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THE COVER

Soldiers master the basic engineer skills during One Station Unit Training at Fort Leonard Wood, MO. By Staff Sergeant Mike Furr.

Information for Contributors

THE MAGAZINE. The Engineer is an official Department of the Army magazine which provides timely and authoritative information on Army engineering concepts, plans, policies, doctrine, procedures, operations, and developments to active Army units, reserve components, and national guard units. As a medium for disseminating information, it seeks to increase understanding of the role and importance of Army engineering and to promote the professional development and knowledge of officers, enlisted personnel, and civilians engaged in Army engineering activities.

WRITERS. The primary requisite for being published is your message, not your writing ability. If you have something of value to offer, whether it be in the form of a feature article, announcement, photograph or illustration, we want to hear from you.

SUBJECTS. The Engineer uses articles on all activities of Army engineering, from item development to item disposal, from field utilization to support operation. The scope of the coverage includes all functions at all levels, from Department of the Army staff to the smallest field units.

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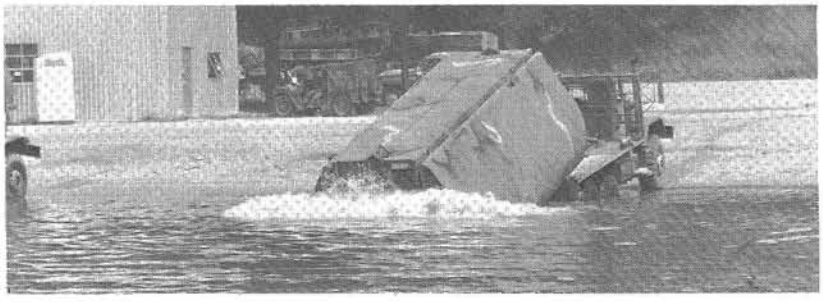
News & Notes



Ribbon Bridge

Ribbon bridges have long been an important asset of combat engineers due to the speed and ease of assembly. The 902nd Engineer Company (FB) 11th Engineer Battalion (CBT), Fort Belvoir, demonstrated ribbon bridge advantages during a recent "Float-by" at the U.S. Army Engineer Center and School. Unloading (top photo) takes just two men and very little time. The bridge section unfolds (center) by itself. Separate spans, once off-loaded and unfolded, are pushed together (bottom) by a bridge erection boat. A complete bridge can be assembled and operational within minutes. (Photos by Gid Pool, Jr.)

Training Brigade

The Engineer Training Brigade has been organized at Fort Belvoir, VA, effective 1 October. Its primary missions are the training of soldiers in the repair courses taught at Fort Belvoir and the care of all students at the school. The Engineer Training Brigade (ETB) is commanded by Colonel Kerwood W. Barrand and the Brigade Command Sergeant Major is CSM Donald W. W. Elms. The ETB consists of three battalions organized from the Engineer Center's existing personnel resources. The 1st Battalion includes instructors and students of the 52D Power Generator Equipment Repairman Course. The 3rd Battalion retained its old configuration and mission of command and control of students attending the Advanced Officer Course, Basic Officer Course and Advanced NCO Course. The 3rd Battalion also includes the Advanced Individual Training Company for students attending the Defense Mapping School and the Foreign Student Support Detachment. The 4th Battalion includes students and instructors of the 35E Special Electrical Devices Repairman Course and the 52C Utilities Equipment Repairman Course. In addition, students attending the 12E Atomic Demolition Course and the Soils Analyst Course are billeted in the 4th Battalion.

Drill Sergeant of the Year

A Combat Engineer, Sergeant First Class Dennis D. Watters, has been selected as the active Army Drill Sergeant of the Year. SFC Watters, whose MOS is 12B4X, was assigned to Headquarters and Headquarters Company, Training Group, Fort Leonard Wood, MO, at the time of his selection. He has since been reassigned to Headquarters, Training and Doctrine Command, Fort Monroe, VA, where he will serve a one-year tour as advisor to the TRADOC commander on the drill sergeant program.

Commemorative Plaque

The U.S. Army Engineer School at Fort Belvoir, VA, has been presented a bronze plaque commemorating the 200th Anniversary of George Washington's "call" for engineering education. The plaque is a duplicate of the one which was unveiled at Valley Forge earlier last summer. Major General James L. Kelly, post commander and commandant of the Engineer School, accepted the plaque from General (Ret.) Bruce E. Clarke during ceremonies on Long Parade Field at Fort Belvoir. The plaque was donated by the Freedoms Foundation and the National Society of Professional Engineers. It is currently on display in the Engineer Museum at Fort Belvoir.

Universal Engineer Tractor

Congress has appropriated $10.6 million for initial production of the Universal Engineer Tractor (UET) during Fiscal Year 1979. Initial Operational Capability-Force Development Testing and Evaluation is scheduled for the third quarter of FY 80. Army engineer field units should receive the first UETs by early 1982 if additional funds are appropriated during the next two years.

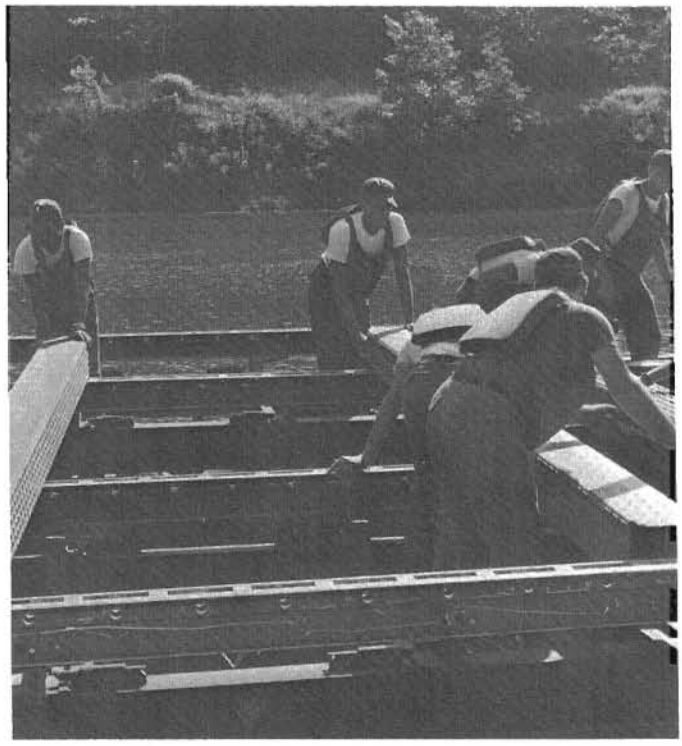
CETEX '78

A German engineer guards a mined road at Military Training Area Baumholder during CETEX '78, which is the annual Central Army Group (CENTAG) Engineer Training Exercise designed to provide combat engineers with a fundamental knowledge and understanding of the equipment, barrier munitions and doctrine of their allies. CETEX '78 was hosted by III German Corps from 22 May to 1 June. Participating forces included the II and III German Corps, V and VII U.S. Corps, the 4th Canadian Mechanized Brigade Group, the II French Army, the I Belgium Corps, and the German Territorial Southern Command.

News & Notes

Bridge Builders

Members of Company C, 1st Engineer Battalion, Fort Riley, KS, assemble an M4T6 float bridge on the banks of the Big Piney River at Fort Leonard Wood, MO. Ninety-eight soldiers assigned to Company C convoyed to Fort Leonard Wood late last summer to undergo 13 days of bridge-building training in preparation for an ARTEP exercise at Fort Riley this November.



Letters

Dear Sir,

Some of my fellow EOAC students believe too much time is allotted to tactics instruction at The Engineer School. For three reasons I disagree with this:

(1) Observations obtained in Vietnam have led me to believe that Engineer officers tend to be weak in tactics though proficient in general engineering. Observed instances of slow perimeter defense establishment, long ambush reaction times, lax job site security, inability to use supporting fires, and misunderstanding between engineer and maneuver units have led to this belief.

(2) In many armies the Engineers are closely integrated with the maneuver units with a resulting increased effectiveness of those armies. This does not seem to be true of U.S. Army Engineers. We tend towards an "Ivory Tower" attitude towards everything except construction engineering. Successful modern warfare in general and European warfare in particular requires close coordination between Engineers and other branches. To realize their full potential Engineers must be able to participate in the early stages of tactical planning. This requires an understanding of tactics which Engineers do not always possess.

(3) Tactics may not be the most interesting of subjects to an Engineer, but required combat use will make it the most important. An officer who has not been in combat, which includes most of the EOAC students, tends not to appreciate this.

With these observations I submit to my fellow students the belief that the current time allotted to tactics is insufficient rather than excessive. I believe the concentration of effort should be towards continual improvement of the subject matter and its presentation rather than reduction of allotted time. An Engineer officer must have a thorough knowledge of tactics to function as an integrated member of the combined arms team and to fulfill his battlefield responsibilities to his personnel. This knowledge comes only with time and effort.

1LT LARRY W. JINKINS
Class 3/78 EOAC

The combat role of Army engineers is often overshadowed by their construction, nation-building, and water resource management missions, particularly during peacetime. Yet, when the Corps of Engineers was redesignated a member of the Army's Combined Arms Team in September 1975, it shouldered an equal burden with the Infantry, Armor, Field Artillery, and Air Defense Artillery in our national defense. Lieutenant General John W. Morris, Chief of Engineers, was asked about that responsibility and other matters related to the combat role of Army engineers during a recent interview with THE ENGINEER.

An Interview with The Chief★★★

THE ENGINEER: In September, 1975, the Corps of Engineers was redesignated as a combat arms. How have the other combat arms accepted the change and what do you think engineers can do to increase that acceptance?

LT. GEN. MORRIS: The Corps of Engineers will always be recognized as being more than just a combat arms. We do other things in a support role and in service to the Army. As I see it, we support the Army in four categories—on the battlefield, in garrison, during mobilization and by doing a lot of special tasks. Our combat arms mission falls only in the first category, support on the battlefield. I think there is full acceptance of engineers as part of the combined arms team by the troop units, the infantry divisions, those forces which will be deployed in the combat zone. But we ought to get it straight. Engineers did not return to the combat arms simply because the Corps wanted to. That wouldn't have been good enough. The reason we came back is because the other members of the team wanted us back. Our field commanders are very, very aware of the importance of engineers to their operations. I am concerned, however, on two scores. First, I believe the engineer should be more involved in planning the battle or operation as well as in executing it. At present, the emphasis on execution is about right, but I think the emphasis on helping to plan the battle is too limited. Why? Well, the kinds of warfare ahead of us will rely heavily on mobility, countermobility, survivability, and general engineering. But even more importantly, if field commanders want to change the terrain to maximize its use, engineers are going to have to do it. So we might as

well help the commander plan his operation. The other deep concern I have—and I may be wrong—is the assumption by field commanders that engineer capability available equals the engineer effort they expect. I'm concerned that field commanders are assuming engineer capability to be greater than it really is, in fact. The relative mobility of engineer units on the battlefield is considerably less than the combat units they fight with. The D-7 tractor doesn't have the mobility of the personnel carrier or the tank or self-propelled artillery. And I'm not sure the commander of the combined arms team is fully aware of the shortfall of engineer mobility in relation to his other units. The combined arms commander's assumptions are not necessarily tested during peacetime field operations. But in wartime, it would become eminently clear quickly that the mobility he expects from his combined arms team is less than he expects.

"I think there is full acceptance of engineers as part of the combined arms team by the troop units, the infantry divisions, those forces which will be employed in the combat zone."

"If field commanders want to change the terrain to maximize its use, engineers are going to have to do it. So we might as well help the commander plan his operation."

"Once we get the UET into the hands of our troops, I think our field commanders will realize what a disadvantage they're at with present equipment."

"While our troop units may be more equipment intensive today, we expect a lot more of the individuals who have this new equipment than we expected of the individuals who had only rifles to fight with."

THE ENGINEER: Won't the Universal Engineer Tractor (UET) and other new engineer equipment now being developed increase the mobility of combat engineers?
LT. GEN. MORRIS: When we get the UET in the hands of our divisional units and support battalions, I will be much more relieved that engineer capability will be, in fact, what the commanders are presuming it to be. But that equipment is not there yet. The lead time on new equipment is long. Fortunately, we are at the threshold of production, and we could be seeing the UET in the hands of our troops in the next couple of years.

THE ENGINEER: What, if anything, can your office do to help solve the funding problems facing the UET?
LT. GEN. MORRIS: There's generally good support for the UET. General Blanchard (USAREUR Commander) has sent a message stating how badly he wants it. And I think the program managers who support this item before the Congress are convincing. But I don't know whether it's a matter of priorities before the Congress, competition from the construction equipment manufacturers, or what, but so far we've not been able to get the UET into production. Once we get it into the hands of our troops, I think our field commanders will realize what a disadvantage they're at with present equipment. I'm optimistic we will get it funded, but I was also optimistic last year.

THE ENGINEER: There seems to be a trend in the development of our engineer TOE to become more equipment intensive and less manpower intensive. What is your reaction to this trend?
LT. GEN. MORRIS: That's not only true, but it's inevitable. And I believe it's proper. Why? Well, our army is mechanized relative to the Army of World War I and World War II and maybe even Vietnam. A man's capacity to influence the situation on the battlefield is a function of the equipment we put into his hands, much more than it was before. That's been an evolutionary thing. And what we have now is a continuation of that evolution that carries with it some other considerations. While our troop units may be more equipment intensive today, we expect a lot more of the individuals who have this new equipment than we expected of the individuals who had only rifles to fight with. So we have to get much more out of the individual soldier than we used to.

THE ENGINEER: Many soldiers contend that the nation-building role of the Corps, both at home and

abroad, diverts the attention and resources of the Corps from its most important mission—combat engineering. What is your response to this concern?

LT. GEN. MORRIS: Well, I don't disagree that the combat engineer role is our most important responsibility, but I do disagree that it is the only thing we can do and do well. In fact, I'm more convinced as the Chief of Engineers than I ever was before that the engineer support to the Army, at all levels, has historically been a direct product of the responsibilities we give our young officers and middle grade officers in other-than-combat engineer assignments. I have the highest regard for the combat engineer troop commander, but I'm also convinced that the very best engineer service that is given the Army and the United States in the field has historically been a product of engineer lessons learned in assignments other than, and in addition to, the troop assignment. I just do not believe that the United States Army could successfully mobilize for war without a peacetime role for its engineers and I don't believe we could have accommodated the kinds of construction associated with World War II and Vietnam—ports, railroads, massive airfield construction, major depot projects—with officers who had served only as troop commanders. I just don't think it would have been possible. Of course, the other side of the coin is the very significant contribution the Army is making to the nation by having its military engineers in leadership positions on those jobs which not only help build our nation, but help our allies build their nations. The Army takes pride in helping others through this opportunity for its engineers. Sooner or later, it all comes back not only to the credit but also to the benefit of the Army.

THE ENGINEER: I understand that a rather common criticism among Engineer School Advance Course students is that too much emphasis is placed on tactics and the role of the Brigade Engineer, relative to construction engineering subjects. What is your response to that criticism?

LT. GEN. MORRIS: Certainly, the criticism is valid among the students you're hearing from. Why? Well, as I understand it, we're sort of in a transition in the advance course. Whereas it used to be a course that rounded out an officer's engineering education, regardless of his next assignment, it is now designed as a pre-company command course. In other words, graduates of the advance course are now expected to become company commanders in their next assignment. I think that's part of the problem. As Chief of Engineers I would like to see that course include some of the skills an engineer officer must have in construction and service support to the Army. On the other hand, until an officer has been a company commander, that should be his next objective.

THE ENGINEER: There are many officers who would like to see the Engineer Officer Specialty (21) split into two or more specialties. What are your views of the pros and cons of such a proposal relative to the status quo?

LT. GEN. MORRIS: Well, certainly there are factors on both sides. I've given that a lot of thought. And I prefer it the way it is. It enhances the engineer officer's utility to the Army and also his opportunities for promotion, particularly as he goes into the field grades. Just the nature of what the Army expects of its engineer officers requires us to have perhaps the busiest career field of all. We not only have to be good at leading our

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troops, but we have to be branch qualified, as I would call it, in a technical sense. We must be proficient as a facilities engineer, in the military construction field, or in the public works field. The engineer officer has to kind of hustle. He shouldn't spend any more time in one of these experiences than is necessary for him to become proficient in it, and then he should move on to another assignment opportunity if he can arrange it. I am concerned that we get officers into troop units or into particular positions in a stabilized tour and they stay there three years. Well, I just don't believe there's enough learning experience requiring three years attention in any one assignment. I think in a three year period he should get more than one opportunity. It's done that way in some cases but not enough. Everytime I go through this problem, I always come out the same way—the Corps of Engineers and the individual officer is better served by having a single engineer specialty than by having more than one. But I think we should be very careful not to allow our young officers to spend too much time doing the same thing.

THE ENGINEER: Some engineer officers believe that engineer companies should be commanded by majors rather than captains. What is your opinion on that?

LT. GEN. MORRIS: Well length of service is a more important criteria to me than grade in terms of ability to run a company. The rationale for majors commanding companies has to be founded on the difficulty of the job as they perceive it. I just don't think it would be justified except under very unusual circumstances.

