Engineer

THE MAGAZINE FOR ARMY ENGINEERS

WINTER 1980-81

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THE COVER

Combined arms team members must work closely with and use engineers to enhance their own battlefield mobility, deny enemy mobility, and reinforce their survivability. Major General David E. Grange, Jr., examines the importance of teamwork between infantry and engineers in battle beginning on page 10. Cover art by Ron Perkins.

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VOLUME 10 WINTER 1980-81 NUMBER 4

FEATURES

page 13

page 20

page 32

DEPARTMENTS

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NEWS & NOTES

US BUYS UK BRIDGE ERECTION BOATS

The United Kingdom Combat Support Boat (UKCSB) has been adopted by the US Army for bridge erection operations following 10 months of testing and evaluation. Selected on the basis of its compatibility with the US ribbon bridge, the diesel-powered, aluminum craft is shown here pushing an interior bay of the ribbon bridge into position. The UKCSB features a shallow draft, only 22 inches compared to 41 inches for the current US standard 27-foot bridge erection boat it will eventually replace. It is also 27 feet long, has a top speed of 25 mph, and is unsinkable. Like the US model, it can be carried and launched by the ribbon bridge transporter fitted with a cradle. The UK boat will be delivered to US Army units beginning in November 1981.

AWARD AUTHORITY DELEGATED

The Department of the Army has approved a change concerning the award authority for the Good Conduct Medal. Company, battery, and troop commanders are now authorized to award the medal to deserving soldiers. Formerly, award authority was reserved for general officers and field grade officers. The recent decision to further delegate award authority of the Good Conduct Medal places authority at the proper level to promptly recognize soldiers while maintaining the integrity of the award.

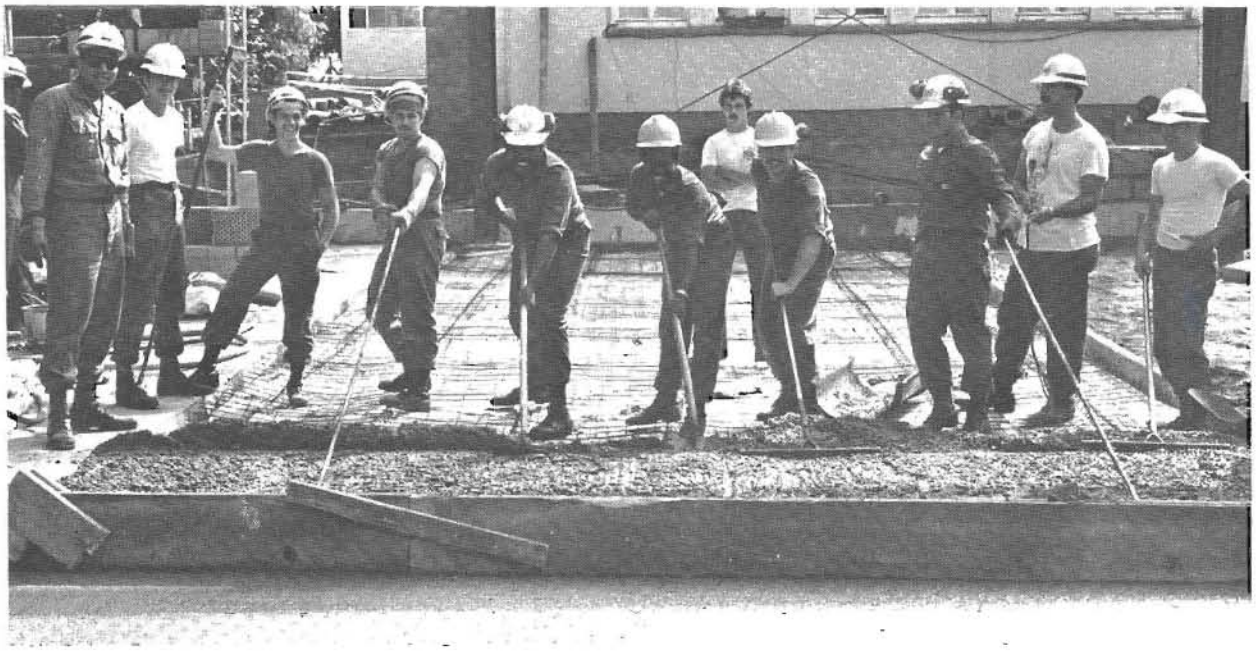
WARRANT OFFICER TERRAIN ANALYSIS COURSE

A new Warrant Officer Terrain Analysis Course, conducted by the Defense Mapping School at Fort Belvoir, VA, will provide the Army with its first Terrain Analysis Technicians (841A). WOTAC graduates will serve as leaders of newly formed Division Terrain Teams, occupy positions on Corps and Theater Army Terrain teams; and serve in operations sections of Topographic Battalions. The 15-week course includes nine weeks of terrain analysis instruction, one week of instruction on the Analytical Photogrammetric Positioning System (APPS), three weeks of weather analysis, and two weeks of cartographic/graphic arts instruction. After graduation from WOTAC, new Terrain Analysis Technicians will be required to attend a two-week Warrant Officer Orientation Course at Fort Rucker, AL. Course prerequisites include the requirement that selected NCOs possess one of four MOS: Cartographer (81C), Surveyor (82D), Meteorologist (93E), or Image Interpreter (96D). (WOTAC 1-80 began on 27 August and concludes 18 December.)

continued

BAGGAGE RATE CHANGES

The Military Airlift Command (MAC) began last October to base baggage allowances on the number of pieces shipped rather than the weight. Passengers flying on military and MAC contract charter flights can check two pieces of baggage free. Each piece may not exceed 62 linear inches (Length plus width plus height) nor 70 pounds. One piece, not to exceed 45 linear inches, may be hand carried onboard. Before, a passenger was limited to 66 pounds of baggage. Passengers exceeding the free baggage allowance will be charged a flat rate of 18 percent of the MAC passenger fare. Those who are authorized excess baggage will also pay the 18-percent rate if they exceed their limit. The flat rate will be assessed if a bag exceeds size or weight limits. Duffle bags will be accepted as an authorized single piece regardless of weight or size. Passengers flying on a space-available basis will be allowed two pieces of checked luggage not to exceed a combined weight of 66 pounds. When pet shipment is authorized, the pet is considered excess in all cases, and a flat rate will be assessed for each increment of 70 pounds, regardless of the dimensions.



ENGINEERS PULL TOGETHER

Engineer soldiers of D Company, 249th Engineer Combat Battalion (Heavy), pull together when they're given a construction assignment. One of their most recent construction projects was a 5500-square-feet controlled environment steel and masonry building to house the 25th Data Processing Unit in Schwetzingen, Germany. D Company engineers are shown here preparing the concrete foundation for the building. The 249th is headquartered at Gerszewski Barracks in Karlsruhe. (US Army photo by SP4 Frank Lyles)

NEWS & NOTES

NEW PT PROGRAM

Army Chief of Staff General E.C. Meyer has approved a new PT Program for personnel over 40 years of age. It includes an emphasis on cardiorespiratory fitness and body composition (reduction of fat); a six-month get-in-shape period after medical clearance; and a diagnostic of current fitness levels with prescribed intensities for appropriate workouts. The new PT test for over-40 personnel is "Go/No-Go" and presently consists of a two-mile run. Substitute tests for those whose medical profiles restrict running include swimming, cycling and walking. A by-product of the program will be the implementation of new procedures in the biennial physical examination for those over 40. The procedures will include a comprehensive heart attack risk analysis to assist doctors in providing sound medical advice to individuals and commanders.

RETIREMENT APPLICATION RULES CHANGE

Officers and enlisted soldiers may now apply for retirement up to 13 months before their retirement date. Changes to AR 635-100 and AR 635-200 permit soldiers to apply for normal voluntary retirement and retirement in lieu of PCS once they have completed 18 years and 11 months of active federal service. Those who apply more than six months early must request a retirement date no later than the end of the month during which they attain 20 years of service.

Soldiers requesting retirement to avoid a PCS have 30 days from the time they are notified to apply for retirement. Enlisted soldiers are notified in writing. Officers may receive written or oral notification.

SECURITY FENCE GOES UP

Three line companies and a headquarters contingent of the 299th Engineer Combat Battalion (Corps), stationed at Fort Sill, OK, provided the expertise and muscle to construct more than four miles of security fence at Fort Chaffee, AR, during late August and early September. A total of 185 soldiers worked in two 12-hour shifts around the clock for 22 days to complete the project in 30 percent less time than officially allotted for such projects. Fort Chaffee is now the primary relocation center for Cuban refugees in the US.

continued

BRANCH TRAINING TEAMS

Branch Training Teams (BTT) have been activated by TRADOC to work as the primary interface between units and Branch Schools. As part of the BTT program, each school will visit representative proponent units to: inform the unit of current Branch School products, processes, and concepts; assist the unit in applying school products toward their training program, in conjunction with the Battalion Training Management System; and collect training and combat development data that will enable the schools to better serve the needs of the unit. A test of the program ending last summer had 15 service schools, in cooperation with HQ FORSOM, visit more than 170 units. The feedback reports were unaminous in their assessment that the program helped the training environment within the unit, as well as focusing attention on school products and processes that may need changing. Schools will be conducting an expanded program during FY 81 with visits scheduled for Eighth Army, USAREUR, Reserve Component units and FORSCOM.

NEW STORAGE FOR POMCUS

Soldiers assigned to the 249th Engineer Combat Battalion (Heavy), 18th Engineer Brigade, Karlsruhe, Germany, prepare to work on the interior of a new storage structure. Last March, these soldiers began the mission of constructing 26 Stress Tension Structures to provide storage space for POMCUS (Prepositioned Materiel Configured to Unit Sets) military equipment in Northern Germany. The buildings, procured by the US Army Troop Support and Aviation Material-Readiness Command, are among the largest prefabricated structures ever erected by a troop unit. Each of the huge buildings is comprised of more than 22 tons of steel and 30,000 square feet of nylon fabric covering and is capable of providing more than 20,000 square feet of storage space. (Photo by PFC Carl H. Foschi)

NEWS & NOTES

SQUAD ASSAULT COURSE

Soldiers of the 17th Engineer Battalion, 2nd Armored Division, cross Fort Hood's Cowhouse Creek in rafts on the first leg of the battalion's new combat engineer assault course. Designed to provide realistic training in offensive tactics, the course requires many of the same tasks that engineers are required to perform in a combat environment. Along the way, they must fire their individual and crew-served weapons, fire bangalore torpedoes, use smoke for concealment, and demolish a bunker with explosives. (US Army photo by Jack Raudy)

NEW WATER DISTRIBUTOR

Combat heavy battalions and construction support equipment companies will soon receive the 6000 gallon semitrailer mounted water distributor system recently type classified as a standard item of Army equipment. The semitrailer mounted system will replace the truck-mounted water distributor system presently in the Army inventory and provides a six-fold increase in water capacity. This increased water capacity will provide the Army with a maximum compaction capability. The distributor will be employed worldwide with the initial fielding due to be completed by April 1981. The system will be used to supply water for soil compaction and dust control, and to provide a limited fire-fighting capability. A liquid-cooled Perkins diesel engine mounted at the rear of the distributor directly drives its 600 gallon-per-minute centrifugal pump. The spray system is made up of two nozzles that can produce a fan type spray pattern covering a swath up to 70 feet wide. The semitrailer mounted distributor is towed by a standard military truck tractor. A remote control panel is used to operate the system from the tractor's cab.

LETTERS

Dear Sir:

I am disappointed that "Tactically Qualified, Technically Proficient" was published in the Spring 1980 issue without editorial comment.

The first part of the article is basically a summary of current engineer tactical doctrine. Although nothing new is presented, at least the summary is accurate. However, it is when the author starts discussing command and support relationships that I believe he fails to keep reading the very same manuals he was so aptly summarizing.

I question his sweeping conclusion that more efficient and timely engineer support can be provided maneuver commanders via a command relationship of attachment. In addition, his figure illustrating the lengthy tasking channels for a corps engineer battalion DS to a division is wrong. In developing his argument, CPT Robertson forgets both the role of the division engineer as well as the definition of direct support.

To allow us all to have the same frame of reference, I would like to use a few extracts from FM 5-100, 30 March 1979.

a. p 2-9: "Whatever command relationship may be established between corps engineers and the division, **three cardinal principles apply for engineers operating within the division area of operations:**

(1) The thrust of engineer effort is forward, with the corps engineer elements habitually working as far forward as the brigade areas.

(2) The concept of normal association is followed in that the same engineer units, as a matter of normal procedure, operate with the same maneuver element.

(3) All engineers operating within the division area of operations are coordinated or directed by the division engineer as the single engineer point of contact for the division commander. Within the brigade areas, the normally associated divisional engineer company commanders (brigade engineers) normally perform this coordinating or directing function for the division engineer and act as the single point of contact for brigade commanders...."

b. Likewise, under the Command and Control section, p 4-28: "The division engineer:

(1) Commands the division engineer battalion.

(2) Coordinates or directs the total engineer effort in the division area including the effort of engineers from corps."

c. p N-3: Direct Support.

"Direct support is defined in JCS Pub 1 as follows:

> A mission requiring a force to support another specific force and authorizing it to answer directly the supported force's request for assistance.
>
> An engineer unit placed in direct support provides liaison with the supported unit commander on engineer matters, and takes support requests directly from the supported unit. In case of engineers operating in a division area, the division engineer and the brigade engineer are the single engineer points of contact for the supported maneuver commander.
>
> Corps engineer units operating in a direct support role in a division area establish liaison with, advise, and take support requests directly from the engineer single point of contact in whose area they are operating. Command responsibility is retained with the parent engineer unit unless the direct support engineer unit has been attached to the supported unit for certain logistic functions, e.g., rations and POL."

Operating within the framework, corps engineers coming to the division with a command relationship of DS, OPCON, or attachment can have their assets shifted by the division engineer. Only requests for additional personnel or equipment not originally supporting the division must be relayed to the parent engineer headquarters (group or brigade). Reallocation, readjustment, and reinforcement of engineer effort is best requested through engineer channels for speed as well as quantification of the need. If the brigade engineer cannot satisfy the request with his assets (divisional as well as nondivisional) he forwards the request for the division engineer. Command channels requests are not required by doctrine, nor are they normally used in the real world. If requests do come through command channels, from a maneuver unit with a DS engineer, this is an indicator that some supporting engineer hasn't been doing his job!

Let's not forget that when engineers are attached to a maneuver force, the ability of the engineer one level higher to reallocate assets is severely restricted. Now requests must, in fact, go through command channels. For example, if all engineers supporting three committed brigades were attached, a simple action such as moving a dozer from the 2nd to the 1st Brigade would have to be accomplished via a G3 tasking. This lack of flexibility is exactly what the current engineer system is designed to avoid.

Logistical support for widely dispersed DS engineer units is a problem; however, attachment is not a cure-all. Tank and infantry units cannot completely support our equipment. Some parent unit support always has to be provided. However, we need not despair, as most units faced with this support problem have been able to develop workable solutions. As an example, the 1st Armored Division FSOP specifies that DS engineers receive Class I, Class III, common parts of Class IX, and maintenance and recovery support from the supported maneuver unit. Unfortunately, peacetime logistics restrictions prevent this support from being as complete to corps engineers as it is to the divisional battalion, but progress is being made in this direction. This is the way we train, and this is the way we plan to fight.

In summary, FM 5-100 gives combat engineers and maneuver commanders a tested, workable method of utilizing engineer support in order to effectively multiply combat power. Some situations dictate that engineers should be attached to maneuver units. However, DS is normally preferred since readjustment of engineer effort is quicker and simpler. Logistics problems inherent in DS can be and are being overcome in the field. The publication of FM 5-100 has been long overdue. However now that it is in print, we should all read and understand it before proposing changes.

Joseph P. Kish
LTC, CE
16th Engineer Battalion

FORUM

Compulators

An argument for the acceptance and use of calculators by Army engineers

by Captain Trent Keeble

The time is near for the merging of two different technological fields—computers and calculators. We think of calculators as very portable, and sometimes very versatile adding machines, but not much more. We perceive computers, on the other hand, as a massive array of wires and diodes that solve some of the world's most difficult and complicated problems. We have kept the two separate in our minds primarily because of the vast differences in capabilities. Slowly but surely the technology to mature a calculator into a computer is evolving and the differences wane. What will happen when we finally have a calculator that is as versatile as a computer was just a few years ago?

When calculators first appeared on the open market they were very simple and expensive. But gone are the days when a simple four-function calculator sold for $135. Today, the same capabilities are packaged in a calculator that is credit card thin and retails for under $30. Such prices have allowed calculators to become a common household or school item.

Everyone is affected by them to some degree, good or bad. They are quick and reasonably reliable. They also lessen the element of human error. Such reliability and accuracy, however, lulls us to the point of forgetting principles underlying basic mathematics (and even higher levels with some of today's advanced scientific or business calculators).

We can either view calculators as a tool or as a crutch. As a tool it has a valuable place in the scientific and business communities. It can be used to manipulate data and/or variables to arrive at different solutions. This ability provides a basis upon which to make decisions. The more reliable the data, the more confidence in making a decision. Calculators can provide the confidence.

