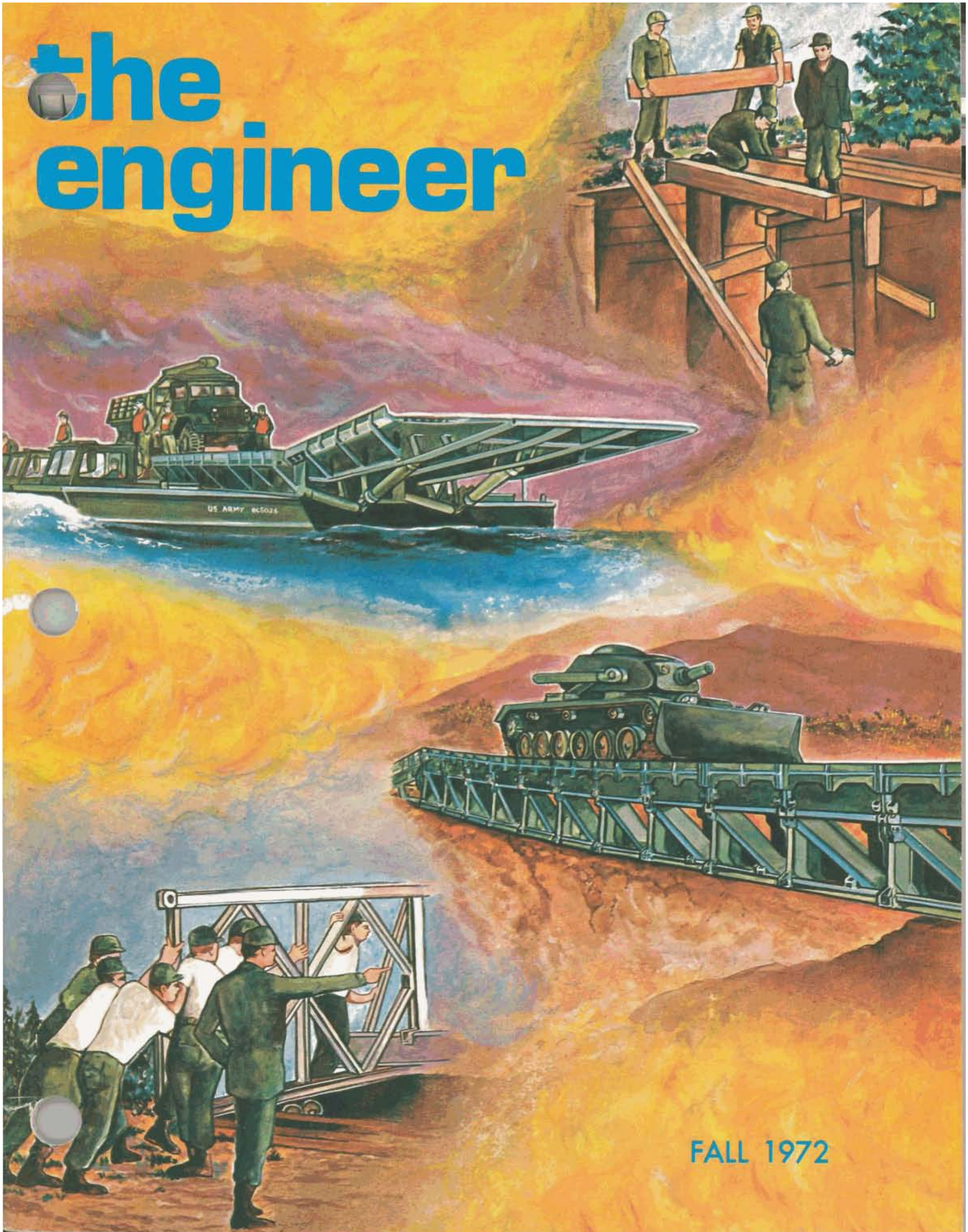
the engineer



FALL 1972

the engineer

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CHIEF'S BRIEFS.....

When Lieutenant Colonel Stephen Rochefontaine retired from the Army in 1798, President John Adams appointed Colonel Henry Burbeck Chief Engineer and Commandant of the Corps of Artillerists and Engineers at West Point. Burbeck thus became the fifth Chief Engineer of the U.S. Army, a position he held until legislation in 1802 divided the Corps into two new organizations—the Corps of Engineers and the Regiment of Artillerists. Burbeck remained with the latter as its Chief.

Henry Burbeck was born on June 8, 1754 at Boston, Massachusetts. With the growing discontent of the colonists with home rule from England, Burbeck joined the Continental Army, serving in 1775 as a Lieutenant of Artillery under Colonel Richard Gridley, the Army's first Chief Engineer and Artillery Commander. He remained in the Artillery Corps under General Knox, with Washington's Army, until the Yorktown Campaign. Thereafter, his command remained in the north to defend Hudson Highlands, and had the signal honor of marching into New York when the British evacuated that city at the close of the war.

