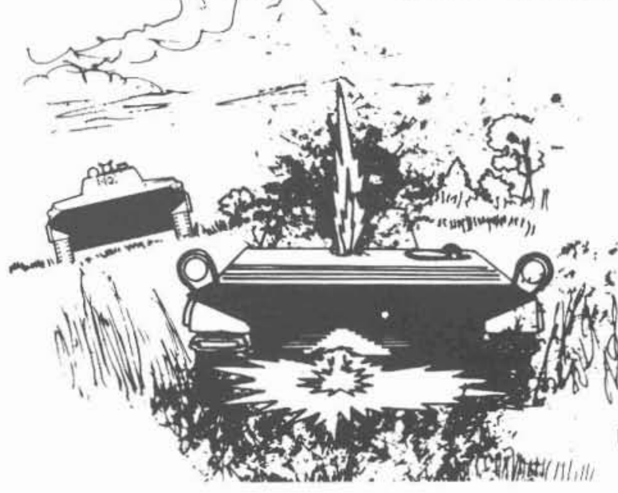
The Future

New high-tech mines will not totally replace conventional hand-emplaced, nonself-destruct mines. Conventional mines will always be required where precise emplacement is necessary, like around installation perimeters. There also are numerous international constraints regarding emplacing remotely-delivered, self-destructing mines prior to hostilities.

Both conventional and high-tech systems have their place on the battlefield. Used together, they provide the maneuver commander with a key combat multiplier.

MAJ John D. Pawulak is a graduate of the University of Maryland and the Engineer Officer Advanced and Army Aviation Rotary Wing Courses. He has served with the 2d Engineer Gp., 76th Engineer Bn, 522d Engineer Co., 222 Aviation Bn., and 54th Infantry Bn. (Mech). He now serves as chief, Countermobility Branch, Directorate of Combat Developments USAES, Ft. Belvoir, Va.

CPT James C. Loo is a graduate of the U.S. Military Academy and the Engineer Officer Basic and Advanced Officer Courses and the Atomic Demolitions Course. He served with the 62d Engineer Bn., Ft. Hood, Texas, as a platoon leader, S1 and company commander. CPT Loo is now aide-de-camp to the director of the Defense Nuclear Agency, Washington, D.C.



RAMM

COUNTER MINE

for the AirLand Battle

Obsolete, Word War II vintage countermine capabilities have long haunted U.S. engineers. The situation is finally improving.

by LTC Russell L. Fuhrman

Emerging AirLand Battle doctrine has significant engineer implications. To inflict maximum damage on the enemy, maneuver commanders must strike deep. They must use economy of force measures to blunt the enemy penetration while making deep attacks into the enemy's flanks and rear. Engineer countermobility operations will be vital to economy of force operations while mobility operations will help the maneuver commander strike deep.

To give the maneuver commander an AirLand Battle level of mobility, combined arms teams must bypass or breach mined areas in stride and under fire. With increased emphasis on mobility, flexibility and staying power, all units must cope with both remotely delivered and conventionally emplaced mines on the battlefield.

Soviet mine doctrine, like ours, uses mines to block the enemy. Soviet forces would use mines extensively in offensive and defensive operations. They have millions of mines and can emplace them rapidly with aerial and ground mechanized-delivery systems. Soviet combat troops are well trained in land-mine warfare; specialized units perform all phases of mine warfare quickly and effectively.

Maintaining mobility against this threat is a challenging problem for the maneuver commander. To stay mobile, he must have the capability to detect, neutralize and mark cleared lanes through minefields.

Unfortunately, our minefield breaching operations are too slow. Explosives and hand-held detectors

The Robotic Obstacle Breaching Assault Tank (ROBAT) is slated for heavy division engineers. ROBAT detects, neutralizes and marks lanes by remote or manual control.

are all we have to counter the mine threat. The Army does have some line charges, but most are in stateside storage, and units are not trained in their employment. Current inventories include about 550 M157 (Diamond Lil) rigid, tank-pushed line charges and 360 rocket-propelled, sled-mounted M173 line charges. Our countermine capability is no better than during World War II.

New Systems

However, several countermine items are under development and can be fielded by 1986-88. These systems give the maneuver commander the mobility required by AirLand Battle doctrine. A critical issue will be Army funding for production. Countermine systems compete for procurement dollars with other systems ranging from the M1 tank to night vision goggles.

Armor units will have an organic countermine capability with the track-width mine roller introduced in Europe during 1982. The roller can detect and neutralize mines and survive the blast of several encounters. Under battle conditions, it can be mounted on the tank in 15 minutes and released remotely within 30 seconds. At a breaching speed of 10 mph, it is 90 percent effective in neutralizing single-impulse, pressure-type mines. Standard issue is three mine rollers per tank battalion.

Like the roller, the track-width plow gives armor units an organic countermine capability. The plow is a relatively lightweight system carried on the tank. It can physically extract, neutralize and remove land mines on the surface or tactically buried 4- to 6-inches deep. A "dog-bone" and chain assembly activates any tilt-rod mines between the tracks. The plow can be operated from inside the tank.

SLUFAE & Others

The Surface Launched Unit Fuel Air Explosive (SLUFAE) provides the Army with a significant new countermine capability. SLUFAE allows the maneuver commander to breach a known minefield from more than half a mile away. The system is a 30-tube rocket launcher mounted on a M548 full-tracked cargo carrier. A resupply vehicle with an on-board crane is used to load the rockets and supports the system. The thirty rockets produce a cleared lane 8 meters wide by 240 meters long.

The track-width mine roller was issued to armor units in Europe last year. The roller was reverse engineered from the Soviet PT55/KMT5.

They can be fired individually or in ripples from concealed positions in all weather, day or night.

The Mine Clearing Line Charge (MICLIC) complements SLUFAE in breaching minefields where a "close-in" system is required. The Marine Corps M58A1 trailer-mounted line charge is currently being evaluated to meet this requirement. The MICLIC clears a lane 8 meters wide by 100 meters long. Light forces will receive the first MICLICs procured.

Another line charge being evaluated is the Portable Mine Neutralization System (POMINS). It neutralizes antipersonnel mines, booby traps, and wire obstacles for dismounted infantry. POMINS can be easily set up, fired in less than 30 seconds and will clear a footpath 25 meters long. POMINS is a Class V item for engineers, infantry and armor.

To counter the threat of magnetic mines, the Vehicle Magnetic Signature Duplicator (VEMASID) is being evaluated. A coil device, VEMASID projects a magnetic field forward of the vehicle which creates a tank-like signature, detonating magnetic mines harmlessly in front of the vehicle.

To complete a breach, the cleared lane must be marked for following vehicles. Current marking methods, like using engineer tape or the Hand Emplaced Minefield Marking System (HEMMS), are slow and will not survive in a heavy force environment. The Cleared Lane Marking System (CLAMS) is a mechanical device that will significantly improve our marking capabilities. It attaches to the rear of combat vehicles and uses chemiluminescent markers visible day and night.

The Robotic Obstacle Breaching Assault Tank (ROBAT) is a near-term, affordable solution to the countermine problem for heavy forces. Based on a systems approach, the ROBAT can detect, neutralize and mark a cleared lane by remote or manual control. ROBAT uses existing hardware—an M60 chassis with turret removed and a track-width mine roller or plow on the front. It has two or more protected line charges in the turret well and a marking system on the rear. The ROBAT program is an accelerated, two-year research and development effort with production starting in the third year. Twelve ROBATS will be issued to each heavy division engineer battalion.

This USMC Mine Clearing Line Charge (MICLIC) is being evaluated as a countermine option for light units.

Detecting mined areas and individual mines continues to be a serious shortcoming. There is no current capability to remotely detect minefields and no foreseeable solution until the 1990s. Despite the Army's emphasis on high mobility, minefield detection in the 1980s will be through visual means or encounter.

With new countermine hardware, our capability to breach minefields will significantly improve in the late 1980s. Under cover of suppressive fires and smoke, tank-mounted plows and rollers will breach lanes through lightly defended hasty minefields. Systems like ROBAT and SLUFAE will breach deliberate minefields and establish additional lanes in hasty minefields. With several breached lanes, friendly forces will move through the minefield in stride and under fire. This is a substantial improvement over the slow, labor-intensive capability we currently have. However, our future countermine capability depends on resources committed to these systems.

The Future

With mobility the key to winning the AirLand Battle, an effective countermine capability is vital. Enemy use of mines will be widespread and continuous in an attempt to disrupt and delay our forces and logistics. We can expect threat mines throughout our operational area. We may also have to move through our own minefields. Today, we can't provide the commander that mobility. But field commanders are striving to improve our countermine capability through combined arms battle drills and improvised hardware like armored bulldozers.

This critical hardware deficiency is recognized and a concerted effort is underway by TRADOC and DARCOM to field remedies. The accelerated ROBAT program and buying the Marine Corps M58A1 line charge clearly shows the Army's determination to solve the countermine problem.

LTC Russell L. Fuhrman is commander of the 10th Engineer Bn., Germany. He previously served with the Engineer School's Directorate of Combat Developments in the Development Div. and as chief of the Plans, Programs and Operations Div. He is a graduate of Command and General Staff College and has a master's degree in engineering from Pennsylvania State University.

The 548th Engineers
test their readiness
(and impress the Navy) with
an intense construction exercise.

TASK FORCE PUERTO RICO LIGHT

by LTC John A. Tudela &
1LT Thomas J. Williams

Although U.S. contingency forces are characterized by light, highly mobile units, part of their most important support comes from combat heavy engineers. The 548th Engineer Battalion (Combat) (Heavy) has a contingency mission to deploy an engineer line company in an extremely short time with the remainder of battalion following later.

As part of the 20th Engineer Brigade (Combat) (Airborne Corps), the 548th also supports its home post, Fort Bragg, N. C., and the XVIII Airborne Corps.

This dual mission (combat and construction engineering) attests to the versatility of the combat heavy battalion. However, versatile, well-trained soldiers are an asset only if they can reach their area of operations.

In the past, the 548th sought to maintain its versatility and readiness by convoying annually to Fort Jackson, S.C., for two weeks of combat and construction engineering exercises. The training improved deployability and construction expertise. Also, officers, NCOs and enlisted personnel praised the unit cohesion these exercises generated.

Being a heavy engineer unit, the 548th at times is precluded, or at least inhibited, from being rapidly air transportable because of the large number of C5A aircraft required to move the unit's bulldozers and road-scrapers. So in a rapid deployment situation, the 548th's contingency company would deploy and use local engineering equipment until their own equipment arrived later via ship or aircraft.