But what of computers? When computers began to find their way into the everyday

business and scientific worlds, people were awed by their power. Some people misconstrued them to be the answer to too many of the world's problems. But the passage of time has radically changed this viewpoint. We now consider computers as a necessity. Our original fears of the computer contrast sharply with our present ideas of calculators. We sell short the calculator and its future. We thought too much of computers then, and think too little of calculators now. We should have learned from the computer experience to respect calculators as tools (and limited ones at that) with practical uses now and a great potential for the future. We should not overreact.

Eventually, the calculator will be able to perform many complex and difficult mathematic manipulations (something similar to a minicomputer). Then we will be faced with an even greater challenge. We must become even more receptive to the use of computers. We have already felt the immense impact of computers in our society—bank statements, bills, moon landings, magazine subscriptions, check-out systems in stores, television, and telephone systems. The impact will be even greater when calculators with comparable abilities to computers are developed and marketed to the public.

We will be forced to change our views of calculators. They will not fit our current concept of calculators. They will be *computers* that fit into the palm of one's hands. We must be willing to grow with the changes and mold those changes to our benefit.

With all this in mind, how should we view calculators in today's Army, and specifically in the engineering fields? We can view them as fancy adding machines. However, I would prefer to see calculators designed to ease management, designing, and administrative burdens. I foresee calculators being readily adapted to: calculating logistical requirements; classifying roads and bridges; designing roads and airfields; CPM; pipeline design; bridge design; ADM; NBC; 2715 and 2406 reports, just to name a few adaptations.

What prevents the use of calculators by today's Army engineers? A lack of interest, funds, fear, or is it a lack of foresight?

At present, the Field Artillery has incorporated programmable calculators into the FADAC, but calculators do not and cannot replace the FADAC. Rather, they support its mission by solving gunnery problems and providing backup. West Point is seriously looking into the possibility of issuing programmable calculators to cadets.

Army engineers, on the other hand, use programmable calculators in only a few areas. Topographic units and surveying teams use them. Some programs are developed for ADM, but not enough. The Construction Engineering Research Laboratory is now conducting research concerning areas of application. But even after applicable areas are identified, how are calculators going to be introduced into the field and who should use them? The US Army Engineer School has not taken steps to include calculators into the Officer Basic or Advanced Courses. So how will a knowledge transfer occur?

Calculators possess a great potential for current application and an even greater potential for the future. With the advent of "bubble chip" technology and other breakthroughs, calculators will certainly evolve into small computers. These new calculators will most likely have many peripherals as options similar to the options on a car. Just like computers, calculators will be able to interface across telephone lines, use cathode-ray tube displays, have X-Y plotters, be capable of expendable memory, and become a portable timeshare terminal. That is a phenomenal amount of power. It is a power that we can use to our benefit, not detriment. Engineers on the battlefield will be able to derive quicker, more accurate estimates upon which to base decisions. There is little doubt that time will be at a premium during the next major battle.

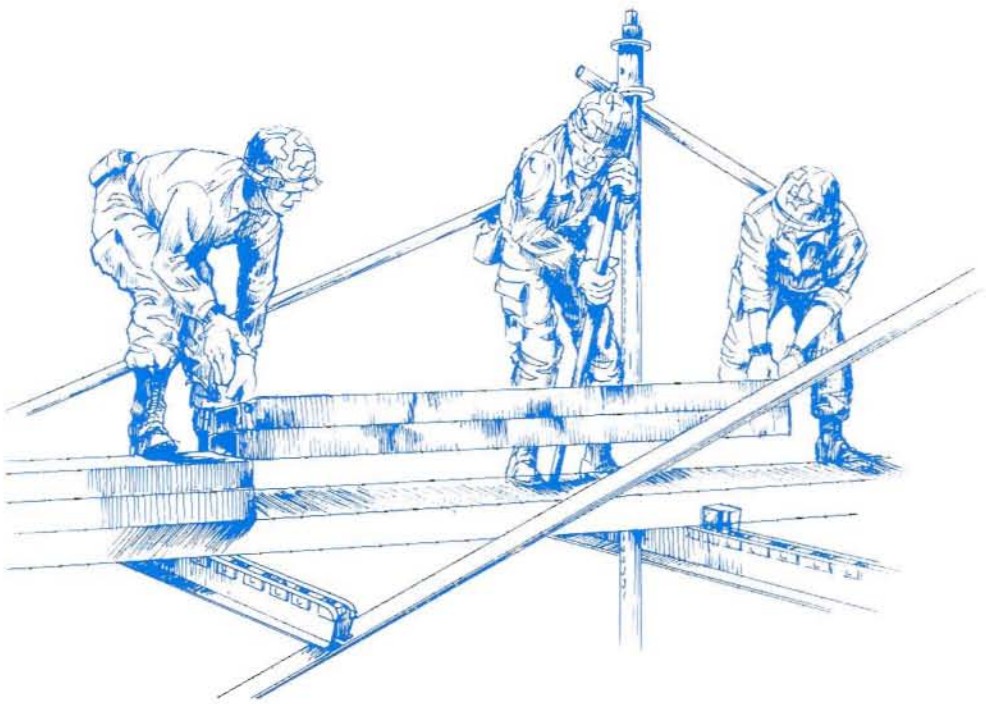
So what should we do about it? We should be willing to change our concept of calculators as technology continues to progress. We should search for realistic engineer areas of application and use the calculator to our benefit. Now! This resource is barely tapped in the military engineering field, yet deserves serious consideration by anyone heading toward a battlefield. The use of calculators on the battlefield is something we must support as a collective whole. The potential of calculators lies in mass usage, not in selective usage. In order to win the next battle we need all the weapons available to us, and one of those weapons is knowledge. Calculators can add to our knowledge.

Captain Trent Keeble is currently assigned as an ADPS and CPM instructor with the Engineer Management Branch, Department of Military Engineering, US Army Engineer School, Fort Belvoir, VA.

Engineers and Infantry in Battle

by Major General David E. Grange, Jr.

EDITOR'S NOTE: The following article was published initially under the heading, "Commandant's Notes," in the September-October 1980 issue of INFANTRY magazine. It represents a keen awareness of engineer capability on the battlefield by other members of the combined arms team.



The 1973 Arab-Israeli War emphasized the importance of combined arms operations and force mobility in modern warfare. This article is designed to focus on two elements of the combined arms teams that are critical to operations and force mobility—the infantry and the engineers. Infantry contributions as part of the combined arms teams during the 1973 War were magnified by the efforts of the engineers who constructed artificial hills, assault bridging platforms, antitank ditches, minefields, and combat fortifications, and those who also did occasional duty as infantrymen when they were needed "up front" with the assault forces.

In the event of war in Europe, United States forces will most likely be in a defensive posture during the initial outbreak of hostilities. Early warning, time, and enemy tactics will determine whether they fight from hasty or prepared positions; it will probably be from both. Our commanders must organize their resources and take the fullest advantage of the key terrain in their areas. They must carefully employ their weapons and maneuver their forces to bring the full effectiveness of their weapons to bear on the enemy. They must also see to it that their units do everything possible to survive the effects of the enemy's weapons.

Covering forces have two missions: to destroy the enemy while causing him to deploy early and expend his breaching and bridging capability, and to gain time for defensive preparations in the main battle area. In the main battle area the enemy must be canalized and held in the firing corridors and kill zones of our weapon systems. Both the covering and MBA forces need to disrupt and slow enemy formations, separating the enemy infantry from their tanks and destroying their armored vehicles.

To accomplish this task, combined arms team members must work closely with and use the engineers to enhance their battlefield mobility, deny the enemy mobility and, throughout the battle, reinforce their survivability through a combination of terrain, weapons, and obstacles.

We should use natural obstacles, reinforced with mines and manmade obstacles, to deny the enemy cover and concealment by canalizing him into selected areas where we can best use our weapons to destroy him or to force him to abandon his offensive. Whenever possible, positions must be established for our antitank systems to take advantage of their full range potential and to provide opportunities for flanking fire. The engineers can help immeasurably in these tasks.

But, to fully use our limited engineer resources (there will never be enough), commanders must establish a priority of work that is derived from their perception of how the battle is to be fought. On the basis of the commander's visualization of the battlefield, the engineers can prepare obstacles to support weapon systems and killing zones in the order in which they will be required to increase the lethality of our weapons.

To establish a priority of tasks for engineer support, a commander starts with the antitank weapons, which are the initial building blocks for the defense, and then determines the positions for other crew-served weapons, tanks, armored personnel carriers, command posts, individual fighting positions, and communications trenches. The best way to dig in vehicles and weapons is to use engineer bulldozers, combat engineer vehicles, and front loaders. Engineer backhoes are also useful in preparing crew-served weapon positions, individual fighting positions, and communications trenches. Engineer chain saws are useful to cut log beams for overhead cover, to create small obstacles, and to clear fields of fire. Camouflage nets, enhanced by natural foliage, when combined with good light and noise discipline, will improve the security and effectiveness of battle positions.

Engineer efforts before a defensive battle are usually divided between battle position development and the emplacement of obstacles. During the battle, engineers will be tasked to command-detonate mines, to close lanes in obstacles, and, if need be, to reinforce the defense by becoming infantrymen.

During a movement to contact, the engineers must be up front with the infantry and armor, clearing the way by removing roadblocks, downed trees, and rubble, breaching minefields, making quick bypasses around obstacles, and crossing ditches with assault bridging. Frequently, combat engineers will accompany infantry patrols to determine the location and dimensions of threat obstacles.

Since a modern army requires a constant resupply of items to maintain the momentum of an attack, engineers will also be tasked to create or repair the supply routes for reinforcements, supplies, and vehicles within the battle area.

Combat in cities demands an even closer relationship between the infantry and the combat engineers. During military operations in urban terrain, engineers with infantry support will remove bothersome obstacles along the route to the built-up area. Within the built-up area, engineers will be tasked to breach walls, remove boobytraps and antipersonnel mines, mark gaps and routes, clear rubble, and maintain passages for combat vehicles. The demolition gun on the combat engineer vehicle (CEV) is excellent for many of these tasks.

Defense in a built-up area presents a new set of chores for combined arms teams. Obstacles must be planned in depth and must include rubble, minefields, and roadblocks. Cratering for roadblocks can be accomplished by filling existing sewer lines with explosives to form hasty craters. The CEV demolition gun can create rubble from buildings to impede enemy ground and mounted attacks. Infantrymen and engineers can work together to construct battle positions at key points such as corner buildings or to dig communication trenches between critical battle positions.

When augmented with additional equipment from their battalion, combat engineers can construct fortifications and emplacements for the defense. A combat engineer battalion can also provide an armored vehicle launched bridge (AVLB) or improve emplaced bridges in support of combined arms operations. Engineer bridge support provides the extra combat mobility for counterattacking forces to position themselves at the right places to destroy the enemy.

When performing assaults on enemy positions, engineers are located with the lead elements of the attacking platoons. Infantrymen

and engineers, using natural cover and concealment aided by smoke and indirect fire, work together to breach obstacles by clearing antipersonnel mines and barbed wire entanglements, marking lanes, providing local security, and neutralizing enemy weapon emplacements, bunkers and pillboxes. To complete the breach, engineers follow up with minefield clearing devices or combat engineer vehicles (CEV) and bulldozers to complete the penetration and destruction of fortifications and to help combat vehicles get through the defensive belts. To overwatch the assaulting and breaching forces, a support force is normally established consisting of tanks,

continued

IFVs, TOWs, and, of course, indirect fire weapons.

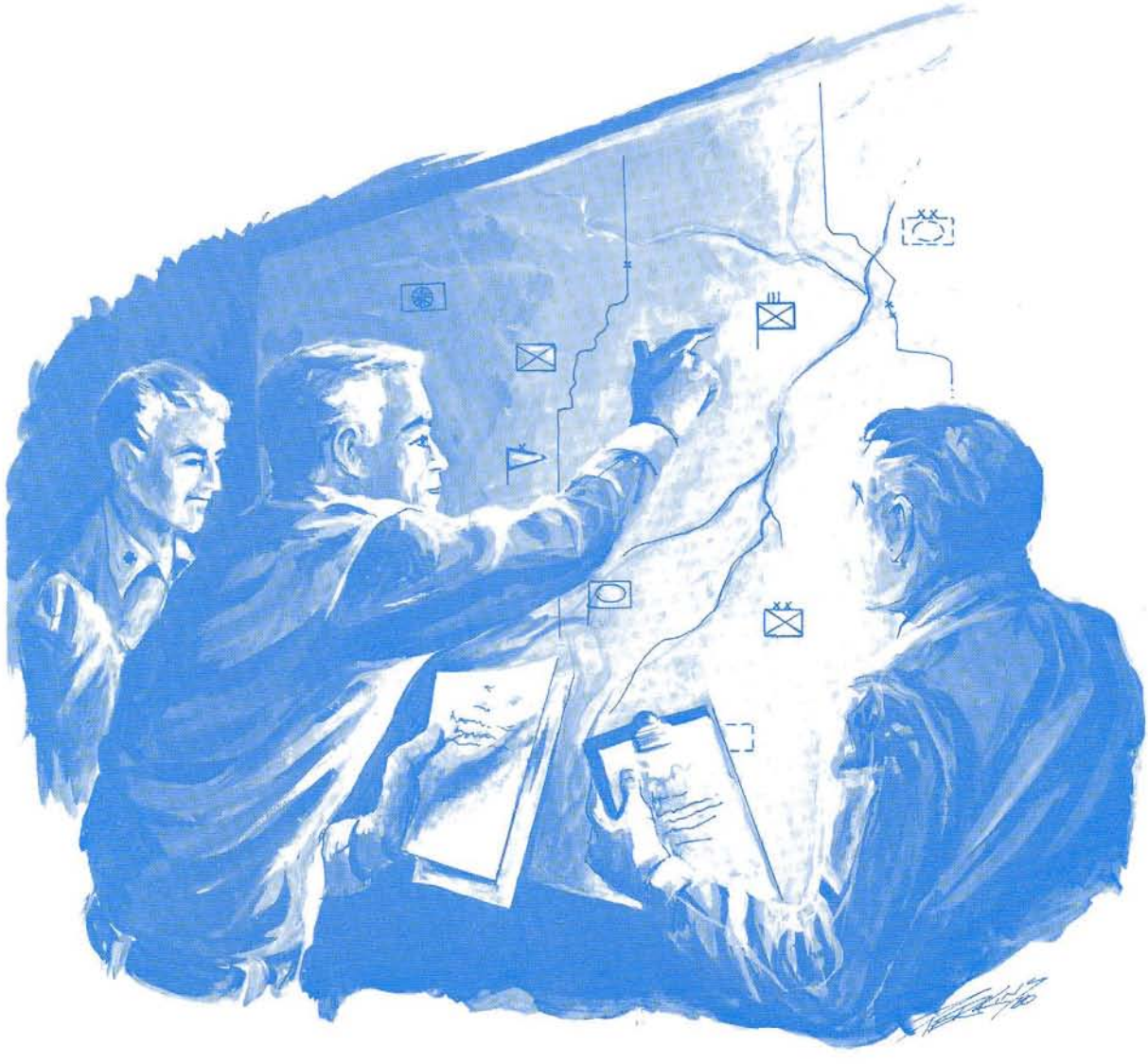
Working with engineers, individual infantrymen can assist in breaching minefields to provide additional lanes for follow-on forces. If mine detectors and other mechanical means of neutralizing minefields are not available, the men can breach them by probing an area for a footpath and marking mines. The marked mines are then destroyed in place and cleared lanes are marked to provide safe corridors.

Maneuver units should take as much interest in training with engineer support units as they do with the other members of the combined arms team. Carefully planned and realistically executed combat tasks such as breaching and constructing obstacles and conducting river crossings, should be integrated into ARTEPs, FTXs, and other training exercises. At the same time, engineer units would gain more knowledge of infantry missions. Infantry units should also be capable of employing expedient obstacles when engineer support is not readily available. Road craters, log hurdles, and log post roadblocks are typical antiarmor obstacles and have good potential. The most interesting training for the infantry and the engineers is the small squad- or platoon-sized drills that bring them together on day or night patrols to locate and reduce obstacles.

Last, but certainly not least, the engineers must know how to fight as infantrymen. Many a desperate fight by a U.S. task force has been won by the timely appearance of combat engineers as a reinforcing infantry force. Commanders should provide opportunities for engineers to serve in infantry roles on every field exercise. It is vital that this skill be kept alive and well.

The goal should be to increase cooperative training among all the combined arms team members and to achieve realistic training that is aimed at a high level of combat proficiency. It should not be just to maintain the capabilities of our respective branches. Now is the time to practice and sharpen the ability of our infantrymen to operate with the combat engineers on any future battlefield and win.

Major General David E. Grange, Jr., is the Commandant/Commander of the US Army Infantry School/Center at Fort Benning, GA.



Molding an Effective Tactical Operations Center

by Major John W. Braden, Jr.

Tactical Operations Center (TOC) operations can make or break a battalion. Effective command and control is especially important for engineers, who will often operate throughout a division area of responsibility, attempting to meet requirements greatly in excess of available assets.

continued

One of the first steps in setting up an effective TOC is to determine *who* will be available to staff the operation. For this, reality prevails over the MTOE. Assuming 12-hour shifts within the TOC, a typical S-2/S-3 organization is shown in Figure 1.

Naturally, shifts will be staggered, and a good way to illustrate this is by using a Duty Wheel (Figure 2). Essentially, this is a 24-hour clock which depicts duty times for each position.