THE ENGINEER: Some officers say that an engineer battalion cannot adequately support a division on the battlefield. What are your thoughts along that line?

LT. GEN. MORRIS: To me, that's at least a two battalion job. I guess the question is whether there should be an engineer group, rather than battalion, in each infantry division. Well, I can visualize circumstances where that would work, but I'm inclined to think we ought to build the battalion to do the job that is needed and then support it directly with additional engineer units which are non-divisional. I kind of feel the place we need to increase engineer strength is in direct support elements. There are not enough engineers in the divisional area, we all agree on that. The question that follows is should they be organic to the division or should they be immediately available to support. I'm inclined to go with the latter, providing the battalion is organic to the division to do the jobs normally expected by the division.

LIEUTENANT GENERAL JOHN MORRIS

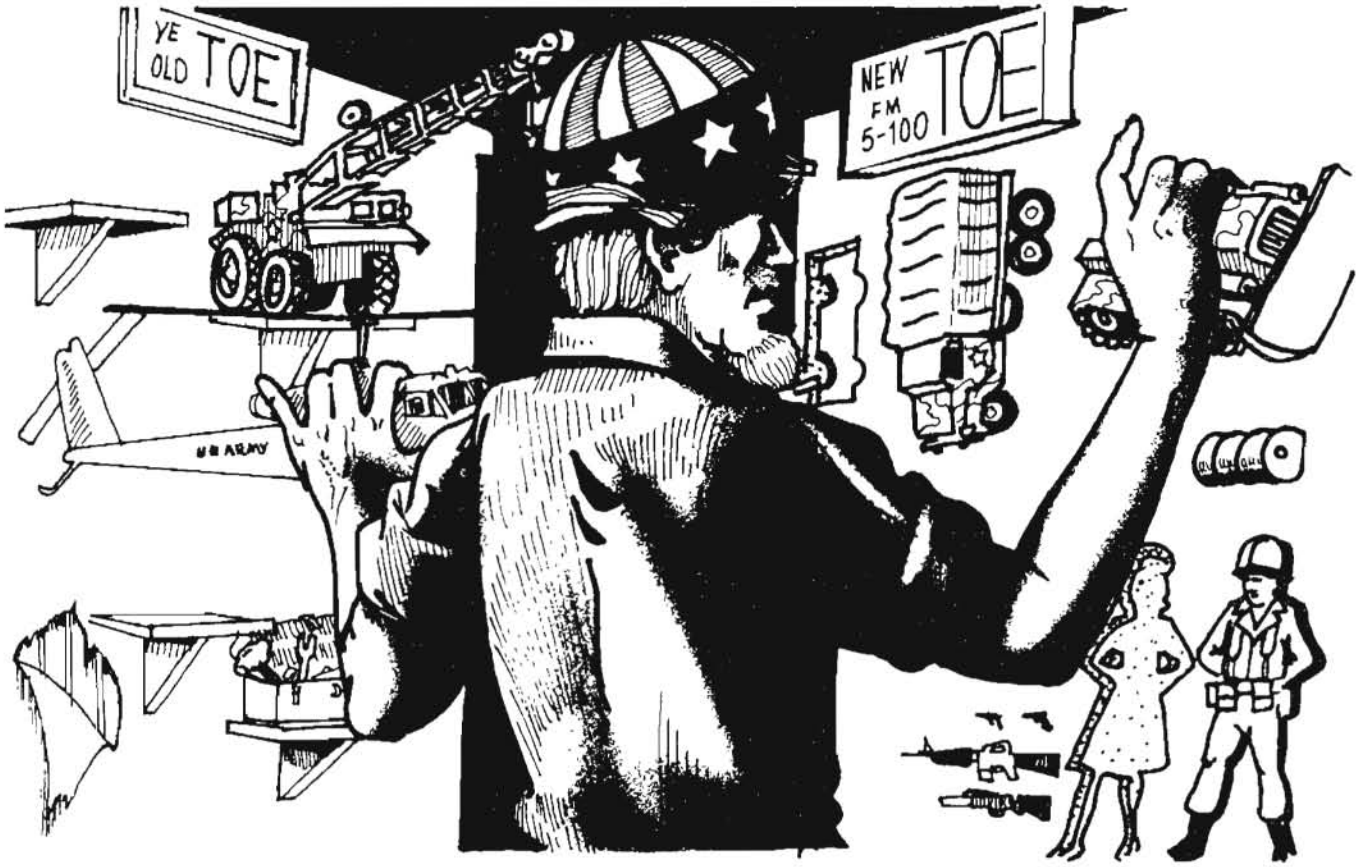
Lieutenant General John W. Morris became the 44th Chief of Engineers of the U.S. Army Corps of Engineers in July 1976. He is the engineer advisor to the Army Chief of Staff and the engineering construction agent for the Departments of the Army and Air Force. He is currently in charge of a major nation-building program in Saudi Arabia which is fully funded by that government.

He is also responsible for the Corps of Engineers' nationwide program for the development and management of our national water resources.

During his career which spans more than three decades he has commanded troops at every level from platoon to a separate brigade. His broad experience in water resources management dates back to 1952 when he was Deputy District Engineer in the Corps' Savannah District. Later, as District Engineer at Tulsa, Oklahoma, he completed several key elements of the McClellan-Kerr Arkansas River Navigation Project and subsequently served as the Corps' Missouri River Division Engineer.

As Director of Civil Works for three years in the early 70's he took major initiatives in support of the new emerging national priorities on environmental quality and energy.

General Morris holds a Master's Degree in civil engineering from the University of Iowa and is a registered Professional Engineer in Oklahoma.



The Revised Engineer Active Force

Captain James E. Meredith

The Revised Engineer Active Force (REAF) is a major effort presently underway at the United States Army Engineer School, Fort Belvoir, Virginia to update all engineer tables of organization and equipment (TO&E). The purpose of REAF is to revise all engineer organizations at one time to accommodate developmental equipment and to incorporate new concepts to facilitate "winning the first battle."

The driving force behind REAF stems from recent acceptance of new doctrine which places emphasis on countermobility, survivability and mobility (COSMO) plus close integration into the combined arms team.

This advanced doctrine, which impacts greatly on the engineer concept of operations and material development, is introduced in the engineer "How to fight" manual, FM 5-100. The doctrine has engineers fighting

farther forward on the battlefield. Engineers must be combat responsive and move forward with maneuver units. Consequently, engineers systems must also move forward. This forward movement on the battlefield required organizational changes in all engineer units in order to optimize the effectiveness of engineer systems.

CURRENT ORGANIZATIONAL DEFICIENCIES

Under the present system, corps engineer units are organized primarily for rear area operations using centralized control. They lack communications or coordination capability for decentralized operations farther forward on the battlefield. Their wheeled-vehicles lack mobility to keep pace with tracked vehicles and are vulnerable to both artillery and direct fire from the opposing force.

Engineer systems are not forward where they are needed to provide COSMO support. Corps engineer units are well prepared to fight the last war with their complement of heavy construction equipment and specialized vertical construction skills. However, today's forward fighting engineers need lighter and more flexible combat construction equipment and a de-emphasis on vertical construction capability.

Division engineer units are better organized for forward fighting because of their flexibility and mobility. However, divisional engineer systems, like corps engineer units, are not forward to provide COSMO work for the combined arms team. Although the assistant division engineer staff provides liaison with the division,there is an increased need for coordination of engineer activities at the tactical brigade level. And finally, with speed and flexibility needed on the battlefield, present day divisional bridging assets need upgrading.

APPROACH AND METHODOLOGY

The urgent need to revise engineer organizations originates from awareness of the opposing force (OPFOR) tactics on the modern battlefield. OPFOR doctrine calls for a very short but devastating battle. Numerous echelons of OPFOR maneuver units preceded by intensive artillery will concentrate their efforts for a major breakthrough and push far into our battle area at a planned rate of 30-50 kilometers per day.

Current US doctrine, as expressed in FM 100-5, requires shifting and concentrating combined arms teams in depth with preparation to defend, using COSMO techniques. It is mandatory for the engineer systems to place COSMO effort farther forward.

Some of the engineer systems that are currently being developed for this role include the surface launched unit, fuel air explosive (SLUFAE); the ground emplaced mine scattering system (GEMSS); the universal engineer tractor (UET); the family of military engineer construction equipment (FAMECE); a rapid excavator; and finally some upgrading of commercial construction equipment.

The Division Restructuring Study (DRS) is a program presently being tested at Fort Hood, Texas that combines FM 100-5 doctrine with many of these new engineer systems. This study has been instrumental in laying the foundation that helped stimulate development of the new Revised Engineer Active Force.

REVISED ENGINEER ACTIVE FORCE

The Revised Engineer Active Force (REAF) reacts to FM 100-5 doctrine by revising all engineer organizations to accommodate each new and improved engineer system. The major goal of REAF is to maintain zero increase in total engineer strength in the active force structure by simply cross-leveling the assets of present engineer organizations.

Since treatment of all organization revision is similar, three typical units will be discussed that represent nearly 75 percent of the Active Army strength. These are TOE 5-145, The Divisional Engineer Battalion, Armored or Mechanized; TOE 5-35, The Corps Combat Battalion and TOE 5-115, The Combat Heavy Battalion.

Some of the general guidelines that were established by REAF include the following:

- Most line companies contain a support platoon with a COSMOS section, an equipment section, and a maintenance section.
- Engineer squads are reduced in size from 10 to eight men in divisions and separate brigades and are provided with more equipment to make them less labor intensive and more equipment oriented.
- Unlike the Division Restructuring Study, REAF divisions retain bridging and water production capability.
- The Assistant Division Engineer Section is retained in divisional battalions and an assistant brigade engineer team is created to better coordinate engineer activities with the maneuver brigade.
- For adequate command and control in the corps battalion, REAF restores squad radios and adds a second battalion command net for greater operating distances in Europe.
- With the increased need for materiel haul, REAF has maintained or slightly increased long and short haul capacity.
- Personnel administration is consolidated at battalion level with organizational maintenance retained at company level.

• REAF makes no major changes in roles and missions of engineer units. In 1985, engineer units are assumed to have only the ribbon and medium girder bridges.

The first revised organization is TOE 5-145, The Divisional Engineer Battalion, Armored or Mechanized. One improvement is deletion of graders, cranes and compaction equipment in a deliberate de-emphasis of main supply route (MSR) maintenance capability in favor of reliance on corps battalions as the divisional battalion moves farther forward in the combined arms team.

Each platoon has one combat engineer vehicle and two universal engineer tractors, thus partially offsetting the reduction in squad size from 10 to eight men. Each line company of divisional battalions has a lieutenant as assistant brigade engineer, augmented by an operations sergeant, and a driver with quarter-ton vehicle and radio for proper coordination between the company and the associated maneuver brigade. Finally, we have the newly created support platoon, one for each line company. This innovation is the organizational home of the majority of COSMO systems. It is the means of getting engineer systems forward into the companies which form the brigade team.

The next revised organization is TOE 5-35, the Corps Combat Battalion. The construction section has been reduced by half, deleting many specialized MOSs and thus de-emphasizing vertical construction capability. A significant modification to many corps combat battalions is replacement of five-ton dump trucks with armored personnel carriers as the squad vehicle. This is a new tracked version of the battalion specifically designed to operate forward with the armored or mechanized division. Each line company of the corps combat battalion also has the support platoon with the standard COSMO and maintenance section.

The third revised organization is TOE 5-115, The Combat Heavy Battalion. The general philosophy was applied to reduce the size of equipment in the line companies for greater mobility and flexibility in the newly acquired combat engineering role. Five-ton dump trucks replace 20-ton dumps, 2½-cubic yard scoop loaders replace 5-cy loaders, and D-7 dozers replace D-8 dozers with consolidation of all heavier equipment in the equipment and maintenance company. The entire quarrying and rock crushing capability has been deleted.

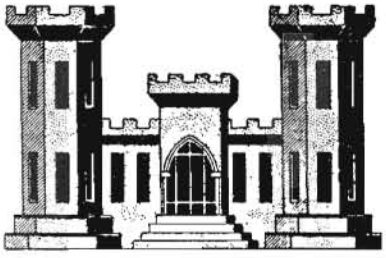
This move, indorsed by USAREUR, places reliance on local national sources and supporting engineer units for crushed rock and recognizes the increased combat engineering role. Most specialized MOSs have been deleted in the support section in recognition of reduced requirements for specialized vertical construction capability. There is no FAMECE or UET in the unit, but only a general upgrading of commercial construction equipment.

CONCLUSION

The REAF concept was not established to bring about a one-time revision of all engineer TO&Es. Instead, REAF presents a concept under which engineer organizations are revised on a schedule to optimize engineer systems effectiveness in line with improvements in tactical doctrine. In conclusion, REAF is a significant milestone in organizational development. It places the horse before the cart. For the first time, doctrine and organization leads materiel, personnel and training developments instead of the reverse.

REAF is a blueprint to guide organizational, materiel and training developers in making combat engineers the multiplier of combat effectiveness that FM 100-5 intends them to be.

CPT Meredith is a recent graduate of the Engineer Officers Advanced Course. He is currently assigned to Headquarters, Forces Command (FORSCOM), Fort McPherson, GA.



Combat Engineers and the Heavy Division

Major Joseph Kish

(EDITOR'S NOTE: This article describes a training exercise which placed a combat heavy engineer battalion in direct support of a maneuver division. According to current engineer doctrine, direct support to a maneuver division is provided by a corps combat engineer battalion, rather than a combat heavy battalion. Other doctrinal matters questioned by the author are being considered in the Revised Engineer Active Force (REAF) Study.)

INTRODUCTION

"Today, more than ever before, the engineer plays a critical role as a member of the combined arms team. As movement and lethality on the battlefield increase, the requirement to reinforce the terrain increases. The engineer brings to the combined arms team a terrain oriented system that enhances the capability of our weapons systems while decreasing the effectiveness of the enemy weapons."

Is the doctrine spelled out in the paragraph above, taken directly from the Coordinating Draft of FM 5-100, merely a modern substitute for "two up and one back," or can it really provide us with a roadmap for future operations?

I believe the roadmap is there. However, we must have the necessary mapreading skills to take advantage of it. Fortunately, our field units are learning those skills through training and testing. GALLANT CREW 77 provided an excellent opportunity for such training during the Spring of 1977.

GALLANT CREW 77, conducted at Fort Hood, Texas, was the large-scale Readiness Command Exercise for 1977. The free-play, two-sided Field Training Exercise (FTX) was conducted from March 26 through March 31 and included as participants both active and reserve Army and Air Force units. The major maneuver units were the 1st Cavalry Division, the 2nd Armored Division and the 6th Cavalry Brigade (Air Combat).

The 1st Cavalry Division and supporting units employed opposing forces tactics, while the 2nd Armored Division and supporting units employed U.S. tactics. The 2nd Armored Division deployed as part of a contingency corps with austere logistical support in anticipation of a short duration conflict. The setting was a high air threat-nuclear-electronic warfare environmment.

The 1st Cavalry deployed with only two companies of its divisional engineer battalion. The 2nd Armored deployed with the entire divisional engineer battalion as well as non-divisional engineer support.

It should be noted that several limitations were placed on the participants. Fort Hood is limited in maneuver area. Brigades were deployed on an 8-12 kilometer front. Similar restrictions existed in depth, resulting in a higher than desired density of combat and combat support units for such a high threat environment. Since not all radio frequencies could be cleared for Electronic Counter Measures (ECM), opposing forces could not completely utilize the ECM equipment available. Furthermore, a satisfactory method to simulate the casualty producing effects of artillery fires was not employed.

THE EXECUTION

The 2nd Armored was employed at the request of a friendly nation to counter an armed invasion from the North. Initial combat power favored the invaders by a three to one ratio. The employment of additional units by the 2nd Armored would enable the 2nd to stabilize the line of contact in the vicinity of the brigade rear

boundaries. Thereafter, the 2nd Armored would be expected to attack, conduct a deliberate river crossing, and restore the friendly country's border.