Bright Star 81 provided the battalion the opportunity to deploy a heavy equipment platoon by ship to Somalia. The *Cygnus*, a roll-on/roll-off ship, easily accepted the heavy equipment. A few equipment operators sailed with the *Cygnus* on its one-month journey; most other operators were air deployed, timing their arrival to coincide with the ship's. The exercise demonstrated that people, but not heavy equipment, can be quickly air transported. It also highlighted one of the most challenging, but untested, rapid deployment requirements: Deploy without your equipment and still accomplish the mission.

The 548th met that challenge head-on, testing itself by deploying Task

One of the task force's missions was to improve drainage in flood-prone areas. The task force used Guard and Reserve equipment.

Force Puerto Rico Light to the Roosevelt Roads Naval Station, Puerto Rico.

Members of the 548th's Headquarters Company (for administrative and medical support), A Company (for pile driving support), and B Company deployed by air from Pope Air Force Base, N.C. They drew equipment in Puerto Rico and spent two weeks completing a variety of construction tasks.

A two-man advance party preceded the main body by five days to secure engineering support from the Army Reserve's 488th Engineer Battalion at Fort Buchanan, Puerto Rico. A Puerto Rican Army National Guard unit and the 699th Port Construction Company, both at Roosevelt Roads, supplied tactical vehicle support, bridge boats and a crane barge.

The naval station's Public Works Department (PWD, equal to an Army post's Directorate of Engineering and Housing) identified eight projects for the engineers. When the 548th Engineer's capabilities became apparent, the PWD quickly added nine more projects to the original eight.

The first tasks were clearing six flood-prone drainage areas, repairing four miles of road shoulder, installing a security lighting system for the PWD building and clearing 400-foot long vegetation strips for survey operations. The engineers also installed a roof on the Roosevelt Roads Yacht Club, dredged a parasitic-contaminated stream, poured five cubic yards of concrete in a pier upgrading project, and drove 70 20-foot poles (piles) into the ocean floor to support and repair the marina area. There were also other smaller, squad-sized projects.

A small task force detachment went to nearby Vieques Island to work with a Naval mobile construction battalion (SeaBees). They dredged ditches, installed concrete culverts, and built concrete hardwalls and roofing for a Navy weather observation post.

One of the most challenging and rewarding projects was driving the piles at the marina and refurbishing the boat pier decking materials. The PWD said at most only 15 piles could be driven because the pile-driver was on a barge and was subject to wave action and jarring. The Alpha Company pile drivers took the PWD estimate as a challenge to do better. Through sheer determination, they drove 70 piles in 15 days.

Pile driving from a barge required careful monitoring of weather and tides. Decaying pier-poles were removed during low tide and new ones driven at high tide.

Another challenging aspect of the deployment was using local equipment for the missions. The only vehicle brought from Fort Bragg was a contact truck. As planned, using local equipment was one of the chief benefits of the entire mission.

The equipment supplied by the Guard and Reserve was well maintained, but as with any equipment unused for long periods, there were minor problems. Also, operators didn't know their acquired equipment as well as their own at Fort Bragg. The intangible quirks of a machine is an important consideration when using unfamiliar equipment. Increased efforts in preventive maintenance solved many problems in this area.

Although the exercise was intended to practice deploying outside CONUS to an unfamiliar tropical area and in using unfamiliar

Decaying marina pier-poles being removed at low tide. Working from a barge, A Co. put in 70 new piles in 15 days—five times more than the Navy thought possible.

equipment, another valuable benefit came from interacting with the Air Force and Navy SeaBees. Since effective wartime performance depends on interfacing the armed forces, these experiences enhanced the battalion's readiness by strengthening their familiarity with interservice operations.

Task Force Puerto Rico Light tested the battalion's operational flexibility by sending a task force without equipment into unfamiliar country. The primary lesson was that mission completion required flexible integration of all aspects of combat engineering. This operational flexibility required a thorough understanding of mission requirements and detailed planning. Without detailed preparation, flexibility becomes a reaction to circumstances rather than an anticipated response.

Another lesson was the importance of using an advance party when acquiring equipment. There is no substitute for face-to-face coordination.

Regarding medical considerations, immunization for Fort Bragg is identical to the Roosevelt Roads area. Only one threatening medical condition existed inside the base. A small, flood-prone stream required rebanking for flood control, but the water was contaminated with schistosomes (a parasitic infection carried by a certain snail species). A problem arose when a D8 bulldozer broke down while the stream was being rebanked. A maintenance team had to work for about 30 minutes in contaminated water while fixing the 'dozer. Complete preventive measures were taken. Everyone earlier had received a medical-threat briefing so the men were aware of the hazard. A medic at the site saturated with alcohol any skin areas which contacted the water. Because the first phase of schistosomes infection is essentially symptom-free, blood tests were done on all exposed personnel.

Although all personnel knew heat injuries were more likely under the equator sun, there were still several cases of sunburn. These were attributable to failure to use sunscreen. Hydration and adequate rest were strictly enforced; there was only one case of heat cramps and no other heat injuries.

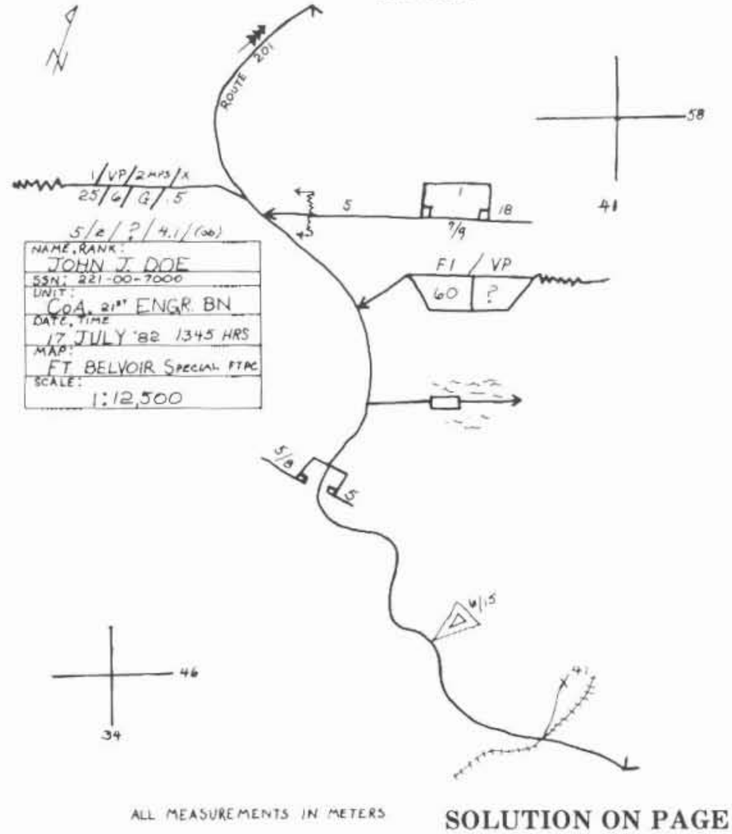
The deployment to Puerto Rico challenged the 548th's ability to move quickly into an unfamiliar environment and to use prepositioned equipment to accomplish a host of demanding missions. The exercise was an exceptionally valuable training tool, one that measurably increased the battalion's readiness to meet rapid deployment contingencies.

LTC John A. Tudela is the Army attache, U.S. Embassy, Mexico City. He commanded the 548th Engineers during the Puerto Rico deployment. He has a bachelor's degree in industrial engineering and a master's in construction engineering, both from Texas A&M. He also has a master's degree in international economics from the Monterey Institute of Foreign Studies and in construction engineering from the Bolivian Engineering College. He had completed Airborne, Special Forces and Foreign Area Officer training; Command and General Staff College; and the Spanish Army War College.

1LT Thomas J. Williams is assigned to the Directorate of Evaluation, Academy of Health Sciences at Ft. Sam Houston, Texas. He served with the 548th Engineers as medical services officer. He has a bachelor's degree from Lincoln University in psychology and a master's from Northeast Missouri State University in community/clinical psychology.

ENGINEER PROBLEM

1. What is the route classification formula?
2. What type of ford is ford #1?
3. What bypass conditions are at the tunnel?
4. What is the minimum radius of curvature in the series of sharp curves?
5. What approach condition is on the left bank of the ford?
6. What is the minimum traveled way width of the underpass?
7. What is the scale of the map used for this overlay?
8. What seasonal limitations does the ford have?
9. What is the percent of the steep grade?
10. What is the turn around time for ferry #1?
11. Is the railroad crossing an obstruction?
12. What type of off route movement/concealment is available along this route?



SOLUTION ON PAGE 39

ICE BRIDGING

When the temperature plunges below zero, the 23d Engineer Company puts Mother Nature to work.

by 1LT Mark L. Prahl

It doesn't take magic for a man, a jeep or even a 27-ton bulldozer to cross deep water in winter. All it takes is ingenuity, hard work and some frigid weather to make an ice bridge.

The first step in building an ice bridge is site reconnaissance because there are important location characteristics to consider in positioning the bridge.

The river channel should be straight and fairly wide, more than 60 feet if possible. Areas with unstable currents or temperatures, such as rapids and hot springs, are avoided. Normally, a straight, wide channel will have a slower flow and a level ice surface, and the channel should lie so prevailing winds won't drift snow across the bridge. Routing the bridge between sandbars yields shorter, stronger spans.

The area upstream is also examined. There should be no significant inflow channels directly upstream (closer than 2 km) which may disrupt normal flow.

The bridge should be as close to existing roads as possible because it merely continues those roads. However, for safety, ease of construction and maintenance, the crossing loca-

An ice bridge built in Alaska by the 23d Engineer Co. The 23d built three ice bridges during Brim Frost 83.