Burbeck was honorably discharged in 1784, but was reappointed a Captain of Artillery to command Castle Williams in Boston Harbor—his father's old command before the Revolution. Later he commanded Springfield Arsenal in 1787 and West Point in 1789. Shortly after serving as Chief of Artillery under General Wayne in 1792, he was assigned the task of building Fort Recovery in the Northwest.

After succeeding Rochefontaine as Chief Engineer and Commandant of the Corps of Artillerists in 1798, Burbeck was also Chief of the Eastern Department of the Army, and played an active role in establishing the Military Academy at West Point. He became the Chief of the New Artillery Corps in 1802, a position he held until he retired in 1815.

Colonel Burbeck died on October 2, 1848 at New London, Connecticut. e

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ABOUT THE COVER

Art Director John W. Savage, Jr., paints various scenes that depict a representative collection of bridging events that are essential to the mission of the Engineer. They vividly point up one of the Corps' major contributions to the total mobility of the U.S. Army.

Pipeline

CORPS ESTABLISHES DISTRICT TO AID FLOOD VICTIMS

A new U. S. Army Corps of Engineers District has been established in Harrisburg, Pennsylvania, to direct recovery and reconstruction work in the Susquehanna River Basin which was hard hit by Hurricane Agnes.

Headed by Colonel John F. McElhenny, the new Susquehanna Engineer District will take over all post-Agnes emergency work within the basin.

Debris removal, repairs to flood control structures and the reconstruction of public buildings, water supply and sewage facilities are some of the tasks they will perform.

The Susquehanna District also will prepare sites for thousands of mobile homes which will provide temporary housing for flood victims.

ENGINEERS TEST NEW ROAD CONSTRUCTION

A radical departure from conventional road construction methods is gaining prominence with test programs at the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, and at Fort Hood, Texas.

The process, called membrane enveloped soil layer (MESL), has been developed at the Waterways Experiment Station for application by a small crew in minimal time with minimal equipment. A crew of 12 with a scanty truckload of materials and little equipment, in fact, has laid a one-half-mile, two-lane MESL road in less than a week.

The process is based on the principle that the soil itself will support military cargo vehicle traffic if moisture is sealed off. The only construction materials are plastic membrane, fabric, asphalt and native soil. The construction technique is simple—wrapping native soil between membranes which are joined and sealed along the edges to form a waterproof encapsulated soil system.

A main road at Fort Hood, Texas, was built using the MESL method. Equipment removed the soil which was to be used to form the foundation layer and a grader was employed to smooth the subgrade surface. Polyethylene sheets, each 32 by 100 feet, were spread by hand on the subgrade and front-end loaders placed the soil on the lower membrane. A grader spread the soil, leaving the lower membrane edges exposed for bonding with the upper membrane to be added later.

After careful compacting, the soil was given a light spray coating of rapid setting emulsified asphalt. The surface layer was placed in one operation using an asphalt distributor fitted with a simple laying yoke for unrolling the fabric, a random fiber polypropylene material that comes in rolls 15½ feet wide by 350 feet long, each roll weighing less than 200 pounds. Since all of the materials are flexible, going around bends and up and down hills presents no problems.

After bonding the upper and lower membranes with the edges to be buried later as shoulders, a final application of asphalt was laid on the polypropylene, a material that can absorb asphalt 270 times its own weight. The surface was then blotted with sand and the MESL was ready to serve as the base course. The asphalt-treated fabric became the pavement surface on that secondary road. On a more heavily traveled primary road designated to support the traffic of both civilian and military vehicles, a two-inch surface of hot-mix asphalt pavement would have been laid over the MESL.

Building of the test road at Fort Hood is another goal met in a research program started several years ago at the Army Engineer Waterways Experiment Station to provide the military with a construction technique when aggregates required for conventional roadbuilding methods were not available. Lack of materials for roads in Southeast Asia, particularly in the Mekong Delta, influenced the Chief of Engineers to seek another method. The MESL road system offers a solution, while cutting work, cost and time.

USARPAC HOLDS FACILITIES ENGR NSTRUCTION

U. S. Army facilities engineers from Hawaii, Vietnam, and Thailand, have begun attending a series of U. S. Army, Pacific Facilities Engineers Management Courses.

The first 10-day course, held at Fort DeRussy, Hawaii, was designed to improve the understanding of facility engineering management practices by supervisors at the middle management level.

The immediate purpose of the course, which graduated 42 facilities engineers, was to upgrade the technical and professional training and management skills of the students. They received 54 hours of instruction in environmental pollution abatement, management and administration, maintenance and repair, and management of facilities engineering contracts.

Courses were also to be held in Korea and Okinawa. It was expected that 125 students would receive instruction from the three courses.

84th ENGINEERS ARE CITED BY ADMIRER

The 84th Engineer Battalion (Construction) at Schofield Barracks, Hawaii, recently received a plaque displaying a beat up, rusty, toy bulldozer from an important admirer.

Major General Thomas W. Mellen, former commander of the U. S. Army, Hawaii, presented the plaque in appreciation of the unit's service to the command since its activation on January 31, 1972.