The S2 Recon Sergeants are not shifted. Experience has proved that they are best utilized on an on-call basis. The S2 radio and journal are maintained by one of the S2 drivers not out on a reconnaissance mission.

The 12-hour shifts of the S3, Assistant S3, Operations Sergeant, and Assistant Operations Sergeant will always be followed by a 6-hour tour on the road. This means that a key representative from the S3 shop will always be out to observe what is (or is not) happening. After 12 hours in the TOC, this person should have an excellent appreciation of the situation and will be able to provide valuable insights on operations. The 6-hour road tour, after debriefing TOC personnel and the next road tour individual, is followed by a minimum of five hours rest. With this, operations can be sustained almost indefinitely without the "crash" that comes after about 36 hours as TOC personnel become uniformly exhausted.

S3 radio operators, clerks, and drivers also have an additional duty. Two hours prior to, and two hours after, their TOC shift are dedicated to TOC guard duty. Conceivably then, these individuals have eight hours per day off-duty. Considering that their "free" time will be used for eating, sleeping, assisting in moving the TOC and other unplanned housekeeping or operational tasks, this is reasonable.

TYPICAL S-2/S-3 SHIFT PAIRINGS IN TOC

FIRST SHIFT	SECOND SHIFT
S-3 officer	Assistant S-3*
S-2 sergeant	S-2 officer
Assistant Opns sergeant	Operations sergeant
Chemical NCO	Construction NCO**
Draftsman***	Construction specialist***
S-3 clerk	S-3 clerk
S-3 driver	S-3 driver

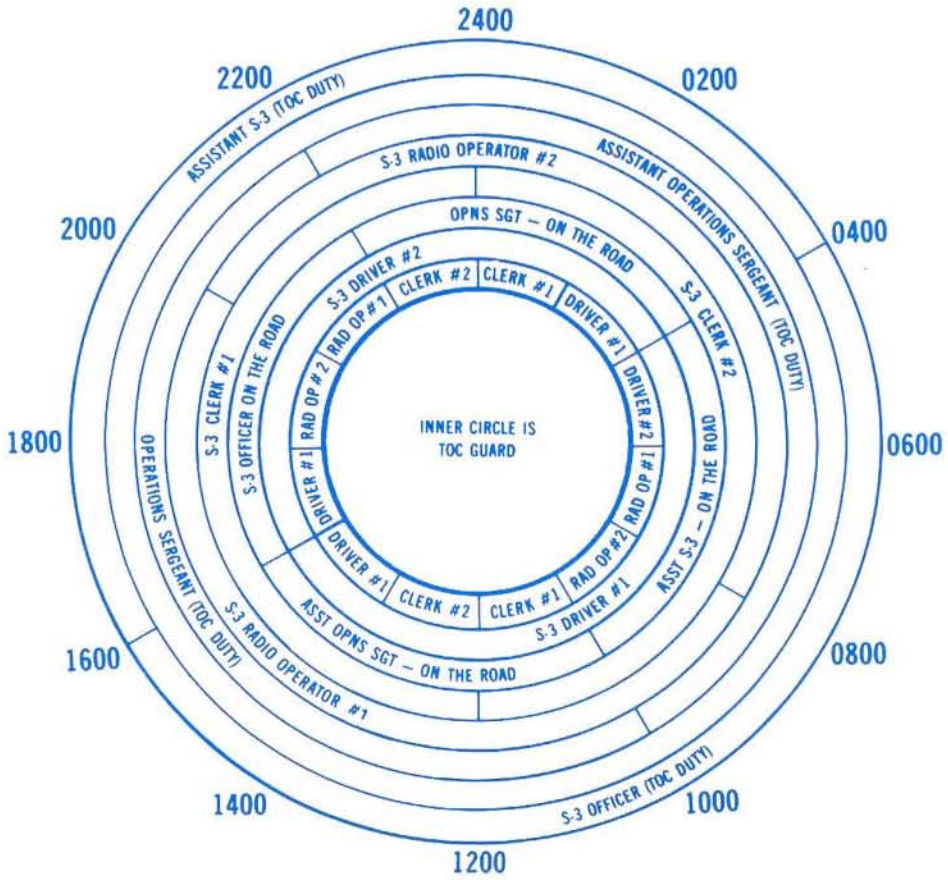
NOT ON SHIFT
Reconnaissance sergeants (3)
S-2 drivers & clerks (3)

* Battalion NBC officer
** Trained for NBC duties
*** Serves as radio operator

FIGURE 1

The Chemical NCO and his counterpart for NBC duties, the Construction NCO, are on 12-hour shifts. During their time in the TOC, they back up the operations personnel and perform special projects as required. When not on TOC duty, they have responsibility for insuring that general housekeeping and maintenance tasks

FIGURE 2



are performed (often by using clerks, drivers, or radio operators shortly before or shortly after they pull TOC guard). Examples include vehicle and generator maintenance, refueling, and improving positions and camouflage.

During displacements of the TOC, the off-duty NBC NCO has the responsibility of supervising off-duty S2 and S3 personnel to take down and put up the TOC and its ancillary equipment and material. Also, during NBC attacks, the off-duty NBC NCO will travel, if at all possible, to the site of the attack, or incident, and provide NBC defense and decontamination advice to the commander.

In summary, there are four advantages of a Duty Wheel. *First*, it provides a formal system for insuring the capability for sustained operations, as opposed to a peaking of efficiency between six and 12 hours followed by steadily declining effectiveness as TOC members "poop out." *Second*, the system establishes performance norms for everyone. It can be seen that there is an equitable distribution of work and responsibility. No one will feel that he must "gut it out" nor will anyone "get over." *Third*, S3 personnel will be on the road 24 hours per day to insure that missions are being accomplished as visualized and to provide face-to-face contact with units to exchange information and report items of interest directly back to the TOC. And, *fourth*, there is a capacity to provide responsive, on-site assistance directly to units under NBC attack, in order to maintain or regain their combat effectiveness.

Once responsibilities have been delegated, the equipment and supplies required for TOC operations must be identified and preloaded. Naturally, there must be a balance between carrying those items needed for normal contingencies versus overloading the TOC with nice-to-have junk which contributes little and acts like deadweight when it come to moving the operation.

Figure 3 gives a "basic load" of administrative supplies and equipment. It is recommended that CTA-authorized electric typewriters be obtained for garrison use so that manual typewriters may be permanently stored in the TOC vehicle.

Training of TOC personnel can be categorized as equipment training and operational training. The former refers to the labor required to set up, maintain, and break down the TOC plus the training to insure that *all* TOC personnel can operate the equipment (radios, CEOI, vehicles, radiacmeters, generators, Coleman lanterns) essential to the job.

Operational training should begin with Command Post Exercises (CPX). A good battalion level CPX can be set up as illustrated by Figure 4.

In this configuration, a Control is set up which plays both higher headquarters and other units outside the battalion, and also plays each of the platoons and squads in the battalion. The battalion XO can serve as Chief Controller. Other battalion officers such as the S1 and the Maintenance Officer, plus off-duty TOC personnel, can staff the Control Headquarters.

- COLEMAN LANTERN PARTS
  - Spare mantels
  - Spare burner and generator assemblies
- TOILET PAPER
- SPARE LIGHT BULBS
- OFFICE SUPPLIES
  - Stapler with extra staples
  - Carbon paper
  - Manifold paper
  - Paper clips, thumb tacks, map tacks
  - Correction fluid for typing paper and for mimeograph mats
  - Typewriter ribbon and correction tape
  - Grease pencils, ink pens, felt tips, pencils
  - Alcohol-base (preferred) or water-base pens
  - Overlay paper
  - Acetate
- MAPS
  - 1:50,000 map boards
  - 1:50,000 road and bridge maps
  - 1:50,000 trafficability maps
  - 1:250,000 maps
- TRASH BAGS
- PAPER PLATES AND CUPS, PLASTIC DINNERWARE
- COFFEE, SUGAR, AND CREAM
- FUEL AND WATER CANS
- SPARE PRC-77, BA-30, and AM REMOTE BATTERIES
- FLASHLIGHTS
- SPARE AM AND FM MICROPHONES
- MASKING, CELLOPHANE, ENGINEER (WHITE), AND GENERAL PURPOSE TAPE
- ROPE AND STRING
- A TOOL SET: WRENCHES, PLIERS, SCREWDRIVERS, HAMMER, NAILS
- BLANK FORMS
  - DD 173 — Message pads
  - DA 1594 — DA 2496
  - DA 1355 — A slice of maintenance forms
  - DA 1355-1 — Spot report forms
  - Range cards
  - Recon forms: DA 1248, 1249, 1250, 1251
- WD-1 WIRE

FIGURE 3

Figure 4 depicts a closed system. Controllers, acting as higher headquarters, can call a mission into the battalion and expect to respond, as a platoon, to that same mission once it has been analyzed and assigned down from both battalion and company levels. A CPX set up as shown should be run first at a garrison local using land lines for communication. Subsequent exercises can be run strictly by radio.

Operational training must include message handling techniques. An incoming message will normally be received by the radio operator, who will use a DD Form 173 to record the message. Appropriate headquarters will be selected for action. Once the message is no longer required, it is returned to the operations clerk where it is filed, in order, in an envelope attached to the back of the log. There will be a strong tendency for the operators to pull messages out of the normal flow. While this may be required for certain critical traffic, this is often not the case. Since such practice will often result in lost paperwork, all personnel should be cautioned in this regard.

continued

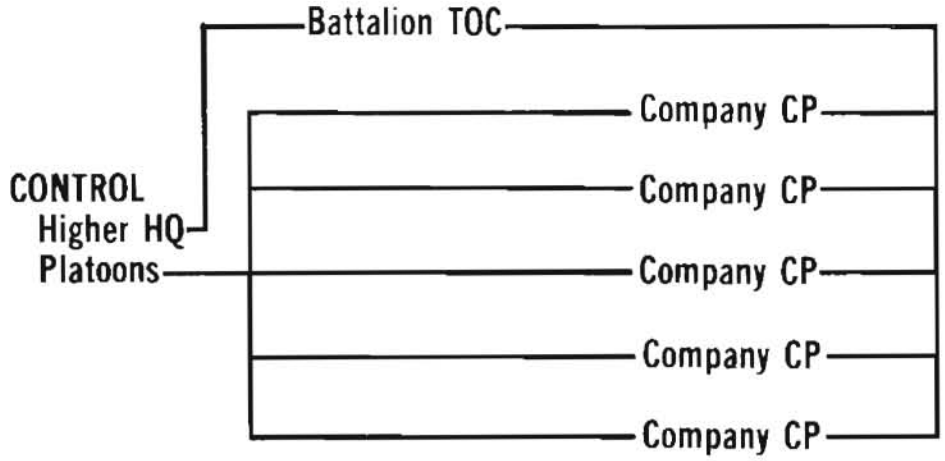


FIGURE 4

The radio operator and the operations clerk will often have to exert a great deal of personal influence to keep the journal straight and messages accounted for.

Since the mechanical effort of drafting or receiving and logging a message is time consuming, it would be wise to overprint a DD Form 173 to meet your needs.

While on the subject of messages, it is a good idea to have a message book readily available to your radio operators and clerks. Normally, this is a 3-ring binder well stocked with appropriate message forms and equally well tabbed. The price for *not* having this or a similar system is that incoming messages get written on scrap paper, C-ration boxes, the walls, or anything else handy.

TC 101-5, Control and Coordination of Division Operations, states that "staff sections maintain the minimum number of information displays required to keep...informed of frequently needed, essential information." At battalion level, besides a situation map maintained by the operations element and the intelligence overlay maintained by the S2 personnel, few other informational displays are needed. Since the contingent of "operations" is small, most extraneous information such as mission-oriented protective posture, weather data, effective downwind message, radiation exposure summaries, personnel and equipment status, and similar information can be maintained on letter size paper in document protectors within a specially designated book.

CEOI callsigns and suffixes are often placed on a chart to aid personnel shifting in and out of the TOC. About the only other informational display which is required is a mission chart.

The mission chart should be an exact blowup of an SOP form which is the Mission Status Report. The form is designed to be included in the Obstacle Annex of a War Plan, though the form is used for more than obstacles, for operating without FM SECURE equipment, and for use in an EW environment where transmission time must be minimized.

Besides listing preplanned missions in an orderly format, the Mission Status Report should be used to assign, in advance, mission numbers to tasks not assigned by the war plan, but highly likely according to the MTOE capabilities of the unit and the commander's best guess as to possible contingencies. These missions can be forecast using the ARTEP as a guide plus a little crystal ball action on the terrain. There is no need to be highly specific in these possible mission assignments since the primary purpose is to provide immediate advance warning to subordinate units so that they may begin appropriate actions while awaiting more definitive instructions.

It should be noted that the reporting requirements for the Mission Status Report can and should be modified for local use. Specifically, there may be neither a need nor a requirement to use all of the columns. This can easily be taken care of by annotating the form. Likewise, not all reports need be transmitted by radio. Data as to the status of non-critical missions can and should be sent by courier.

Once your shifts and operating procedures have been set up and exercised in garrison, you are ready to hit the woods. Begin with an alert and run the CPX discussed earlier from a field location. Note that we're still exercising battalion and company "operators" without wasting the time of our troops.

Natually, if you are going to start with an alert, the first hurdle, other than an effective notification system for all S2 and S3 pesonnel, is to get the TOC operational and up on the net.

This is going to take a little forethought and planning, but shouldn't be too difficult. First, you might think about where your TOC vehicles are normally parked in garrison. Ask yourself if they are in the most advantageous position for immediate operation. For example, instead of the S2 vehicle and S3 vehicle being parked "on line" with the rest of the HHC fleet, maybe they should be routinely backed up to each other in a secure area near battalion headquarters.

Next, put yourself in the position of SP4 Jones, your faithful clerk or radio operator who happens to live in the

barracks and is probably in best shape to quickly set the TOC in motion. There are a few problems, however. Jones needs his mask and weapon, so he stands in line with everyone else waiting for the NBC NCO and the armorer to open up their areas for issue of equipment. Once these have been taken care of, there is the TA 50 to be carried out and the vehicle must be dispatched—so there's more time standing in line. In the meantime, the Battalion Commander, S2, S3, Company Commanders, and a whole lot of other essential people are having a fit because the organization is going without command or control.

How about this instead? At the first word of an alert, Jones, or the first S3 person in, goes to the SDO and draws the extra CEOI issued to the SDO for just such contingency. Then Jones, assuming he's first, goes to the motor pool, performs only those pre-operation checks necessary to safely fire up the vehicle—essentially a check of oil and water—and starts up the TOC to include getting the radios up on the appropriate nets and starting the journal. As TOC personnel arrive, Jones can be spelled to pick up his equipment. Later personnel can get the vehicle dispatched and complete pre-operational checks. (Since Jones didn't move the TOC vehicles, no key would normally be required to simply start the equipment.) An improvement on the system would be to store TOC personnel's TA 50 on the van, truck or trailer in some secure fashion. Same with protective masks.

You can also exercise your ability to handle the various Emergency Action Messages which transition your unit from a peacetime, garrison footing to a fully deployed posture.

Ultimately, you'll move from garrison to the field, normally a local dispersal area. Here's a chance to check out your strip maps and wartime movements procedures.

Once in the field, if you haven't done so earlier, bring in someone to monitor your transmissions and to inject an appropriate amount of jamming and interference to your radio traffic.

Operate for a portion of the time, say in periods up to six hours, in full MOPP.

And one thing you might do after a night or so of operations is to have someone spot check your noise and light discipline. You can figure on a short life span if your TOC is lit like a Christmas tree and sounds like a steel mill.

And, when you think you've got the hang of it, try to maintain operations and communications while moving the TOC an average of six times a day. Frequent moves are a sure way to slim down to nothing but essential equipment.

Displacing the TOC is more than the physical aspect of knocking down, packing up, moving and resetting the equipment. *Continuity of operations* must be maintained. This means that a Jump TOC must be established. Normally, splitting of S2 and S3 vehicles, plus a little fine-tuning of your commo shop retransmission vehicle will do the trick. You'll have to experiment to find out what works best for your operation.

By the way, in order to insure operations continue while moving, have your battalion commander set the move times without notifying anyone, including Control Headquarters, in advance. This can also exercise your ability to select CP locations on short notice. Naturally, you'll want to ask the CEWI types who are monitoring your transmissions if they noted any command and control gaps in your operation while you were shifting locations.

There are a few other things that will make your TOC the epitome of efficiency. Mostly these fall in the category of "helpful hints" that we've all learned the hard way.

Sleep Management. Even using a "duty wheel" such as described earlier, sleep can be a problem—especially in a fast moving environment. There will be a tendency to try to catch a few winks in some of the most uncomfortable positions and places. Personnel should be supervisied to insure within tactical constraints, that they take care of their physical needs by pitching their tent, inflating their air mattress, unrolling their sleeping bag, and laying out fresh clothes. A half hour of setting up a bunk, plus three and a half hours of sleep is far more restful than four, five, or even six hours of "sleep" in the back seat of a jeep (which is unauthorized).