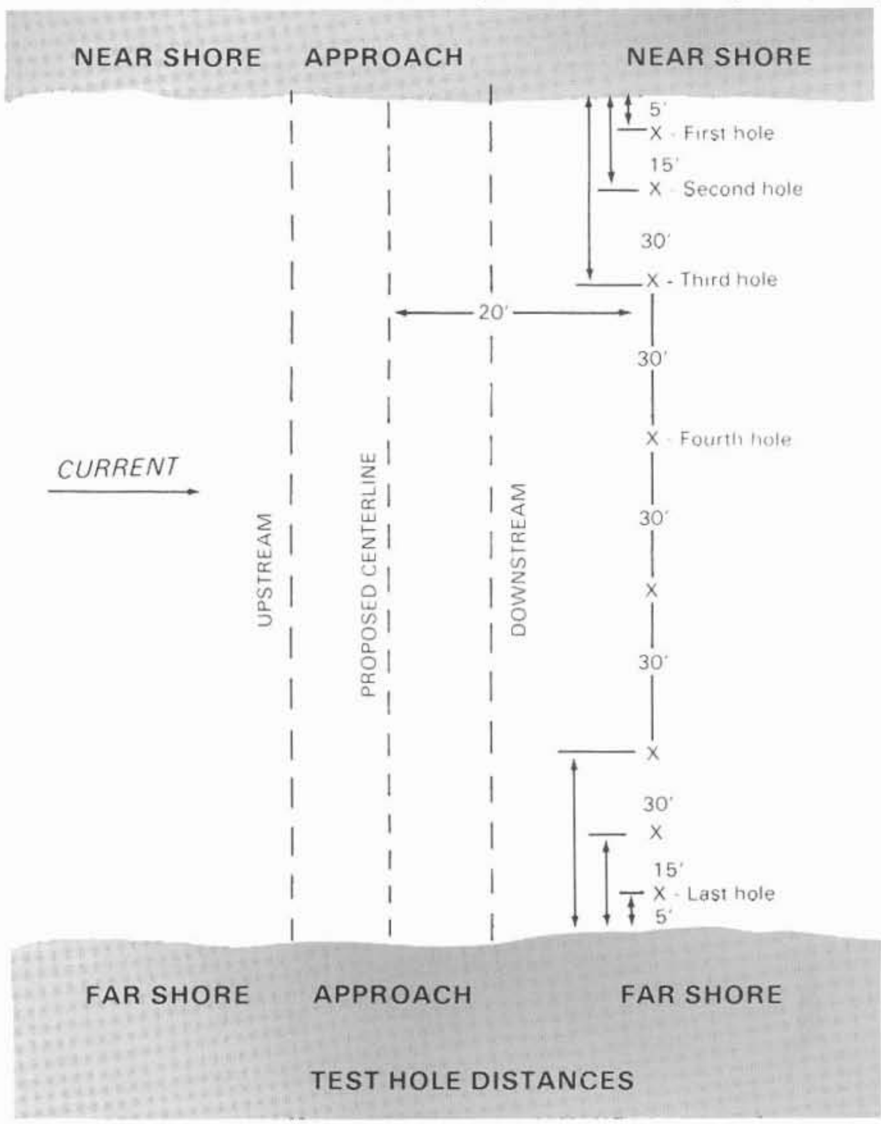
tion has a higher selection priority than its distance to roads, as long as the bridge is easily accessible to wheeled vehicles.

A final primary consideration is the near and far banks. A gradual slope to the stream is best because it ensures ease of access by vehicles. If the banks are too steep, ramps are built from the banks to the stream.

After the bridge location has been chosen, the final check before construction is measuring (profiling) the ice. The profile is the most important step in ice bridging and must be conducted diligently and without shortcuts. All safety precautions must be observed and immediate aid ready in case of ice failure while crews are working.

A profile crew is two or more people, with the lead person tied to the rest of the crew by a line. The lead man bores test holes at 10-foot intervals with an auger or ice-chopper. As he crosses the river, the following persons (the recording crew) belay him and are prepared to assist if he breaks through. Data is recorded for each hole, including its location, ice thickness, snow cover, channel depth and ice quality.

A profiling crew testing ice thickness.



A typical arrangement of profile holes.

If the profile crew encounters ice 4 inches thick or less, they don skis or snowshoes for safety before continuing. Ice less than 3 inches is too thin; a different site or a standard fixed bridge must be used.

When the profile is complete, all information necessary to decide on accepting the ice bridge location has been collected and construction may begin.

Ice bridge construction is the process of artificially increasing the rate of ice formation on the bridge surface.

The first step is dealing with snow covering the crossing strip. The snow is cleared in a lane 30 meters wide. The roadway is standard military road width, but a 30-meter lane ensures plenty of ice to support it. The snow may be cleared entirely off of the bridge or be compacted to no more than 2 inches thick. Compacting may be done with snowmobiles, skis, or snowshoes. Any snow removed from the bridge must be distrubuted to avoid snow berms higher than 12 inches on the edges of the bridge.

Whether the snow is cleared or compacted, the next step is flooding. Hand-operated or gas-powered ice augers are used to drill 12-inch wide holes in the ice on the downstream side of the bridge. The river or lake becomes the water source for a pumping operation.

"We pump water up from below and flood the ice about an inch deep, let it freeze, then flood it again, until we get the thickness we want," explains SFC Lincoln V. Thompson, operations and training NCO, 23d Engineer Company (Combat) (Heavy), 172d Infantry Brigade. "We've crossed a D7 'cat' on 32 inches of ice and it weighs 54,200 pounds with its bullblade."

The 23d Engineer Company uses three commercial, electric submersible pumps (each powered by a five-kilowatt generator), or gasoline-powered centrifugal pumps to raise layers of water.

"The commercial pumps are better for this job than the centrifugal ones," says Thompson. "The electric pumps are self-priming and won't freeze in extreme cold. We just drill a hole in the ice, drop it in and start pumping."

"How fast we can build a bridge depends on temperature and how long the bridge must be," explains CPT Christopher M. Turletes, 23d Engineer company commander. "We figure one squad with one pump can freeze 100 feet of bridge per hour at -10°F.

With the slowness of clearing snow and freezing water, ice bridging can't be considered a hasty crossing for combat use.

"Tactically, ice bridges are used on main supply routes and lines of communication," says Turletes. "They are deliberate crossings used when the area beyond is secured and ready to be opened for resupply."

Like the pumps they use, some of the 23d Engineer Company's ice-bridging techniques deviate from standard Army procedure.

"We've built a lot of ice bridges and done considerable research with the Corps' Cold Regions Research Laboratory (CRRL)," explains Turletes. "There's also a lot of research being done commercially on the North Slope with ice bridges, and we've used that, too.

"Figures in TM 5349, *Arctic Construction*, indicate a 200-foot width for ice bridges," Turletes says. "Of course, the wider the bridge, the stronger it is. But the TM tends to be conservative. Our experience and CRRL's research shows that an ice bridge over 14 inches thick is strong enough to resist bending, and that 30 meters is a good width to work with."

Some experts recommend replacing three or four inches of snow on the bridge as a treadway.

"Snow is an insulator and tends to protect the ice bridge from cold air," says Turletes. "After the bridge is constructed, we replace no more than one inch of snow for a wearing surface."

Other experts advocate freezing timbers into the ice to reinforce the bridge.

"Our research and experience shows that logs, planks and straw don't really strengthen an ice bridge," says Turletes. "They are darker, absorb solar heat and could weaken the bridge. We often use logs for ramps and treadways, but not frozen into the ice itself."

After the 23d Engineer Company builds their ice bridges, they maintain several safety factors. "When in doubt, profile," is the rule. They measure the ice thickness every eight hours not only to monitor the thickness of the ice, but also the distance to the bottom of the channel. "If the ice builds up too thick below, the water dams up behind the bridge and the pressure can cause shears at any weak point," says Thompson.

The 23d Engineer Company built three ice bridges at Fort Greely, Alaska, during exercise Brim Frost 83. Their mission during the exercise was to operate, maintain and upgrade the exercise's main supply route.

1LT Mark L. Prahl is platoon leader of the earthmoving platoon, 23d Engineer Co., Ft. Richardson, Alaska. He designed airfields for the Corps of Engineers, Anchorage District, during his previous assignment. He has a bachelor's degree in engineering from the University of Wisconsin (Madison), and is a graduate of the Engineer Officer Basic Course and the Airborne School.

FOR YOUR INFORMATION

TITLE	OFFICE	TITLE	OFFICE
M9 ACE Effectiveness Analysis (Aug 80)	ATZA-CDE	*Poster* FB 123 - Soviet Combat Engineer Tactics, Groupings and Techniques (Jul 82)	ATZA-PAA-A
Countermine Functional Area Analysis (Jun 82)	ATZA-CDE		
Functional Area Analysis of Land-mine Warfare (Jun 82)	ATZA-CDE	*Poster* FB 124 - Soviet Engineer Equipment - Division and Below (Jul 82)	ATZA-PAA-A
Points of Contact (USAES) (Jun 82)	ATZA-CDE	*Poster* FB 125 - Soviet Combat Engineer Organizations Below Divisions (Jul 82)	ATZA-PAA-A
USAES DCD Periodic Intelligence Report (PERINTREP) (Quarterly)	ATZA-CDC		

For information contact: Commandant, USAES, ATTN: ATZA-_____, Ft. Belvoir, Virginia 22060

TITLE	OFFICE	TITLE	OFFICE
TRADOC Pam 525-18, US Army Operational Concept for Countermine Operations (Jun 82)	ATDO-ZD	TRADOC Pam 525-19, US Army Operational Concept for Land-mine Warfare (Jun 82)	ATDO-ZD

For information contact: Commander, TRADOC, ATTN: ATDO-ZD, Ft. Monroe, Virginia 23651

LIGHT DIVISION ENGINEERS

As the Army's first high-technology engineer unit, the 15th Engineers are the leading edge of Army 86 combat engineering.

by 1LT Robert E. L. Titus

A new kind of combat engineer battalion is taking shape at Fort Lewis, Wash. The 15th Engineer Battalion (Combat) supports the 9th Infantry Division, the prototype High-Technology Light Division (HTLD). The HTLD, a new type of unit scheduled under Army 86 (see "Army 86," page 14), is a motorized light infantry unit capable of striking deep into enemy territory. Its combat support elements must be equally mobile, and this is where high-technology engineers make their debut.

In October 1982, the 15th Engineers began forming into a high-technology engineer battalion. The new design radically alters the battalion's existing structure. With less equipment and fewer personnel, it moves quicker and provides engineering support tailored for the HTLD.

The battalion shed about 150 personnel. A headquarters company provides maintenance and support, three light engineer companies support the infantry brigades, and a deep-strike company supports light-assault missions (compare Figures 1 & 2).

The deep-strike company is a special organization that deploys with a maneuver unit, including on airmobile missions behind enemy lines. Construction of hasty airstrips, building obstacles and digging gun and vehicle emplacements are primary missions.

"The capability to accompany infantry units on airmobile missions and take along the necessary support equipment never realistically existed before now," says LTC James E. Corbin, 15th Engineer Battalion commander. "The deep-strike engineer concept will provide much-needed support to maneuver units assigned such missions."

To support these missions, the battalion is becoming a far-reaching, hard-hitting force to complement HTLD capabilities. Their first combat priority is mobility, followed by survivability and countermobility. Eliminating most large, heavy equipment and sectionalizing items like scrapers and graders helps streamline the battalion.

Using smaller bulldozers and light gap-crossing equipment, the battal-

The Small Emplacement Excavator is a highly prized asset.