In just nine months of duty in Hawaii, the 84th has grown from a handful of soldiers without even the barest of tools to some 400 with a vast array of equipment. They are working on projects on both Oahu and Hawaii.

The inscription on the plaque from General Mellen, who has been reassigned to Thailand, reads: "To the officers and men of the 84th Engineer Battalion (Construction) with respect, admiration, and thanks. Activated at Schofield Barracks on January 31, 1972, as the 577th Engineer Battalion (Construction) with three officers and 11 men and no equipment, the battalion has performed with great skill and energy under trying conditions. You are truly the 'Do It Yourself' battalion."

Lieutenant Colonel Norman B. Gates, Commander of the 84th Engineer Battalion (Construction), seems delighted as he reads the inscription on the plaque presented to the unit by Major General Thomas W. Mellen (left) former Commander of the U.S. Army, Hawaii.

engineer interview

with

major Ralph B. Hill

and

captain Milton Hunter

With the advent upon the military bridging scene of two innovations slated for incorporation into the U. S. Army's inventory within the relatively near future—and amid some speculation that the Medium Girder Bridge and the Ribbon Bridge might eventually replace current standard item equipment in that inventory—**the engineer** felt compelled to interview personnel with first-hand knowledge about these two bridges. We were fortunate.

Major Ralph B. Hill, Royal Engineers, is the British Exchange Officer currently serving at the U. S. Army Engineer School at Fort Belvoir, Virginia, and has acquired considerable experience with the Medium Girder Bridge through past assignments. He has been stationed at the Engineer School since March, 1971, and is now Chief of the Field Engineering and Bridging Division, Department of Applied Engineering.

Commissioned into the Royal Engineers from the Royal Military Academy at Sandhurst in 1953, the major holds a Master of Arts degree in Mechanical Engineering from the University of Cambridge and is a graduate of the British Army Staff College at Camberley.

Major Hill has served in various units, on occasion as second in command, and as a troop commander. He has also been assigned duty as a member of the Royal Engineer Combat Development Staff.

As a member of the Ribbon Bridge Field Test Board, Captain Milton Hunter, Corps of Engineers, U. S. Army, is singularly qualified to discuss that piece of bridging equipment. He is a Distinguished Military Graduate of Washington State University's ROTC Program, and holds a Bachelor of Architectural Engineering degree from that institution. Formerly an instructor in the Bridging Branch, Field Engineering Division of the Department of Applied Engineering at the Engineer School, Captain Hunter has served with the 937th Engineer Group (Combat) in Vietnam, and the 339th Engineer Battalion (Construction) at Fort Lewis, Washington. He has just recently returned from duty with the Baltimore and Susquehanna Engineer Districts where he assisted in Disaster Recovery Operations necessitated by the havoc caused by Hurricane

[illegible]gnes in Pennsylvania. Captain [illegible]ter is a career officer and is currently attending the Engineer Officer Advanced Course at the Engineer School.

Major Hill was interviewed first.

ENGR: Major Hill, could you give us a brief description of the Medium Girder Bridge (MGB) and some insight into its capabilities?

HILL: The MGB is a deck-type equipment bridge using aluminum alloy components, which can be assembled very rapidly by a platoon sized force of engineers, without cranes, in a variety of spans up to 160 feet, including a 100-foot span capable of carrying a Class 60 tank.

ENGR: What prompted the development of the MGB with the Bailey already the standard tactical fixed bridge in both British and U. S. Army inventories?

HILL: The Bailey has not been a standard tactical fixed bridge in the British Army for many years now, although we do still have stocks for use in world-wide emergencies. We replaced the extra-widened Bailey (wider than the M2 version used by the U. S. Army) with a similar, heavier and stronger bridge called the Heavy Girder Bridge (HGB) in the early fifties. However, both the Bailey and HGB take too much time, manpower and logistical effort for requirements imposed by fast, mobile, modern warfare. The infantry and armor are just not prepared to wait while the engineers take hours to build their bridges.

ENGR: Do you think the MGB will totally replace the Bailey M2 Panel Bridge? If so, when?

HILL: You're asking me to stick my neck out—and, perhaps unwisely, I will. No, I don't think it will totally replace the Bailey. The MGB is a brilliant design, but it is too specialized to fill the many uses of the Bailey—it's also too expensive. Although the MGB is

more cost-effective than the Bailey in the conditions for which it was designed, this does not apply when speed, lightness and logistics savings are less important. I cannot see the MGB being used by engineers as "long term" temporary replacement bridges in civil emergencies (except when life is at stake), for special structure in large construction tasks, or even for LOC (line of communication) bridging in war. The special capabilities of the MGB are just not required in these situations, so why pay the extra costs? Also, MGB just hasn't got the flexibility of Bailey although, admittedly, the ingenuity of military engineers will undoubtedly change that in due course. Besides, both the British and U. S. Armies still have large stocks of Bailey, which has a long life, to use up.

ENGR: Does the MGB have any distinct advantages over the Bailey? If so, what are they? Also, could you point up any disadvantages?