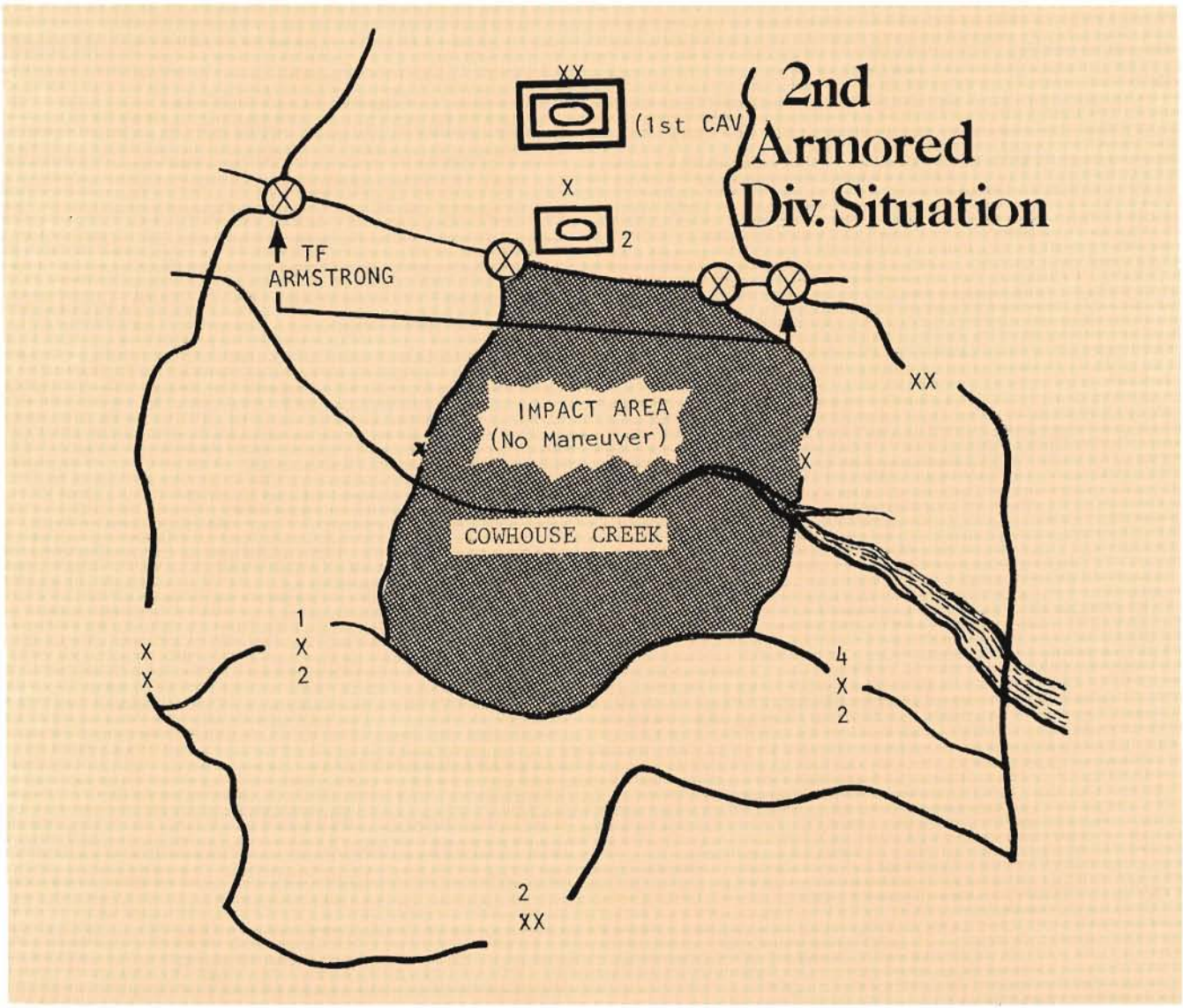
The division commander chose to defend in two phases. Phase I was a covering force mission (Task Force ARMSTRONG) and Phase II was an active defense to be initiated upon the withdrawal of the covering force south of Cowhouse Creek.

It was the first time the 2nd Armored Division had employed engineer task forces as well as a combat heavy engineer battalion in direct support. Task force commanders came from the 17th Engineer Battalion. Task Force BAKER utilized the Assistant S3 while Task Force KISH utilized the Executive Officer.

Engineers moved to the field 18 hours prior to the start of the exercise. All mines and Class IV materials to be used in the exercise were combat loaded on organic vehicles. Based on previous reconnaissance and planning conferences with maneuver commanders, work on the obstacle plan commenced immediately. Prearranged lanes to support the withdrawal of the covering force were prepared for closure. Simultaneously, prearranged lanes were prepared for closure in the other obstacle systems throughout the main battle area. The forward passage points were guarded by engineers until closure was ordered by the withdrawing unit.

In accordance with the austere logistics scenario, obstacles were not heavily dependent on logistics support. The terrain was extensively enhanced with tank ditches and earthern berms. Mines, concertina, barbed wire, logs, and preformed dragons teeth were also used. All obstacles were integrated with overwatch fires to delay the 1st Cavalry advance. All obstacles were designed to support counterattacks and sited to facilitate breaching from the friendly side.

The effectiveness of the obstacles during Phase I is best summarized by the 2nd Armored Division Commander, "That barrier was so good, and so effective, that I was able to execute a very rare tactic—retirement from action—never executed before in my life."



After withdrawal of the covering force, the 1st Cavalry was able to make only one penetration south of Cowhouse Creek. A battalion task force discovered an area not covered by fire in the far west, and by nightfall they occupied a four-kilometer salient south of the creek. The 1st Brigade staged a pre-dawn attack against this salient. Led by a platoon of Company C, 17th Engineer Battalion, selected breaches were made in an obstacle system and the attacking infantry battalion task force cleared the salient. The success was exploited, and the entire 1st Brigade attacked north along the entire front. During the next four days, no sizeable force of the 1st Cavalry penetrated south of Cowhouse Creek again.

In anticipation of the 4th Brigade conducting a river crossing, the engineers reorganized on the third day. Task force KISH released the two companies of the 62nd Engineer Battalion to their parent unit. At the same time, the 586th Engineer Company (FB) was placed in direct support of the 2nd Division.

For three days a war of movement took place, characterized by decentralized execution and extremely frequent changes to task organization. These tactics exploited successes as well as countered enemy advances.

It was a frag-order war, with engineer organization and missions constantly changing. Tank trails were opened and closed time and again. Armored Vehicle Launched Bridges were rapidly emplaced and removed. Coordination was essential and kept at the lowest practical level.

On the fifth day of the FTX the 4th Brigade conducted a pre-dawn deliberate river-crossing. The Crossing Area Commander was the Assistant Division Commander (Support). Company D, 17th Engineer Battalion provided crews for assault boats and far shore clearing teams that accompanied the dismounted assault elements. Vehicles with amphibious capability quickly followed across Belton Reservoir.

Upon establishing a bridgehead on the far shore, Mobile Assault Bridge rafts from both the 8th and 17th Engineer Battalions entered the water to ferry main battle tanks. The 62nd Engineer Battalion was actively engaged in improving access roads to the raft sites as well as the bridge site. Upon order of the Crossing Area Commander, pre-assembled M4T6 bridge floats were airlifted to the bridge site. Personnel from the 62nd Engineer Battalion assembled the bridge, aided by tactical smoke at the crossing sites. The 86th Engineer Detachment (DIV) assisted with underwater recovery operations. The division engineer coordinated all engineer assets in the division area.

Upon relinquishment of the river line by the 2nd Division, the 36th Engineer Group assumed responsibility for the crossing area. They regained control of the 62nd Battalion, 586th Engineer Company, Company E of the 8th Engineer Battalion, and the 86th Engineer Detachment. The 17th Engineer Battalion bridge company remained under division control and followed the attacking elements.

INITIAL ENGINEER ORGANIZATION SUPPORTING THE 2ND ARMORED DIVISION

PHASE I	PHASE II
TF ARMSTRONG	1st Brigade
TF BAKER	TF KISH
D/17th Engr	C/17th Engr
F/17th Engr	F/17th Engr
	B/62nd Engr (Cbt Hvy)(DS)
1st Brigade	D/62nd Engr (Cbt Hvy)(DS)
TF KISH (DS)	
B/17th Engr (—)	4th Brigade
C/17th Engr	B/17th Engr (DS)
B/62nd Engr (Cbt Hvy)(DS)	D/17th Engr (DS)
D/62nd Engr (Cbt Hvy)(DS)	
	Div Troops
4th Brigade	17th Engr
1/B/17th Engr (DS)	62nd Engr (Cbt Hvy)(DS)
	E/8th Engr
Div Troops	
17th Engr (—)	Corps Control
62nd Engr (Cbt Hvy)(DS)	36th Engr Grp
E/8th Engr	586th Engr Co (FB)
	86th Engr Det (DIV)
Corps Control	
36th Engr Grp	
586th Engr Co (FB)	
86th Engr Det (DIV)	

NOTE: The 17th Engineer Battalion consisted of HHC, Companies B, C, D and F as line companies, and Company E (Bridge). Company A was in USAEUR as part of Brigade '75.

LESSONS LEARNED

The outcome of GALLANT CREW 77 was greatly influenced by the responsive combat engineer support. The challenge is to provide analogous support on any future battlefield.

We know that several factors influence the degree of combat power attained. They include a commander's imaginative planning, organization, and leadership, plus training and discipline of the forces, as well as the organizational factors of firepower, mobility, communications, and logistical support available. These elements form a topical outline for us to examine particular engineer lessons learned during GALLANT CREW 77.

PLANNING

Planning for the exercise was critical and highly dependent on terrain intelligence. Early in the planning

process, an extensive series of engineer ground and aerial recons was made. If the engineers had waited for the formulation of the ground tactical plan prior to conducting recons, engineer supportability could have been dramatically degraded.

The withdrawal of a covering force is a delicate operation. Lanes through the obstacles must be kept open until the last friendly vehicle passes, yet closed immediately thereafter. A system for ordering closure at the lowest level possible must be devised. In this exercise, the engineer squad performing closure coordinated on-site with the scouts who led the maneuver unit through the obstacle system.

Planning for the river-crossing was a major undertaking. The 17th Engineer Battalion underwent an internal evaluation 8-11 March which emphasized river-crossing operations. Other divisional units were evaluated at the same time. Prior to these evaluations, an extensive series of coordination meetings with the division staff and participating units was required.

ORGANIZATION

The engineer organization was designed to support the initial deployment as well as to anticipate future operations. The division engineer was the focal point of the engineer support. This is an absolute requirement.

The creation of an engineer task force was found to be a valid means of centralizing direction when more than one company is supporting a brigade. However, it was found that such a task force must be provided some type of staff. The brigade commander needs an engineer representative at his headquarters at all times. Engineer units employed on a wide front also need on-site coordination of efforts. Since elements of two battalions were used in Task Force KISH, an officer from each battalion should have been furnished to constitute the task force staff.

The designation of an Assistant Division Commander as the Crossing Area Commander provided excellent control for the river-crossing. A senior commander is required considering the criticality and control problems associated with major river crossings.

Finally, the 62nd Engineer Battalion should have been OPCON to the 2nd Armored Division for this exercise, as recommended by Field Manual 5-100. Although workable, direct support did not provide the firm degree of control needed to rapidly react to the constantly changing battlefield situation.

LEADERSHIP

Engineer leadership, from the squad leader to the division engineer, was taxed during this exercise. The hours were long, the pace was furious, and the tasks were never-ending. Professionalism was essential.

TRAINING & DISCIPLINE

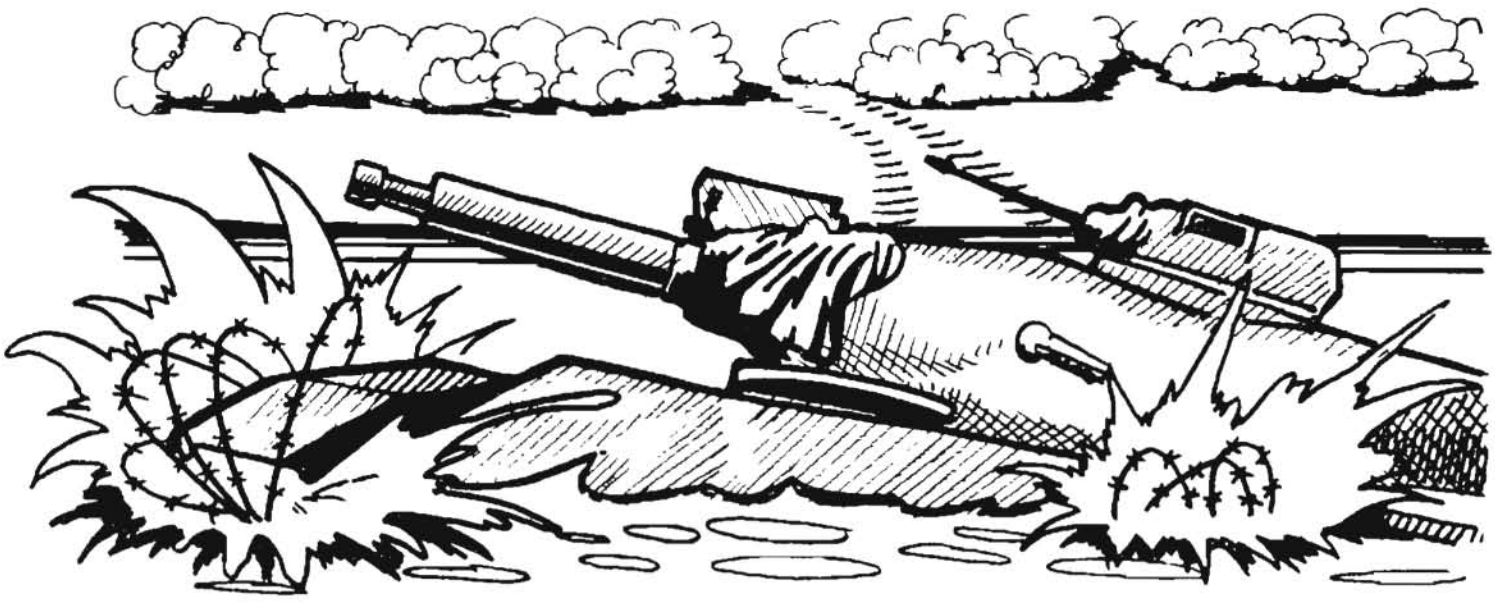
Engineer squad and platoon leaders were often required to give critical advice to maneuver commanders. The siting and construction of obstacles often depended exclusively on their skills.

The heavy ECM environment required a minimization of radio traffic. Changing frequencies, often and at random times, as well as five-second transmissions, helped overcome the ECM.

Finally, a major training advantage of this exercise was the seven-day duration. Most units had become accustomed to three-day field problems. Fatigue encountered during this exercise was more realistic, and required units to enforce sleep discipline.

ORGANIZATIONAL FACTORS

The organizational factors of firepower, mobility, and communications favored the divisional engineers in a direct support role. The squad organization, using the armored personnel carrier, was superior to the combat heavy battalion's functional organization using wheeled vehicles. Although D-8 dozers and big scrapers were a welcome addition to the division area of operations, most of the commercial equipment severely lacked cross-country mobility.



Maintenance support during the exercise revealed the criticality of operator proficiency. A good operator could prevent equipment break-downs as well as make minor on-site repairs. Mechanics were in much demand and spent much of their time in-transit.

For engineer work to be timely, a basic load of Class IV materials must remain combat loaded. However, the effectiveness of the materials carried depends on familiarity with the terrain and thorough prior planning.

Direct support is needed to allow engineer assets to be easily readjusted on a need basis. Yet it is a two-edged sword, since it requires internal resupply. There were times when engineer platoons were extremely difficult to locate. Mobile warfare often requires the maneuver commander to provide Class I, III, and V materials to engineer units less than company size. If the requirement is anticipated, prior coordination will preclude the problem.

CONCLUSIONS & IMPLICATIONS

Two principal conclusions can be drawn from the GALLANT CREW 77 experience. First, it is possible to fight outnumbered and win. However, to accomplish this feat on the modern battlefield, it is absolutely essential to maximize the potential of the combined arms team. Combat engineers must constantly train with other team members to maximize the team effort.

Second, the employment of a combat heavy engineer battalion in direct support of a division has certain disadvantages. The battalion organization lacks foxhole strength, communications, and vehicular mobility. Furthermore, the requirement to maintain construction skills severely limits the training opportunities for the direct support mission. The combat heavy battalion is better organized and equipped to perform area and task missions. The non-divisional combat engineer battalion, TOE 5-35, is better suited for the direct support mission by organization as well as by personnel.

The modern battlefield will greatly strain the command and control capability of the divisional engineer battalion. Organic assets, as well as non-divisional engineer units, will be working in a large division area of operations, requiring increased coordination and liaison by the Assistant Division Engineer section. If an engineer task force is created, officers from the divisional battalion will be required for the task force headquarters.

With corps and division commanders concentrating the forces and brigade and battalion commanders controlling and directing the battle, what is the role of the engineer group headquarters? Many group assets will be under the control of division engineers. If the divisional battalion is not authorized additional personnel, will the group headquarters be able to furnish officers to temporarily assist several division engineers? If so, it will be a type of assistance not traditionally furnished by an engineer group commander.

Deliberate river-crossings require technical expertise by all combat engineer units, not just bridge units. Do we train enough today so that we are prepared to implement tomorrow?

If the GALLANT CREW 77 experience can be reliably extrapolated to the future battlefield, engineer mission performance will depend more on the mobility and the survivability of the engineer squad, not the earth hauling capability of a dump truck.

Major Joseph P. Kish wrote this article to satisfy a requirement of the Armed Forces Staff College Research Program. He is currently assigned to Headquarters, USAREUR & 7th Army.

One Station Unit Training — *Engineer Style*

Brian Porr

From Bunker Hill to the jungles of Vietnam, engineer soldiers have been on the front lines—laying mines, building fortifications, bridging gaps, and sometimes defending themselves in close combat.

In the proud tradition of yesteryear's "sappers" and "pontooners," combat engineer trainees at Fort Leonard Wood, MO, are perfecting the One Station Unit Training (OSUT) concept.

FIRING THE M-60

OSUT testing began at Fort Leonard Wood in late 1975 when two Combat Engineer Advanced Individual Training (AIT) companies participated in a revolutionary 14-week entry level training program. The results of the test pointed overwhelmingly in favor of instituting OSUT on a much wider scale. Shortly thereafter, the 2nd Training Brigade was converted to the OSUT configuration.