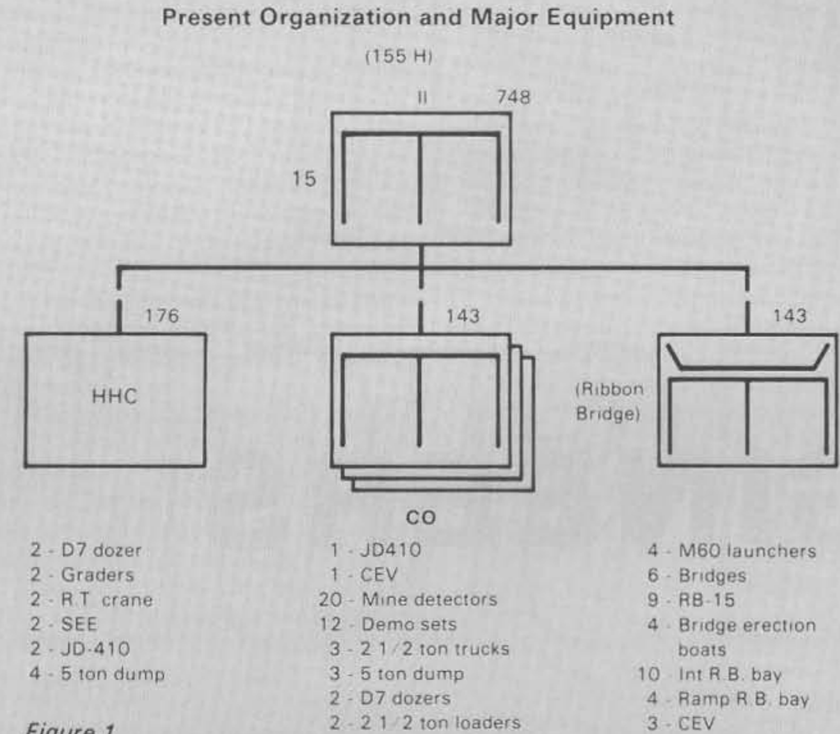


Figure 1

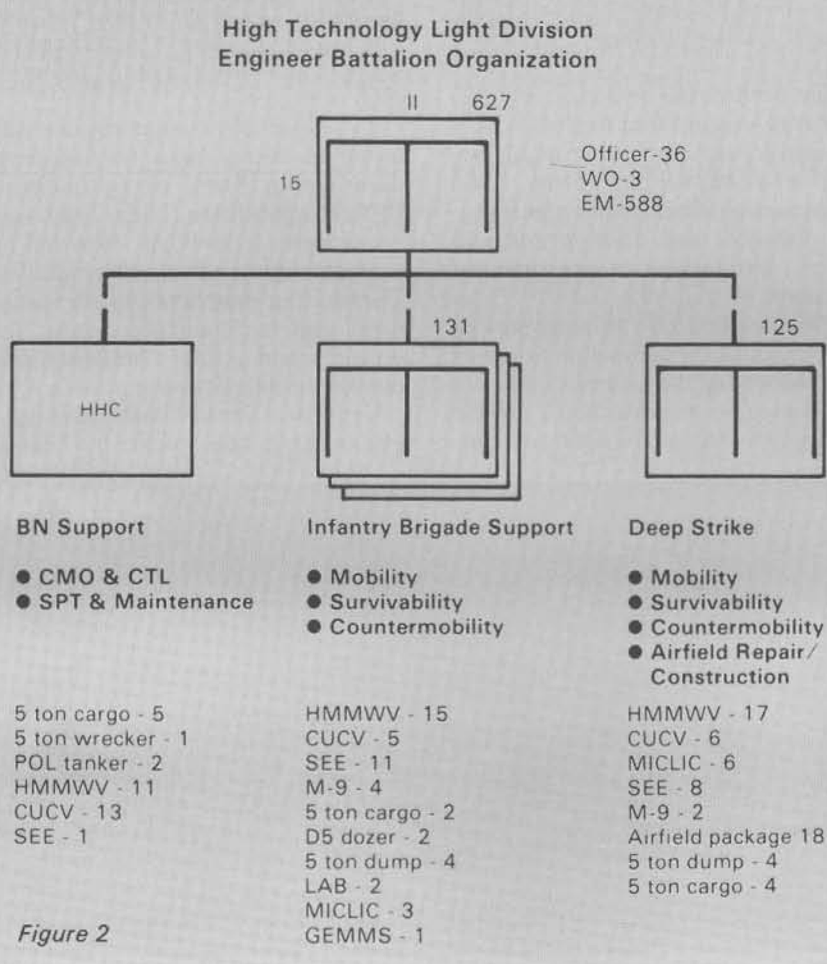


Figure 2

ion will have an airmobile package able to travel with the infantry it supports. The High Mobility Multi-Purpose Wheeled Vehicle, the Mine Clearing Line Charge, the Ground Emplaced Mine Scattering System, and the Light Assault Bridge are all being incorporated into the battalion. However, its most highly prized engineering assets are the Small Emplacement Excavator (SEE) and the M9 Armored Combat Earthmover (ACE).

The SEE is a light, multi-purpose vehicle with a 45 mph road speed. Its four-wheel drive, combined with a differential lock, gives it the power to easily travel through mud and sand. Its two independent hydraulic systems can be used simultaneously. Any of its many attachments can be changed within 30 minutes, allowing one SEE to do a variety of tasks. The battalion has 12 SEEs for concept evaluation.

The M9 ACE can maneuver 200 miles across open terrain without refueling, carry troops, swim and do the jobs of a five-ton dumptruck, 'dozer and grader. It can dig a TOW position in about 10 minutes and M1 tank position in 20-30 minutes.

"The M9 finally puts combat engineers out front, constructing obstacles and preparing TOW and tank positions," says CPT James C. Morris, a former 15th Engineers company commander. "It gives us the same mobility as the infantry we support. With it, we can get in quick, do the job and get out. The M9 frees engineer squads for obstacle construction and demolition missions."

The high-technology engineer battalion revolutionizes the capabilities of combat engineers.

"Now we can lead the way in the attack," says MAJ Emmett Stobbs, battalion executive officer. "In defense or withdrawal, we can do a better job of emplacing mines and building obstacles. Under the new concept, we'll move and fight beside the infantry as an integral part of the combined arms team."

1LT Robert E. L. Titus is the assistant public affairs officer, 9th Infantry Div., Fort Lewis, Wash. He has also served with the division's 3/39 Infantry as a platoon leader and S3 (Air). He is a graduate of Virginia Military Institute.

The CPX AS A TRAINING AID

by MAJ Harley Brinkley
&
CPT Paul E. Dorr

A well-planned command post exercise (CPX) is an exceptionally valuable training aid. Using a CPX, the battalion commander, for example, can concentrate on training and evaluating his staff and commanders without draining personnel, equipment and monetary resources.

The 875th Engineer Battalion (Combat), Arkansas Army National Guard, participated in two CPXs as preparation for its external Army Training Evaluation Program (ARTEP). The commander of the 875th requested the 95th Division Maneuver Training Command (MTC), Oklahoma City, Okla., to prepare and administer the CPXs and the ARTEP. To establish continuity among the exercises, the 95th MTC developed a three-part, two-year training program.

The CPXs were designed to provide the battalion first-hand experience with the combined arms concept while learning the extent to which combat engineers could be used as a combat multiplier. Each CPX integrated the general scenario guidelines and specific training objectives of the battalion commander. Additionally, objectives and situations entirely new to the battalion were also injected to create a vibrant, intensive training environment. Doctrine and recently published articles were used extensively to develop the missions and situations portrayed to the battalion.

The CPX centered around the European scenario in which the 10th U.S. Corps defends the Fulda Gap in West Germany. Several basic changes were made in the problem to enhance the training potential of the CPX, including:

- The 3d Corps from Fort Hood, Texas, defended the sector to add CAPSTONE realism.
- The covering force mission was given to an armored cavalry regiment (ACR).

The 875th Engineer Battalion was attached to the ACR in the covering force area, making the battalion an important element of a combined arms team located well forward in the defensive area with little time to perform a mammoth mission. This also met the Guard commander's desire to locate the battalion forward of the committed division's rear boundary.

The first CPX, called Pioneer, covered the two days before violation of the international border by opposing forces (OPFOR). The exercise emphasized the planning functions vital to success in the defense. During the second CPX, Pioneer II, the covering force battle was fought. The obstacle and denial plans developed in CPX Pioneer were implemented and the withdrawal of the ACR from the covering force area planned. In the ARTEP, the battalion supported the ACR in the corps rear area as they constructed blocking positions.

For CPX Pioneer, the 875th Engineer's commander established the following training objectives:

- Review command relationships.
- Improve staff coordination.
- Review and practice task planning for engineers in the defense.

The CPX started two hours before the battalion's attachment to the regiment with the engineer battalion commander and his S3 being briefed by the ACR commander. The major tasks assigned to the engineers included:

• Conduct a terrain analysis and recommend changes to phase lines, control points, maneuver routes, unit positions and unit sectors as required.

• Prepare the engineer subparagraph to paragraph three of the ACR's operations order (OPORD), including task organization.

• Assume operational control (OPCON) of the regiment's engineer company.

• Prepare the *Engineer Annex* and the *Obstacle/Denial Annex* to the ACR's OPORD. Coordinate and include all engineer actions down to squadron level to reduce paperwork for squadron commanders.

After analyzing the assigned missions and his unit's capabilities, the 875th commander identified further areas for staff concentration:

• The wheel-mounted engineer battalion did not have the flexibility and maneuver mobility compatible with the regiment.

• The battalion lacked organic capability to communicate throughout the covering force area due to distance, terrain and shortages of equipment.

Perhaps the most unique feature of the CPX over past exercises was the attachment of the engineer battalion to a tactical unit. The engineer commander's responsibility was vastly expanded, for now he had to consider the engineer requirements of a unit four to five times larger than his battalion. When the engineer tasks exceeded his unit's capabilities, he had no engineer group to which he could turn for assistance.

By changing the chain-of-command from engineer to tactical channels, command and support relationships, as well as mobility and communications situations, were practiced and improved. By having a mechanized engineer company OPCON to the battalion, new problems arose for a staff which previously had not deployed "engineers without dump trucks." With a company OPCON to his battalion, companies in direct support of the squadrons and a company in general support of the regiment, the engineer commander and his staff had to understand, in detail, all command and support relationships.

Developing the obstacle plan and and writing the annexes for the ACR's OPORD required detailed coordination. Intra- and interstaff coordination were necessary to ensure that the obstacle plan supported the maneuver concept and that the plan could be supported logistically.

While writing the engineer and obstacle annexes, the engineer battalion planned and coordinated those expressed and implied missions given by the regimental commander. Those missions, by their nature, coincided with the tasks designated by the engineer battalion commander in his training guidance for the exercise, i.e., crater roads and construct vehicle and track defilade positions.

The training benefits from CPX Pioneer were exceptional. The 875th commander developed his next year's training schedule around training deficiencies identified in the CPX. Because of such focused training, the battalion personnel became considerably more qualified to conduct engineer tasks in the defense.