HILL: Well, I've already mentioned some of these—the advantages are speed of assembly, and savings in manpower and logistics. The disadvantages are a comparative lack of flexibility (e.g. special uses, longer spans) and straightforward cost. However, the latter is not true in the tactical context when costs of vehicles manpower and logistics are included.

ENGR: The MGB was designed around new materials with weight reduction and minimal assembly time in mind. What is the weight differential between a 100-foot Class 60 MGB and a similar Bailey unit?

HILL: A 100-foot, Class 60 MGB weighs 19.7 tons, compared with over 60 tons for the comparable Bailey.

ENGR: Money is always a factor in introducing non-expendable items with a long-inventory life into the system. How does the expense of a unit of MGB compare to a unit of Bailey?

HILL: As I have already indicated, this comparison is difficult to make. You should really include costs of vehicles and ancillary equipment—and many other factors have to be considered. The MGB will probably be cheaper to maintain, but repairs may be more costly. How do you cost the manpower savings and time saved in a military context? I feel sure that the MGB can produce a cheaper answer to the problems for which it was designed, but in many cases the Bailey cannot even be compared. For example, there is no way to produce a 100-foot Class 60 bridge in one hour using Baileys, and this has been done on several occasions using MGB. However, it is interesting to note that one set of MGB, which will provide one 160-foot double story bridge capable of carrying a Class 16 load will cost between $200,000 and $250,000 as compared to $42,000 for one set of M2 Bailey which will produce one 130-foot double-double bridge capable of carrying a Class 18 load. The Bailey set needs 25 bridge vehicles or trailers, whereas the MGB set can be carried on 12 bridge vehicles or trailers.

ENGR: How long do you think it will take before the MGB is actually introduced into the in-

ventory of U. S. Army Engineer units? Will it be exactly the same as the British version?

HILL: If the bridge is accepted, which seems likely, I understand that the first sets would come into service in the next year or two. It is not yet known whether the bridge would be manufactured in the United Kingdom or the United States under license. However, even if made here, I would expect it to be substantially the same as the British version.

ENGR: Could you sum up the total effect the MGB will have on the bridging capabilities of our Army Corps of Engineers?

HILL: This will depend on how much is procured, and to whom it is distributed. I think the combat engineer will greatly appreciate his new ability to provide a 100-foot bridge rapidly wherever the combat arms want it. The combat arms are going to be impressed too!

ENGR: The MGB reportedly incorporates new materials and design to reduce weight and speed assembly. Can you identify such materials and explain the new design features?

HILL: The bridge is made of an aluminum-zinc-magnesium alloy, which was specially developed by the Military Vehicles and Engineering Establishment (MVEE) at Christ Church, England. These are the people who, under Sir Donald Bailey, developed the Bailey Bridge. The greatly improved strength of this metal alloy for its light weight, made possible the design of the fabricated boxes which form the girders of the bridge. The strength of these girders is achieved without the overall depth of the Bailey Bridge panel-type girder, and thus the MGB is a deck-type bridge rather than a through-girder type like the Bailey. Also the bridge is much stronger in twisting and does not require end-posts, base plates or grillages, because the ends of the girders can just rest on the ground. This greatly shortens assembly time, and also means the bridge can be built on sloping sites without time-consuming preparation of bank seats. The whole key to these time and labor-saving factors lies in the novel guidance system which enables pins to be inserted by hand and the avoidance of grillages and site preparation plus the ability to offload pallets quickly.

ENGR: We know that a cable-reinforcement kit has been produced for use with the Bailey Bridge, which reduces the assembly work supposedly by more than a third. Is a similar kit contemplated for the MGB?

HILL: Yes, but this is some way from being finalized. The MGB is probably not quite as well-suited for this modification as was the Bailey. MVEE(C) has developed a trestle-type pier for the MGB which will enable it to span longer gaps at a higher load-classification, and this is now entering service with the British Army. The cable-reinforcement kit which is being developed by MERDC (U. S. Army Mobility Equipment Research and Development Center) is really a means of lengthening the span-crossing capability of the MGB rather than ducing assembly work, and so fers an alternative to the tres piers.

ENGR: How long do you think the MGB will remain in our inventory before a suitable improved replacement is developed?

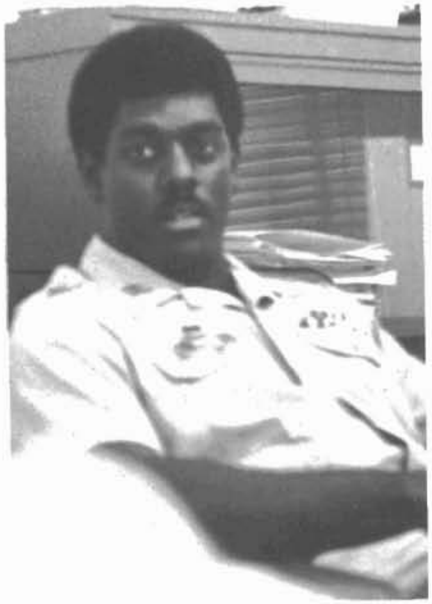
HILL: Developing bridges takes a long time. The experts on both sides of the Atlantic never stop working on new ideas, of course, but as far as I can see, the MGB will take us well into the eighties. There are ideas of longer AVLB's, but these are only on the drawing board, whereas the MGB exists now, and has been well and truly proven. The biggest hope for the future, as I see it, is the helicopter-emplaced bridge, and this depends on newer, bigger helicopters as much as on stronger, lighter bridges. There are ideas of pneumatic bridges and rigid foams, of course, but these are some way off. I think the M together with the MAB and Ribbon Bridge should see us through to the mid-1980's.