Lights. Since generators tend to go out at the most crucial times, gas lanterns with ample spare parts are a necessity. Vehicular powered lights are adequate in a bind, but they are generally insufficient for sustained operation. A recommendation must be that one lantern should be burning when the generator is working and that two or more lanterns be used at night (to back up each other) when the generator is down. You might note that some units have *only* used lanterns due to noise discipline. (It should go without saying that one of your daytime chores is to fire up all your lanterns to make sure they'll work at night.)

Coffee and chow. It almost goes without saying that the TOC runs on "java," but coffee pots tend to draw Kibitzers and other interested on-lookers. The problem is that all this detracts from the job at hand. Likewise, while the TOC may be a cozy place to eat, this is just something else to take the edge off operations and should be avoided to the extent possible. (It also gets your TOC crew out for a little fresh air every so often.)

You should agree that TOC operations *can* make or break a battalion. Unfortunately, learning to run an effective operations center is like learning to ride a bicycle—you can't do it by reading a book. You have to get out and practice it.

So, good luck to you and your organization, and get out there and *peddle* for all you're worth.

Major John W. Braden, Jr., is an engineer officer currently assigned to the Office of the Inspector General, US Army Training and Doctrine Command, Fort Monroe, VA.

SOMETHING NEW IN BRIDGING

Training on large-capacity, fixed bridges pays off for the 249th Engineer Combat Battalion (Heavy)

by First Lieutenant Dennis E. Linn

The 18th Engineer Brigade, which includes four combat heavy engineer battalions, a topographic battalion, and an engineer construction labor group, is not normally considered a bridging unit. However, one traditional wartime mission for its combat heavy battalions is the maintenance of corps and theater rear area Main Supply Routes.

Current doctrine dictates that German Territorial Commands, in conjunction with the Deutches Bundesbahn (DBB, the German Federal Railway), are responsible for restoring damaged or destroyed rail and high-capacity highway bridges. However, coordination visits to the German Territorial Commands early in 1979 revealed that they stock few semi-permanent or permanent fixed-span bridges.

Another eye-opener was that the German Territorial Commands have few resources of their own. Instead, they rely upon assets drawn from civilian industry. Such dependence is not only risky, but time-consuming in a crisis situation. For instance, it will take a relatively long period of time to convert steel girders and I-Beams to replace a destroyed bridge, *if* the girders and beams are available in the first place.

Therefore, the commanders of the 18th Engineer Brigade and the 249th Engineer Combat Battalion (Heavy) determined following their visits to the German Territorial Commands that expertise in the construction of large-capacity fixed bridges was required.

An analysis of resources available within the theater identified project stocks containing a variety of non-standard bridges.

A site visit to the Reserve Storage Area at Kaiserslautern was arranged to inspect the bridges for suitability and condition. It was discovered that there were a considerable number of bridges and trestles scattered throughout Europe but they had not been used in many years. No one knew if troop units could construct the bridges with organic equipment, if the bridges were truck transportable, or if their design was applicable to modern railway use.

Bridges for training were selected and their release from war reserve stocks was secured from the Department of the Army. The training mission was assigned to B company, 249th Engineer Battalion. Very little was known about the bridges and even the necessary training manuals were difficult to locate. The bridges to be used were the Unit Construction Railway Bridge (TM 5-372 dated 9 November 1943) and the 17-foot and 27-foot I-Beam Railway Bridges (TM 5-371 dated 14 March 1944). In addition, B Company drew a Bailey Bridge Trestle Conversion Kit to use as temporary support during construction. Arrangements were made to borrow ties, rails, and fittings from the DBB to add realism to their training.

The I-Beam bridges were tackled first. Minor variations of these bridges are available in 17, 21, 27, 31, and 35-foot lengths, and are adjustable in one-foot increments by means of a cutting torch. They are deck-type bridges and loading capacities are available up to Cooper's E-45 (or 20 British Standard Units more than enough capacity for any military loading) by using either four or six main girder variations.

The girders are spaced by means of diaphragms and spacers, and reinforced by diagonal bracing on the horizontal plane. This type bridge can be skewed to the left or right and will accept curved track. Bridges can be spliced end to end for longer spans, but must be supported by trestles at their junctures. Trestles may be concrete, timber, or the standard (T type) or light (L type) trestle kits available in war stocks.

The I-Beam bridge is both light and compact for hauling. An entire kit can easily be loaded on a single low bed trailer organic to most engineer battalions. An entire span, less ties and tracks, can be lifted into place using the 25-ton hydraulic crane. The I-Beam's greatest advantage is that it can be assembled in four to five hours, complete with ties and rails, by a relatively inexperienced crew.

The only parts required are I-Beams, spacers, nuts,

and bolts. All bolts are the same diameter and come in just two lengths. Ties are bolted to the I-Beams by means of tie bolts supplied with the kit. Several kits can also be combined to construct trestles according to plans in TM 5-371.

The 249th included the I-Beam bridge in its 1980 training evaluation program (ARTEP) after a minimum of training, and achieved excellent results. During the ARTEP, the 17 and 27-foot bridges were spliced to form a single 44-foot bridge. For the sake of reality, these bridges were placed on steel pile abutments over an expedient trestle from the Bailey conversion kit. Finally, the ties and rails were placed on the bridge, proving that the I-Beam bridge can be constructed in a reasonable time period under simulated combat conditions.

The I-Beam bridge is portable, flexible, easily constructed, and is currently in the European inventory in quantity—97 bridges of various lengths are currently stocked in Germany. These bridges, although old, have been well maintained and provide an inexpensive resource for maintaining our supply routes.

B Company began training on the Unit Construction Railway Bridge (UCRR) shortly after the battalion ARTEP. It is designed as a through-type bridge utilizing trusses for structural strength. It is constructed in sections, based on chord lengths of 15 and 20 feet, allowing spans from 55 to 85 feet in five-foot increments. Load bearing strength of the UCRR is also Cooper's E-45. It can be skewed left or right by five feet (the length of one bay). The bridge is considerably more complex than the I-beam bridge, but is well designed for ease of construction. Major bridge components are the truss, made of a top and bottom chord with verticle and diagonal webs, and the floor, made of heavy floor beams and light stringers, and stiffened by means of diagonal bracing on the horizontal plane. All bridge components are fastened using a combination of bolts and short drift pins, and rails are fastened directly to the floor beams without ties. Fewer bolts are used than pins. Pins are used at major stress points, on the principle that bolts fasten parts to one another, while pins, which must be driven into their holes, provide shear strength across the joints. This combination increases the strength of the bridge and at the same time cuts down considerably on the time necessary to construct it. Longer bridges can be built by combining kits and using intermediate trestles. The trestles may be concrete, lumber, or steel. Standard (T type) or light (L type) trestle kits may also be used.

The Unit Construction Railway Bridge is considerably heavier than the I-Beam type. Its weight exceeds 1100 pounds per linear foot of finished bridge, and chords and floor beams weigh over 2000 pounds each. It is, however, easy to transport. A complete bridge kit, capable of building an 85-foot span, is easily loaded on three lowbed trailers and two five-ton dump trucks.

The UCRR was designed to be built on an existing railway with a launching nose. It should be launched across the gap on dollies and lowered into place. However, B Company concluded that the best means of construction using assets of the combat heavy company is to prefabricate the bridge in chord length sections on flat land near the gap and lift them into place on temporary supports of Bailey Bridge trestle or other suitable material. This method of construction is compatible with most uses of the bridge. It also provides an increased work force because crews and sites can be duplicated for each chord section. It also reduces by half the amount of material which must be hauled by eliminating the need for the launching nose. The Unit Construction Railway Bridge is stocked at several locations in Germany, with a combined stockage of 35 kits.

Troops assemble unit construction railway bridge.

Aside from the railroad application of these bridges, both the I-beam and Unit Construction bridges can easily be modified for expedient highway use. The I-Beam bridge can be widened with additional spreaders and by decking it to suit the intended class of vehicle. The Unit Construction Bridge may also be used as a highway bridge, but its normal configuration limits vehicular width. The bridge has a clearance between trusses of 10 feet-4 inches, while the width of an M60 tank is 10 feet-6 inches. However, the bridge can be built in an inverted position and decked over, providing an overall width of 14 feet-8 inches. Two-way traffic can be handled by addition of a floor section and one truss, providing a three-truss bridge with an overall width of 27 feet-2 inches. The deck design provides the load limit for either the one or two-lane bridge.

The I-beam and Unit Construction Railway Bridges are permanent, heavy capacity bridges. The fact that they are both easily transportable and easy to construct means that they can be adapted to a wide range of uses. The German Territorial Commands and the DBB may be capable of maintaining rail beds and bridges under combat conditions, but the 249th Engineer Combat Battalion (Heavy) now stands ready to assist them in keeping open vital supply lifelines.

Lieutenant Dennis E. Linn is currently attending the Engineer Officer Advanced Course at the US Army Engineer School, Fort Belvoir, VA. He was formerly assigned as the construction officer for B Company, 249th Engineer Battalion (Combat), Karlsruhe, Germany.

The Engineer Museum

"Resolved, that there be one Chief Engineer at the Grand Army, and that his pay be $60 per month. That two assistants be employed under him, and that the pay of them be $20 per month....."

The Continental Congress
June 16, 1775

Text by Mary Vitek

Photos by Specialist Four Jim Eady

The original art of a World War II recruiting poster.

More than two centuries of military engineering, beginning with the legislative proclamation above, are preserved and displayed within the US Army Engineer Museum at Fort Belvoir, VA, home of the US Army Engineer Center and School. The museum's historical collections and artifacts reflect the Army engineer story and depict our nation's progress in times of peace and war.

Perhaps the most priceless artifact on display in the museum is an original map rendering in detail the siege of Yorktown, VA, during the Revolutionary War. British forces at Yorktown surrendered to the American and French troops on October 19, 1781, ending the war and assuring our country's independence.

Although the Continental Army Corps of Engineers disbanded after the Revolutionary War, engineers were still needed to construct fortifications. Therefore, between 1807 and 1812, military engineers designed and built 24 forts and 32 coastal batteries. Several years later, in 1839, a turreted castle was officially approved as the symbol and insignia of the Corps of Engineers. Exhibited in the museum is the original drawing of the castle approved by Chief of Engineers Major General Joseph G. Totten. The original insignia was initially worn on the uniform belt, but later on the cap and epaulatte. It has remained the symbol of the Corps to this day.

Museum photographs and diagrams illustrate various construction projects completed by the Corps during the 19th century. Among them is the Washington Monument, completed in 1885. Colonel Thomas L. Casey of the Corps of Engineers supervised construction of the monument and later supervised construction of the Library of Congress (1896) and the State, War, Navy Building (1888).

Among other remarkable Corps of Engineers achievements recorded

The Corps of Engineers "castle" first appeared on the hilt of a nineteenth century Army rapier which is part of a collection of miscellaneous accessories and uniforms displayed throughout the museum.

by the Engineer Museum is the salvage of the Battleship "Maine." The Maine sank in Havana Harbor in 1898, following a mysterious explosion. Fourteen years later (1912), the Corps raised her, towed her out to sea, and gave her a fitting burial. The raising of the Maine has been described as "an engineering task without precedent, frowned upon at the start by many prominent engineers, but now considered by the most skeptical....an unqualified success." The Maine began her last voyage at 2 p.m. on March 16,1912. Three miles and 41 minutes later, the 324-foot battleship was submerged again, this time at 600 fathoms. To document the engineering achievement, the ship's wheel, a cable section, hatch lock, lamp and photographs are on display in the museum.

The oldest artifact on display is a Greek ring dated at approximately 350 B.C. The face of the gold ring bears a resemblence to Alexander the Great.

More than 400 Army engineer insignia are also displayed. The collection includes: the 405th Engineer Battalion's insignia, upon which is inscribed "The camels are coming;" the 391st Engineer Battalion's insignia with the inscription "Y'all come;" and the 203rd Engineer Battalion's insignia, inscribed with "Don't kick our dog."

Other Army engineer memorabilia includes uniforms, posters, personal items, portraits, firearms, and furniture.

Today, the US Army Corps of Engineers is the world's largest engineering organization. It serves the Army and our country in the tradition which began more than 205 years ago. The US Army Engineer Museum conveys the proud tradition of the Corps in a colorful and interesting format.

Mary Vitek is a former Army journalist and staff writer for ENGINEER Magazine.

Ship's wheel of the battleship Maine, salvaged in 1902.

Field Manual 100-5 prescribes four basic tasks for the covering force.

*Force the enemy to reveal the strength, location, and general direction of his main attack. To do this, the covering force must strip away enemy reconnaissance and advanced guard elements, establish contact with the enemy main body, and fight with sufficient intensity to make the enemy prematurely deploy maneuver and fire support units and begin his main attack.

*Deceive the enemy, or prevent him from determining the strength, dispositions, and locations of friendly forces in the main battle area.

*Divest the enemy of his air defense umbrella, or force him to displace his air defenses before attacking the main battle area.

*Gain time for the main battle area force, enabling it to deploy, move, or prepare defenses.

The employment of an armored cavalry regiment in covering force operations is doctrinally routine. Numerous service schools and staff college exercises incorporate this mission since cavalry is generally considered superior to other units for the covering force mission. Their special training, superior communications capability, integral air units, and high density of surveillance equipment particularly suit them for such a role. Cavalry will probably fight the first battle of the next war. Nevertheless, the employment of an armored cavalry regiment in the classical covering force role on a free-play maneuver exercise had not been attempted for at least a decade prior to CERTAIN SENTINEL/REFORGER '79.

During that exercise, the 2d Armored Cavalry Regi-

Combat Engineers Up Front

by Lieutenant Colonel Gerald C. Brown

The covering force battle is a key to the active defense. Success in those operations demand the skillful utilization of all elements of the combined arms team. Today, more than ever before, combat engineers play an indispensable role. The January 1979 REFORGER exercise CERTAIN SENTINEL provided a unique opportunity to evaluate forward combat engineer support on a battlefield where terrain reinforcement was the focus of the tactical plan. Every aspect of the engineer's role was scrutinized under rugged winter conditions, during a scenario as demanding as peacetime conditions permit. This article describes that experience and major lessons learned.

ment (2 ACR), reinforced by the 4-73d Armor Battalion, 17th Field Artillery Group, and the 82d Engineer Battalion (Corps, Combat), was employed on a covering force operation forward of a deploying reinforced mechanized infantry division. The Covering Force Area (CFA) was established in the Steigerwald Forest along the Main River plain bounded by a simulated international boundary. The terrain was a low mountainous forested area interspersed with river obstacles, but still affording several high speed avenues of approach into the covering force area. The sector stretched 93 kilometers wide with an average depth of 26 kilometers.

For over two days and two nights the regiment and its supporting units covered the sector against the ORANGE attack of a reinforced armored division. Effective terrain reinforcement was the cornerstone of the operation's success, clearly demonstrating the feasibility of covering force operations outlined in FM 100-5.

The problems resulting from a 93-kilometer front are difficult to imagine. REFORGER '79 stretched the capabilities of the 82d Engineer Battalion and the OPCON 84th Engineer Company from the 2 ACR to the maximum. But combat engineer operations across vast expanses are the norm today in the European environment. Therefore, the lessons learned by combat engineers on the Army's only recent experience in full scale covering force operations can hardly be overstated.

Supporting the same maneuver unit they had worked with on several previous exercises afforded the 82d Engineers an important edge in planning and executing their varied missions. They knew the commanders, their style of fighting, and the particulars of their weapons systems, enabling them to anticipate tactical requirements for obstacles. The battalion was ready from the day it was designated as direct support to the 2 ACR.

To the Regimental Commander of the 2d Armored Cavalry, combat engineers were the key to his active defense. His concept of operations hinged on the covering force's ability to:

"...structure the battlefield through obstacles and fires to halt the enemy for the purpose of conducting combat operations on the enemy's flanks and rear where the ratio of combat power is in our favor and battlefield victory can be achieved."

Linear obstacles to stop or canalize tank formations were paramount in stopping the enemy. However, those obstacles had to be supported by carefully chosen and fully coordinated gaps and lanes, which permitted counterattacks to defeat enemy advanced elements and develope the situation.

The 82d Engineer Battalion developed the obstacle portion of the draft operations plan. It was initially prepared using map analysis. A detailed reconnaissance then followed, conducted down to the platoon leader level. Positions were selected for weapon systems to cover obstacles. Exact ranges and dead space were determined. And counterattack lanes were selected by the supporting engineers and tactical commanders. The regimental plan was subsequently refined, and the final operations plan was published. The next step was a tactical rehearsal without troops, directed by the regimental commander. Engineers participated down to squad leader level, using that period to verify communications, prepare target folders, and practice target turnover procedures.

The even distribution of engineer effort across the battlefield, or perfunctory weighting of engineer support to favor the most dangerous avenue of approach, is wasteful of combat power. Engineers should be concentrated on terrain with lucrative terrain reinforcement potential. During this exercise, engineers concentrated their effort in the river valleys south of Bamberg and in the Steigerwald. The plains to the west, where the lack of defensible terrain would have required several battalions to produce significant results, received light engineer support.
The western open expanses afforded great opportunities for counterattack against the exposed flanks of the attacking enemy, especially using aerial antitank systems. The regimental commander appreciated the fact that once the battle is joined, overwatching maneuver units can be rapidly shifted to counter opposing threats while precious engineer effort invested to structure the battlefield cannot be relocated. His analysis proved accurate in the subsequent battle.