CPX Pioneer II continued the Pioneer scenario with an international border violation. During the exercise, the 875th Engineers performed three major tasks:

• Implemented the obstacle and denial plan prepared during CPX Pioneer.

• Supported the delaying effort of the ACR in the covering force area by preparing fighting and protective positions.

• Planned for the withdrawal under fire of the ACR, including route selection and evaluating potential crossing sites of the Fulda River.

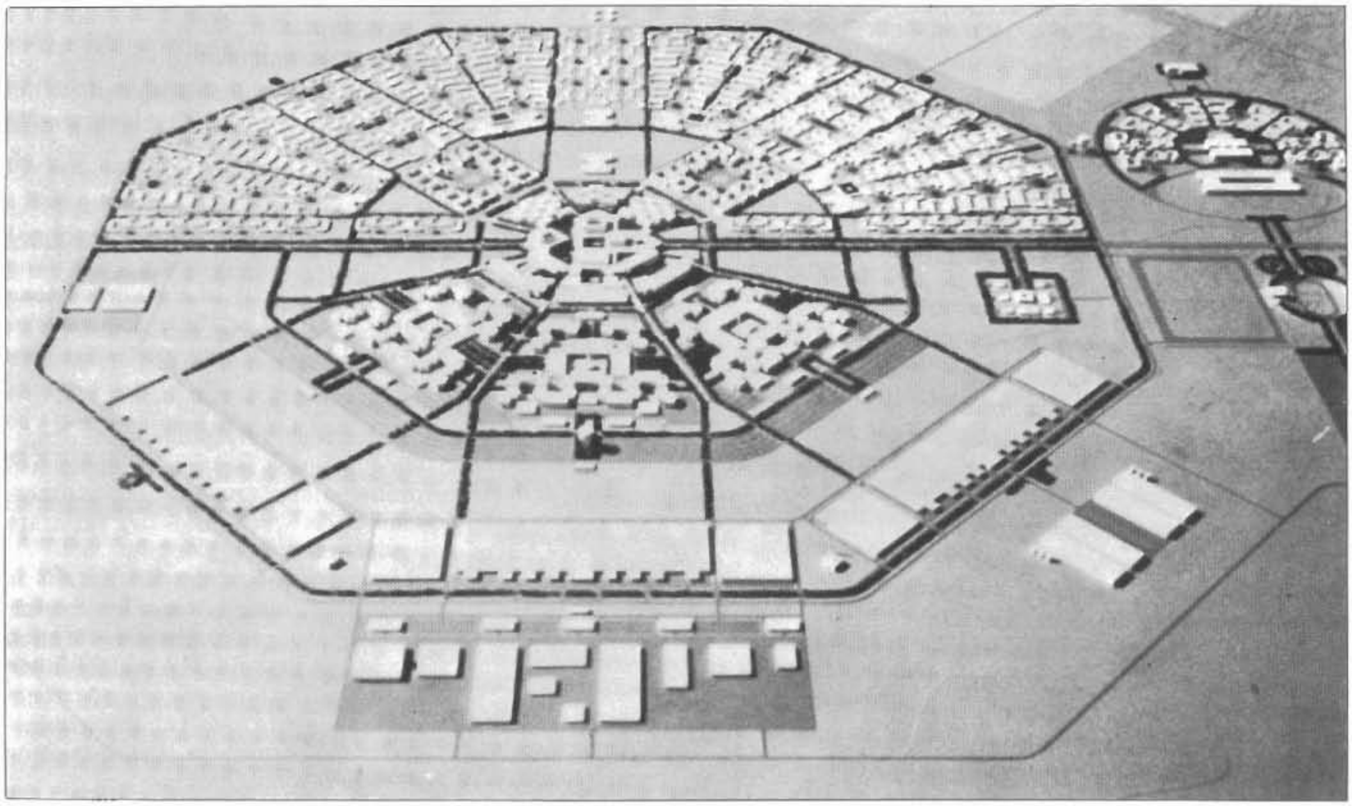
As in CPX Pioneer, Pioneer II provided the battalion commander with the challenge of providing engineer support in a highly mobile defense to a unit whose mobility far exceeded his own. The special areas of concern identified in CPX Pioneer continued to exist, but since they had been identified as potential problems early in the exercises and received special attention, they did not significantly hamper the engineer effort. Engineer company commanders worked closely with a maneuver commander so that engineer activities fully complemented the tactical unit's mission. The company commanders, particularly, applauded this portion of the exercise for its realism.

Using a multi-staged, integrated approach like the Pioneer exercises provides positive, cost effective results. Specifically, it replaces disjointed training and evaluation with a realistic continuum and a scenario on which a flexible training program can be built, evaluated, refined and reevaluated. The time between stages can be used by the commander to provide training in those areas where additional work is needed to improve ARTEP task performance.

The CPXs generate enthusiasm for training. When key command and staff personnel see how vital their role is to the success of the combined arms team, the engineer mission gains new meaning and importance. Fear of the ARTEP disappears as commanders and staff look forward to the ARTEP as an opportunity to display the prowess of their unit.

By identifying specific training objectives and then establishing the parameters within which to work, a series of exercises can be developed to provide excellent, low cost training. The enormous support requirements in personnel, time, equipment, space and money, make it practically prohibitive to conduct a simultaneous battalion ARTEP. Rather, CPXs can be used to fine tune command and control procedures and staff relationships to enhance the ARTEP evaluation at the squad, platoon and company levels.

MAJ Harley Brinkley and CPT Paul Dorr are both assigned to Engineer Team 3, Exercise Division B of the 95th Division Maneuver Training Command in Oklahoma City, Okla. Both previously were assigned to the 130th Engineer Bde. in Germany.



UNDER KKMC

by Donald E. Slater

A remote desert area in the Kingdom of Saudi Arabia is being transformed by the Army Corps of Engineers into a 16 square mile military base for 70,000 military and maintenance personnel and their families.

When completed, the $7 billion King Khalid Military City (KKMC) will be a major cantonment for Saudi troops defending Saudi Arabia's borders. The installation is about 950 kilometers northeast of Jiddah and 450 kilometers north of Riyadh in a remote, sparsely populated desert near the Iraqi border.

The city is octagonal with a Centrum containing the main religious, administrative, and social facilities. All housing is north of the Centrum; all support functions are south. The Saudi Engineer Center and School is west of the city; the parade ground, stadium, race track, hospital, and VIP quarters are to the east. The water supply is also east of the city.

As James Michener began his novel *Centennial* with a description of that town's geology, so the first step in building KKMC was to study the earth that would support the Corps' largest construction project.

Topography

The city is located on a flat, gravelly plain. Relief is in the 7 meter range with a median elevation of about 410 meters. The regional slope is from the northwest with localized depressions. Surface materials consist of lag deposits ("desert pavement") resulting from deflation activity, and surface rock exhibits a film of iron oxide ("desert varnish"). Vegetation is sparse.

Geology

The King Khalid Military City is within a subdivision of the Arabian shelf called the Northern Tuwayq Segment. The area is composed of sedimentary rock from the Paleozoic, Mesozoic, and Cenozoic Ages. The sedimentary rocks are covered in many areas with a thin deposit from the Tertiary and Quaternary Ages.

Rock at the site is sandstone, limestone, and sandstone-conglomerate. The limestone shows evidence of solution activity which formed small caves, pinnacles, and an uneven surface. The solution activity apparently happened before the Quaternary. The sandstone conglomerate is generally weakly-to-moderately cemented. Most of the observed rock exhibits moderately-to-widely spaced, high-angled joints.

Soils

The soils at the site are silty-sands, silts, gravelly-sands, and gravel 0.3 to 3.0 meters deep. The geologic soil age is Quaternary. The gravels are composed of transported subrounded to rounded particles and are mainly igeneous or metamorphic. Soil cementation increases with

The $7 billion King Khalid Military City is the largest construction project ever handled by the Corps. It will be completed late this decade.

depth. The soil's silt component is of low plasticity. There are scattered pockets and layers of gypsum. Permeabilities are low to medium. The soils are moisture-sensitive when remolded during compaction.

Ground Water

Ground water was usually not encountered within the depths explored. However, human activities have caused localized perched water tables. Surface irrigation contributes to forming ground water, as do pipe leaks and sewage disposal areas. Shortly after the city is occupied, ground water will probably become perched on the bedrock, with a water table developing within less than 3 feet of the surface.

Exploration

Subsurface exploration at KKMC was performed in several phases between 1974 and the present. The phases consisted of general exploration for such things as coarse and fine aggregate sources, foundations for structures and specific exploration for facilities like the airfield, stadium, underground storage tanks, and ammunition storage.

Borings ranged in depths between 5 to 15 meters with several extending to 30 meters. Borings were done with truck or trailer-mounted drill rigs using both diamond rotary and hollow stem augers.

Many test pits and test trenches were excavated to depths of up to 5 meters. The test pits were dug with a backhoe to determine the effort required to excavate soil and cemented soil with mechanical equipment. The test trenches were to determine the ripability of surficial rock. Test pits and test trenches both supplied samples of soil and rock for engineering evaluation.

Two types of percolation tests were performed at various locations throughout the site. One type involved a 30-centimeter hole with a 24-hour soak. The other involved a test pit hole with a 24-hour soak. Both were performed to evaluate the rate of water flow into the soil and rock. Extensive laboratory testing was performed on the soil.

Applications

The soil and decomposed rock may be excavated by normal heavy equipment, with blasting required for excavation to any appreciable depths.

Structural loads have been supported on shallow foundations. Insitu soils generally have an allowable bearing capacity of 1.5 kilograms per square centimeter with a footing depth of about 0.6 meters. Rock generally has an allowable bearing capacity of 15.0 kilograms per square centimeter on conglomerate. The bearing capacity of conglomerate is low due to artifically produced ground water which could cause the loss of cementation.

In areas underlain by limestone, caution was exercised because of possible solution activity. Subsurface probes along foundations in limestone areas were necessary to locate cavities and enlarged joints.

In geotechnical terms, KKMC is built on a thin soil layer overlaying rock. The soil is a combination of silts, sands and gravels. The rock is either limestone, sandstone or sandstone-conglomerate. Perched ground water may occur due to irrigation or sewage leaching fields.

When the King Khalid Military City is completed late this decade it will end an epic construction project. Those who inhabit its hundreds of buildings may never know of the Corps of Engineers' geological survey, nor of the eons taken to form the area's geology.

But as Michener said of his fictional Centennial's geological history, it will ". . . lie upon the consiousness of man the way vague memories or ghosts survive in the recollections of childhood. When man did finally arrive on the scene, he would be the inheritor of those vanished years, and everything he did would be limited to some degree by what had happened to his earth in those forgotten years, for it was then that its quality was determined, its mineral content, the value of its soil, and the salinity of its waters."