Trainee insecurity and the high cost of moving trainees from one station to another during their initial training were key factors favoring conversion to OSUT.

The original OSUT program merely combined Basic Combat Training and Advanced Individual Training into one cycle of 14 weeks duration with an obvious point of transition from the former to the latter after the sixth week of training. Due to the special nature of Combat Engineer training and the motivational requirements for new engineers, the two distinct programs of instruction gradually merged into the completely integrated OSUT program of today.

By eliminating repetitive training and adding a comprehensive review of course content, the total training time was reduced to 12 weeks, thus saving the Army two weeks per trainee. All combat engineer training previously conducted as AIT is included. However, various subjects are now taught throughout the 12-week cycle. Every effort is made to provide new soldiers with continuous motivation and identification in their role as combat engineers.

The new program has resulted in better trained combat engineers for several reasons. The retention of all subject matter is generally better, since subjects are taught, reinforced, reviewed, and tested continuously throughout the cycle. And since drill cadre have a longer

period during which to observe trainees, more accurate identification and separation of unacceptable personnel is accomplished. Marginal soldiers are brought up to standards or separated much more effectively in the longer cycle than in the short BCT/AIT cycles. The retention rate for OSUT trainees is five to 10 percent greater than the retention rate for either Basic Trainees or AIT students.

OSUT trainees are better motivated than BCT and AIT trainees because they are exposed to combat engineer skills and tasks from day one of the OSUT cycle. Drill sergeants in the program are combat engineers, themselves, and they're present for nearly all training throughout the 12-week cycle. Thus, trainees develop confidence in them and rely on them to provide the answers to many of their questions.

Early in the first week of OSUT, trainees receive a class on the role of combat engineers. During that class, many young trainees receive a rude awakening, for they're reminded that combat engineers work with hand tools, not heavy equipment. They begin to realize that the tasks they'll be expected to perform in the field is often dirty, back-breaking work. They soon find out that training is geared to basics. If a trainee learns the basic skills at Leonard Wood, he can build upon those skills once he reaches his first permanent duty station.

During subsequent weeks, trainees are exposed to demolitions, map reading, tools, and rigging. At the same time, they're learning basic military skills familiar to every soldier: basic rifle marksmanship, road marches, drill and ceremony, military justice, and physical training. Subjects are spaced to maintain a high level of interest among trainees.

On the last day of the seventh week of training, each OSUT unit conducts an "all trainee" ceremony, including a short parade. All leadership positions during the ceremony are manned by trainees. The unit is awarded an Essayons streamer for its guidon, symbolizing the completion of the first half of training. Each individual who has met all training requirements to that point is allowed to wear the Engineer Castle on the pocket of his uniform for the remainder of the cycle to identify his achievement.

EMPLACING A CLAYMORE MINE

After completing landmine warfare training in the eighth week, the mobility phase of instruction begins. Trainees learn bridging, tactics, and other subjects to aid in the movement of friendly forces during the next three weeks.

The highlight of the entire training cycle is Engineer Week, a week-long tactical field training exercise conducted during the eleventh week of training. In order to make the training as realistic as possible, each unit is

fully equipped according to TO&E specifications. Activities during Engineer Week include bridging, minefield construction and destruction, demolitions, and participation in the live fire assault course, the combat engineer defensive exercise, and the strongpoint assault course.

Engineer Week reinforces training previously received, further instills an appreciation for the mission and role of the combat engineer, and provides a logical transition from training into a TO&E unit. The tactical exercise incorporates all aspects of training into a comprehensive review and awareness package, and for the first time trainees are able to apply the knowledge and skills they have learned.

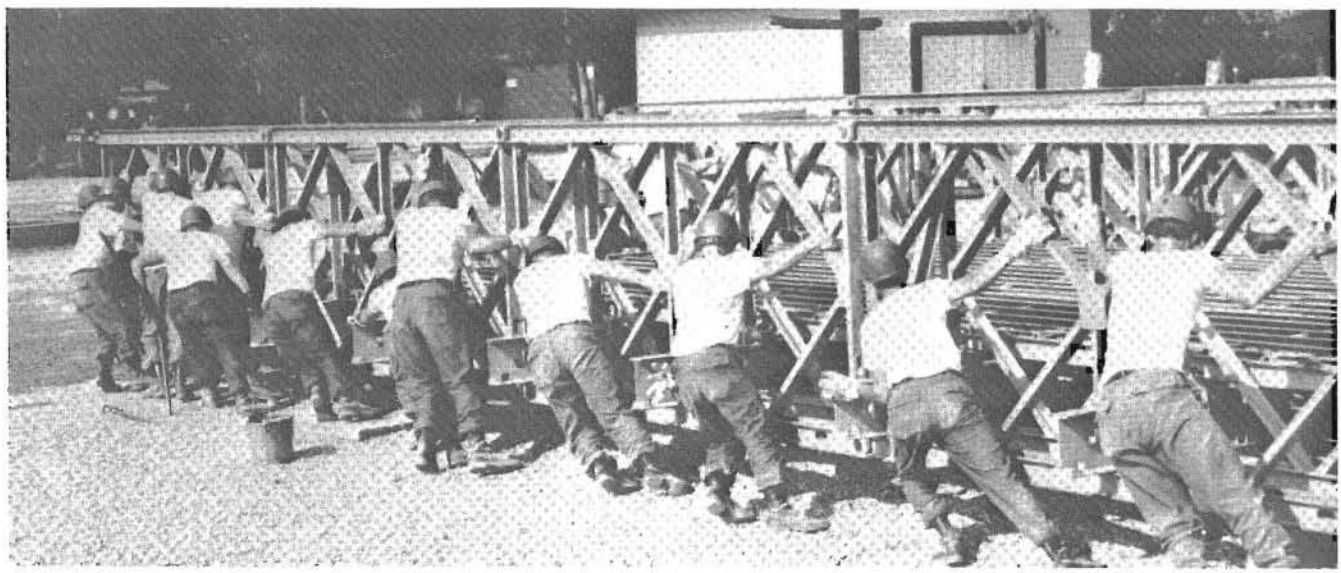
Graduation from OSUT takes place during the twelfth week of the cycle with a formal ceremony, complete with a sound and slide presentation of the history of combat engineers. Every trainee graduate has the Corps of Engineers Castle pinned on his collar by the drill sergeant with whom he has worked most closely during the previous 12 weeks.

More than 21,500 trainees have graduated from Engineer OSUT since early 1976. They bear little resemblance to the raw recruits who arrive daily at Fort Leonard Wood, scared, out of shape and confused. Engineer OSUT is a demanding course which smooths, polishes, and matures young men and women. Although graduates of Engineer OSUT are not complete "sappers" or "pontooners," most have mastered the basics and will readily assimilate additional information and skills in their first permanent units.

They have earned the privilege of wearing the Castle and can state with pride, "Essayons,"—Let Us Try.

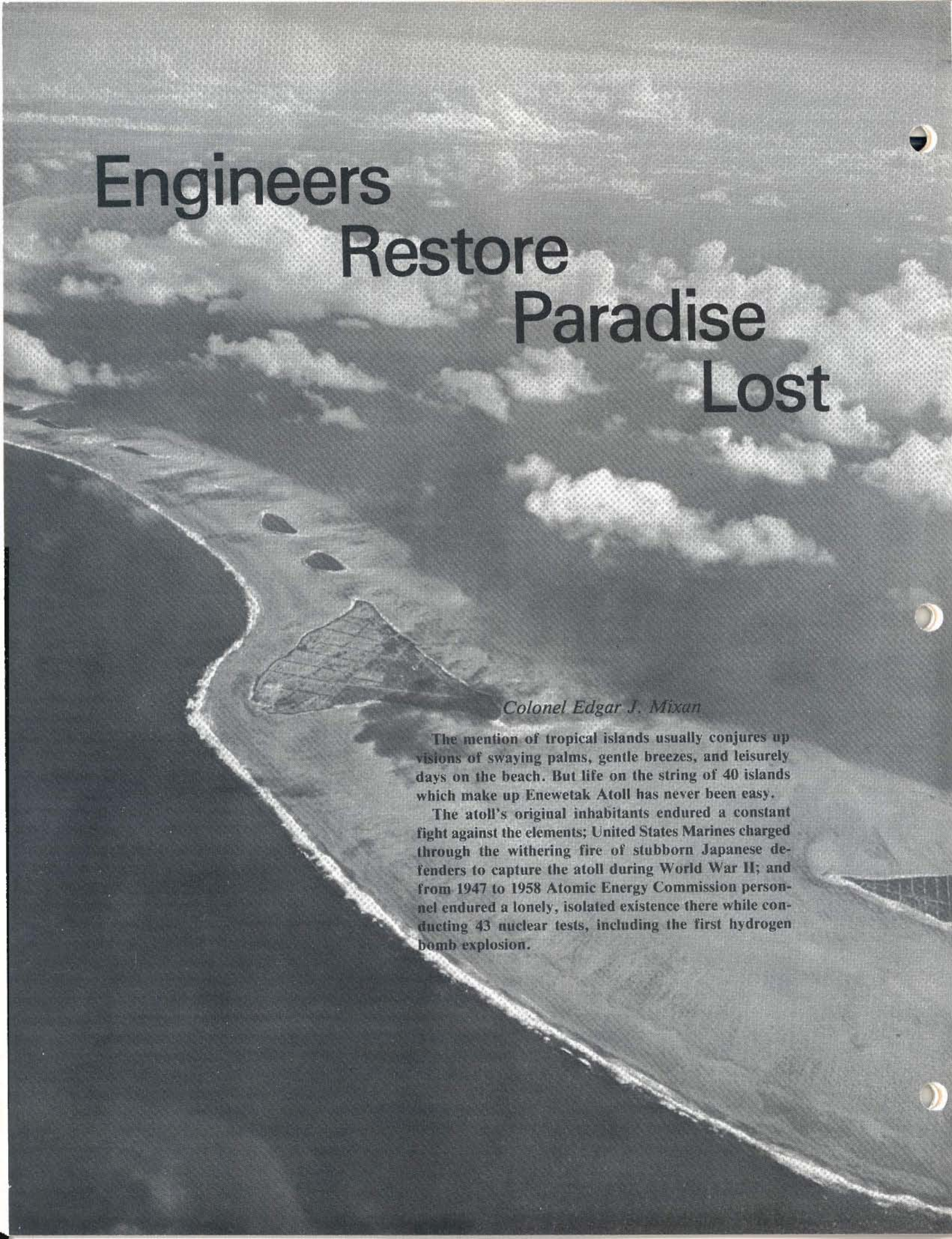
Mr. Porr held the rank of Captain and served as the Operations Officer of the 2nd Training Brigade at Fort Leonard Wood, MO., when he wrote this article. He is now a civilian residing in Sherman, TX.

NEGOTIATING THE CONFIDENCE COURSE



EMPLACING A PANEL BRIDGE

Engineers Restore Paradise Lost



Colonel Edgar J. Mixan

The mention of tropical islands usually conjures up visions of swaying palms, gentle breezes, and leisurely days on the beach. But life on the string of 40 islands which make up Enewetak Atoll has never been easy.

The atoll's original inhabitants endured a constant fight against the elements; United States Marines charged through the withering fire of stubborn Japanese defenders to capture the atoll during World War II; and from 1947 to 1958 Atomic Energy Commission personnel endured a lonely, isolated existence there while conducting 43 nuclear tests, including the first hydrogen bomb explosion.

Today, almost 20 years after nuclear testing ended on Enewetak (previously spelled Eniwetok), American military and civilian workers have returned to restore this tropical paradise lost for approximately 450 dri-Enewetak (pronounced dree) who were relocated when testing began.

A part of the U.S. Trust Territory of the Pacific Islands, Enewetak is in the Marshall Islands, located roughly halfway between Hawaii and the Philippines.

The three-year reclamation project began in June 1977 when a Joint Task Group of U.S. soldiers, sailors, airmen, and civilian scientists and engineers descended upon the deserted island chain. Under the direction of the Defense Nuclear Agency (DNA), the 900-man task force was spearheaded by the 84th Engineer Battalion, U.S. Army Support Command, Hawaii.

The project was designed to progress in three phases—mobilization, cleanup operations, and construction. Military participation was limited to the first two phases, after which the Department of the Interior will take over. Cleanup operations are expected to continue until October 1979.

MOBILIZATION

The most immediate problems facing planners of the operation were the site's remote location, the lack of adequate housing facilities on the atoll, the need for specialized equipment, and special coordination requirements of a joint activity.

A design team in the 84th operations section prepared the bill of materials for the Lojwa base camp and the encryptment operation on Runit Island. Unit personnel who were designated to execute the construction were included in the planning phase to insure the complete coordination of the operation.

Special equipment which had to be procured included seven ready-mix concrete transit trucks and a concrete pump to be used in the tremmie operation for disposal of the contaminated soil on many of the islands.

Major housing construction was concentrated on Lojwa since the tiny island was occupied only by rats, scrub, and a collapsing tin shed. The Army Functional Components system was used as the basic planning document for the 500-man camp, but due to strict time limitations, it became necessary for staff officers to draw up the bill of materials for local purchase and delivery by contract. Some of the building designs were also modified to fit the special requirements of the work group.

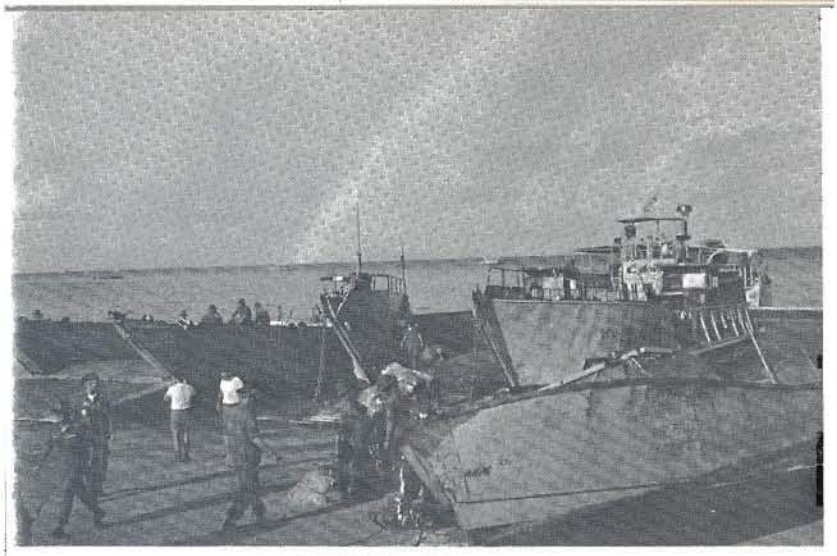
The 84th Engineers actually lived in tents while they built their own camp from a mountain of timbers and corrugated sheet metal delivered to the beaches of Lojwa. Rising to the occasion, they seemed to thrive on hardship while developing into a determined, high-spirited team.

"It's difficult to realize how much work an engineer battalion can do and the teamwork it can develop until you move it away from the petty problems and irritants of garrison life and give it a real mission," noted one young company commander.

Just being on Enewetak requires acclimation, for it's a shoulder-to-shoulder existence. About half of the work force is housed on Enewetak Island and the other half on smaller Lojwa. The northern base camp at Lojwa is a city of open-air, open-bay metal huts and outdoor showers. On Enewetak, however, most of the troops and civilian workers live in a multi-storied, air conditioned concrete dorm, where they share four-man rooms.

One problem peculiar to Enewetak is the proximity of the islands to one another. They are scattered around a lagoon which measures 23 miles at its widest point. Thus, transportation of men and equipment from living and storage areas to work sites has been a major chore in itself. For example, a 21-foot open boat carrying the mail clerk from Enewetak to Lojwa got turned around one day in a rain squall. Ten hours later he was found heading for New Guinea.

CLEAN-UP OPERATIONS ON MEDREN



MOVING OUT TO LOJWA FROM ENEWETAK

But in the true tradition of Army engineers, innovation and ingenuity have solved most problems. For example, engineers set up a makeshift shop on Enewetak using home made jigs and commercial saws to mass produce roof trusses in lieu of building them piecemeal at each work site.

Innovation also surfaced in the application of corrugated siding to wall panels. Unit commanders discovered that much time could be saved if siding was applied prior to, rather than after, erection of panels.

Another time-saving innovation involved the salvage of an abandoned ready-mix concrete truck from the scrap heap left from the nuclear testing period. Since the truck had no motor, it was pulled by a five-ton truck from slab to slab and charged with a jerry-rigged conveyor from a rock crusher. As awkward as it sounds, the unit significantly decreased pouring time that would have been necessary using only the standard 16S mixers.

Electrical power to operate all facilities and equipment on the atoll was provided by the Army's Facilities Engineering Support Agency, which deployed, installed and put into operation a 2,000-kilowatt power plant. The logistical problems encountered in operating a power plant of such size in a remote location have proven to be valuable training for future military contingency missions.