ENGR: Captain Hunter, it is our understanding that you were the assistant project officer for the Ribbon Bridge Service Test that was recently conducted in the State of Washington. What was the purpose of the test and what specifically was involved in your job?

HUNTER: Yes, that's correct. I was attached to the Ribbon Bridge Field Test Board that was sent to the State of Washington to conduct the Service Test. The test staff was from the US Army Armor and Engineer Board located at Fort Knox, Kentucky. The test was conducted to determine the feasibility of the Ribbon Bridge for military use. My specific job was to assist the Project Officer, Major (now Lieuten Colonel) Norman H. Morris in the execution of the Service T..., to evaluate the proposed methods of employment and to conduct river ing operations consistent with ent bridging doctrines as taught by the U. S. Army Engineer School here at Fort Belvoir. I was also responsible for gathering data in the field during the bridging missions.

ENGR: We've heard the name 'Ribbon Bridge' but this title doesn't really tell us what type of bridge it is or why the bridge was so named. Could you explain?

HUNTER: Surely. The Ribbon Bridge is a sectionalized floating bridge made principally of aluminum. Each module of the bridge can be rapidly connected to another to form a bridge or continuous 'ribbon' across a river. The bridge sections are of two types and are called bays. There is an inner bay and a ramp bay. Each bay is 22 feet long and consists of four sections called pontons. When the idge bays are unfolded, there wo to each side of the road- containing a four-foot walkway. The ramp bay differs in that it is tapered on one end (shore end) to provide a bridge approach on the river banks. The ramps are hydraulically operated by a hand pump for ramp articulation to accommodate various bank angles. Each bay is individually transported, launched, and retrieved on our standard 5-ton bridge trucks which have a modified chassis for handling the ribbon bridge. When the bay is launched, it automatically unfolds in the water and the pontons lock together in the unfolded position. Prior to retrieval, the controls are disengaged and as the bay is pulled out of the water, the pontons come together and automatically lock in the folded position as the bay is pulled onto the truck. When you see the bays connected to- er, forming a bridge across the , you see one solid strip that someone cleverly compared to



stretching a piece of ribbon across the river. Thus the name "ribbon bridge."

ENGR: We understand that the Ribbon is almost a carbon copy of the Soviet Union's ribbon-type bridge. Is this true?

HUNTER: Not entirely. The Russians have a similar bridge that operates in a similar manner. It's called the 'PMP' Bridge and from my limited knowledge of it, they've had it for sometime, maybe as far back as 1961. I can't say that I have much more information than that about that bridge.

ENGR: That's very interesting. Do you think your testing gave the Army sufficient information to decide whether or not it could use such a bridge?

HUNTER: Yes, I do. In fact, the Ribbon Bridge is now a "standard A" item and will soon be in the hands of our troop units. We conducted 100 bridge missions, crossing the bridge thousands of times with a mixed density of vehicles that would normally use this bridge in a tactical situation, and I'm convinced that it proved itself each time. During the test, we were able to observe the bridge used for rafting or bridging, in various stream velocities, day and night, and in various extremes of weather. It was easy to see the distinct advantages of this bridge over any of our present floating bridges in the system.

ENGR: Did you observe any significant problems with the Ribbon Bridge during the test?

HUNTER: There were some problems with the bridge and its carrier that were resolved during the test. Field models that will go to troop units will have these problem areas corrected. One problem was the hydraulic cylinders and the ramp pump. The articulation time on the ramp, to accommodate various bank angles, was too slow. In addition, the ramp angle was limited to the range of 13-15 degrees maximum when crossing the AVLB (Armored Vehicle Launch Bridge) because of the position of the outriggers on the carrier. The outriggers will puncture the deck if the angle of the ramp is any steeper. The ramp pumping system was improved to provide better ramp articulation. Another problem was the smooth roadway surface. The nonskid paint initially used was completely worn after a very small number of crossings and the roadway became a safety hazard in inclement weather. The roadway decking was changed to provide a more durable surface with better traction characteristics. A third problem area was the welded seams on the bridge bays which showed cracks after repeated use. This problem was the result of poor connection of the exterior membrane of the bridge bay as well as poor welding. Both problems were resolved through use of a better membrane connection procedure and positive welds with good quality control. Basically, this means a better way of connecting the membrane to the structural members and using a different type of weld. Other significant problems were associated with the modified portion of the transporter. First, the operator would have a tendency to bring the bridge bay in too close to the A-frame type boom on the rear of the bridge truck during retrieval. This often resulted in damage to patches (controls) on the bridge bay itself. This was corrected by increasing the length of the boom which was found to be too short, and providing a guide on the boom to properly position the bridge bay during retrieval. Finally, the rollers would freeze up during cold weather, or jam due to dirt being trapped in the roller housing; and the vertical tie-downs used to secure the folded bays to the transporter (bridge truck) during travel would loosen during travel. The roller housing was modified to prevent freezing the rollers; two sets of rollers were eliminated; and a better tie-down system was designed.