Donald E. Slater is a civil engineer with the Foundations, Materials, and Surveys Branch of the U.S. Army Engineer Division, Middle East (Rear). He has practiced in the geotechnical discipline for over 14 years. He has a bachelor's degree in civil engineering from the Catholic University of America and a master's in civil engineering from Oklahoma State University. He is professionally registered in Maryland and Virginia.

"A military engineer must have the ability to improvise. He will have to do his job with what is available on the spot."

Brigadier General (Ret.) Hugh J. Casey

ENGINEER INGENUITY

A FADING ART?

by COL Don W. Barber

Any student of military history understands that war places great demands on the military engineer. In wars from antiquity to the 20th century, there are countless examples of engineer ingenuity turning the tide of battle.

Peacetime training, however, places little emphasis on engineer ingenuity and its precursor, reconnaissance. We must rekindle interest in ingenuity during training because the ability to improvise will certainly be a key factor on the next battlefield.

Ingenuity is more than mere technical expertise. It is the engineer leader's ability to assimilate data *and to use it creatively!* The scarcity of resources in combat has frequently driven engineers to ingenious solutions. Moreover, innovative use of locally available materials was the paramount factor in most engineer successes on past battlefields.

Such ingenuity, based on personal reconnaissance, was demonstrated during World War II by then-Colonel Emerson C. Itschner, engineer of the Advanced Section (ADSEC), Communications Zone, Europe.

On Aug. 12, 1944, Itschner took a mission of great importance and difficulty. General Patton, who had broken through the German lines and was racing towards Paris, needed fuel for his tanks and trucks. Itschner had to rebuild the railroad to LeMans in three days.

He faced an immense job. The rail line extended 137 miles, seven bridges were down, and three rail yards were heavily bombed. Few watering and coaling facilities remained. He had 75 hours to do a job requiring several months.

ADSEC's 10,500 engineer troops were scattered throughout Normandy. Itschner had to notify them, assign tasks, and deploy them between Folligny and LeMans.

But first came personal reconnaissance. Itschner flew over the rail net to select lines that could be quickly repaired. He ruled out the most

Captured German equipment is used by engineers of D Co., 332d Engineer Reg., to repair a railroad near Aldenhoven, Germany, during World War II.

direct route because bridges at Pontaubault and Laval were too damaged for quick repair. He decided to use the double-track between LaChapelle Athenaise and LeMans.

The bridge over the Selune River at St. Hilaire-du-Harcourt presented the worst obstacle. The Germans had blown the south end off its abutment. The 347th Engineer General Service (GS) Regiment cut off the damaged end, jacked up the bridge, and rested it on a crib. Men went without sleep so they could complete this task in three days.

When Major General Cecil R. Moore, chief engineer, ETO, flew over the bridge with Itschner six hours before deadline, he saw spelled out in white cement, "Will finish at 2000." And it was.

The first trainload of gasoline left Folligny Aug. 15 and reached LeMans two days later. Thirty trains carrying fuel for Patton followed at 30-minute intervals.

Meanwhile, another general service regiment began repairing bridges at Pontaubault and Laval. When completed by the end of August, they allowed opening a better line to LeMans. Itschner's troops helped speed along the gasoline required for Patton's armor to thrust across Northern France and shorten the European war.

While the LeMans railroad illustrates personal reconnaissance, it doesn't tell all about engineer ingenuity.

The American forces were critically short of bridge materials. In earlier reconnaissances, ADSEC engineers spotted quantities of German-produced meter beams. In an interview conducted by the Office of the Chief of Engineers, Itschner recalled how they were put to use:

All through Europe we found these big meter beams . . . We found other sized beams, too, but the meter beams were the mainstay of the Germans and they were all stamped with the name of a single steelmill—Hadir—located at Differdange, Luxembourg. So we determined right from the start if we ever got into Luxembourg, and we thought we would, we'd head right away for Differdange. And as soon as it was captured we had our people there, and lo and behold, the steelmill was intact. They were badly in need of rubber belts, and of course we didn't have any of them, but we found some others and replaced them, cannibalized and replaced them. But above all they needed manganese to mix with the ore. It was a steelmill located right at an iron mine and near sources of coke. So you had everything right there. We had our scouts out all over and fortunately they reported there was a large pile of manganese right on the west bank of the Rhine, at the time the Germans were on the east bank. So we sent our trucks up there at night and with some cover from our own forces we got the manganese that was needed and hauled it back.

Resources located through personal reconnaissance and used creatively compensated for critical material shortages. Fifty thousand tons of meter beams were produced after the United States took over production at Hadir, and over 90 percent of all railroad bridges built by engineers used them. Engineers throughout Europe used these meter beams to build bridges which permitted tactical operations that would have been impossible or delayed.

In *The Military Engineer*, Feb. 1943, Brigadier General Hugh J. Casey, listed the following attributes of a successful military engineer:

- initiative
- intelligence
- ability to reduce problems to fundamentals
- ability to see the big picture
- proper sense of balance
- commitment to the welfare of subordinates
- a sense of humor
- ability to improvise
- cooperation
- a reasonable degree of professional or technical knowledge
- composure
- continuous exercise of active reconnaissance

The following excerpts from Casey's article represent his experience as chief engineer, General Headquarters, Southwest Pacific Area. Casey knew the meaning of ingenuity:

A Military Engineer must have the ability to improvise. He will have to do his job with what is available on the spot. There is no corner hardware shop to get the supplies, or industrial establishment to turn out the tools that he needs for the job immediately ahead. He must do it with what is on hand. If hand grenades are not available, a cookie (most appetizing to serve) can be made from a piece of bamboo, a stick of

dynamite, some nails, mud, a cap and fuze with cellophane-wrapped match attached. A larger cookie with a piece of automobile spring for a catapult or with a bow and arrow arrangement made of discarded inner tubes may make a workable, even though less capable, substitute for lacking mortars. In the absence of tank mines, a tiny wooden coffin with ten pounds of dynamite, an electric cap, a flashlight battery with contacts operated by crushing in the top, secured by only sufficient brads to sustain a 400-pound load, will give reasonably satisfactory results. At least the tanks don't like it. The use of boiler plate properly emplaced will make a small cruiser out of a large-size rowboat. Piers and bridges can be built out of discarded gasoline drums. The job, no matter what it is, must be done with whatever is available. The Military Engineer will never say he can't do the job because he lacks the means.

The Military Engineer must continuously exercise Active Reconnaissance. He must reconnoiter the area in which he is engaged, evaluate the difficulties which may be encountered, and determine and know the engineering resources that are available in the operations area. He should know the condition of roads, bridges, railroads, and their potential sources of trouble. He should devise plans beforehand as to what he must, can, and will do to handle those problems. He should know where sources of timber, gravel, water, barbed wire fences, stocks of engineer tools, plants or supplies are available. Only by continuous reconnaissance will he remain a jump ahead of such problems and contingencies that will be continually arising.

The engineers are among the first ones in and the last ones out. The Military Engineer in time of war is rough, tough, and fast. His whole mental makeup and characteristics must be adjusted to that tempo if he is to accomplish his job.

All engineer leaders must be concerned about battlefield ingenuity. The ingredients are reconnaissance, assimilation of data, and improvisation. We train our soldiers in part of the ingenuity equation, but fall short in solving the whole problem.

For example, units in field training exercises frequently receive reconnaissance missions. But what happens to the data? Usually the reconnaissance form is evaluated and filed, not used for accomplishing a battlefield task. Locally available materials spotted during reconnaissance aren't used in a mission. In other words, we aren't fostering battlefield ingenuity.

There are many obstacles to creating a proper training environment—restraints on using locally available materials, prohibitions against cutting trees, training areas without usable materials, and environmental objections.

Many leaders also argue you can't teach ingenuity. That mentality is hogwash. It better be, because we'll need all our ingenuity in the next war.

Engineer leaders should be fostering an innovative spirit. If you have suggestions for improving officer or NCO training or if you tried something in your unit that may improve our curriculum, tell us. Write to USAES, DTAD, Fort Belvoir, Va. 22060. The Engineer School is incorporating the topic of ingenuity into instruction programs.

With military history as a beacon, we can foster a creative spirit by meeting challenges with enthusiasm and imagination. Between those of us at the Engineer School and each of you in the field, we can work together to bring ingenuity back to the forefront in combat engineering.

COL Don W. Barber commands the Engineer Center Brigade at Fort Belvoir. He has completed Engineer Officer Basic and Advanced Courses, Airborne and Ranger training, Command and General Staff College, and the Industrial College of the Armed Forces. He has a master's degree in civil engineering from the University of Tennessee and is a registered professional engineer in Virginia. Past assignments include HQ, U.S. Army Vietnam; Operation Deepfreeze; Operations Personnel Directorate, DCSPER, DA; and command and staff positions in the 7th and 8th Infantry Divisions. Engineer School assignments include director, Directorate of Training and Doctrine and director, Department of Military Engineering.

ENGINEER SOLUTION

1. 5/Z/?/4.1/(OB)

5-Minimum width encountered was 5 meters.

Z-Route is type Z anytime a ford or ferry is encountered along a route.

?-Lowest Military Load Classification-No bridge along the route and the load classification along the worst section of the route is undetermined.

4.1-Lowest overhead clearance was encountered at the railroad crossing, 4.1 meters.

(OB)-Used if any obstructions were encountered, i.e., sharp curves, ferry ford, overhead clearance 4.3 meters, and traveled-way width of underpass.

2. Vehicle/Pedestrian
3. Difficult
4. 15 meters
5. Difficult
6. 6 meters
7. 1:12,500
8. No seasonal limitations
9. 11%
10. 30 minutes
11. Yes-overhead clearance is 4.3 meters
12. Tracked vehicle turn-off with coniferous concealment

Topographic Support:

A new operational concept

by CPT(P) David R. Gallay

Battle graphics, survey data, terrain analysis, updated maps and reproductions—all are products and services required by commanders at all levels. What is the best way to provide those essential services to the light, mobile units of the U.S. Central Command (CENTCOM)?

Fort Belvoir's 30th Engineer Battalion (Topographic) (Army), part of the reactivated Third U.S. Army (which includes CENTCOM), probably would support a CENTCOM deployment. After analyzing the support requirements of likely CENTCOM missions, the 30th has devised a new topographic operational concept.

The analysis defined the battalion's mission in terms of general support—the surveying, mapping, terrain analysis, and map storage/distribution requirements of a light force operation at echelons above corps.

The analysis baseline was predicated on the current Modified Table of Organization and Equipment (Figure 1).