CLEAN-UP OPERATIONS

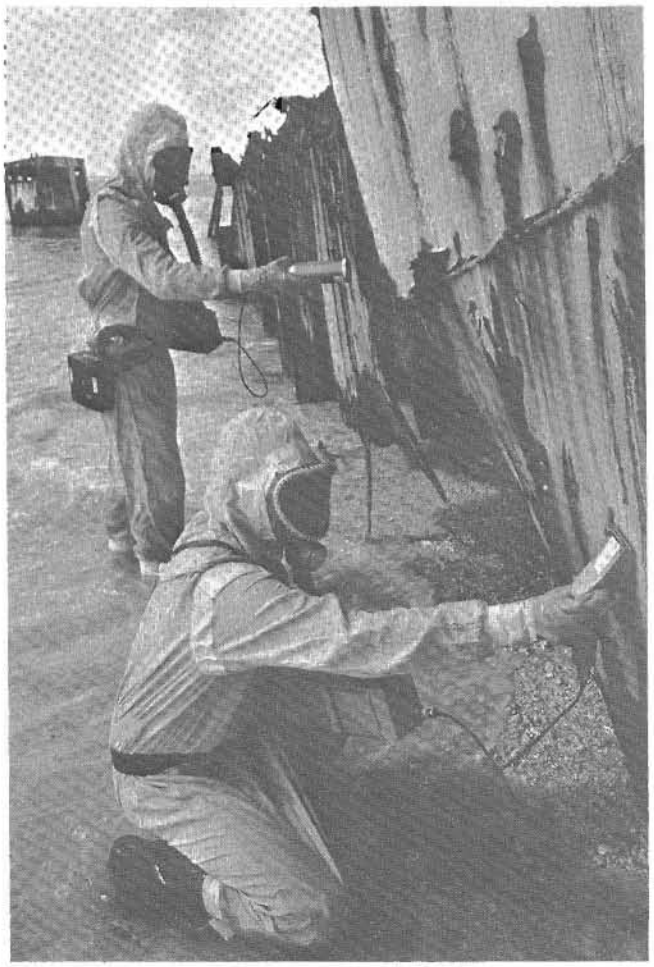
Hundreds of tons of debris are scattered over the northern islands and traces of radioactive fallout from the past can still be detected in much of the soil. Countless hulks of decaying landing craft used by the Atomic Energy Commission to move men and equipment during the testing period are aground on lagoon beaches. And rusting, metal ghost towns, once teeming with AEC scientists and technicians, stand on the atoll's southern rim.

But, little by little, these mute monuments to the early days of nuclear testing are falling to the dozer blades of the 84th Engineers. And the radioactive soil and debris is gradually being removed and deposited at the bottom of Cactus Crater, a huge crater on Runit Island left by Test Shot Cactus.

Army engineers have had to learn new techniques in the removal of soil and vegetation from contaminated sites. Heavy equipment operators were retrained to remove soil in lifts as small as six inches. They have to work slow and take small bites in order to minimize the amount of contaminated dust in the air. Vegetation removal has been accomplished with minor soil disturbance by connecting a 200-foot anchor chain to two D8 dozers and dragging it through the scrub. Machetes are used in areas where dozers can't operate.

Collection of the contaminated soil is one problem and disposal is another. Navy causeways or landing craft transport Army dump trucks carrying the soil to Runit Island, the site of 18 nuclear explosions. There the soil is stockpiled and eventually mixed with cement and a type of bentonite to increase adhesion.

The mix is then loaded in the ready-mix transit trucks, mixed with water, and moved to the tremmie site. From that point, a pump forces the mix under pressure to a barge anchored at the center of the crater, where it is deposited 36 feet under water on the crater floor.



DECON TEAM AT WORK

CRATERS CAUSED
BY NUCLEAR EXPLOSIONS
ON RUNIT ISLAND

When all contaminated soil has been removed from the islands and placed in the crater, an 18-inch concrete cap will be placed over it as a seal until the radioactive materials decay to safe levels. That is expected to take approximately 26,000 years.

Justification for U.S. participation in the clean-up is derived from our agreement as Trust Territory administering authority to protect the dri Enewetak against loss of their land and resources, and to a commitment to return the atoll when it was no longer needed.

The people of Enewetak are glad to be going home. The first group of 50 returned to Japtan Island, on the southern rim of the atoll, in March 1977. Chief Johannes Peter, their 84-year-old, gravel-voiced chief, said at that time "It is very sad to see what has happened to our islands, but we are home now and we are happy."

Since their return, the dri Enewetak have survived mainly on fish they catch in the lagoon and basic staples delivered by ship. They spend most of their time clearing brush and nursing a few frail pandanus and breadfruit seedlings, which will not be productive for another five or six years.

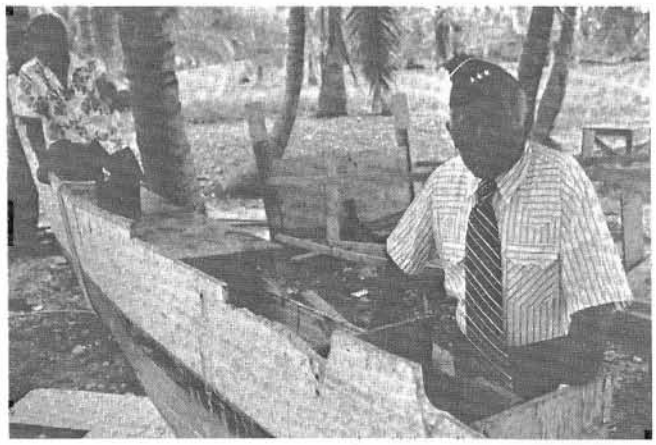
Eventually, the Department of Interior will build homes on Japtan, Medren, and Enewetak and replant other islands with more breadfruit, pandanus, coconut, and other crops. But it will be years, if ever, before life on Enewetak returns to a semblance of what it used to be.

MILITARY BENEFITS

The development of leadership skill is the primary benefit to military personnel involved in the Enewetak project. Junior officers and non-commissioned officers have a unique opportunity to use their initiative and resourcefulness to solve basic engineering problems in an environment similar to that which might be encountered in a future war zone.

Platoon leaders, in addition to their normal duties, must coordinate activities of Navy boats, Army landing craft, helicopters, and radiation survey teams. They must alleviate the fear of radiation by subordinates. They must make simple, yet critical, decisions. They must make the best use of equipment in a unique environment. They must be alert for changing situations. They must be firm, yet remain flexible in their position of leadership. The job is tough and demanding, the standards high. But we are meeting the challenge.

Colonel Edgar J. Mixan was the Joint Task Group Commander during the first year of the Enewetak Clean-up Project. He is currently assigned as Commander and Director of the Facilities Engineering Support Agency, U.S. Army, Fort Belvoir, VA.



CHIEF JOHANNES PETER

Assault Breaching

The key to closing with the enemy

Major Michael L. Viani and Major Peter D. Knight

"The best defense is a good offense" not only in football, but in warfare too.

Is the U.S. Army capable of conducting the type of offense necessary to win on the modern battlefield? The active defense requires an offensive capability to whittle the enemy down to size both by fire, and by fire and maneuver. However, it is not enough just to stop the enemy advancement. We must then be able to mount an offensive against him.

Mobility is essential to a successful offensive, but it is not guaranteed by mechanization. Mobility also depends on the ability to breach obstacles, which is, itself, dependent on the following three factors:

1. Doctrine, which must include tactics and drills that enable us to plan ahead for the control and execution of assault breaches.
2. Equipment, which must provide the capability to quickly breach all types of obstacles and be placed in units so that it is readily available when needed.
3. Training, which must be practiced at all levels, utilizing all components of the combined arms team.

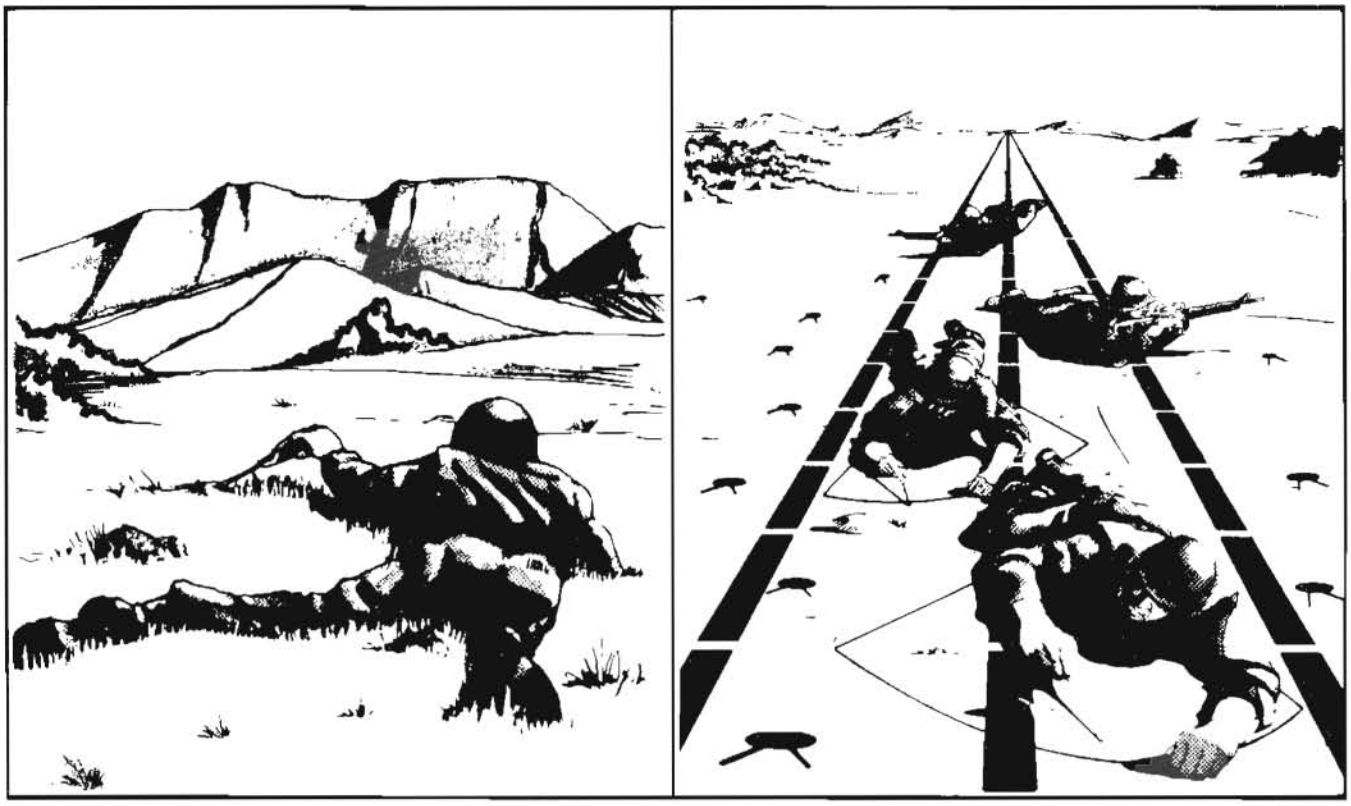
Once the enemy attacks, we are not necessarily going to hold ground. Instead, we will utilize the ground to our advantage so that our fire and maneuver capability can be used to attrit the enemy, thus giving us the time to concentrate our forces against his commitments. Throughout the battle we intend to counter-attack not necessarily his front, but his rapidly developing flanks deep into what is becoming his rear.

Historically, the enemy has been able to very quickly organize strong, hasty defenses. Obstacles are an integral part of his defenses. We should not discount the enemy's ability to use dynamic mining to strengthen his defenses and protect his flanks. He can lay conventional mines by armored vehicles and helicopters, and may be developing more sophisticated mine systems. We also must expect our counter-attacks to encounter obstacles that we originally executed.

Current U.S. offensive doctrine stresses the hasty attack, which includes armored forces maneuver and outflanking enemy positions, by-passing obstacles and, in general, maintaining the momentum and initiative of the attack. The deliberate attack is conducted only when the attacking force encounters an enemy defense in depth. Doctrine implies that obstacles are really only a problem in a deliberate attack, but the ability to by-pass all obstacles in the hasty attack is doubtful.

THE BREACHING PROBLEM

As our preoccupation with the techniques of defense diminishes, a realization of the breaching problem grows. Although many arguments have been made, the overall goal is to maintain the breaching operation as an integrated combined arms effort utilizing many options. Giving the problem to the engineers would probably mean that they would have very limited resources (unacceptable in terms of the mobility of our attacking forces) or that the engineers' organization would dramatically increase (an unlikely increase in authorization and funding).



HAND BREACHING BY THE INFANTRY

AN OVERVIEW OF CURRENT DOCTRINE

Doctrinally, there is scant consideration given to breaching at this time. FM 90-7 (Obstacles) and FM 5-100 (Engineer Combat Operations) do address the problem, but in a general manner. The drills and combined arms immediate action techniques necessary to insure the success of the attack have not been detailed. The same applies to FM 20-32 (Mine/Countermine Operations at the Company Level). Significantly, FM 71-100 (Brigade and Division Operations—Draft of May 1977) barely mentions the subject and FM 71-2 (Tank and Mechanized Infantry Battalion Task Force) has less than two pages devoted to the subject. There is no discussion of how to establish and control a breaching force, where the necessary equipment comes from, or how to execute a successful breach. There is no development of drills designed to save time and lives when obstacles are encountered unexpectedly.

FM 71-1 (The Tank and Mechanized Infantry Company Team) has more detail but only in regard to hand breaching by the infantry. FM 7-20 (Light Infantry Battalion) plays through a Brigade deliberate attack scenario, with little mention of breaching requirements. FM 90-3 (Desert Operations) details a method of attacking a strongpoint which does consider the problem of breaching, but it is vague, does not get into the "how to," and only considers hand breaching. TM 5-220 (Passage of Obstacles Other Than Minefields) was last published in 1958 and requires much updating.

Much can be learned from other armies. The Israeli Army, in particular, has highly developed and detailed doctrine designed to enable their combined forces to efficiently conduct assault breaches. The British and Germans have approached the problem in a similar manner as have the Soviets. Forethought, detailed planning and preparation are the keys and each member of the combined arms team must thoroughly understand the role it must play.

EQUIPMENT AND TRAINING STATUS

If we needed to conduct an assault breach today, what equipment would be available? We have AVLBs, tank

ISRAELI PROJECTED LINE CHARGE DEMOLITION SYSTEM, APC MOUNTED

dozers and CEVs to assist in the reduction of gaps, blockades, and bunkers. We have line charges, either towed behind or pushed ahead of tanks, to breach lanes through minefields. However, we have no positive armored means of locating the forward edge of a minefield—a critical deficiency. If the forward edge of the minefield cannot be located, line charges may be placed and detonated at the wrong point in the approach. Since each charge varies from only 70 to 90 meters in length, the problem should be obvious.

Only two methods of locating the forward edge are available today: bulling through—which is very hazardous to armored crews; and with the use of detectors and probes by dismounted troops—which is very hazardous to troops and very slow. In essence, the rate at which we opened routes in Vietnam against purely nuisance mining would be faster than the rate we could expect in a conventional war. Is such a rate acceptable for the speed of the hasty attack? The obvious answer is NO.

Because of the deficiencies in doctrine and equipment, training cannot be considered fully effective.

NEW DEVELOPMENTS IN DOCTRINE

After discussions between the Engineer and Armor Schools during early 1978, the following proposals were submitted by the Armor School:

— One tank per tank platoon would be fitted with a mine plow;

— All tanks would be fitted with hard points to accept the mine roller;

— Each division engineer line company would carry three mine rollers per supported tank battalion and armored cavalry squadron;

— Line charges would be carried by the engineers;

— Development of an improved line charge (probably a Giant Viper version) would be continued to provide a better capability. (All line charges would be ordered as needed, but each engineer company would carry a basic load.);

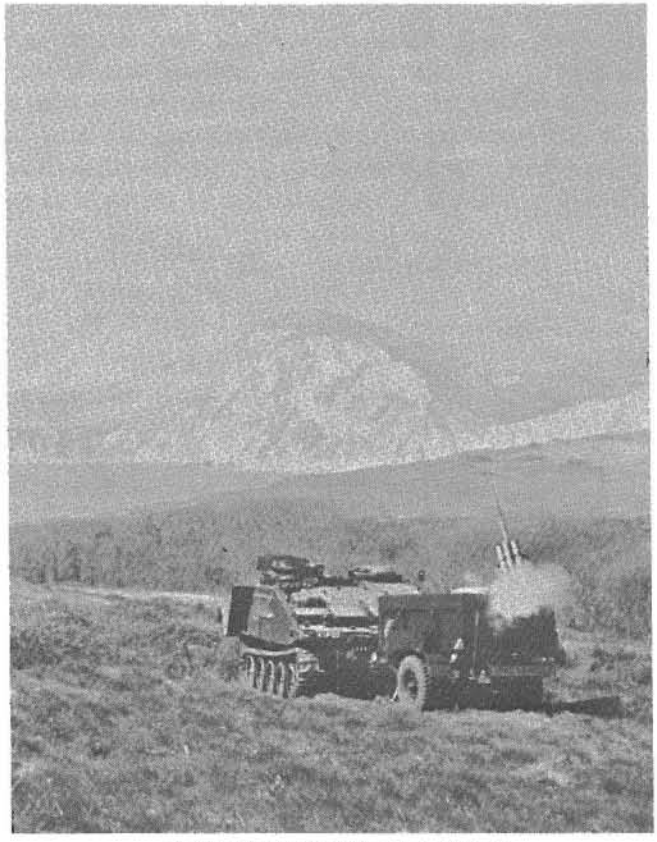
— Continued development and testing of SLUFAE.