There were four avenues of approach into the covering force area. In the west, the open terrain north of Wuerzburg afforded a rapid approach to the FEBA and turned the flank of the riverline defense along the border. However, this approach was bounded on three sides by the Main River. It would have required a deliberate river crossing into the FEBA. This avenue was dubbed Bowling Alley West and was lightly defended by one reinforced cavalry troop supported by two platoons of engineers. The engineer missions were to destroy several major bridges over the Main River and disable the four-lane Kassel autobahn. Mobile Assault Bridging from MBA forces was planned to recover friendly forces withdrawing back across the Main.

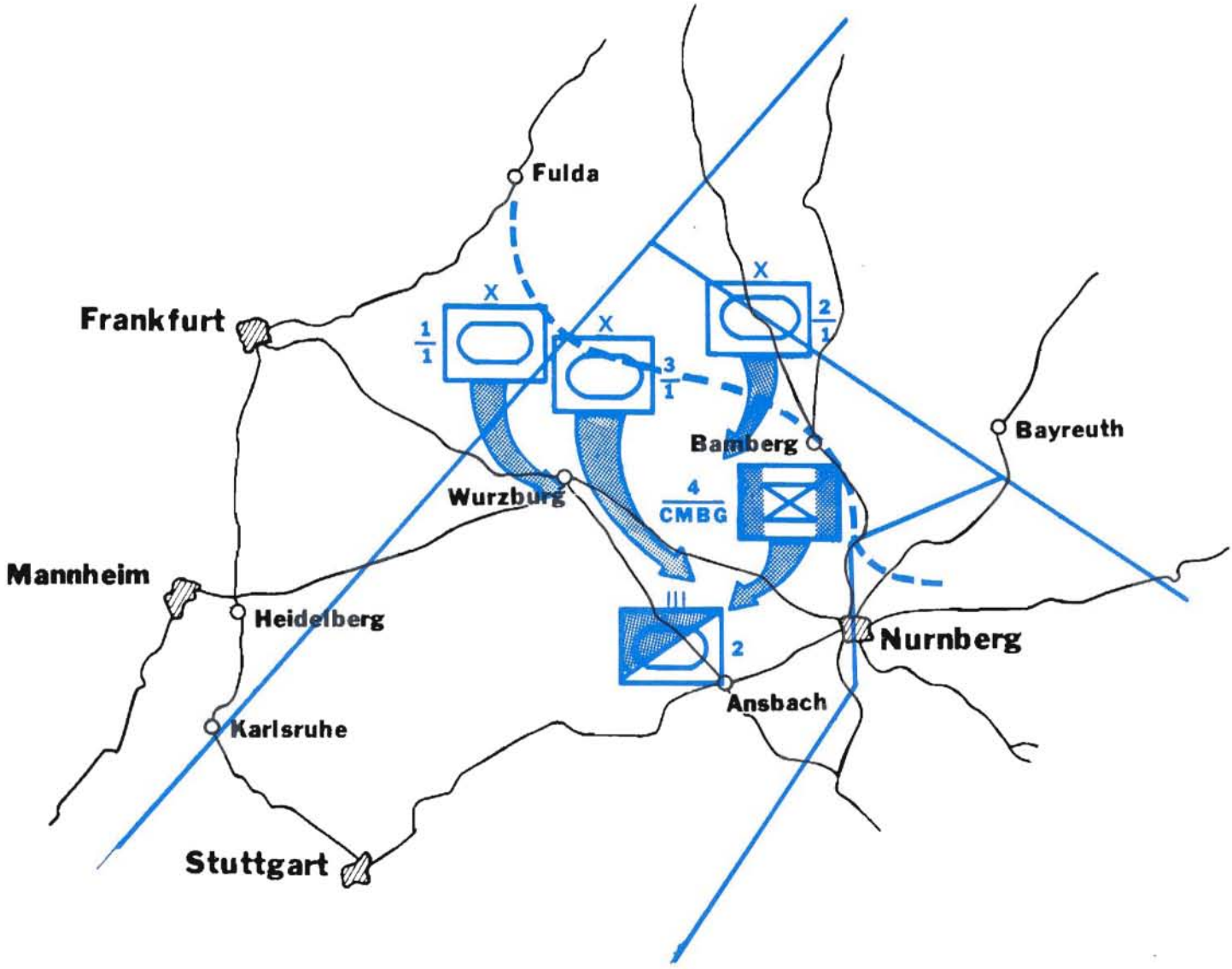
The plain between the Main River and the escarpment of the Steigerwald, given the sobriquet "Bowling Alley East," offered a second high-speed approach to the FEBA. In this sector, the enemy could conduct a river crossing along the simulated international boundary against light resistance due to restrictions along the simulated politically sensitive border. However, mediocre crossing sites complicated this advantage. In addition, the natural terminus to this avenue of approach was a wide choke point near Schwanberg Mountain, with further advance to the south difficult. The evident vulnerability of an attacking force to air and ground counterattack permitted it to be lightly screened. The four engineer platoons utilized on this avenue of approach prepared the bridges for destruction and prepared that battlefield for a highly mobile defense.

The Steigerwald approach between Eltman and Bamberg offered good river crossing sites that were covered and concealed. It also offered a good armor approach onto the MBA. The dominating ridgeline south of the river was too close to the simulated international

continued

boundary to organize a strong defense against a deliberate river crossing. The main disadvantage of this avenue was the cross-compartmentalized terrain in the CFA, which facilitated terrain reinforcement. This area was defended by TF 4-73 Armor, a balanced task force of two mechanized infantry companies and two armor companies, supported by three combat engineer platoons.

The Valley Complex between Bamberg and the east boundary was the most dangerous avenue of approach. It provided the shortest route to the FEBA, running down a series of ridges and valleys and was easily entered by crossing the fordable Regnitz River. ORANGE Force success in this area would endanger operations in the Steigerwald and allow premature penetration of the FEBA. Drawbacks to this approach were the difficulty in lateral movement created by forested ridges and tributaries to the Regnitz. The regimental commander directed top priority of engineer support to this area,



where the first battle could be quickly lost. Eight combat engineer platoons were employed to structure the battlefield for defense by one squadron of cavalry. The regimental commander counted on a defense based on engineer obstacles to make this avenue impassable.

The regiment's broad concept of the operation was to economize on the relatively invulnerable left flank, weight the right flank heavily with engineers to block enemy penetrations, and to concentrate forces on the two center avenues of approach. One cavalry squadron plus a tank company was held in regimental reserve. Initial positioning of the maneuver forces and preparations by the 82d Engineers were designed to support the two most likely contingencies: a fast, fluid attack across the plain of Bowling Alley East, or a slow, methodical delay through the Steigerwald.

The bridges across the Main River between Schweinfurt and Bamberg, and across the Regnitz River from Bamberg to the right boundary posed a dilemma for the covering force commander and his engineers. These rivers constituted the simulated international boundary across 80 percent of the front. Political restrictions similar to those along the actual Communist border in Germany prohibited fires across the boundary until after formal declaration of hostilities. Forbidden were preemptive spoiling operations and overflights into enemy territory for either air strike or reconnaissance.

When combat begins along an inviolate international border, the enemy will enjoy a tremendous initial advantage of political and tactical initiative. Capture of a bridge intact will provide the enemy with an even greater tactical advantage. Therefore, all 31 bridges over the Main and Regnitz Rivers in the covering force area had to be destroyed, regardless of their size. The covering force commander was placed in the unenviable position of either starting the war by blowing the bridges too early or losing it by blowing them too late. Detailed planning went into their destruction, including redundant firing systems and multiple communications means.

Senior personnel headed each firing party, whether executed by engineers or cavalry. With instructions to destroy the bridges on order, or to prevent capture, problems developed. Spirited troops eager for action faced each other across narrow expanses of water. Small arms and machine gun harassing fires were directed against the defenders at several sites. Some firing party commanders considered their positions in danger and destroyed their bridges prematurely. Their decisions, made under fire, were difficult to explain to senior commanders who had issued clear orders that ORANGE must intiate the battle.

Terrain reinforcement requires time. During CERTAIN SENTINEL, the 82d Engineer Battalion prepared obstacle plans, assuming 48 hours would be available for around-the-clock work, before the onset of hostilities. Generally, combat engineers are among the very first to deploy. The effectiveness of the defense depends to a large degree on the time available for preparation, which in turn depends upon the political release of alert measures to permit preparation of the battlefield. NATO war plans give priority to the covering force area, where specific targets have been authorized by the German government for earlier emplacement.

But under the tactical scenario for CERTAIN SENTINEL, obstacle work was not permitted until the attack was imminent. Fortunately, targets on the bottom of the list were not emplaced. Tactical commanders sought optimum effort from their engineers by having them work to the rear of the line of contact, preparing positions for turnover as they fell back. This concept worked well where supporting engineers were thoroughly familiar with their supported unit.

The alert measures for REFORGER 79 represented a short notice from Warsaw Pact Forces that NATO allies must be prepared to counter. Political restrictions can be expected to result in the release of alert identifiers in a careful and deliberate manner. Precious little time may be available to structure the battlefield effectively and to provide time for the MBA force to deploy and prepare. The combat engineer family desperately needs improved equipment and methods to increase responsiveness on the huge, dynamic European battlefield. Needed now are the M-9 Universal Engineer Tractor, the M-180 Cratering Device, and Scatterable Mine Systems, all in various stages of development and testing or procurement.

Target turnover was not a problem with 2d Armored Cavalry Regiment units because of normal association and joint training. All targets turned over were non-electrically fired. Detonating cord for each circuit of the dual-primed systems terminated at a small stake on the friendly side of the obstacle. A sand bag placed on each stake contained two sections of time fuse with cap and fuse lighter, necessary tape, and illustrated instructions. These methods had been incorporated into the SOPs of both the cavalry and engineers. Target turnovers to the attached armor units were much less successful, however.

CERTAIN SENTINEL clearly demonstrated the need for the mechanization of engineers supporting the covering force. The 84th Engineer Company, organic to the regiment, was generally more effective than the wheeled Corps engineer units because of superior mobility, additional firepower, and greater survivability. The 82d Engineers were not always able to keep up with supported cavalry elements, especially when maneuvering cross-country over snow and ice covered terrain. Operating near the line of contact and despersed over a wide area with heavily outnumbered friendly forces to their front, covering force engineers needed the additional firepower provided by mechanized fighting vehicles.

Communications were a major problem. A Corps engineer battalion needs a higher density of communications equipment for the covering force mission. Communication during CERTAIN SENTINEL was dependent upon carefully selected FM sites for command posts and relays to net across the vast area. AM afforded some backup, but was unreliable. RATT was able to stay in contact with the engineer higher headquarters, the 7th Engineer Brigade.

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The ORANGE attack was well executed. At 8:00 p.m. on January 29, a series of demonstrations were conducted along the simulated international boundary and continued until 11:00 p.m. At 8:25 p.m., TF 4-73 Armor responded to border incursions by destroying two bridges. At 9:50 p.m., the regimental commander ordered all remaining bridges blown immediately. All bridges were down by 10:00 p.m.

The enemy launched two strong supporting attacks on the flank avenues of approach on January 30. In Bowling Alley West, the light screening force withdrew under the attack of an enemy brigade. Two troops from 3d Squadron, 2 ACR, crossed one of the unblown bridges and attacked the rear of the enemy brigade with excellent results until called off by an umpire who was confused about the status of the bridge they had crossed. Friendly troops were then withdrawn from Bowling Alley West, which was successfully covered by air cavalry. In the Valley Complex, the 4th Canadian Mechanized Brigade attacked but was skillfully handled by the 2d Squadron, 2 ACR, thanks to the priority of engineer effort placed in that sector.

ORANGE Forces infantry crossed the Main River at Eltman, and surprised and destroyed A/1-16 Infantry at 3:00 a.m., January 30. The 3d Squadron in reserve deployed one cavalry troop to a blocking position behind that sector. Minor build-ups continued during the day, and by early evening, bridging was reported at Eltman and Bischberg. Pressured by intense artillery and rocket fires, friendly artillery had withdrawn and could no longer range to the bridge sites. Lance missiles were fired on enemy engineers at the crossings, slowing their efforts. Counterattacks to destroy bridges under construction were unsuccessful. Early on the morning of January 31, major elements began crossing into the Steigerwald. The cross-compartment terrain reinforced by engineers and covered by outnumbered cavalry, greatly slowed the ORANGE attack to the south.

The enemy again demonstrated near Hassfurt on January 31, but did not cross. By early afternoon on that date, all ORANGE units south of the Main had been identified. The regimental commander briefed the MBA commander and key VII Corps staff personnel on enemy dispositions and the direction of the main attack. No longer hamstrung by political restrictions, the regimental commander proposed a major counterattack to seize the initiative. His recommendation was denied, primarily due to administrative requirements of exercise control and deteriorating weather conditions. The covering force was orderd to break contact and begin withdrawal at 5:00 p.m. on 31 January.

The experience of the 84th Engineer Company and the 82d Engineer Battalion during CERTAIN SENTINEL/ REFORGER 79 demonstrated that engineers can reinforce the terrain for the covering force battle over a vast, dynamic and lethal battlefield. It also revealed major problems of aging equipment and outdated methods. Lessons learned are difficult to visualize by personnel responsible for designing equipment or developing doctrine. In an era when field exercises on the scale of CERTAIN SENTINEL are all too few those lessons should be embraced throughout the engineer family for training, and improvement of our equipment and doctrine.

Engineers must also communicate these lessons to tactical commanders, who must employ combat engineers more effectively with the combined arms team. Their full support is vital for the procurement of new equipment and for the development of new doctrine to improve engineer responsiveness on future battlefields.

Lieutenant Colonel Gerald C. Brown is currently a student of the Army War College in Carlisle Barracks, PA. When he wrote the article above, he was assigned as the commander of the 82nd Engineer Battalion, 7th Engineer Brigade. His unit was in direct support of the 2nd Armored Cavalry Regiment (the BLUE covering force) during FTX CERTAIN SENTINEL.

ENGINEER PROBLEM

The Brigade Commander has directed you, the Brigade Engineer, to emplace an antitank minefield from coordinate UT042835 to coordinate UT045831, with a depth of 250 meters. No antipersonnel mines are required. The commander has specified that the probability of tank kills should be at least 70 percent. Your company is equipped with an M57 Antitank Mine Dispensing System that is available for use.

Three tasks must be completed in order to accomplish the mission:

1. Compute the required antitank mine density to produce a 70 percent kill probability.
2. Determine the total number of mines required and the number of mine rows.
3. Determine the required number of platoon hours to emplace the minefield and the required number of five-ton dump trucks to transport the mines.

See THE SCHOOL SOLUTION, page 40

Engineer Preparation of a Position

by Colonel F. Palaguta

During the years of the Great Patriotic War, intelligent use was made by service personnel of the protective features of terrain and various field defensive structures in order to successfully execute assigned missions and reduce casualties. This enabled us to maintain the capacity to fight back even after strong artillery attacks and bombing raids and beat off superior enemy forces.

In his book of reminiscences, "Malaya Zemlya" (Small Earth), Leonid Il'ich Brezhnev writes: "The question might arise as to how it was possible for people to survive after having been plastered by hundreds of tons of lethal metal by an ememy force greatly exceeding our own?" And the answer to that is that "all this was opposed by experience, presence of mind, cold calculations, and routine daily work....scores of kilometers of communications passages, thousands of riflemen pits, trenches, and foxholes were dug."

Front line experience testifies that the intelligent concealment of firing weapons and personnel along with other factors predetermined the success of battle in the final analysis. An antitank gun located in a position prepared by engineers and properly camouflaged usually destroyed two or three enemy tanks, but if it was in an exposed position, it could fire only one or two rounds and destroy at best but a single tank.

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Given the constant improvements made in missiles and conventional means of attack, the role of troop protection and, therefore, engineer preparation of a position, is dramatically increasing. A simple calculation will show that the more simple structures, such as trenches, ditches, communication passages, and slit trenches can reduce losses to personnel from the shock wave of a nuclear blast by a factor of 1.5 to 2.0, reduce the flow of penetrating radiation, and provide protection against light radiation.

In the opinion of foreign specialists, the neutron weapon greatly complicates the solution of the problem of protecting personnel on the battlefield. Here, protective works are deemed more effective than armored vehicles.

The new developments in infantry, artillery, and other types of weapons and military equipment call for changes in the forms of protective structures, especially trenches and shelters. The principle of erecting such structures remains the same—to insure the most effective use of tank, artillery, and motorized rifle elements in warfare, their maneuver, and provide the necessary protection against all manner of attack means. Additionally, another element is required in the engineer preparation of a position, which, in modern times, is one of the decisive factors, and that is speed in setting up the protective works. Toward that end, it is necessary to work persistently to perfect engineer troop training and more fully utilize mechanized equipment and explosive charges which will reduce the time for preparing a position.

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Unfortunately, during the course of tactical instruction of subunits, only limited tasks in engineer preparation of a position are performed. In such subunits, the troops have acquired no skills in digging trenches or ditches, to say nothing about constructing equipment dugouts and shelters, and the like. We sometimes had occasion to observe a situation wherein after a few rounds from an artillery piece it was necessary to strengthen improperly prepared works that were intended for prolonged use. We still get reports about individual officers, especially among the younger men, who point out that they can prepare a position which will meet all regulations when that will be required in a real battle situation. However, experience shows that ability and practical skills do not come of themselves, but are acquired through persistent effort. It is necessary to improve and consolidate them continually.