The major objective of the analysis was to develop a self-sufficient and responsive task organization. Self-sufficiency, for analysis purposes, is achieved when an element meets its topographic support requirements without operational backup. Responsiveness is attained when it meets its topographic requirements in the time set in the topographic chapter of the Engineer School's Mission Area Analysis.

The Concept

The battalion's preliminary analysis suggests the organization shown in Figure 2. The analysis also suggests that this organization can provide both general "base-plant" topographic support in rear areas and mobile, combat topographic support.

In concept, the battalion conducts base-plant operations in a semisecure location. Its headquarters company performs staff and unit housekeeping functions. The staff is augmented with the major who was the terrain detachment commander under the standard MTOE. With the detachment ceasing to exist under the new concept, the major becomes the

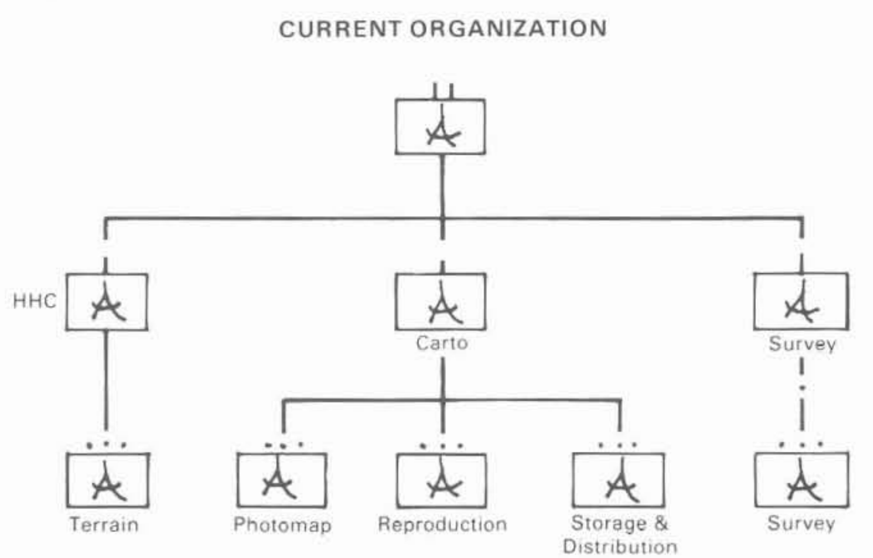


Figure 1. Current MTOE of the 30th Engineer Battalion (Topographic) (Army).

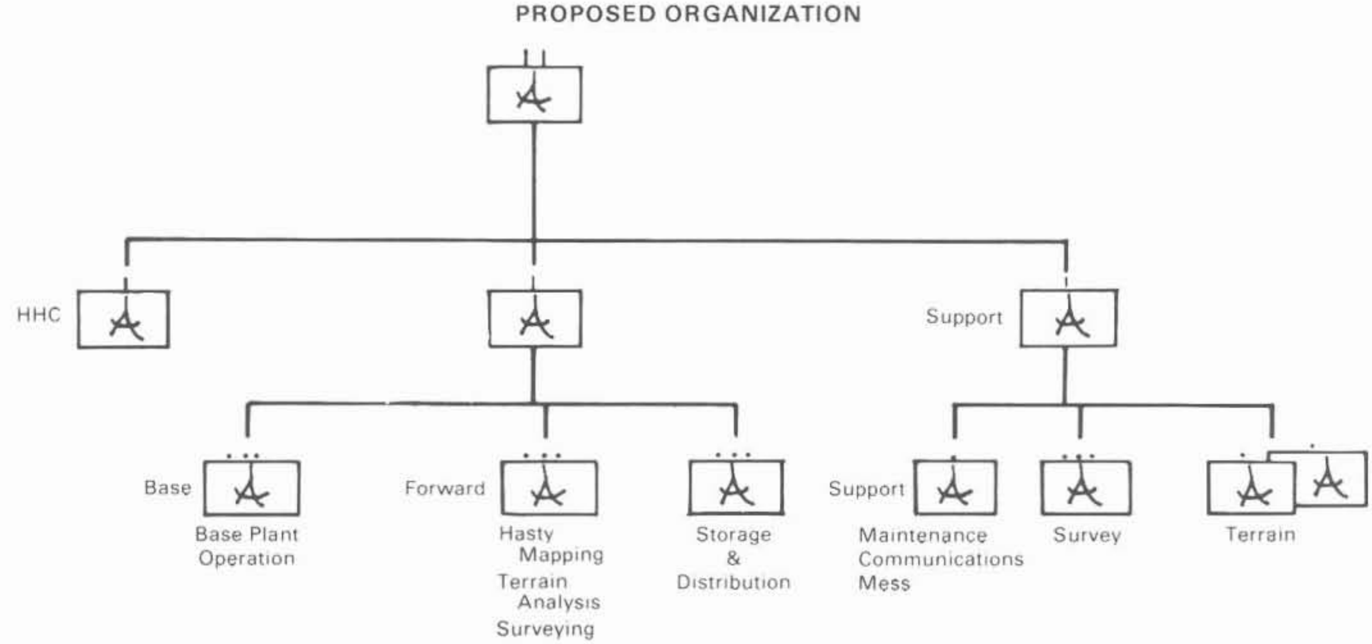


Figure 2. The 30th Engineers' analysis suggests that this organizational structure would best support a CENTCOM deployment.

assistant command topographer. He or she represents the battalion commander and serves as a liaison to higher headquarters.

The new concept shows the topographic company with three platoons: base, forward, and storage/distribution. In the semisecure location, the base platoon performs most mapping missions, while the storage and distribution platoon prepares standard Defense Mapping Agency and nonstandard Army map products for supply-point distribution.

(The Engineer School and others know that storage and distribution functions may be better performed by logistic units using supply support concepts, and that there may be a need for greater Defense Mapping Agency support. However, for the time being, the 30th Engineers will rely on battalion assets.)

As its title implies, the forward platoon isn't confined to a rear area. Its mappers, surveyors, and terrain analysts provide forward combat topographic support to the corps' topographic assets.

The topographic support company is also in the semisecure area. It provides support with specially tailored teams to meet specific requirements. The support platoon, for example, supports the battalion with maintenance, communications and mess resources. The remaining company elements, the survey platoon and two terrain teams, provide general topographic support where needed.

Evaluation and Interpretation

This task organization, plus four alternatives, were evaluated in tactical exercises without troops. Besides the criteria of self-sufficiency and responsiveness, the analysis addressed command and control, communications, logistics, and liaison.

Based on the tests, the task organization's support platoon appears to enhance logistic and communication support. The forward platoon also increases the battalion's operational capabilities. Additionally, the assistant command topographer provides good liaison with both higher and lower headquarters. More importantly, both response time and operational self-sufficiency are improved significantly.

Future Actions

The 30th Engineer Battalion will continue to test the new organization. The plan is to conduct a command post exercise of the battalion's most likely mission. This will be followed by two field training exercises, the first evaluated internally, the second externally. All tests will be compared with the battalion's ARTEP performance when the unit was configured conventionally.

The findings and conclusions of those tests will be consolidated, recommendations prepared, and the entire analysis submitted to the Engineer School. Perhaps a new organizational standard will evolve.

Topographic support to the combined arms team is crucial. The 30th Engineer Battalion's proposed task organization points us in the direction to more effectively support the battlefield commander.

CPT(P) David R. Gallay, XO of the 30th Engineer Battalion, has a bachelor's degree from the U.S. Military Academy, a master's degree in engineering from Purdue University and a master's in management from the University of Southern California. He has commanded engineer companies in Korea and Germany and is a graduate of the Command and General Staff College. He is a registered professional engineer in Virginia.

NONPOLLUTING

WASH FACILITIES

They use up to 99% less water and 86% less energy.

by Joe Matherly & Jerry Benson

A system developed by the Army Construction Engineering Research Laboratory (CERL), Champaign, Ill., cuts time spent washing a mud-caked tank from three hours to 10 minutes. The system also solves attendant wash rack problems of clogging storm drains and polluting adjacent water supplies. CERL's concepts are being successfully applied at Forts Lewis, Wash., and Polk, La.

Fort Lewis completed a one-year pollution abatement project based on CERL recommendations. Project results confirm that the CERL procedures control water pollution from vehicle maintenance areas and reduce time spent on vehicle cleaning.

The Army Environmental Hygiene Agency (AEHA) Western Region Office evaluated the CERL-designed systems at Fort Lewis and found them performing effectively. Better washing equipment, appropriate water pressures, improved station layouts and recycling treated water reduced potable water use by 90 to 95 percent. At a CERL wash facility at Fort Lewis' Yakima Firing Range, washing an M60 tank used only one percent of the water and 14 percent of the energy needed with the previous system.

David Hanke, chief, Sanitation Branch, Utilities Division at Fort Lewis says, "We remove 12,000 cubic feet of dirt from vehicles annually. The wash racks were scattered and storm drains got so clogged they were cleaned once a week. Now there are only two collection facilities to clean. The operation is a dream compared to what it was."

Historically, Fort Lewis has had difficulty meeting pollution-control requirements for water leaving the installation. The primary pollution source was vehicle maintenance activities.

The changes at Fort Lewis motor pools involved eliminating wash racks, constructing vehicle maintenance platforms that use hot-water cleaners, improved waste oil collection/storage, and using overhead cranes. The hot-water cleaners eliminated using vast amounts of detergents, solvents and other aids for cleaning engines and mechanical components. The greatly reduced, simplified waste-water flow is pretreated in small, comparatively inexpensive gravity oil and sediment separators before entering the sewers.

Fort Polk recently began operating a new centralized wash facility using the "tank bath" option. The bath is a water basin with adjustable water levels through which tracked and wheeled vehicles drive. Both entrance and exit areas are equipped with fixed spray guns that an operator plays across the vehicle. The bath's purpose is to wet and quickly remove most soil on the vehicle. The baths also retain the soil, avoiding the costly handling at individual washracks.

Jim Kelly, general engineer, Master Planning Branch, Facilities Engineers at Fort Polk, says, "Washing an M60 tank took a crew of four people three to four hours because of the thick clay mud here. Our new facility with the same crew washes it in about 10 minutes; the record is six minutes. This lets soldiers concentrate on training and maintenance, and boosts morale by getting soldiers out of the motor pool and home sooner."

Joe Matherly is the team leader of CERL's Maintenance Facility Pollution Abatement Team. He has a B.S. in chemistry from Eastern Illinois University and a M.S. in environmental engineering from the University of Illinois. He is a registered professional engineer in Illinois.

Jerry Benson is an environmental engineer with CERL's Environmental Division. He has a B.S. in civil engineering from the University of Illinois.

At this new Ft. Polk facility, M60 tanks are washed in 10 minutes.