The Armor School's proposals are a positive step, but the jury is still out on many details. If and when they are implemented, it would mark a real breakthrough in U.S. breaching capabilities.

Just consider the possibilities. A tank heavy force moving to contact would be able to maneuver its elements so that one lane per tank platoon could be made with organic battalion means. Any area suspected of mining would require only minor shifts to employ breaching assets to that point. The engineer elements accompanying the leading maneuver task forces would be organized for more extensive breaching and other mobility tasks. Specifically, mine rollers and a supply of appropriate line charges would be carried forward in the column. These would be employed when necessary, but most definitely during the deliberate attack. SLUFAE and additional engineers would be positioned to breach additional lanes as the assault is completed.

Such an approach would help solve the breaching problem for armored columns, but it must be remembered that no single type of equipment can be a panacea, for each has its limitations. But what about the strongpoint, which is specifically designed to be "unbypassable," and requires extensive infantry effort to dislodge the defenders? In such cases, the classic procedure is to cross a light force to seize the objective, then reinforce with heavy weapons as soon as possible.

How will we best get the light forces on the objective? The use of air assault is most innovative. Because of the enemy's massive air defense umbrella, such a deliberate attack would be proceeded by intensive counter air defense fires, coupled with normal artillery preparation and direct fire suppression. These fires would lift to allow the air assault to be made onto the objective. The assaulting troops would be equipped to kill tanks and other armored vehicles at close range, neutralize troops in bunkers, and engage the enemy in close combat. While direct and indirect fires and smoke are placed about the objective to isolate it from its mutually supporting threat positions, breaching forces would open lanes to move heavy weapons and tanks onto the objective.



BRITISH GIANT VIPER IN ACTION

EQUIPMENT REQUIREMENTS

Pressure on equipment development should not stop until all necessary items are in the field. Even then, research and development must continue in order to preclude another 30-year stagnation in the field. The mine plow and roller are most likely to be fielded first. One problem with the roller lies in its storage, transportation and rapid mounting. Because of its weight, bulk, and criticality, the mine rollers must be issued with a dedicated prime mover. A twenty-five ton low bed trailer could probably be fitted to carry two rollers nested and capable of quick connect. A lifting device may be required and thus included. Additional low beds should then be authorized for each company carrying rollers. To insist that the company assume the extra equipment without additional transportation would dramatically lower its mobility. (Low beds have limited mobility off-road, so another alternative should be investigated.)

Line charges must either be fitted to tanks or APCs, or towed behind them without unnecessarily limiting their mobility. The charges must be armed and launched from within a closed vehicle. The Israelis have such operational capability and the Warsaw Pact Armies have something similar. Training charges are needed to allow the practice of transportation and deployment in breaching exercises. SLUFAE also should come with dummy rounds, so that loading and firing can be practiced.

TRAINING PHILOSOPHY

In the training for these tasks, we should not be misled into thinking that the technical aspects of setting up and firing a charge or manipulating the plow or roller are enough. Nor is the exercise in which engineers play all roles of the attacking force. Training exercises must be built around the combined arms team, but need not be lengthy. In fact, initial exercises should be repeated over varying terrain and situations, much like a football team practicing offensive plays prior to a scrimmage. A maneuver brigade could practice these vignettes locally in a series of one-day exercises. It is vital that the question of breaching not be begged off by calling for the engineers to do all things.

In summary, we must insure that in the area of breaching we obtain the proper equipment and train in the proper way, making necessary allowances of time, equipment, personnel and logistic support. Although the sweeping flank maneuver is more glamorous, we must be fully competent in performing the more essential mission of closing with the enemy.

Major Michael L. Viani is currently assigned as Chief of the Tactics and Operations Division, Department of Combined Arms, Directorate of Training, USAES. Major Peter D. Knight, a member of the Royal Australian Engineers is currently serving as the Chief of the Advanced Tactics Branch, Department of Combined Arms, Directorate of Training, USAES.

U.S. TANK PUSHING SOVIET PROTOTYPE ROLLERS

A Bridge Too Long

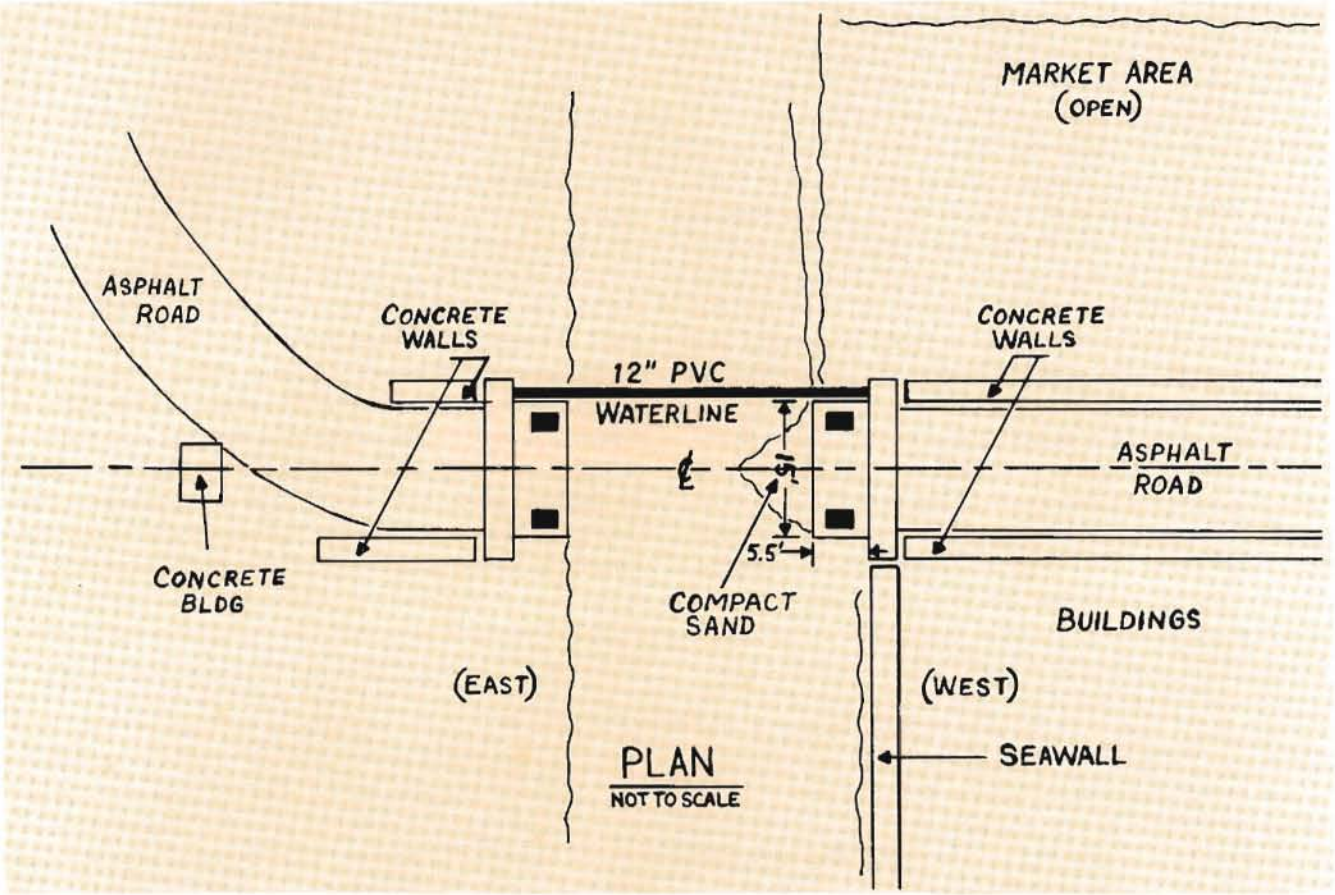
Major Harvey Q. Ramsey

History is filled with uniquely designed and constructed Bailey bridges. The versatility of this unique equipment is legend. For almost four decades, the Bailey has been the backbone of the military engineers' bridging inventory. It has been built as single story, multistory, partial story, underslung story, suspended, floated, cantilevered and cable reinforced. From this perspective, the 170-foot triple single Bailey bridge built at Cap Haitian, Haiti earlier this year is not particularly unique. But considering available skills and equipment in backward, subtropical Haiti, the bridge takes on the aura of a much larger accomplishment.

Cap Haitian is Haiti's second largest city and the only port of any consequence on the north shore. As such, it serves as a commercial center. On 21 August 1977, a 79-year-old French-built bridge collapsed in the center of Cap Haitian, severing the city's major route of economic intercourse.

An American engineer under contract to the U.S. Agency for International Development (USAID) saw the Bailey bridge as the solution to the problem. Through his experience as an engineer officer during World War II in Europe and in Korea, he was aware of Bailey bridge capability. If, in his zeal, he erred relative to the bridge design and construction requirements dictated by the site, he should not be condemned. The situation was critical and an immediate solution was considered necessary.

One set of Bailey, along with selected erection equipment, was ordered by the Republic of Haiti from excess U.S. property. Shortly thereafter, the American engineer from Haiti arrived at Fort Belvoir for a "brush-up"



class on Bailey bridge construction. It was to be a rather simple project; 150-foot gap, MLC 8 bridge placed on the existing abutments. He was given about 12 hours of instruction, a preliminary bridge design, and the necessary construction manuals. Carrying with him expressions of envy about "wintering" in the Caribbean, he returned to Haiti.

Messages requesting a two-man Army mobile training team began almost immediately, waxing and waning through the holiday season of 1977. When Major Harvey Ramsey and Sergeant First Class Richard Pattin were dispatched from Fort Belvoir in late January 1978, they envisioned a two-week holiday with pay in the warm Caribbean sun. As always, it just didn't work out that way. What they expected to be a four-day build and a ten-day "inspection" wound up as 21 consecutive days of construction.

Upon their arrival in Haiti, Ramsey and Pattin were immediately impressed with the high level of political interest in the project. Cap Haitian was in economic agony and its pain was being felt across the total political spectrum. The Minister of Public Works was under pressure and he was pressing hard on the USAID engineer staff which had promised help. The supporting bureaucracy had been less responsive than USAID had hoped, causing delay, revised estimates, and a concomitant loss in credibility both to the Haitian and U.S. officials. Continuing bureaucratic frustrations had acted to intensify expectations, reduce discussion, and raise tempers. What was anticipated to be a relatively anonymous, low-level project had escalated to visions of a grandiose ribbon cutting ceremony by the President of Haiti and the U.S. Ambassador.

The initial feeling of casual confidence felt by the two-man team was shaken when they arrived at the construction site late on the evening of 25 January. The gap wasn't 150 feet, it was almost 163 feet, thus requiring a 170-foot bridge. To place a 170-foot bridge on the existing abutments required the construction of 180 feet of bridge. A quick reference to the Bailey Bridge manual confirmed no design criteria for 170 feet of bridge, to say nothing of 180 feet.

The approaches to both shores were fills and bounded by a masonry wall which constricted the construction site. Both fills were sloped at an angle of five percent, causing problems in site layout, construction, and removal of the launching nose. The extended centerline of the bridge on the near shore ran directly through a new office building constructed for the local police. The city's main water supply, a semi-suspended 12" PVC pipe, was immediately adjacent to the bridge site.

The bridge itself was stored rather haphazardly about a quarter mile from the site. To move it to the far shore and construct from west to east would require almost a week. The only equipment available was a 3,500 pound forklift and a compressor with pneumatic hammer. A

front loader and crawler tractor were promised. Hand tools and equipment, available in limited quantity, were individually owned and in varying states of disrepair.

To compound the problem, the bridge was delivered with an inadequate number of plain rollers and stringers, and neither four-inch nor six-inch grillage came with the bridge. The only grillage available was a hodgepodge of hand-sawn timber of varying width and depth, unique only because of its lack of uniformity. The team chief was surrounded by a milling throng of unskilled but enthusiastic workers who were without leadership and who had never seen a Bailey bridge. He threw his preliminary design into the river.

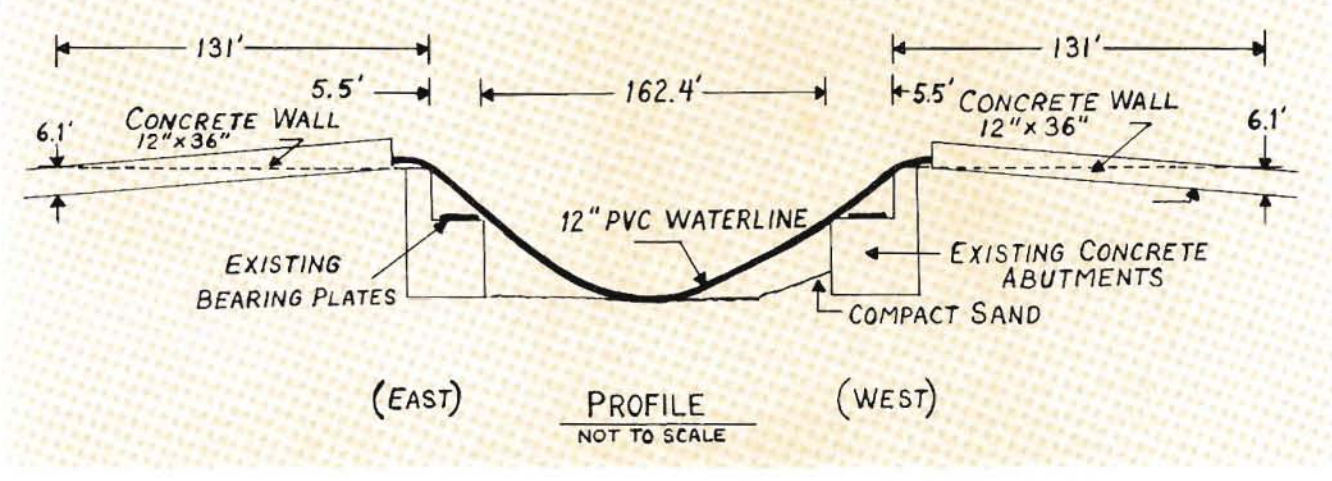
The next day, 26 January, was one of decision. Considering available equipment and site conditions, perhaps the bridge should not be constructed. The initial mistake in measuring the gap acted to reduce the class of the bridge from MLC 8 to MLC 4. Was the capacity worth the effort? Construction from east to west would require demolishing the police station. To build from west to east would mean a week's delay to move the bridge.

The team had brought a Bailey bridge film to be used in training the work force. Local interest in the bridge was obvious as a crowd of about 500 jammed into the theater to watch the 1945 Army training film. It was indicative of things to come when it was discovered after several false starts that the only available projector was designed to run backwards.

While the work force and other interested citizens reviewed the training film, the team chief conferred with local political officials and engineers. Their decision was predictable and almost immediate. The bridge must be built! Demolish the Police Station! Build from east to west!

Rocking rollers were placed immediately behind the end dam of each shore, producing a clear span of 177.12 feet. Since the span was well outside the design limits of the launching nose and bridge, as a safety measure, an additional set of rocking rollers was placed on grillage on the sand immediately in front of the abutment on the far shore. To provide the grillage, 10-foot towers had to be constructed from available timbers. This reduced the clear span to 167 feet. Tidal action in the river and anticipated high water due to rains upstream mitigated against moving this intermediate set of rollers closer to the near shore.

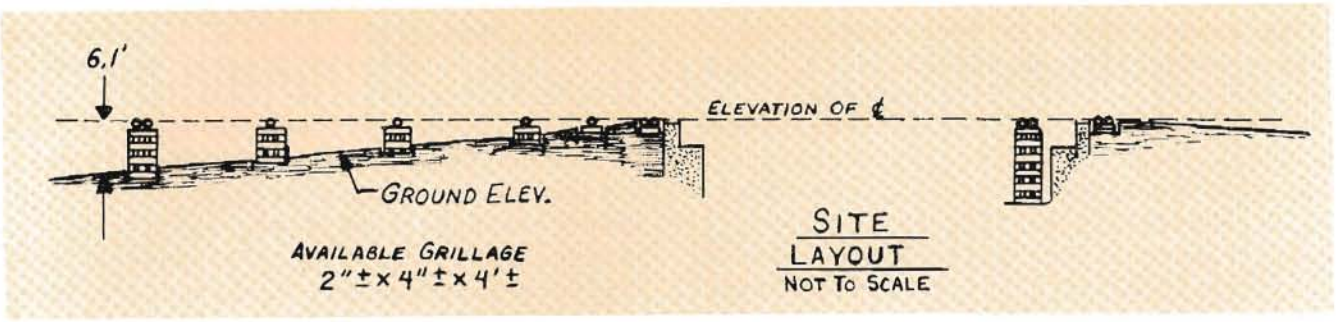
Only part of the site layout problem had been solved. Backspace required for 180 foot DD is 117 feet. Equipment constraints limited truss type to Triple Single. There was an excess of rocking rollers but a shortfall in required plain rollers. By using rocking rollers in place of plain rollers, and by removing construction rollers once the nose was complete, 100 feet of backspace could be provided. Additional counterweight was provided by using two bays of Single Single construction. There was absolutely no margin for error as every available panel would be used.