As we know, in order that a unit occupying a certain area in the field be in a state of constant combat readiness, its personnel and equipment should be positioned beforehand in structures built according to a certain definite sequence.

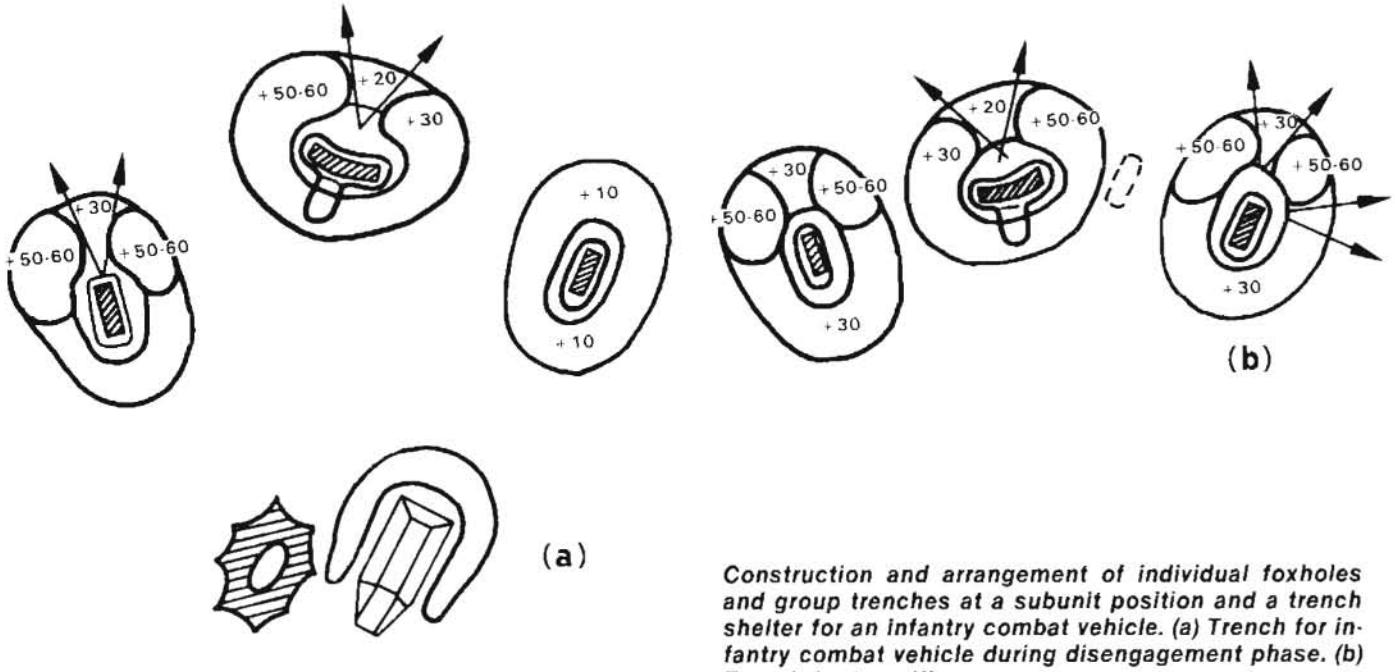
First, foxholes, pits for all firing weapons, slit trenches for personnel, and the basic structures for control posts and for providing first aid to the wounded are dug, and obstacles constructed forward of the main line of defense on the flanks.

Second, trenches are dug for the subunit, reserve pits for weapons, and structures are further fitted out for staff officers and medical aid centers; covered slit trenches and dugouts are prepared, shelters are dug for equipment and material, and obstacles reinforced. Sections of roads and the man-made structures on them are prepared for demolition and routes are prepared for maneuver.

Later on, the protective works are improved upon, their protective features augmented, areas of deployment of the second echelons and antitank reserves prepared, and the necessary trenches and shelters in areas earmarked for the reserves at the alternative and dummy positions, etc., constructed.

All measures are carried out with strict observance of camouflage discipline. Engineer preparation of a position usually begins with digging in. First, foxholes are dug for fire from prone positions, which are 60 centimeters wide, 170 centimeters long, and 30 centimeters deep. For convenience in conducting fire, a support is constructed 10 centimeters higher than the bottom of the pit for resting the elbows. This threshold is 25 to 30 centimeters wide. The earth or snow is thrown forward when forming a breastwork 30 centimeters high, the sloping side facing the enemy. The foxhole for use in fire from prone position provides primary protection against rifle and machinegun fire and shell splinters. Gradually deepening the trench, the trooper adapts it first for fire from a kneeling position and from a standing position. In these cases, the depths dug are, respectively, 60 and 110 centimeters, and the height of the breastwork is increased to 50 or 60 centimeters.

In addition to the one-man trenches, two-man and occasionally three-man trenches are built in the form of slit trenches of rectilinear or broken outline up to three meters long. Roughness of ter-



Construction and arrangement of individual foxholes and group trenches at a subunit position and a trench shelter for an infantry combat vehicle. (a) Trench for infantry combat vehicle during disengagement phase. (b) Trench for two riflemen.

FIGURE 1

rain greatly facilitates laying out the trenches. However, here it is inadvisable to locate one's position near individual bushes, mounds, or boulders readily visible to the enemy, because they might be used as reference points for registration fire. In all cases, the trenches should be carefully camouflaged in keeping with the surrounding terrain background, using materials readily available and special camouflaging, weaving in bunches of grass and tree branches.

The time required for troops to dig a foxhole of the single man type in class 1 and 2 soils is: for prone fire, not over 30 minutes; fire from kneeling position, up to 1.2 hours; and for fire from standing position, up to 1.5 hours. The time required for digging a two-man trench is 1.5 to two times greater.

The position for fire with machinegun consists of two slit trenches disposed at a slight angle with an area of 100 by 100 centimeters. The breastwork is constructed on three sides with a height of 50-60 centimeters, and in the arc of fire, it should be up to 20 centimeters high. About 2.5 hours is required to dig this type of trench.

Time permitting, single foxholes are connected together into trenches for a squad, and these are subsequently formed into trenches both for conducting fire and observation, and for movement along the front. As a result, the troopers have an opportunity to establish contact with one another during the course of the battle, a fact which has a very positive effect on their psychological state. Former front line fighters know how important this is in a combat situation. In his book, "Soldier's Duty," Marshal of the Soviet Union K.K. Rokossovskiy cites such an example. He writes, "Our manuals in force before the outbreak of the war taught us to build our defenses based on the so-called 'yacheyechnaya," or small trench system. But alas! The war taught us something different. Upon reaching one of the small trenches I relieved the soldier sitting there and remained alone. As an old soldier who had taken part in many battles I frankly confess that I felt awfully bad in that nest. During the entire time I had the desire to jump out and see if my comrades were sitting in their nests or whether they had abandoned them and left me alone. And if the sense of alarm did not leave me, what must it have been like in the case of a man who, possibly, was in combat for the first time. People will always be people and, naturally, one wants to have a buddy by his side. In addition, one wants the commander to be near, especially during periods of danger.

The author continues: "Everyone decided it was necessary to get into the trenches immediately. On that day all units were given appropriate instructions....Everything was accomplished easily and efficiently. And the defense became stronger." Subsequently, regardless of the type of action it became a fixed rule to: stop, dig in, and, if time permits, improve your positions.

The outlines of the trenches and communication passages should be curvilinear, broken and with recesses, depending on the method of digging and the terrain relief. In order to reduce casualties to

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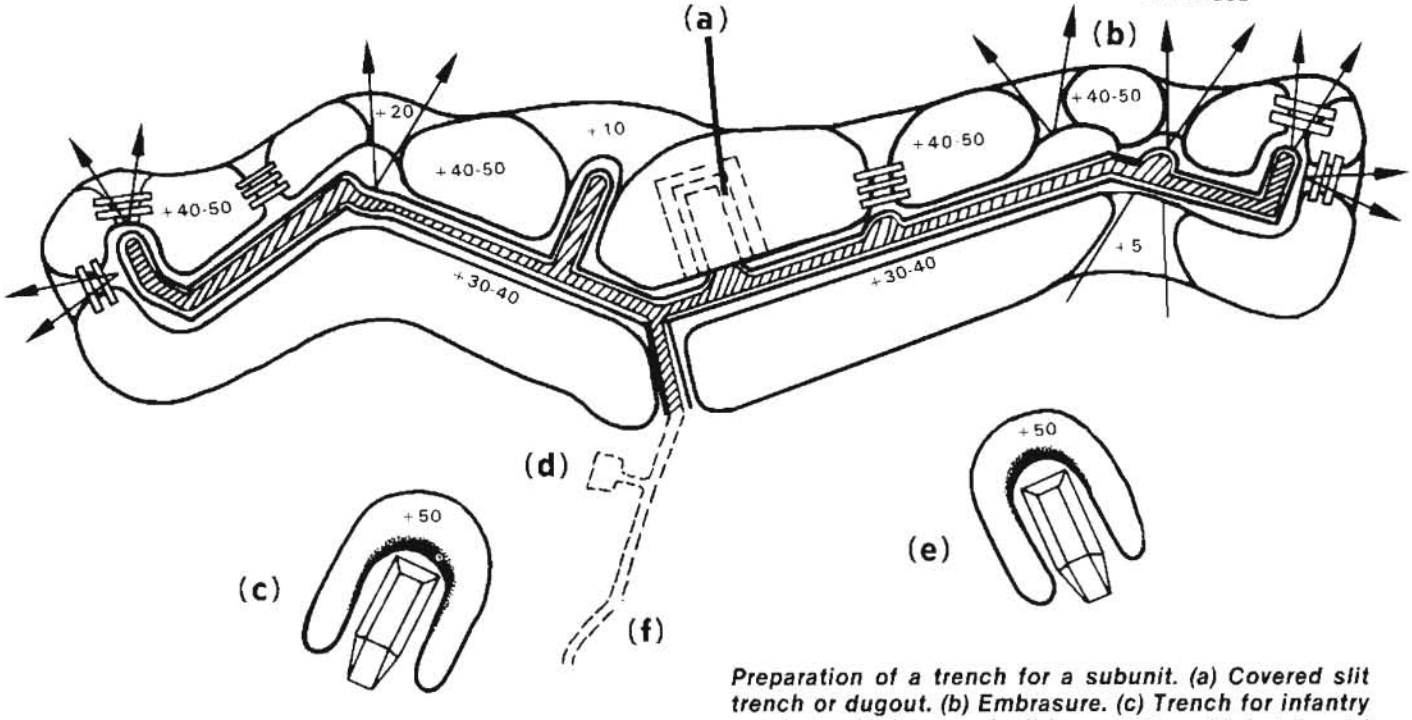


Preparation of a trench for a subunit. (a) Covered slit trench or dugout. (b) Embrasure. (c) Trench for infantry combat vehicle at main firing position. (d) Latrine. (e) Trench for infantry combat vehicle at reserve fire position. (f) Possible communications trench.

FIGURE 2

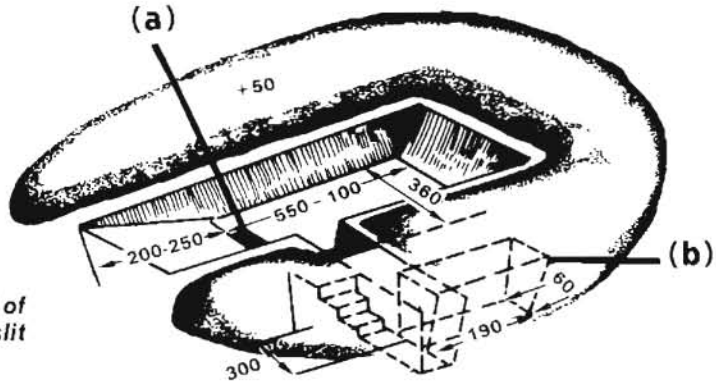


FIGURE 3

Trench for infantry combat vehicle with circular field of fire. (a) Water collecting sump. (b) Shell slit (covered slit trench).

personnel by the shock wave and splinters, the rectilinear portions are made 15-20 meters long at angles of 120 to 160 degrees to one another. Covered portions of trenches and overhead protection above embrasures with earth cover over 10 cm thick protect troops against incendiary mixtures such as napalm, radioactive substances and droplet gases, and are used as often as possible. The construction of trenches and communication passages is accelerated considerably if mechanical equipment is used. For example, the PZM (regimental excavating machine) type equipment in ten hours of operation can replace 200 men digging for ten hours in medium type soil. However, protective works of this kind should be finished off manually.

In addition, combat conditions generally restrict the use of engineer machinery to the areas of the first and second trenches. Accordingly, each trooper must know how to dig and prepare trenches and other of the more simple shelters manually, especially in hard ground, using various devices and explosives.

Armored equipment per se is a reliable shelter but trenches for tanks, infantry combat vehicles, (armored carriers) and artillery greatly improve protection for teams, crews, and equipment against the effects of modern attack means. Such trenches consist of an area for conducting fire, shelters for the crew or team, ramps, and breastworks. Depending on the mission assigned, the conditions of the terrain, and time available, trenches for tanks are constructed by the crews themselves with the aid of multipurpose bulldozer equipment (BTU) both with a limited sector of fire (60°-120°) and with a circular sector of fire. Trenches for infantry combat vehicles are prepared in the same manner.

Artillerymen additionally excavate ammunition recesses. In all cases, the service equipment should be well camouflaged with standard means of makeshift materials. Since various kinds of vegetation is often used for this purpose, one should bear in mind that cut grass and branches of the leafy species change color and the spectral characteristic in several days, whereas the evergreen varieties preserve their color longer—up to 15 days in the summer and over a month in the winter. Reeds, sedges, and moss do not lose their properties for from 10 to 15 days. Branches of such deciduous species as oak, birch, basswood, and maple are considered the better camouflaging materials. Branches of aspen and alder turn brown in 24 hours. In the winter, snow and flaky ice formed by spattered water make the best camouflaging materials.

An important factor in engineer preparation of the terrain when constructing trenches, foxholes for riflemen, machinegun emplacements, as well as shelters is the coordinated construction of protective structures and camouflaging activities. Therein lies the guarantee of success in conducting combat operations.

Secrecy in work activities is achieved by making maximum use of the dark period of the day, the camouflaging properties of the terrain, and weather conditions. All structures dug during the night should be carefully camouflaged before the arrival of morning light. Remnants of building materials, various types of containers, and the like should be cleaned up and tracks of vehicles in the soil should be eliminated.

The following sequence should be adhered to in constructing trenches: select an area, clear the terrain and the field of view and the fire sector, dig foundation area and ramps, prepare ammunition pits and shelters for personnel, and camouflage area.

In the process, the team, crew, and subunit should at all times be prepared to go into action.

INTEROPERABILITY

—more than just a word

by Major Laurence R. Sadoff

The goal of USAREUR's Project Partnership is to strengthen our NATO forces through mutual training and social interaction. The 9th Engineer Combat Battalion (Corps) and the German Pionierbattalion 12 demonstrated the effectiveness of the program during 1979.

Soldiers of the Pionierbataillon 12 cross US floating footbridge.

Every soldier who has served in Europe during the last 13 years is familiar with the USAREUR Project PARTNERSHIP Program designed to facilitate interoperability training among NATO allies. Through such training, soldiers of allied nations develop confidence in and understanding of each other's tactics and procedures. They learn about each other's equipment, weapon systems, munitions and logistics. They learn about each other's culture and heritage, about what motivates and inspires both the individual soldier and his nation.

During 1979, the 9th Engineer Battalion (US) and the Pionierbattalion 12 (GE) were recognized for their outstanding PARTNERSHIP affiliation. Many successful joint training exercises and professional development activities have resulted from their affiliation—activities which have helped develop a unified peacetime deterrent force.

JOINT TRAINING

The foundation of the PARTNERSHIP Program and INTEROPERABILITY training between these two battalions has been team and unit training. Some of that training is described below.

Exercise Harter Amboss (Solid Anvil) was a joint battalion training exercise conducted 5-10 April 1979 and hosted by the PiBtl 12. Included was a two-day MAPEX and a two-day joint CPX/FTX. Participants included representatives from the Panzerpionierkompanie 140, Panzerpionierkompanie 350, Panzerpionierkompanie 360, 9th

continued

Troops load test a Bundeswehr pneumatic float bridge constructed by personnel of Pionierbataillon 12 and D Company, 9th Engineer Battalion on the Danau River.

Engineer Battalion, 565th Engineer Battalion and Pionierbataillon 12 (PiBtl 12). Participants analyzed and discussed various problems that might arise if US and Bundeswehr units were in support of, under operational control of, or attached to each other during combat operations.

During the joint CPX/FTX, each unit set up a Tactical Operations Center (TOC) in a school house. The exercise commenced when an OPORD (IAW NATO STANAG 2014) was issued to both headquarters. The order, issued in German, directed each battalion to conduct reconnaissance and plan munitions for a series of preselected obstacles.

From their reconnaissance, an estimate was made of the amount and types of munitions that were needed for the obstacles. After this information was passed to higher headquarters, another OPORD, also issued in German, directed the battalions to estimate the time and manpower to emplace the obstacles and report certain information. The 9th Engineer Battalion, since it was in an FTX mode, actually emplaced the obstacles, assisted by Wallmeisters from VBK 64. Target turnover was also practiced.