"Why wasn't I selected?"

by CSM (Ret.) Marvin Knowles

After a promotion list is published, the questions start. "Why wasn't I selected?" Commanders and leaders wonder, "Why wasn't Sergeant Tentpeg selected?"

The same questions are asked after every promotion board. Promotion board members would like to answer them personally, but obviously they can't. However, they do provide a review and analysis report to the Soldier Support Center at Fort Benjamin Harrison and to the commandant of each proponent school.

The selection criteria are based on the "best qualified" method through a "whole person" evaluation of each soldier's record. The best qualified method identifies NCOs who have proven they possess personal characteristics and duty potential greater than their CMF contemporaries.

Undoubtedly, the toughest part of a board's job is determining who is best qualified. It is impossible for each NCO to personally meet with the selection board, so board members must base their decisions on the NCO's Official Military Personnel File (OMPF).

Each year, DA announces the dates for all centralized promotion selection boards. Messages alert all NCOs in the zones of consideration to ensure their OMPFs are complete and to verify the information in their promotion packet.

When I sat on a promotion board several years ago, I was shocked at how many OMPFs were incomplete. NCOs must remember that to the board, *your OMPF is you*.

Here are some observations from recent E-7, E-8 and E-9 selection boards:

Physical fitness: Sometimes a service member's height and weight could not be verified. The data was either not posted or not current on the DA Form 2-1. Some official photographs did not correspond to OMPF height and weight statements. In other instances, photos and records showed the NCO was overweight, but no comments or corrective action were noted on EERs. An overweight condition is a major obstacle to being promoted.

Utilization and assignments: Some records revealed an NCO had a profile which logically prevented him from working in his primary MOS. However, the records didn't reflect what action was taken to reclassify him. Sometimes an NCO had spent a considerable amount of time in ROTC, as a recruiter, drill sergeant, instructor, or in an invalid TDA/MTOE position. These "offline" assignments must be limited. Strive to be assigned to and do well in TOE leadership positions.

Performance and potential: Some EER numerical scores weren't supported by the narrative. On some reports, the rater and indorser recommended promoting the service member, yet the numerical rating was low. Indorsers many times merely parrot rater comments. Comments regarding performance should be specific; an appropriate level of NCOES and future assignments should be recommended.

Board recommendations: NCOs should serve in mainstream assignments and avoid repetitive tours outside the CMF. NCOs must maintain the weight standards listed in AR 600-9, and *must* validate their records before any board. Commanders and leaders need to know the importance of writing EERs which accurately reflect the NCO's performance. Records are important and NCOs must review them conscientiously.

Promotion isn't a reward for past performance; it's recognition of *potential* to serve in a position of greater responsibility. However, judging your potential is based on a review of your file—a file that must be accurate and up-to-date to be fair to you.

CSM (Ret.) Marvin Knowles was command sergeant major of the Engineer Center and School when he retired in 1982. He now lives in Petersburg, Va.

Career Notes

NCO & Enlisted Branch

Tougher Topo: The physical requirements for topographic soldiers have been upgraded to provide the Army with combat-ready field topographic units and to enhance this career management field.

The physical profile serial (PULHES) for MOSs 41B, 81C, 83E, 83F, and 81Z has been changed to ensure these soldiers are able to meet the physical demands of their job.

It should be stressed to commanders and soldiers alike that the physical profile serials listed for MOSs in AR 611-201 are only guidelines.

A common misconception about such changes is that soldiers whose physical profile doesn't meet the new MOS physical standards must be reclassified. This is not always the case.

As long as a soldier with a limiting physical profile can perform his MOS duties, no reclassification is necessary. However, if he can't perform his MOS duties, he should be encouraged to reclassify for medical reasons.

Warrant Officer Branch

Updating Records: Warrant officers must have up-to-date physicals, photographs and Officer Record Briefs (ORBs) for all promotion boards and senior course boards. Recent changes require a photograph for promotion boards.

Phase II Moves: Warrant Officer Advance Course Phase II moved from Fort Belvoir, Va., to Fort Leonard Wood, Mo. in April. Phase I remains at Aberdeen Proving Ground, Md.

Info: For information concerning warrant officer careers, contact CW4 Edward L. Walls, (202) 325-7839/3840; AVN 221.

Commissioned Officers Branch

Company Command: Current DA policy for company command tours of 18 months, plus or minus six months.

Preference Statement: A current preference statement is an important tool for your career manager. It's especially important that Engineer Branch, MILPERCEN, have your current phone number, and your residence and official mailing addresses. Also, list any special conditions, e.g., handicapped dependent.

Commissioned Officers, cont.

Official Photographs: DA selection boards use official photos in addition to the ORB and microfiche records. Photos should be updated every four years or after promotion; wear individual awards and a pressed, well-tailored uniform.

Civil School Applications: Officers who desire to compete for civil schools should apply to Engineer Branch. The Civil Schools Selection Board meets in September and March. Applications should be made on DA Form 1618-R. Graduate degree programs are restricted to shortage disciplines in the officer specialties. Applicants must have successful company command and be advanced course graduates.

3R and IG Assignments: Engineer officers captain to lieutenant colonel should plan on at least one ROTC, recruiting, reserve component advisor, or IG assignment.

Tech Jobs for LTs: Lieutenants who do well with troops and have a technical background may qualify for the few technical jobs available to lieutenants. For information, contact the Lieutenants' Assignment Officer.

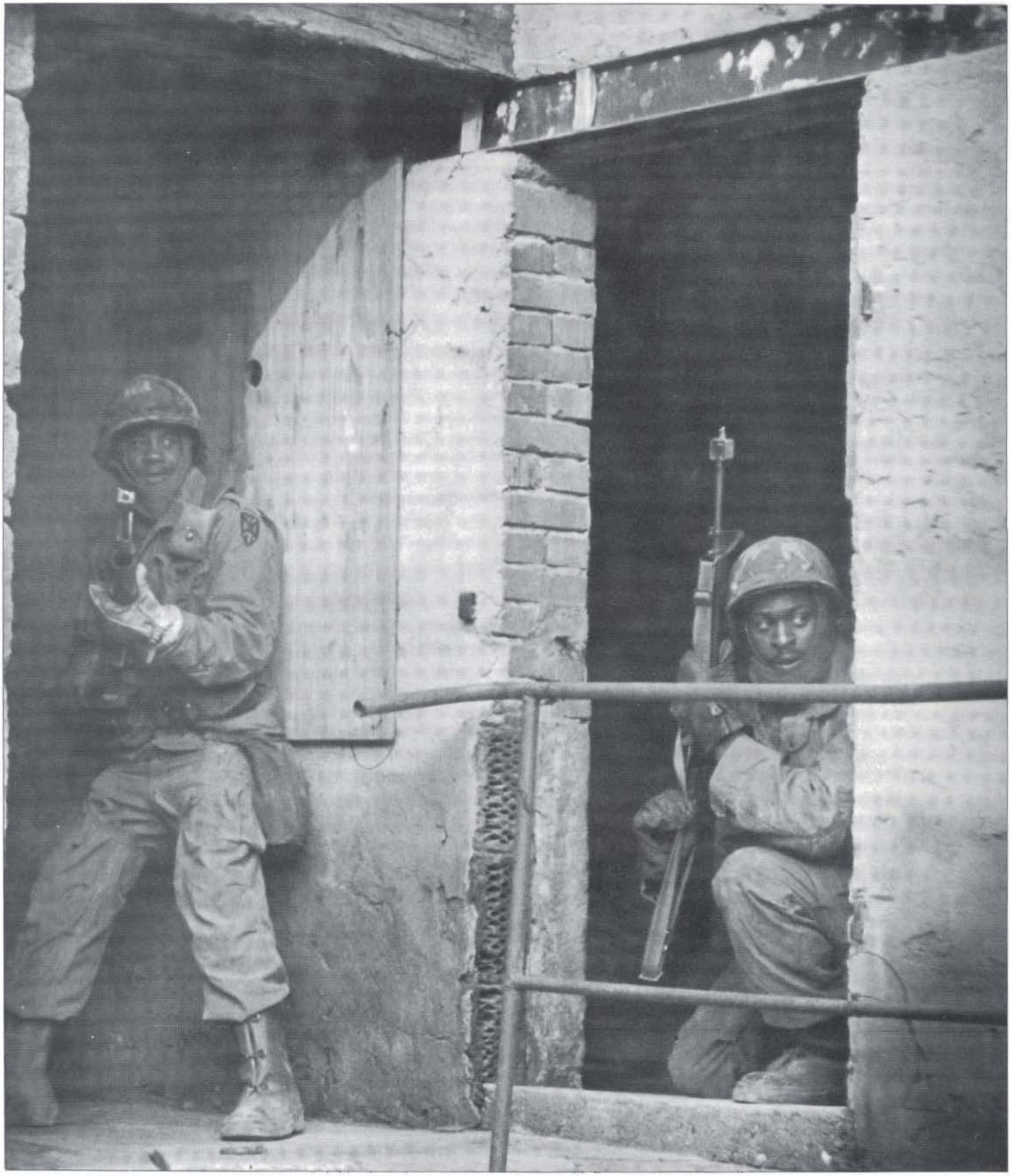
SC 21 Restructure: DSCPER recently approved the restructuring of Speciality Code 21, "Engineer" for commissioned officers. This change, the culmination of an 18-month study by the Engineer School, separates SC 21 into two clearly defined functional areas: Combat Engineering and Facilities/Contract Management Engineering.

The new SC 21, "Combat Engineer," will encompass positions related to missions involving battlefield mobility, countermobility, survivability, and general engineering tasks. Also included are positions requiring combat engineer expertise. Like the other combat arms specialities, Combat Engineer will be an accession speciality. It will not be available as an additional speciality.

The new SC 23, "Facilities/Contract Construction Management Engineer," will include positions related to Army facilities/family housing support and positions related to civil works and military construction programs. SC 23 will be an additional speciality available to officers of all specialities.

MILPERCEN will review the records of current SC 21 officers and identify those qualified for Combat Engineer and Facilities Construction Management Engineer. Experience, education, and training will be the determining factors in reclassification. Most officers with SC 21 as their initial speciality will be assigned Combat Engineer. About 60 percent of these Combat Engineer officers will also be assigned the additional speciality of Facilities Construction Management Engineer. Officers who now have SC 21 as their additional speciality will generally be reclassified as SC 23.

MILPERCEN will send letters to each officer affected by speciality redesignation. The actual reclassification will occur between April and September, 1984. More details concerning this change will be in future issues of ENGINEER Magazine.



SP4 James Baldwin, left, and SP4 Gregory Bost prepare to move against a sniper during MOUT (military operations in urbanized terrain) training in Bonnland, Germany. Both soldiers are from A Company, 9th Engineer Battalion, 7th Engineer Brigade. (Photo by John Vastyan)