ENGR: Do you think the Ribbon Bridge is going to be a maintenance burden for field commanders?

HUNTER: Personally, no. There are so few functional components that I think it will be easier to maintain this bridge, and for a longer period of time, before parts have to be replaced.

ENGR: There are rumors that the Ribbon Bridge is expected to replace the M4T6 Floating Bridge. If this is the case, how does operating costs of the Ribbon compare to those of the M4T6?

HUNTER: I'm sure that the Ribbon Bridge will play a significant role in our future river crossing operations. Whether it replaces M4T6 in part, or completely, will have to be decided at the DA (Department of Army) level. Since our test involved the prototype, I can't give a cost comparison to you.

ENGR: Will the Ribbon ever be used in tactical situations in place of the Mobile Assault Bridge?

HUNTER: No doubt it can be, but this will depend on several conditions in any one tactical situation. These variables might include

availability of either bridge, density of vehicles crossing the river, and duration of time that the bridge will be required, just to mention a few.

ENGR: Can you give us a "ballpark" estimate as to how soon and in what numbers the Ribbon Bridge will show up in the Army's inventory?

HUNTER: I would probably expect to see the Ribbon Bridge in the field by 1975, but I couldn't say in what numbers.

ENGR: What impact on training requirements of personnel will the Ribbon Bridge have—compared to that of employing M4T6?

HUNTER: I tend to feel that the simplicity involved with employing the Ribbon Bridge will make it possible to train personnel at the unit level and relieve service schools to a great degree. This means that a good OJT (on-the-job-training) program at the unit level is important for effective training. The rapid emplacement capability will also give the unit commander more opportunities to improve the unit's training exercises as a whole.

ENGR: How did the troops who tested the Ribbon Bridge respond to it?

HUNTER: We had quite a mixture of opinions on the Ribbon Bridge because of some peculiarities that existed on this particular test. The bridge test was conducted using members of the 18th Engineer Company (Panel Bridge), which is a separate company attached to the 864th Engineer Battalion (Construction) located at Fort Lewis, Washington. The company was augmented with sufficient personnel to perform a float bridge company mission. Although many of the men recognized the simplicity of employing the Ribbon, I felt that the noncommissioned officers who had been in several type bridge units, as well as the enlisted personnel who had previously worked with the M4T6, recognized the tremendous difference of working with the Ribbon Bridge. One of the most memorable pair of comments that I heard during testing was from one NCO who had just come to the unit from an M4T6 Company and, after observing a bridging operation, turned to me and said, "Is that all there is Sir?"—and one enlisted man had just finished AIT (advanced individual training) at Fort Leonard Wood said, "Sir, this sure beats 'humping' that balk with the M4T6!!"

ENGR: Do you think the Army needs both the Mobile Assault Bridge and the Ribbon Bridge?

HUNTER: Yes, I do. Both bridges have distinct characteristics and capabilities that could easily dictate which bridge should be used in a given tactical situation, but the other important point is that we're giving our bridge units the flexibility and high degree of mobility that they're going to need to support our ground combat forces in river crossing operations in the future.

ENGR: What significant differences did you note in the characteristics and capabilities of the Ribbon Bridge and our standard M4T6?

HUNTER: The most significant difference between Ribbon and M4T6

is the number of components each requires to assemble a bridge of the same length. I would tend to say [illegible] a reasonable proportion of parts [illegible] 10 to one: M4T6 to Ribbon. In terms of construction time, I'd say that the Ribbon has an assembly rate at least five times faster than that of M4T6, with bay replacement just as fast. Some other notable observations were: The easy passage of debris under the Ribbon contrasted to it hanging up between the pneumatic floats of M4T6; a greater load-carrying capacity in higher currents without additional reinforcements; permanent or short term anchorage can be used; and, finally, the Ribbon lends itself to a greater degree of flexibility in bridge construction as well as rafting.

ENGR: The Ribbon represents an interesting and practical departure from the M4T6. Were the Russians the original designers of this bridge?

HUNTER: Yes, I believe that they were the first to develop this concept of bridging.

ENGR: Do any other countries other than Russia and the United States have a Ribbon-type bridge in their inventory as standard equipment?

HUNTER: Not to my knowledge. However, several of our allies have displayed some interest in the Ribbon Bridge.

ENGR: Do you think the Ribbon Bridge is worth the money and effort that it will take to get it into production and in our standard inventory?

HUNTER: Yes, very much so. I firmly believe that the introduction of the Ribbon Bridge will enhance troop training, increase our mobility in future river crossing operations, and provide much more flexibility in bridging.