The 1979 exercise was considered an overwhelming success and led to MAPEX HARTER AMBOSS II, hosted by the 9th Engineer Battalion in April 1980. The format remained the same as 1979. Salient topics discussed and analyzed included:

(1) Support of ADM operations
(2) Conduct of river crossing operations
(3) Development of realistic resupply rates
(4) Various methods of command and control under engineer task force organizations.

Every American soldier is familiar with the Army Training and Evaluation Program (ARTEP). It was designed to fill a significant void in training guidance to the field. Units can use the ARTEP to train and evaluate themselves and to diagnose their strengths and weaknesses through dynamic performance-oriented training.

During 1979, the PiBtl 12 participated with 9th Engineer Battalion units in both squad and platoon ARTEPs. Only previous operational commitments prohibited their participation in a formal company ARTEP.

During these evaluations, US standards, tasks, and conditions were used to evaluate two Bundeswehr squads and one platoon.

In June 1979, soldiers of Company D, 9th Engineer Battalion and PiBtl 12 participated in a joint river crossing exercise across the Danube (Donau) River, the second swiftest river in Europe. During the first portion of the exercise, known as EINING AM DONAU BRIDGE TRAINING, soldiers from Company D trained with Bundeswehr pneumatic float bridging equipment. They learned about the various rafting configurations, and about German river crossing doctrine and tactics. Training was also accomplished on the French Mobile Assault Bridge. The culmination of the exercise was a complicated and sophisticated link-up of an eight-raft section, 132-meter bridge across a quickly rising Danube River. The link-up was remarkable because it involved rafts constructed and controlled by both US and Bundeswehr soldiers and was conducted as the Danube began to flood.

Flooding was so great that all bridging had to cease. During the training lull, units conducted essential interoperability training in target turnover. Interpreters were purposely not provided. Soldiers were forced to communicate using their inherent skills.

The collective training during CPX/FTX HARTER AMBOSS, ARTEP training, and Eining am Donau Bridge Training was instrumental in resolving differences in doctrine, tactics, terminology, organization, command and control, and logistics.

PROFESSIONAL DEVELOPMENT

In addition to continued participation in major joint training, both units conducted special professional development training to demonstrate their respective doctrine, tactics, terminology, organization, command and control, and logistics. Let us examine some examples of this training.

In January 1979, the 9th Engineer Battalion gave an antitank ditching demonstration for personnel of the PiBtl 12 and selected cadre of maneuver units they support. Another such demonstration was conducted in January 1980. The importance of these demonstrations cannot be over-emphasized. Antitank ditching is an integral part of US doctrine and defensive planning. While US maneuver commanders are aware of their capabilities and routinely include them in their barrier operations, many senior Bundeswehr maneuver commanders remain skeptical about the effectiveness of antitank ditches. They question the ditching effectiveness and data on the rate of construction and labor required. But through demonstrations, Bundeswehr maneuver commanders are able to observe the merits of antitank ditches and are starting to adopt them as part of their mobility and countermobility plans.

Does the individual soldier, NCO, and officer know the tactics, doctrine, and weapons systems of his allied counterpart? Commanders of the 9th Engineer Battalion and Pionierbataillon 12 realize the importance of grass roots training and have initiated extensive individual training programs between battalions.

In March 1979, a combined team from the 9th Engineer Battalion provided detailed instruction to the cadre of the PiBtl 12 on US munitions and explosives. The Bundeswehr soldiers learned how to use the M-57 mine dispensing system, US mine detectors, antihandling devices, antipersonnel mines, antitank mines, cratering charges, demolition kits, and minefield recording forms. Later, officers for PiBtl 12 instructed the cadre of the 9th Engineer Battalion on Bundeswehr munitions and explosives. US soldiers became proficient in the use of the Panzermine DM 11 (antitank mine), Schutzensplittermine DM 31 (antipersonnel splinter mine), Schutzendruckmine DM 11 (antipersonnel blast mine), Sprengkorper DM 11A1, DM 21A1, DM 12 (100g, 200g, 1000g explosive charges and 500g plastic explosive), Sprengschnur DM 11 (det cord), and Zundschnur DM 11 (time fuze). Dynamic hands-on training was emphasized rather than standard classroom presentations.

PARTNERSHIP—A MARRIAGE OF UNITS

A PARTNERSHIP between units is much like a marriage. Both parties must work hard to make it successful. An unsuccessful partnership is agonizing for both parties.

The partnership activities between units are the result of detailed, careful planning. In December 1979, the S3s of both battalions met and discussed their planned activities for 1979. They reviewed each other's plans. PARTNERSHIP training was not developed to simply entertain, but to involve each other in mutual unit training.

Besides joint training, specific individual professional development programs were planned to enhance mutual understanding. The S-3s of each battalion met each quarter to review previous training and activities, and to coordinate specific training for future months. This procedure produced no less than 38 PARTNERSHIP activities in 1979 and the process has continued throughout 1980.

PARTNERSHIP training is conducted so that soldiers of each unit can fight alongside each other using the other's weapon systems, if necessary. Through high-quality joint training, many differences in doctrine, tactics, terminology, organization, command and control, and logistics have been resolved. Detailed instruction is provided on each's weapon systems and munitions. Officer and NCO professionalism courses have been conducted on a mutual basis and each has participated in the other's high-quality unit training on a regular basis.

Volleyball competition between US and Bundeswehr soldiers.

German recovery vehicle is stymied by an antitank ditch constructed by personnel of the 9th Engineer Battalion for a demonstration at the Hohenfels Training Area.

Involvement in training and social activities at all levels is encouraged. The result may be a Schutze participating in 9th Engineer Battalion Organization Day activities; a Specialist Four playing in a 12 PiBtl volleyball tournament; a Gruppe or Zug participating in an ARTEP; or a US officer participating in Advantessen.

The PARTNERSHIP Program is based on a long term arrangement that requires effort from both parties if it is to succeed. Perhaps the strongest testimonial to the lasting relationship between the 9th Brigade and 12 PiBtl is the distance separating them---160 kilometers by autobahn. Despite the driving time (nearly four hours), the PARTNERSHIP units engaged in 38 activities in 1979, as mentioned.

The accrued benefits of a successful PARTNERSHIP include mutual understanding, increased awareness of social and cultural differences, and greater knowledge of each other's doctrine, tactics, terminology, organization, command and control, and logistics. A successful PARTNERSHIP increases the strength of our NATO forces, which must be prepared for any contingency. Interoperability is, indeed, more than just a word.

Major Laurence R. Sadoff is currently attending the Naval War College in Newport, R.I. He formerly served as the S-3 of the 9th Engineer Battalion.

RESERVE COMPONENTS

PARTNERSHIP PROGRAM

Division and brigade-sized combat units of the Army National Guard and the Army Reserve will soon train with active Army "partner" units.

The new AC/RC Partnership Program, initiated by the US Army Forces Command (FORSCOM), will pair the major infantry and armor units of the Guard and Reserve with similar active Army units for training support, evaluation and assistance. Partnership differs from earlier active component training support programs in two ways. First, it is planned as a long-term relationship. Second, partnership will be expanded beginning in FY 81 to provide year-round AC support for RC training.

In comparison, the two programs being replaced by partnership, the Active Component Support to Annual Training (ACSAT) and the AT evaluation programs, were operated only during the RC unit's two-week AT period and the AC/RC unit alignments changed each year.

Partnership complements on-going programs, such as the Affiliation Program and the Army Capstone Program.

The partnership program relationships were developed based on several factors, including geographic proximity of units, likeness and compatibility of skills and equipment, AC unit's capabilities to provide training support, previous relationships (ACSAT, etc.), and Capstone methodology.

PX PRIVILEGES DOUBLED

Army exchange privileges for members of the Army National Guard and the Army Reserve have been doubled. Members now earn one day of PX privileges for each four-hour drill. That means four days of PX privileges for a two-day drill weekend, instead of only two.

Dependents of Reserve Component members may use the PX, but they must be accompanied by their sponsor. Unit members must present their red Reserve Component identification card and Leave and Earning Statement when using the PX. Only Reserve Component unit members may use the PX privileges; individual Ready Reserve members are not eligible.

RAFT BUILDING CHAMPIONS

Army Reservists of the 652nd Engineer Company (Float Bridge) work against the clock during the annual M4T6 Five Float Reinforced Raft Building Competition at Fort Leonard Wood, MO. The Ellsworth, WI, unit shaved three minutes from the old record which it established last year to become the 1980 champion with a time of 68 minutes. Finishing second with a time of 71 minutes was Company E, 632nd Engineer Battalion, Minnesota National Guard, Hutchinson, MN. Other participating units included Company A, 5th Engineer Battalion, Fort Leonard Wood, MO; the 522nd Engineer Company, Fort Knox, KY; and the 224th Engineer Battalion, Iowa National Guard, Burlington, IA. (US Army photo by SFC Ron McCumber).

TRAINING EXERCISE

A soldier with B Company, 469th Engineer Combat Battalion (Heavy) out of Fort Dix, NJ, is hard at work (at right)trimming trees removed as the battalion builds a new parking lot in Monmouth County Park System's Turkey Swamp Park, Freehold, NJ, as part of a weekend military construction training exercise. Dump trucks, supply trucks, bulldozers, a front end loader, a grader, jeeps and various other vehicles lined an open field as members of B Company participated in this Army Reserve training exercise. Other units included A Company and HQ Company from Caven Point, NJ, and C Company from Northfield, NJ. Campers and other park visitors were invited to watch and ask questions and learn about the Army Reserve and how it functions.

CIVILIAN SCHOOLING

Army sponsored graduate education is restricted to those disciplines in which the Army Educational Requirements Board has validated requirements and a "shortage" of qualified officers exists. Currently, these disciplines, for engineer officers, include the following:

Civil Engineering
Aeronautical Engineering
Chemical Engineering
Engineering Physics
ORSA Engineering
ADPS Engineering
Nuclear Effects Engineering
General Engineering
Electronics Engineering
Geodetic Science
Nuclear Physics
Oceanography, Hydrology

These shortage disciplines also support a second specialty in addition to Specialty 21, Engineer. Graduate school opportunities during FY 81 are anticipated to be at approximately 55-65 officers depending on requirements and officers availability.

Fully funded advanced degree training (AR 621-1, Chapter 4) is the principal program for obtaining a graduate degree and provides the primary means to train officers at the masters level. Application is made by forwarding DA Form 1618-R. An officer's application is automatically considered each time he becomes available for reassignment. The primary zone for consideration for schooling is five to 14 years service. The program is very competitive and requires an outstanding overall record of performance.

The degree completion program for graduate degrees is covered by Chapter 8, AR 621-1. It allows up to 18 months at an accredited university to complete a masters degree in one of the aforementioned disciplines. This program varies from the fully funded program in that tuition cost must be defrayed by the student. All participants are schooled in a shortage discipline for which an AERB position exists and serve in a follow-on utilization assignment.

Officers must possess the following qualifications in order to be considered competitive for selection:

- Performance ratings must be among the top one-third among their contemporaries;
- They must have successfully completed the Advanced Course;
- They must have successfully completed a company command tour;
- They must have completed two tours with preference to those that have been overseas.

The maximum period of undergraduate training under the degree completion program that can be supported is 18 months. The objective is to support those officers with outstanding performance records in obtaining a bachelors degree in disciplines that the Army can use. The disciplines are too numerous to list here, but undergraduate education directed in the areas where graduate level shortages exist receive preferential consideration.

SPECIALTY DESIGNATORS

The Officer Personnel Management Directorate has initiated file reviews to determine second specialty qualifications of all OPMD-managed officers in Year Group 1974. Some of the factors being considered include time served in various specialty areas, performance ratings in these specialty assignments, civilian and military education, and individual preferences.

The final determination of second specialties, formally designated for all officers completing eight years of active service, is based on the following criteria: Army needs, individual experience, and personal preferences. Army requirements must be the primary consideration in making final designations.

Year Group 74 officers have had, or soon will have, an opportunity to cite second specialty preferences on personal questionnaires which OPMD furnished through servicing Military Personnel Offices (MILPOs) during November 1980. Questionnaires returned to OPMD are compared with the results of the file reviews before OPMD makes a final designation for each officer in YG 74.

The specialty designation process is more complex than most officers realize. The least complicated situation occurs when the company grade officer cites specialty preferences which correlate with his education, training, and experience. If there is little or no correlation, OPMD must evaluate the officer's experience and preferences and make a judgement decision based on both Army requirements and individual preferences.

If an officer's preferences are not supported by experience, the OPMD evaluator must also judge the officer's potential to complete the necessary training, and whether Army requirements could be filled better by other captains with similar specialty preferences who already have the required training and experience.

OPMD career managers may have to designate some officers from YG 74 into OPMS specialties in which Army requirements exceed the number of officers who prefer those specialties. But OPMD's goal is to minimize the number of captains who are designated specialties which they do not list as preferences.

STAFF SCHOOLS REVAMPED

Studies/programs are underway to revamp our military schooling for company grade officers. The new programs reflect some of the recommendations contained in the Review of Education and Training of Officers (RETO) study.

Under RETO, the Army will establish a Combined Arms and Services Staff School (termed "CAS-cubed" or CAS^3) at Fort Leavenworth, KS, this fiscal year. When the system become fully operational in FY 85, all officers can expect to attend the new school sometime during their seventh to ninth year of service. This means that more than 3,300 officers will be enrolled in CAS^3 each year. The school will include both resident and nonresident instruction.

After an officer has completed the nonresident phase, he will attend the resident phase during his seventh, eighth or ninth year of service. All officers will be required to participate in the program.

The resident phase of the course is tentatively scheduled to span nine weeks. Students will attend the resident phase in

a TDY status. As an outgrowth of the CAS[3] program, the Army has had to develop a new system for selecting officers to attend resident command and staff college level schools. Beginning with academic year 1982-83, a year group method will be used to select officers for CSC. Under the new system, officers will be eligible for CSC consideration during their eighth through eleventh years of commissioned service and will compete with officers from their own year group for selection.

During the transition period to the new CSC system (until 1983), the Army will continue to give CSC consideration to officers with eight through 15 years of service. During 1982 and 1983, the selection of officers with 12-15 years of service will be influenced by how many officers from those year groups already have attended CSC. Year-group competition for officers with eight through 11 years of service will begin in 1982. The new CSC system should be fully operational by 1985.

COMBINED ARMS COURSES

To perpetuate the combined arms atmosphere at the Infantry and Armor advanced course, one engineer officer will be selected to attend each course. Only the most qualified officers will be selected to represent the engineers and participate in these school courses.

PHOTOGRAPHS

What does your photograph in your Military Personnel File say about you? Are you well dressed? Does your uniform fit? Are you represented as an officer who is ready for added challenges? Your official photograph should represent you at your very best. Don't wear "special" items such as jump boots, unauthorzied tabs, ribbons, berets, etc., when having your photo taken. And avoid wearing photo-sensitive glasses which tend to look like sunglasses when placed on microfiche. If your latest photo is outdated, or if you appear overweight, it may be doing you an injustice. Remember that AR 640-30 requires a new photo of every officer every three years.

PHYSICAL EXAMS

Army Regulation 40-501 requires physical exams for every officer at four-year intervals up to age 39, at two-year intervals from age 39 through age 48, and annually beginning at age 49. Officers should make sure that their correct height and weight measurements are reflected on their Officer Record Briefs (ORB), particularly those who have experienced a recent weight gain or loss. Local Military Personnel Officers should post the ORB based on a physical exam or height-weight certificate from local medical activities.

HOMEBASE ASSIGNMENTS

Officers desiring to return to their current installation following a dependent restricted overseas short tour must apply through their installation commander to Commander, MILPERCEN. Installation comments will be considered by MILPERCEN in programming homebase assignments. This procedure does not delegate veto authority on homebase assignments to installation commanders. Final authority is retained by the commander of MILPERCEN.

Requests must be submitted in writing to arrive at MILPERCEN (appropriate assignment division) no later than 30 days after initial notification for the overseas assignment. If the request is not received within 30 days after initial notification, an advanced assignment will be projected based on Army requirements, individual professional development needs, and personal desires.

OPMD REORGANIZATION

A plan for the reorganization of MILPERCEN's Officer Personnel Management Directorate (OPMD) was approved during Fall 1979. The reorganization, scheduled to take place over a 19-month period, is designed to provide efficient and effective "life cycle" career management for Army officers under the Officer Personnel Management System (OPMS).

The reorganization plan calls for three vertically structured career management divisions: Combat Arms Division, Combat Support Arms Division, and Combat Service Support Division. These divisions will be responsible for assignment of lieutenants through lieutenant colonels. The Colonels Division and Warrant Officers Division will be retained without change. The Majors Division was disbanded in August 1980 and integrated into the Combat Support Arms Division. The Lieutenant Colonels Division is scheduled to be disbanded and integrated by the end of February 1981.

Under the new structure, an officer's career will be managed by one of the three career divisions from the day he enters the Army as a second lieutenant through selection for promotion to colonel. This not only improves total management but also gives officers a single point of contact throughout their careers from grade 0-1 to grade 0-5.