The launching nose design emphasized once again that the bridge was to be constructed on the outside limit of equipment capability. TM 5-277 made no allowance for a launching nose in excess of nine bays. Available equipment posed the same limitation. Given this limitation, where should the launching nose links be placed? Sag expected during launch over a span of 167 feet was 83 inches. Placing the links at 20 feet and 40 feet would raise the end of the nose 81 inches. If the links were placed at 30 feet and 40 feet, the end could be raised 94.5 inches.

The designer opted for placing the links at 20 feet and 40 feet and accepted the requirement to lower the far shore rollers by two inches. In actual practice, the point was moot because compression in the very high (10') grillage towers on the far shore necessitated constant jacking and adding of grillage.

The bridge was launched with the first 10 bays undecked. Additionally, the near shore was counterweighted to reduce problems of shear in the launching



nose. Even this had to be precise to eliminate problems of panel deformation and negative moment. This counterweight had to be removed slowly as the bridge moved across the gap. In all respects, the design was outside normal procedures and relied upon safety factors designed into the bridge.

The inconsistency of the grillage required that every piece be selected in the fashion of a stone mason selecting stones for a perfect fit. Every two-inch layer had to be leveled and aligned. The height of the roller towers (six feet at the 100-foot point) magnified the problem. The entire process was compounded by an ebb and flow of dignitaries and onlookers who stumbled into completed roller towers and tripped over the centerline.

Construction began on Tuesday, 31 January. Although the Haitian workers learned quickly, individual ownership of tools, pride in capability, and limited supervision prohibited full use of the available labor. The launching nose was completed 1 February and Triple Single construction began immediately.

Triple truss construction was slow. Differential compression in grillage towers required constant jacking and releveling. The length of bridge and the problems of working outside the specified limits of equipment dictated that the launch be level. Construction was set back several hours when an overzealous worker put the security picket into the rocking roller while the bridge was still moving.

Progress was slow. The bridge had to be jacked up and the far shore roller height adjusted with every 20-foot advance. By the end of the day on 2 February, the bridge advance was completed and the launching nose had been removed.

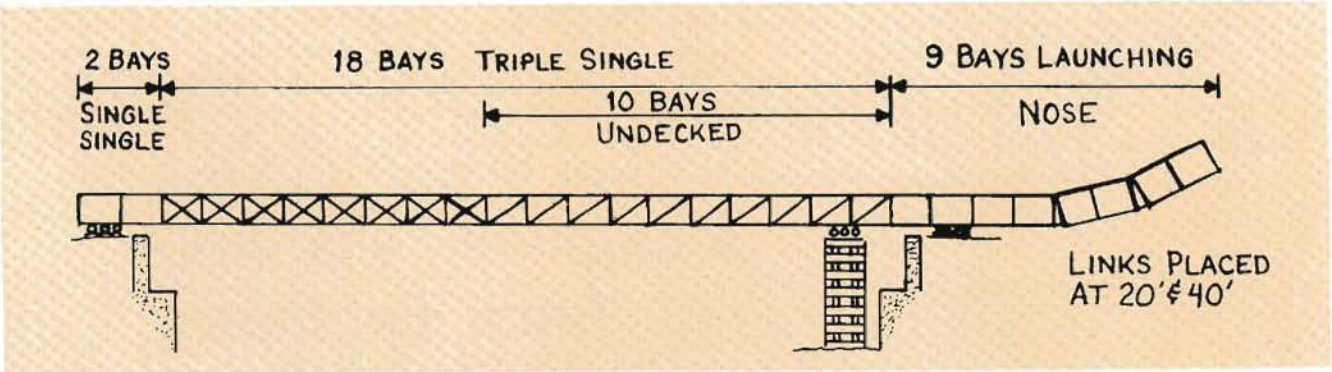
Plans called for the bridge to be jacked down the next morning. But, cranes to set the bridge on the abutments never materialized and the team had not considered the problems of jacking with the bridge and posts only 18 inches from the end dam of the abutment. They discovered there wasn't room for the jack handle to fit into such a restricted space.

It was decided to jack-up the bridge, remove the grillage, and jack the bridge back down. But as the bridge was jacked up, the grillage expanded back through the 10 inches it had compressed, making it impossible to change all six jacks from using the top to using the toe. The end dam had to be removed and the bridge jacked from the end post as originally designed.

Once the end dams were removed, the rest of the job proceeded smoothly.

As the moment of completion neared, the number of spectators increased. By late afternoon on 5 February, while final checks were being made, the crowd swelled to about 7,000, each intent on being the first to cross the bridge. The local Bishop was on hand to bless the bridge and the politicians anointed it with champagne before crossing in their cars. The last few minutes were tense, the speeches lengthy, and the crowd exuberant. It somehow seemed a fitting climax to a project that had been so close to failure so many times.

But even though the bridge was opened, its capacity was just too low to adequately support the traffic requirements. The Government of Haiti, with the assistance of USAID engineers, began planning immediately to upgrade the capacity. A number of solutions, intermediate supports, cable reinforcing and additional stories were considered. After much discussion, it was decided



to add a second story to the bridge, thus increasing it from a triple single to a triple double. Once again, assistance from the U.S. Army was requested.

Assistance came from Fort Leonard Wood in the form of First Lieutenant Joseph K. Schmitt and Sergeant First Class Larry A. Simmons. The job they faced was in many respects more difficult than the original construction.

Reinforcement in place began 27 June 1978 at the center of the bridge, center truss, and progressed toward each end. At first, the panels went in very easily, but, as more panels were added, work crews experienced difficulty with cord bolt and pin hole alignment. To remove some of the dead weight from the bridge, the riband, chess and plain stringers were removed. Only the button stringers were left in place with chess laid lengthwise on the stringers for safety purposes. That relieved some of the sag and allowed for easier assembly, but as construction continued, misalignment of cord bolt holes appeared again, causing work to be suspended. The only alternative was to construct a temporary intermediate pier.

On 28 June, the MTT returned on site to evaluate the possibility of building a grillage tower 45 feet from the far shore. Low tide revealed that the soil was firm enough to safely facilitate construction of an adequate pier in which the bridge could be jacked to assist in evenly distributing the load. The bridge was jacked to a height of approximately one-quarter inch from the bearings, thus eliminating more than six inches of sag from the bridge. Reinforcement in place procedures resumed, but again with an increase in sag.

Due to difficulty in aligning cord bolt holes at the near shore, it was decided that an additional temporary pier was needed to provide structural support and to relieve some of the compression load on the top members of the first story panels. A pier, constructed with panels and supported by grillage consisting of standard 6 x 6 timbers and bridge stringers, was constructed 15 feet from the near shore abutment. The bridge was jacked until the near shore end posts were approximately one-eighth inch off the bearings, reducing the effective bridge length to 110 feet.

The last panel of the near shore was inserted and pinned to the end post on 30 June. The bridge was jacked off the near shore towers and jacked down on its bearings. Work crews returned to finish construction at the far shore. The bridge was again jacked at the far shore grillage towers to help relieve additional sag due to the increase in bridge weight and tower settlement.

On 1 July, more than five months after initial construction began, reinforcement of the bridge was completed. The bridge was jacked from the grillage towers on the far shore, and both shore piers were dismantled. The stringers, chess, and riband were replaced.

The job was finished. The bridge was permanently reopened.

Major Harvey Ramsey is the Chief of the Combat Operations Division, Directorate of Training, U.S. Army Engineer School, Fort Belvoir, Virginia.

ENCOA

The spring and summer editions of THE ENGINEER carried articles dealing with the Engineer NCO Advanced Course (ENCOA). The articles were aimed at NCOs selected for attendance at ENCOA, providing information to help selectees prepare for the course. Information contained in the articles is still valid and copies of the articles are available from the Engineer School upon written request.

Anyone scheduled to attend ENCOA, or who just wants to know more about the course, may write to the Commander of the NCOES Detachment. He will give you a description of the course, and advice on how to prepare for the course.

Math and reading skills are still the biggest problem areas for ENCOA students. A 12th grade equivalency is recommended in both math and reading skills. The failure rate for ENCOA is approximately 10 percent. Some students arrive at Fort Belvoir with the idea that all they have to do is attend classes in order to graduate. Be advised that the course of instruction is not easy and no one is passed because of their good looks or sparkling personality. The offer of individual assistance to prepare for attendance at ENCOA is open, so take advantage of it.

PRIMARY TECHNICAL COURSE

The 12C (Brigade Crewman) Primary Technical Course (PTC) is conducted at Fort Belvoir. PTC is aimed at Skill Level 2 training and is SQT oriented. In the near future this course will be redesignated as a basic technical course (BTC) and aimed at Skill Level 3. The course trains personnel in Grades E4 and E5 for assignment in SL2 duty positions, but other personnel may attend with a waiver.

It is desired that personnel have a working knowledge of military tactical bridging prior to attending the PTC. The course is five weeks in length, and upon successful completion, graduates will be qualified in all aspects of tactical bridging.

The PTC uses the latest instructional methods. Training includes practical exercises and classroom instruction. Instructor-to-student ratio is usually about 1:5, and class size averages about 20. Intensive, individualized instruction is thus provided. A complete set of tactical bridging reference material is available to each student which he may keep upon completion of the course. Subjects taught include bridge classification as well as design and construction procedures on the following bridges: the M2 Bailey, MAB, M4T6 (Class 60 raft and fixed span), LTR, Ribbon and medium girder bridge. Instructor personnel are among the most highly qualified in the US Army and are willing to provide individual assistance to each student.

If you are scheduled to attend 12C PTC and need additional information about this excellent course, write to: CSM, US Army Engineer Course, Fort Belvoir, VA 22060.

12E ATOMIC DEMOLITION MUNITIONS COURSE

The Atomic Demolition Munitions Course taught at Fort Belvoir is a self-paced course designed to qualify personnel in MOS 12E10. Though primarily designed for entry level personnel, individuals reclassified or reenlisting for MOS 12E may also attend. Recent changes in the 12E course which will be of interest to ADM units in the field include the following:

- Reinforcement of timer calculation training using informal lecture and practical exercise with small groups of students in addition to the self-paced materials.
- All option mission, practical training exercises for small groups of students near the completion of the course.
- An all inclusive "end-of-course-test" used to detect and correct individual student weaknesses. (Emphasis is placed on quality and retention of training—not speed of completion.)

The ADM course is constantly being revised and improved, so comments from the field are welcome. Requests for additional information and questions or comments should be addressed to: Commandant, USAES, ATTN: ADM Branch, Fort Belvoir, Virginia 22060.

A note to personnel reenlisting for MOS 12E: remind your reenlistment NCO that a school allocation for the 12E course must be obtained manually. The automated system provides 12E school information for initial entry personnel only.

DEFENSE MAPPING SCHOOL

The Defense Mapping School (DMS) is located at Fort Belvoir and works closely with the Engineer School in developing Career Management Field 81. DMS is a component of the Defense Mapping Agency and is responsible for instruction in military cartography and related subjects. The school provides direct support to the Army, Navy, Air Force, Marine Corps and allied nations, with instruction and advisory services in the functional areas of mapping, charting, and geodesy. DMS conducts resident instruction in the following fields: surveying, cartography, graphic arts, topographic sciences and related subjects.

If your topographic unit has a training problem that might be solved by a Mobile Training Team (MTT), contact the Defense Mapping School. The point of contact should be the Director, Defense Mapping School, ATTN: PPO (MTT Coordinator), Fort Belvoir, VA 22060. Be prepared to outline your problem and state why you think a MTT might offer the solution.

If your unit is within CONUS, it's possible that assistance will not cost you anything. Assistance is available to reserve units as well as active units.

Officer Career Info

COLONELS

Physicals: Is your official personnel file up to date? Is there a copy of your latest physical in your official file? Paragraph 10-23c(4) of AR 40-501, including Change 29, states that officers 39 years of age and older should receive physicals in the birthday month of the odd numbered years of their age until they reach the age of 50 and thereafter annually. Lieutenant Colonels, Majors, and junior officers simply provide a copy to their MILPO for posting to their Officer Records Brief (ORB), but Colonels and Lieutenant Colonels (P) should have a copy forwarded for official filing and review by promotion boards. Critical items of note are profiles (three or more) and body weight and height.

Senior Service College: Eligibility for resident instruction in the Senior Service College extends through 23 years of active service, computed from the first day of September each year. Officers who have a basic service date between 2 September 1956 and 1 September 1957 are currently in their last year of eligibility. The board in session in August selected officers to start school in the Fall of 1979. Officers who are not selected for resident instruction should strongly consider applying for Non-resident instruction in accordance with AR 351-11.

MAJORS

Congratulations to those officers recently selected for promotion to Lieutenant Colonel AUS and those selected for promotion to Major RA. The files of those selected for LTC have been transferred to Lieutenant Colonel Tom Fisher in the Lieutenant Colonels Division for future actions.

Recent discussions with members of various selection boards revealed the following vital areas for Engineer officers:

- Officer Record Briefs (ORBs) are incorrect. Some items are correctable by MILPERCEN, but others must be changed through SIDPERS. Check with your MILPOs for corrections.
- Military Education Level (MEL): Completion of the Command and General Staff College by resident or non-resident instruction of great importance in consideration for promotion to Lieutenant Colonel AUS. When considering officers for assignments requiring MEL 4 schooling, there is no discrimination between resident and non-resident graduates.

CAPTAINS AND LIEUTENANTS

There have been some personnel changes in the company grades division. Lieutenant Colonel H. A. Froehle is the new chief and Captain Bob Melchior has replaced Captain Matt Dominy as the Lieutenants assignment officer.

The importance of having an accurate up-to-date ORB in your file cannot be overstated. It is critical for use in career management and selections for school and promotions. Pay particular attention to the height/weight ratio reflected. Regulations require an annual update of this highly visible element.

Photos are also important. Remember that you must have a photo taken upon promotion to first lieutenant and every four years thereafter.

Congratulations to the 231 lieutenants recently selected for promotion to captain. Selection rates for Specialty Code 21 was 90 percent. Your files are now managed by Major Mike Foster, same office, different desk.

WARRANT OFFICERS

The Warrant Officer Regular Army Promotion Board adjourned July 14. The list should be released to the field during the September/October time frame.

The Warrant Officer Regular Army Automatic Consideration Board for Fiscal Year 1978 adjourned August 24. The list of those selected was released in September.

The Fiscal Year 1979 Warrant Officer procurement program was announced in DA Circular 601-81 and was released August 22. A copy of the circular may be obtained by calling the Publications Center (Autovon 584-2045/3210). The call should be made by the unit's Publication Management Officer since he/she holds the activity's Publication Account Number.

ALL OFFICERS

All active duty officers and warrant officers may call the Personnel Records Division Automatic Telephonic Answering Service to ask questions pertaining to their Official Military Personnel File (OMPF). This service operates on a 24-hour basis and can be reached by calling AUTOVON 221-8792/3 or Commercial (202) 325-8792/3. As calls are received, a recorded message will ask for basic identification data from the caller. The caller will then be asked to state the request. Requests are transcribed and logged during the next normal operating day. Every effort is made to provide a telephonic or written response to the individual within five working days.

Questions which are appropriate for this service include:

- Has the OER for the period ending (state ending date of the OER) been filed?
- Has the award (indicate specific award and date of the award) been filed?
- Has the specific document authorized for file been filed?

Questions which cannot be answered by this service include:

- Requests for copies of documents or copies of the OMPF. Only written requests will be accepted.
- Lengthy or complicated problems pertaining to the OPMF. These questions should be referred through the servicing Military Personnel Office (MILPO) to the Personnel Records Division.

Engineer Personnel Management Contacts in OPMD:

- Colonels Division (DAPC-OPC-AF)
  Engineer Assignments / Lieutenant Colonel Lin Lufkin / x7871

- Lieutenant Colonels Division (DAPC-OPL-AS)
  Engineer Assignments / Lieutenant Colonel Thomas Fisher / x0423

- Majors Division (DAPC-OPM-A)
  Engineer Assignments / Major Wayne Roth / x8109

- Combat Support Arms Division (DAPC-OPF-E) (Company Grade)
  Engineer Branch Chief / Lieutenant Colonel H. A. Froehle / x0650
  Captain Assignments / Major Mike Foster / x0651
  Lieutenant Assignments / Captain Bob Melchior/x7434

- Warrant Officers Division (DAPC-OPW-AU)
  Engineer Assignments / CW3 Aleck Fletcher / x7837

NOTE: Commercial telephone line: Numbers above preceded by 202-325-.
AUTOVON line: Listed number preceded by 221-.

OERs

Early in the life of the current Officer Evaluation Report, there existed a wide disparity in scores between and within commands. As a result, many raters felt the need to send to DA unsolicited, after-the-fact explanatory letters which attempted to clarify their original rating intent. Even though not specifically authorized by regulation, these letters were accepted and filed. In the past few years the score disparity has disappeared and with it the value of the explanatory letter.

Effective 6 June 1978, explanatory letters concerning previously submitted OERs are no longer accepted for inclusion in the OMPF. The change in policy does not affect the submission of addendums as authorized in AR 623-105.