ENGR: The Ribbon Bridge is to be one of our tactical bridges. Aren't there too many components for it to be practical in a combat situation?

HUNTER: Negative. As I stated earlier, there's a tremendous reduction of components on the Ribbon Bridge which actually increases the Ribbon's desireability for useage in combat situations; especially where time is a vital factor in conducting a successful operation.

ENGR: Could you give us a brief summation of what this new bridge will mean to the U.S. Army and the Corps of Engineers?

HUNTER: Yes. I think that the Ribbon Bridge will become a very important item of equipment in the Army's inventory. It will add that element of speed to our tactical operations that can be a very influencing factor in modern warfare. Further, it will assist the Army in being able to highly mobilize its combat forces. As to the Corps, bridge units will develop a new image by becoming "self-sustaining." They will have that added dimension to their mission; that is, employ the bridge that they transport, maintain and provide technical assistance for its use. Training will become more professional without requiring excessively long field exercises; thus, becoming more meaningful. The Ribbon Bridge will, undoubtedly, offer all Engineer Officers that employ it quite a challenge. It's an excellent bridge and it has possibilities for employment in future river crossing operations that will only be limited by the bridge commander's imagination.

CETEX 72: An

Engineer troops from four North Atlantic Treaty Organization (NATO) member nations have a better understanding of the capabilities of each other's combat bridges and rafts these days.

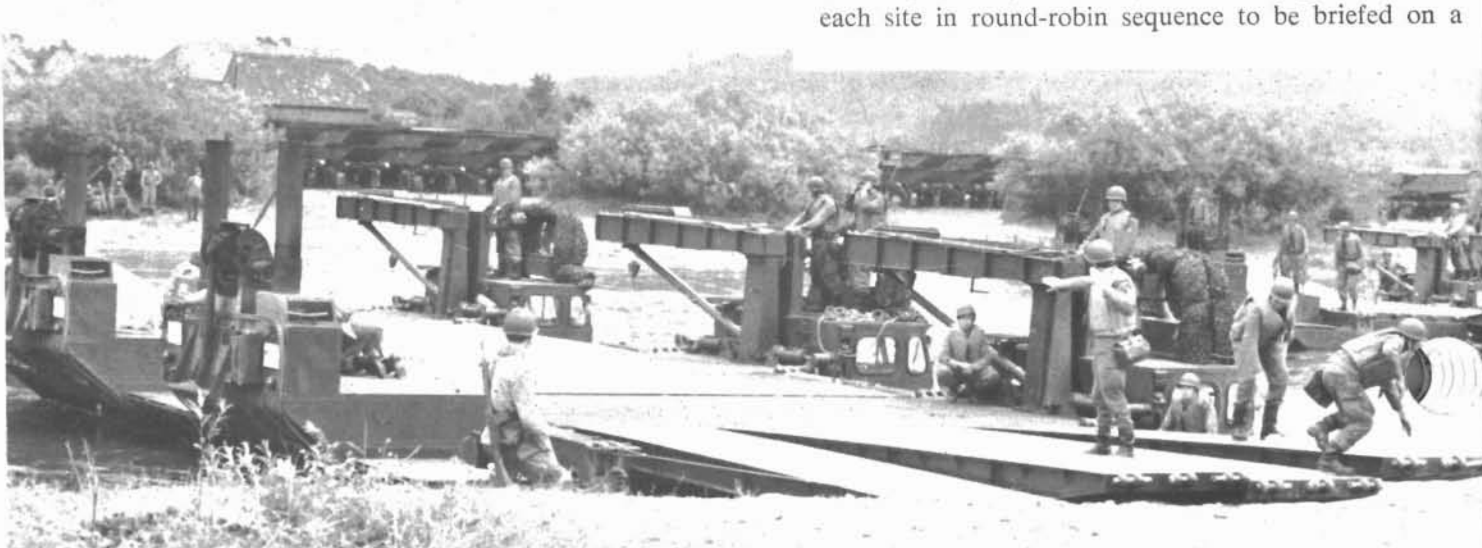
It all happened earlier this year when engineer soldiers from Germany, France, Canada, and the United States participated in a week-long exercise called CETEX 72. Hosted by the 7th Engineer Brigade (Combat) of the VII U. S. Army Corps, headquartered in Kornwestheim, Germany, the scenario required the troops to get a feet-in-the-mud, hands-on-equipment look at each other's combat bridges and equipment.

It was easier for the soldiers to understand their respective roles in the exercise than why the operation was named CETEX 72. But it was not all that difficult. CETEX 72 is an acronym with another acronym inside it. CETEX stands for CENTAG Engineer Training Exercise and CENTAG stands for NATO's Central Army Group. The 72, of course, stands for the year the event took place.

The reason for the exercise, according to 7th Br[illegible] planners, was to get the NATO engineer troops toge[illegible] for a "feel" of the overall bridging picture in Europe. They selected the Main River below Schweinfurt, Germany as the site for the exercise.