Officers who hold entry specialties 11, 12, 13, 14, or 15 will be managed by the Combat Arms Division. The Combat Support Arms Division will manage those officers with entry specialties 21, 25, 27, 31, 35, 36, 37, 72, 74. The Combat Service Support Division will manage officers with entry specialties 42, 43, 44, 71, 73, 75, 76, 77, 81, 82, 87, 88. and 92.

"ONE STOP" RECORDS SERVICE

Officers visiting MILPERCEN to review their Official Military Personnel File are now also provided assistance to update their Officer Record Briefs (ORBs). The new service is part of MILPERCEN's effort to provide "One-Stop" personnel records service for officers visiting the personnel center in Alexandria, VA.

To insure that ORB information is accurate, officers should communicate first with their local MILPO to update the information and not wait until they visit MILPERCEN.

ARMY APPRENTICESHIP PROGRAM

Engineer soldiers have the opportunity to earn civilian credit for their military job by participating in the Army Apprenticeship Program. The program directly relates MOS skills to civilian skills.

To be eligible, engineers must have as a primary or secondary MOS one of the specialties approved for the program, and must be working in that MOS.

Most programs require 6,000 or 8,000 hours of documented work. However, previous work experience and training can account for up to half of the total required hours. Not all soldiers participating in the Army Apprenticeship Program are guaranteed an apprenticeship completion certificate. All criteria must be met. Since a soldier is required to perform some duties in an MOS not related to the apprenticeship requirements, and since the Army is not always able to provide the needed tasks, some hours of qualifying work experience may have to be completed when the soldier leaves the Army.

Soldiers leaving the Army before completing the program can obtain letters from their local education services officer (ESO) to certify their documented work experience.

For each approved program there is a pamphlet in the DA PAM 621 series to explain the requirements. Engineer soldiers who are interested in the program should contact their local ESO who will help them fill out a short application. The Army service school sponsoring the particular program decides how much credit a soldier should get for previous training and work experience.

The approved occupational programs draw soldiers from more than 130 MOS, all of which are open to women. So far, the programs with the most participants are wheeled vehicle mechanic, grading and paving equipment operator, helicopter mechanic, and cook. Approximately 16,000 soldiers are currently participating in the program, but an estimated 100,000 more soldiers could participate.

NCO DEVELOPMENT PROGRAM

The Army Chief of Staff has approved the establishment of an Army-wide NCO Development Program (NCODP). The objective of the program is to increase combat effectiveness of the Total Army by strengthening the NCO Corps in the following areas: leadership; professional skill development; training; counseling; care of the soldier; and military conduct and discipline.

The NCODP will be a unit commander's program, conducted primarily under noncommissioned officers when appropriate. It is at the unit level where potential noncommissioned officers are selected, where their most significant training is accomplished, and where their performance counts most in the Army's mission. Therefore, commanders will be responsible for creating, implementing, and guiding noncommissioned officer development programs within their units and organizations based on individual requirements and available resources.

The NCODP will contain training tasks, duties and responsibilities which enhance unit combat readiness. The unit NCODP will be supported by an HQDA program which will develop initiatives to strengthen those Army-wide programs providing support to the NCODP such as EPMS, Army Training Literature Program, Army Continuing Education Program, and the Quality of Life Program.

To assist commanders in NCODP development and execution, each major command will establish a Noncommissioned Officer Development Advisory Council chaired by the command sergeant major. Members will include senior noncommissioned officers from the command. The Sergeant Major of the Army has been charged with overall responsibility for the program.

PROGRAMS AVAILABLE FOR ENGINEER SOLDIERS

OCCUPATION	MOS	DA PAM 621-
Plant Equipment Operator	62G/H	76
Grading & Paving Equip Operator	62E/H/J	77
Heavy Duty Repairer (Const Equip)	62B	78
Universal Equipment Operator (Constr Equip)	62F	79
Carpenter	51B	84
Plumber, Pipefitter	51N	85
Electrician	51R	86
Firefighter	51M	116
Refrigeration/Air Conditioning Repairer/Servicer	52C	115
Lithographer (Offset Press Operator)	41K, 83E/F	112
Drafter (Architectural)	81B	113
Industrial Electrician/Repairer	52E	117
Powerhouse Electrician/Repairer	52E	118
Rigger	12B/C 51C/H	123
Surveyor, Engineering	82B/D	107

COMMANDERS AWARD PROMOTION POINTS

Unit commanders now have more to say about who gets promoted to E-5. Commanders will award up to 150 points based on the soldier's knowledge of and ability to perform assigned duties, dependability, attitude, initiative, conduct, physical condition, and potential to perform at the next higher grade.

Previously, up to 150 points on the 1,000-point worksheet were awarded based on Enlisted Evaluation Report weighted averages. Enlisted Evaluation Reports are no longer required for E-4s.

Commanders will have to submit a DA Form 4187 (Personnel Action) awarding the points at the time that the soldier is recommended for promotion. They can change the score awarded a soldier by submitting another DA Form 4187.

ASSIGNMENT IN RESERVE COMPONENTS

Active Army soldiers are being assigned full time to high priority Reserve Component units to enhance their readiness. Their presence in troop units is expected to ensure daily attention to key areas of readiness. These areas include administration, supply, maintenance, and training activities.

The reassignment of Active Army soldiers to Reserve Component units is one of the Army's highest priority personnel objectives. It involves the cooperative efforts of both the losing and gaining organizations to select qualified soldiers.

Before being selected, each individual has to be checked against the high standards associated with Reserve Component duty. These standards are specified in AR 614-200, Enlisted Personnel Selection, Training and Assignment System: Grades E-1 through E-9.

SOCAD COURSES

The Army has added 21 new associate degree programs to those already offered through the Servicemen's Opportunity Colleges Associate Degree (SOCAD) Program. New courses include: Law Enforcement; Aviation Maintenance; Communications Electronics; Accounting; Automotive Maintenance; Civil Engineering; Communications (Media); Computer Maintenance; Construction; Data Processing; Diesel Maintenance; Office Management; Security Services; Correctional Services; Transportation; Electrical Power; Digital Electronics; Food Service Management; Instrumentation; Management Science; and Medical Records.

Each of the 21 new curricula is in a technical field related to certain MOS and career management fields. In each program a soldier may be awarded credit for technical skills achieved through military service.

More than 300 colleges participate in the SOCAD program, and soldiers may transfer credit easily from one participating school to another. More than 70 of the schools offer a management program geared to combat arms soldiers.

SELECTIVE SERVICE REGISTRATION

Military personnel on active duty are not required to register for selective service. However, males born in 1960 or 1961 who were on active duty at the time registration started and are later separated, are required to register within 30 days of their separation. These individuals should go to their local post office and fill out a registration form. Beginning January 1, 1981, males born in 1962 will register, and there will be continuous registration for 18 years olds. Male personnel separated from active duty after the period specified for their registration must register within 30 days of their separation.

OFFICER PROCUREMENT

Qualified soldiers are encouraged to apply for either Warrant Officer School or Officer Candidate School.

To be eligible for acceptance to Warrant Officer School, soldiers must be between the ages of 18 and 46, and have sufficient education, technical training and practical experience to perform prescribed duties in the MOS requested. Other requirements include a minimum GT score of 110, good moral character, good leadership qualities as demonstrated by personal background and previous experience, and a favorable security screening.

Enlisted personnel and warrant officers on active duty wishing to apply for the 14-week Officer Candidate School, now called Branch Immaterial Officer Candidate Course (BIOCC), must be between the ages of 19 and a half and 29 at time of enrollment. However, a waiver of age may be granted by Commander, US Army MILPERCEN. In addition, applicants must have completed two years of a four-year college degree program. Male personnel must have a minimum GT score of 110 and a composite score of at least 200 between the Officer Candidate Test (OCT) and the Officer Qualification Inventory (OQI). Female personnel must have a minimum GT score of 115. The OCT and the OQI are not required for females. Individuals must have a Class A physical which should be accomplished no earlier than six months prior to the date of application, a score of at least 300 points on a PT test taken no earlier than two months before the date of the board, and a favorable security screening. Soldiers currently serving overseas will not be able to PCS to CONUS until completing 24 months of a long tour. Short tour assignments of less than 24 months will be completed before PCS.

Class dates and cutoff dates for submission of applications for BIOCC have been scheduled as follows:

CLASS NO.	REPORTING DATE	GRADUATION DATE	CUTOFF DATE
3-81	April 19, 1981	July 28, 1981	January 16, 1981
4-81	June 14, 1981	September 22, 1981	March 13, 1981
5-81	August 2, 1981	November 10, 1981	May 7, 1981

THE SCHOOL SOLUTION

I. MINEFIELD DENSITY

From Figure M-2, FM 20-32 (below right), the required minefield density is determined to be .8 mines per meter of front.

II. TOTAL MINES REQUIRED

Compute the total number of mines required by multiplying the minefield density by the minefield width and add a 10 percent safety factor (mine rejections, strip length variance, etc.). The minefield width is the distance between the minefield coordinates, which you determine to be approximately 500 meters.

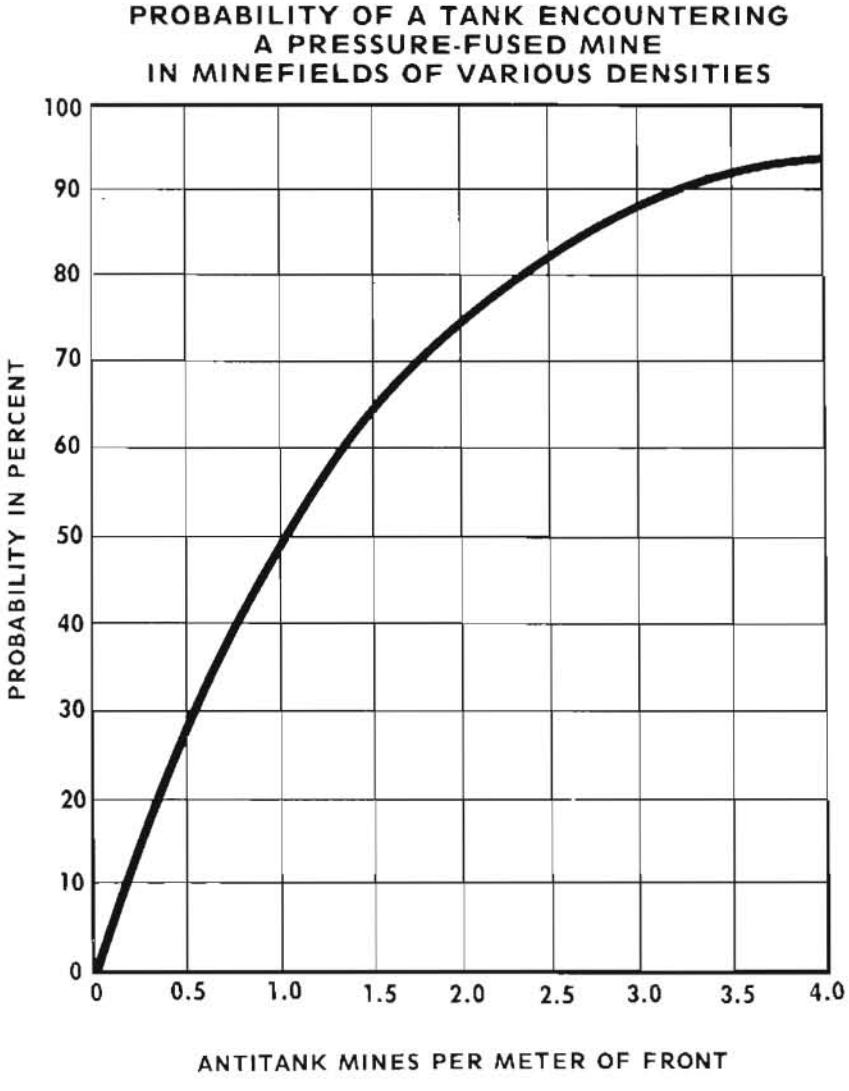
Width x Density + .10 (Width x Density) = mines required

500 x 0.8 + .10 (500 x 0.8) = mines required = 400 + 40 = 440

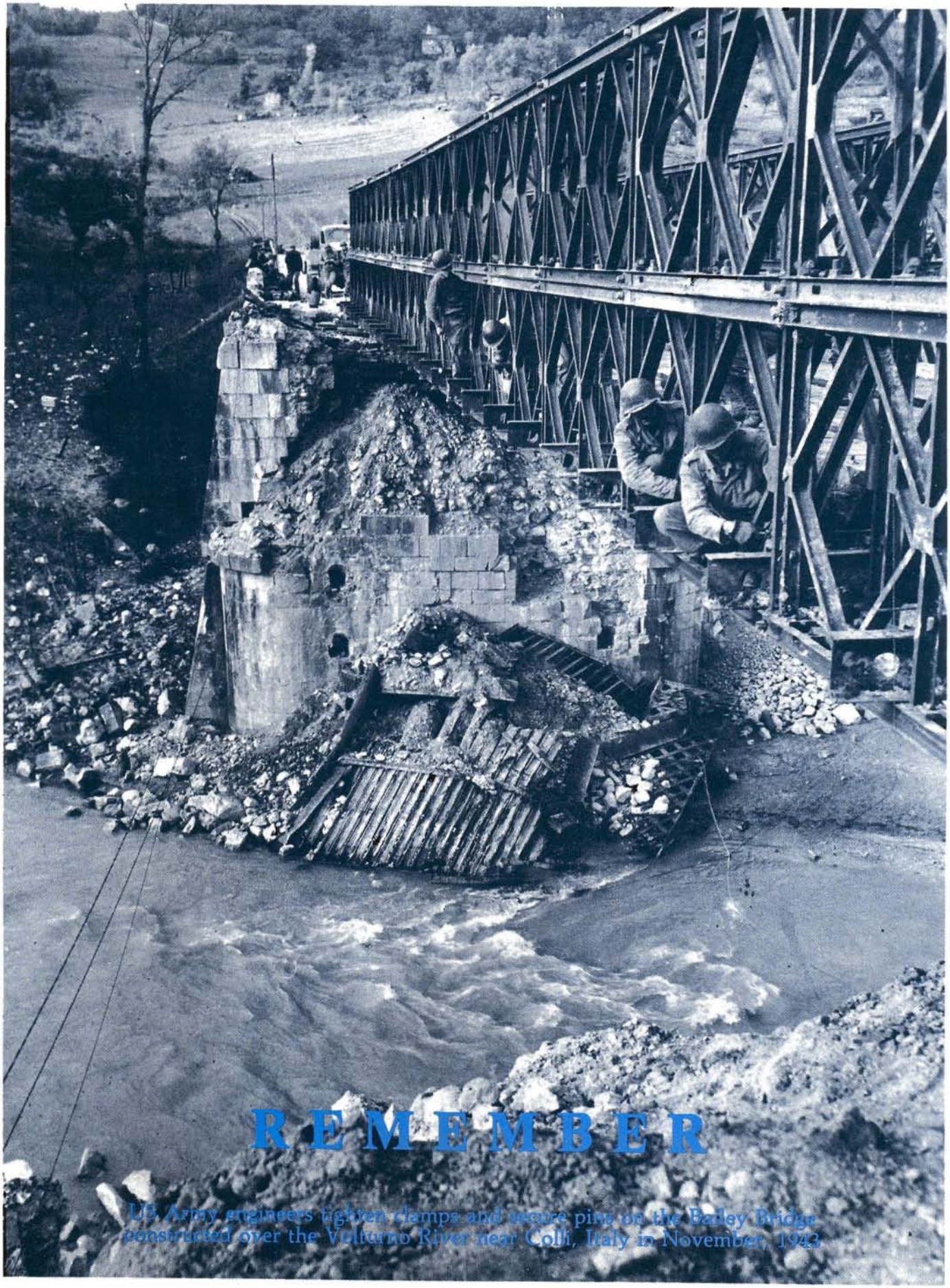
In calculating the number of mines per row, you must allow at least six meters between mines to prevent sympathetic detonation (paragraph 4-4, FM 20-32). Therefore, 500 meters divided by six meters equals 83.3 mines, or rounded *down* to just 83 mines per row. The number of rows required is determined by dividing the number of mines required (440) by the number of mines per row (83). The result, rounded *up*, is six rows of 83 mines each.

III. PLATOON HOURS/ TRUCKS REQUIRED

The time required to emplace the minefield using the M57 ATMDS is calculated by dividing the number of mines by the M57 dispenser capability, which is 385 mines per hour (para F-5, FM 20-32). The result is 1.14 hours, rounded *up* to 1.5 hours. The number of 5-ton dump trucks required is determined by dividing the total number of mines (440) by the truck haul capability, which is 288 mines per truck (para F-4, FM 20-32). The result is 1.53 trucks, or rounded *up* to two trucks.



*U.S. GOVERNMENT PRINTING OFFICE: 1981-0-720-094/1



US Army engineers tighten clamps and secure pins on the Bailey Bridge constructed over the Volturno River near Colli, Italy in November, 1943

"As contrasting as life appears for soldiers serving in Germany and Korea, in Alaska and Panama, there is a common denominator. I have seen it from Checkpoint Charlie in West Berlin looking across a wall which has slowed but not stopped the flight of those desperate for freedom. And I have seen it from observation posts overlooking the barren emptiness of the Demilitarized Zone in Korea. It is the difference between democracy and totalitarianism. It is because of that difference that our soldiers willingly serve today."

—Clifford A. Alexander
Secretary of the Army