MICROFICHE FILES

The program to mail out a personal copy of the microfiche Official Military Personnel File (OMPF) to every active duty officer and warrant officer in the Army has been completed. More than 94,000 files were mailed, beginning last November. However, approximately six percent of the files were returned to MILPERCEN because the address reflected on the data base was not current.

Officers and warrant officers who have not yet received their personal microfiche file copies should forward a request directly to: Commander, MILPERCEN, ATTN: DAPC-PSR-SR (Document Request Section), 200 Stovall Street, Alexandria, VA 22332. The request should include name, social security number, duty telephone number, and the address to which the microfiche copy is to be mailed.

The OMPF paper files from which the microfiche files were created are still available for purchase by individuals, but time is running out. The paper files of general officers and colonels will be retained only until 1 March 1979. Warrant officer files will be retained only until 1 April 1979. Captains may purchase their paper files until 1 May next year, lieutenant colonels have until 1 July, and lieutenants have until 1 September.

Files may be purchased in person at MILPERCEN's Records Review Office, Room 5S33, Hoffman II, or through the mail by writing to the same address.

Purchases by mail should include a check made payable to the Treasurer of the United States. The total amount of the purchase price is determined by grade and includes the cost of mailing. The fees, by grade, are listed below.

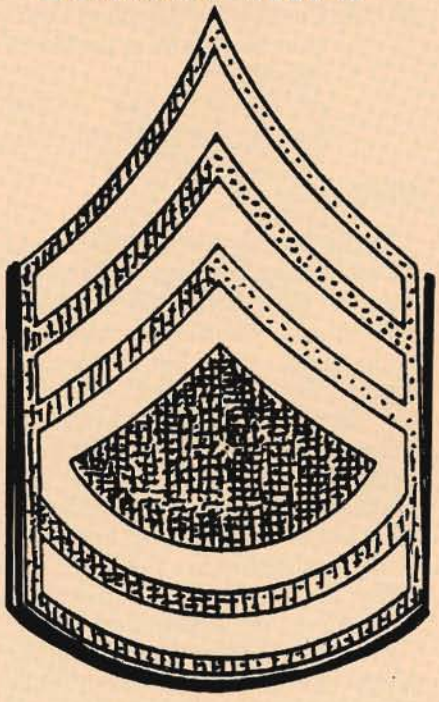
GRADE	AMOUNT
General Officers	$6.00
Colonels	5.50
Lt. Colonels	4.75
Majors	4.50
Captains	4.25
First Lieutenants	4.00
Second Lieutenants	3.00
Chief Warrant Officers (CW3 and CW4)	5.00
Chief Warrant Officer (W2) and Warrant Officer (W1)	4.50

SPECIAL OMPF UPDATE

To expeditiously process OMPF updates on a priority basis for officers in the zone of consideration, a special processing section has been established in the Officer Personnel Records Branch at MILPERCEN. Documents for OMPF updates should be sent through the MILPO to: Commander; MILPERCEN; ATTN: DAPC-PSR-RP; 200 Stovall Street; Alexandria, VA 22332.

A letter of transmittal indicating name, grade, social security number, and the identification of the selection board by which the individual is being considered should be used.

Enlisted Career Info



NEW ASSIGNMENTS POLICY

Under a new assignments policy spelled out in AR 614-30 (effective 15 August 1978), Hawaii is included as part of the CONUS sustaining base for reassignment purposes. In other words, soldiers stationed in Hawaii who are nearing completion of their tours will be considered along with soldiers stationed in CONUS for selection as replacements for other overseas areas, such as Germany, Korea, Japan, Alaska, etc.

Priorities for selection of personnel for any overseas assignment are outlined in chapter of the regulation. These priorities are designed to maintain overseas assignment equity. Soldiers stationed in Hawaii have been placed low on both the long and short tour area priority lists.

Changes in the assignment policy were the result of a revision of Department of Defense Directive 1315.7, "Military Personnel Assignments" and reflect an effort to reduce personnel turbulence and rising PCS costs. Other regulations and changes stemming from the revised directive are expected later this year.

OMPF PROBLEMS

The Official Military Personnel File (OMPF) should accurately represent the accomplishments and shortcomings of every soldier's military career. The OMPF is made up of many documents from a variety of sources, and it is important that every authorized item be included. As far as selection boards are concerned, if it's not in the OMPF, it doesn't exist.

Currently, thousands of these very important OMPF documents are backlogged because of one common problem: missing or incorrect social security numbers.

The Records Maintenance Division at the Enlisted Records and Evaluation Center (EREC), a field operating activity of MILPERCEN located at Fort Benjamin Harrison, IN, maintains more than 666,000 enlisted records. Over two million documents flow through this office each year.

Although the problem of missing or incorrect SSNs is not new, it has been magnified during the past two years by the on-going conversion of the OMPF from paper to microfiche.

Adding a document to the microfiche OMPF is a quick and simple process when the document contains a valid SSN, but when the number is missing or incorrect, the process becomes an administrative nightmare.

So help yourself by helping the folks who maintain your OMPF. Make sure every document submitted to EREC for inclusion in your file contains your social security number.

CAREER ADVISERS

The Enlisted Engineer Career Branch, U.S. Army Military Personnel Center (MILPERCEN), has the mission to get the right soldier with the right grade and skill, to the right command, at the right time. The branch chief is normally a Corps of Engineers lieutenant colonel and his professional development non-commissioned officer is normally a sergeant major. The sergeant major's job is mainly one of coordination, while the real work—advising the soldier in the field—is accomplished by Career Advisers.

A Career Adviser is selected because of his expertise in his field, not because of his qualifications as a personnel specialist. He is the most important person in the branch when it comes to managing your career. He is the one who makes sure each soldier is properly assigned and that career progression is considered. He is also the person who answers questions on future assignments, schools, promotions and career goals in general.

Master Sergeant Kelly Brown is the Career Adviser for Career Management Field (CMF) 81, Topographic Engineering, plus MOS 12E, Drill Sergeant (at Fort Leonard Wood only), and all E8s and E7s (P). Sergeant First Class Garry Barth is the Career Adviser for CMF 51, General Engineering, and Sergeant First Class Al Henderson is the Career Adviser for CMF 12, Combat Engineering.

The Enlisted Engineer Career Branch maintains a Career Management Individual File (CMIF) for grades E6 through E8 in CMF 12, 51 and 81 (except MOS 81E and MOS 82C). CMIFs are also maintained for grades E1 through E7 in MOS 12E and individuals having a Special

Qualification Identifier (SQI) "X" (drill sergeants at Fort Leonard Wood only). These files are a major tool used by career advisers in managing your career.

The files contain copies of Enlisted Efficiency Reports (EERs), Senior Enlisted Efficiency Reports (SEERs), Enlisted Evaluation Data Reports (USAEEC Form 10), copies of DA Form 2, DA Form 2-1, item 38 of DA Form 20, Enlisted Preference Statement (DA Form 2635), reclassification actions, and letters pertinent to the individual's career or letters of inquiry submitted by the soldier.

Should you, at any time, wish to call or write your Career Management Branch regarding an assignment or other aspects of your career, the address is: U.S. Army Military Personnel Center, ATTN: DAPC-EPL-E, 2461 Eisenhower Avenue, Alexandria, Virginia 22331. The telephone number is (Commercial) Area Code 202, 325-7710/11/12 or Autovon 221-7710/11/12.

SKILL QUALIFICATION TESTING

Skill Qualifications Tests (SQTs) for Career Management Field 12 will be conducted January 1 through June 30, 1979, according to the latest word from the U.S. Army Training Support Center at Fort Eustis, VA. All personnel with MOS 12B, 12C, and 12E should have already received their Soldier's Manuals, which were distributed to the field during the May-June time frame. The Soldier's Manual is the soldier's personal copy to retain and maintain. It is his/her personal textbook to career advancement.

LETTERS OF COMMUNICATION

Effective August 1, a new procedure for filing letters of communication to selection boards was initiated. All such letters, including all inclosures, are now considered privileged correspondence and filed with the record of board proceedings maintained by MILPERCEN, instead of being filed with the OMPF.

Also effective August 1, only letters from personnel in the primary zone of consideration are accepted. In the past, letters from personnel in both the primary and secondary zones were accepted.

Because letters of communication have previously been filed in the OMPF, some members have been using them as a means to insure that documents of career importance are added to the OMPF. With the changes in filing procedures, this means of file update is no longer available. OMPF material must be submitted through the MILPO, not directly to the board.

OFFICER CANDIDATE SCHOOL

Applications are being accepted from active duty enlisted personnel and warrant officers for Officer Candidate School (OCS) at Fort Benning, GA. OCS is a 14-week course designed to produce professional commissioned officers for various Army branches. Basic eligibility requirements are:

- No more than 10 years of active service at date of OCS completion.
- Two or more years of college credit (minimum of 60 semester hours).
- At least 19½ and not more than 29 years of age on enrollment.
- Test scores of 110 GT, 115 OCT, and composite OCT/OQI of 200 for male and 115 GT for female personnel.

Other requirements include leadership ability, an outstanding military attitude, and high motivation to become an officer. Weight and height requirements are listed in AR 600-9. If the applicant is overseas at the time of application, 24 months of the tour must be completed (waiverable).

The first step for soldiers interested in applying for OCS is to complete a DA Form 61, Application for Appointment. Unit commanders are then responsible for counselling applicants and administering an Army Physical Fitness Test, and rating each applicant.

Check with your local Military Personnel Officer or unit commander for additional details of the application process.

The next deadline for receipt of OCS applications at MILPERCEN is 22 January 1979, so interested personnel shouldn't waste time in submitting their DA Form 61 to their unit commanders.

EERWA DATA

As of 30 June, the Enlisted Efficiency Report Weighted Averages (EERWA), by pay grade Army wide, were as follows:

PAY GRADE	EERWA
E-9	124.24
E-8	123.49
E-7	121.91
E-6	119.39
E-5	116.43
E-4	111.57

An up-to-date compilation of the weighted averages is scheduled for release by MILPERCEN in October 1978.

Tactical Problem

You are the commander of Company A, 54th Engineer Battalion, currently in direct support of the 1st Brigade of the 54th Infantry Division (Mechanized). As the brigade engineer, the brigade commander has discussed with you the requirement for a tactical minefield to support one of his battle positions.

In further discussions with the Brigade S-2 and S-3, you note the following: the required minefield will be located from AB042835 to AB048843; the task force commander who will cover this obstacle with observed fires requires at least three mobility kills on a Threat force armor company proceeding through the minefield in company line formation; a gap of 150 meters must be left in the tactical minefield to facilitate the withdrawal of the corps covering force; and the leading Threat force tanks are given a 60 percent capability of neutralizing any encountered mine.

You have determined that sufficient M15 antitank and M16 antipersonnel mines are available to install the required minefield, and that your battalion commander will issue one of his M57 antitank mine dispensing systems to your company. In order to reduce installation time, you have decided to include only one antipersonnel mine for each antitank mine your company emplaces. In addition, the brigade #S-3 air officer has just notified you that up to three sorties of the M56 helicopter-delivered scatterable mines are available from corps' 178th Assault Helicopter Company if you can utilize them.

In planning this tactical minefield, you must determine the density, the time required to emplace the field using the M57 antitank mine dispensing system, and the number of M56 helicopter-delivered scatterable mine sorties needed to close the gap in the field.

See page 40 for THE SCHOOL SOLUTION

THE ENGINEER

welcomes your comments on any material published. You may have your viewpoints/ideas published as "Letters to the Editor" or you may wish to submit a feature length article for consideration. If you have something to contribute, let us hear from you.

Editor

Reserve Components

FROM THE CHIEF, ARMY RESERVE

"Proof is in performance, and there is no room for non-performance in the Army Reserve. Our mission and responsibility to the nation, to our communities, and to our families are too important to allow any unit, large or small, to drift along."—Major General Henry Mohr, Chief, Army Reserve.

MOBEX 78

A mobilization and deployment exercise labeled "Nifty Nugget" is scheduled to run from 10 October to 3 November at numerous FORSCOM and TRADOC installations. The thrust of the paper exercise is to evaluate mobilization and deployment systems and procedures. Full mobilization play will take place at the following Army installations: Fort Benning, Fort Bragg, Fort Carson, Fort Chaffee, Fort Dix, Fort Drum, Fort Hood, Fort Knox, Fort Riley, and Camp Shelby. Each Reserve Component unit scheduled for mobilization at these installations during the first 30 days of mobilization will send a player cell representing that unit's command element to the installation one weekend during the exercise. There, the cells will review mobilization procedures with the installation staff.

Player cells representing early deploying Reserve units will report to one of 39 installations in CONUS, Hawaii, and Puerto Rico to review deployment procedures and to determine if the units are actually deployable.

RECORDS CONVERSION

Personnel records of active reservists, both unit and Individual Ready Reserve (IRR) members, are being converted to microfiche. The conversion process is expected to take up to three years.

A decision on the disposition of paper records once the conversion to microfiche is completed will be made later. If the paper records are made available to individuals, a processing cost will be charged. Requests for paper records prior to notification will be returned without action.

06 PROMOTION BOARD

The board scheduled to consider Reserve Component lieutenant colonels for permanent promotion to colonel has been rescheduled. Originally set for 7 August through 1 September, the board was rescheduled to convene at the U.S. Army Reserve Components Personnel and Administration Center in St. Louis on 22 October. It is scheduled to adjourn on or about 17 November.

NEW COURSES AVAILABLE

Two new NCOES courses will be taught by many USAR schools this year. They are the Primary NCO Course, Combat Arms (PNCOC-CA), and the Primary Leadership Course (PLC). The Combat Arms Course is designed to develop leadership skills for E4s in MOSs 11B/C/H, 12B, 13B/E/F, 16P, and CMF 19. It will be taught during two weekend training sessions and during two weeks Annual Training. The Primary Leadership Course involves management instruction for junior combat support and combat service support personnel. It can be taught on weekends, evenings, or during two-week Active Training sessions.

NEW ENLISTMENT OPTION

Students and seasonal workers who enlist for six years in a troop program unit now have the opportunity to participate in their initial Active duty for training (IADT) in separate sessions. Under a new option, new enlistees may return to their home station following successful completion of active duty basic training, an eight-week period. Within one year of the last day of basic training, the individual returns to IADT for advanced individual training (AIT). Enlistment grades authorized by Table 2-4, AR 140-111 are applicable to nonprior service applicants enlisting for this program. No participant, with the exception of honor graduates, however, will be promoted to grade E-3 or above until completion of AIT.

EQUIPMENT FALLACY

Many reservists apparently believe that new equipment will be issued to Reserve units in the event of mobilization. Such beliefs are unrealistic. Equipment currently on hand is considered part of the total assets of the Army, and new equipment is procured by matching these total assets against total requirements. This means each unit must maintain on-hand equipment and be prepared to use that same equipment in the event of mobilization.

FACTS AND FIGURES

- Reservists on continuous active duty for 30 or more days may now apply for Army Emergency Relief loans through their units.
- Approximately 25 percent of all Army personnel belong to the Army Reserve.

The School Solution

You determine from Appendix M, FM 20-32 (Mine/Countermine Operations at the Company Level) that the required antitank mine density is 0.80 mines per meter of front. This gives a field density of 0.8 AT — 0.8 APF — 0 APB.

Since the frontage of the minefield is 1,000 meters (3-4-5 right triangle), the time required to emplace the field using the M57 antitank mine dispensing system for the M15 antitank mines and laying the M16 antipersonnel mines by hand is calculated as follows:

Frontage to be laid: 1,000 meters minus 150-meter gap = 850 meters

AT mines required equals frontage times density: 850 mines times 0.8 mines per meter of front = 680 mines (M15)

Add 10 percent for non-parallel rows: 680 times 1.10 = 748 mines

$$\text{Time required} = \frac{\text{M15 mines required}}{\text{385 mines per hour}} + \frac{\dfrac{\text{APF mines}}{\text{8 per man hour}} + \dfrac{\text{APB mines}}{\text{16 per man hour}}}{\text{30 men per platoon}} \times 1.20$$

$$\text{Time required} = \frac{748}{385} + \frac{\dfrac{748}{8} + \dfrac{0}{16}}{30} \times 1.20 = 1.94 + 3.74$$

$$= 5.68 \text{ platoon hours}$$

The number of helicopter sorties required to close the gap in the minefield is calculated as follows:

Frontage of gap = 150 meters

Number of mines required = AT density times frontage
= 0.80 × 150 = 120 M56 AT mines

$$\text{Number of sorties} = \frac{\text{M56 mines required}}{\text{160 mines per sortie}} = \frac{120}{160} = 0.75 \text{ or } 1 \text{ sortie}$$

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FROM THE EDITOR

THE ENGINEER magazine is designed as a medium for disseminating information throughout the Army engineering community. Its goal is to increase the understanding of the role and importance of the engineer on the battlefield and to promote the professional development of the entire engineer family. Those goals are met best if engineers in the field tell us what they are doing and ways they see to improve the profession of arms as engineers. One way to do that is to provide input to THE ENGINEER. Input may take one of several different forms—letters to the editor, feature length articles, photographs, artistic material, announcements, brief news items, or simply suggestions on how to improve the magazine. Remember, THE ENGINEER is your magazine. With your help, we can make it a top-flight professional journal.

JJH

See PAGE 20