Engineer troops from Germany, France, and the U. S. set up their equipment at eight different sites along the Main to teach each other how to erect their particular bridge or raft.

The two U. S. sites were manned by instructors from the 563rd and 565th Engineer Battalions. The other six sites were manned by the German and French engineers. Then, in the days that followed, contingents of German, French, Canadian, and U. S. engineers visited each site in round-robin sequence to be briefed on a



Exercise In Bridging Understanding

particular bridge or raft.

The 2nd German Corps engineers instructed on how to erect their Medium Girder Festbruecke. And the 3rd German Corps and the German Territorial Southern Command taught how to erect the Hohlplatte and Hohlplatte raft. France's 2nd Corps engineers gave instruction on the intricacies of the Class 60 Bridge.

Members of the 38th Bridge Company of the 563rd instructed in the use of the Bailey Bridge and troops of the 502nd Engineer Company of the 565th taught how to erect the M4T6 Float Bridge. Some of the M4T6 instruction also centered on the Class 60 load.

Highlight of the exercise was the show put on by the assault bridge companies of the NATO-member nations from France, Germany, and the U. S.

The mission of each company was to put a bridge across the Main as rapidly as possible. They put up their bridges in a hurry. First, the French mobile Gillois Bridge vehicles churned into the water and produced a bridge in slightly less than 30 minutes. The Gillois relies on preparatory lateral ponton inflation for buoyancy. Next came the Germans with their mobile M2 Bridge. It took them slightly more than 30 minutes to get their bridge in place. Like the Hohlplatte, the M2 uses its aluminum construction around a hollow deck for buoyance and requires no extensive preparation before entering the water.

The U. S. was represented by Echo Company, 10th Engineer Battalion, 3rd Infantry Division. And Echo did a job. Its members put their bridge together in about 13 minutes—less than half the time it took the French and German companies to put up their bridges. One expert said that the key to the U. S. victory was simply disciplined tight control and quick reaction—engineer bridging musts.

STOP-16

Because STOP 16, our "letters to the editor" department is new this issue, many of the comments reflect views about articles in our earliest issues. The editors encourage timely, spirited response and constructive criticism about **the engineer** *and its contents.*

BLEAH BLEAH BLACKBIRD

Sir/I am working as a Legal Aide with the Corps of Engineers this Summer, which is why I happened to come across the Summer issue of your magazine. I was, to say the least, dismayed by your article "Bye Bye Blackbirds." I have never seen a more blatant example of the application to an ecological problem of that mentality which cannot conceive of any interference with man's efforts to denude the landscape. To set forth as a tremendous accomplishment the following result quoted from your article is maddening, and extremely sad and pitiable:

> "Only charred stumps and a few larger trees remained in their once highly-wooded home."

It is my fervent hope that the 952nd Engineer Company will fade from the memory of man before the trees they destroyed do.

ROY R. ROBERTSON, JR
WILMINGTON, NORTH CAROLINA

THE BLACK HAT

Sir/Having been a tactical officer and later a Company Commander in the Officer Candidate Regiment at Fort Belvoir, I feel qualified to reflect on some of the comments in an article entitled "Grossing Out Delta Company" by Specialist 5 Hugh M. Gildea. There is another side to the coin.

As the author stated, the Engineer Officer Candidate School was implemented to provide officers for the expanding Army and the increasing needs in Vietnam. Based upon my experience as both a combat engineer and infantry company commander, I can say that the prevailing condition in Vietnam did exert a tremendous degree of both physical and psychological pressure on an officer and that the OCS program was designed to duplicate these pressures as much as possible.

The vices or "plagues" that SP5 Gildea described were real; however, not as concentrated as one might expect after reading his article. The author asks why there was no guidance given to the candidates so they could cope with these problems. The answer is found by examining the OCS program. It was designed to develop maturity and self-reliance which helped the young officers deal with the problems mentioned. The program was geared to the standards and needs of the Army of the late 60's, not the VOLAR Army of the future. The day-to-day activities contained a great deal of harassment, but how else could a young second lieutenant learn to function in the daily situations that would confront him in the real world?

I can't believe that SP5 Gildea would have voluntarily commenced mental training for Vietnam in lieu of waiting in the "tac shack" or shining his brass. Shined brass, boots, etc., instill a high degree of standards and self-respect in the potential officer.

Not only Sp5 Gildea but almost every candidate found fault with his OCS training. For example, the candidates considered the coveted three day pass a poor stimulus for achievement. The EOC cadre, however, had the responsibility to develop and maintain the highest degree of proficiency and standards in the candidates to insure graduation of qualified second lieutenants.

In summary, I think the author's comments were made based upon his frustration in failure. I cannot begrudge him, for at least he tried. But what is needed now is a look toward the future for improvement and innovation, not an attitude of stacking arms.

CPT JOHN L. NEWELL
UNIVERSITY OF PUERTO RICO

Response to Sp5 Gildea's article has been overwhelming and, for the most part consistent with the "establishment" point of view promoted by CPT Newell. The editors wonder if this is an accurate reflection of prevailing opinion among those exposed to Engineer OCS.

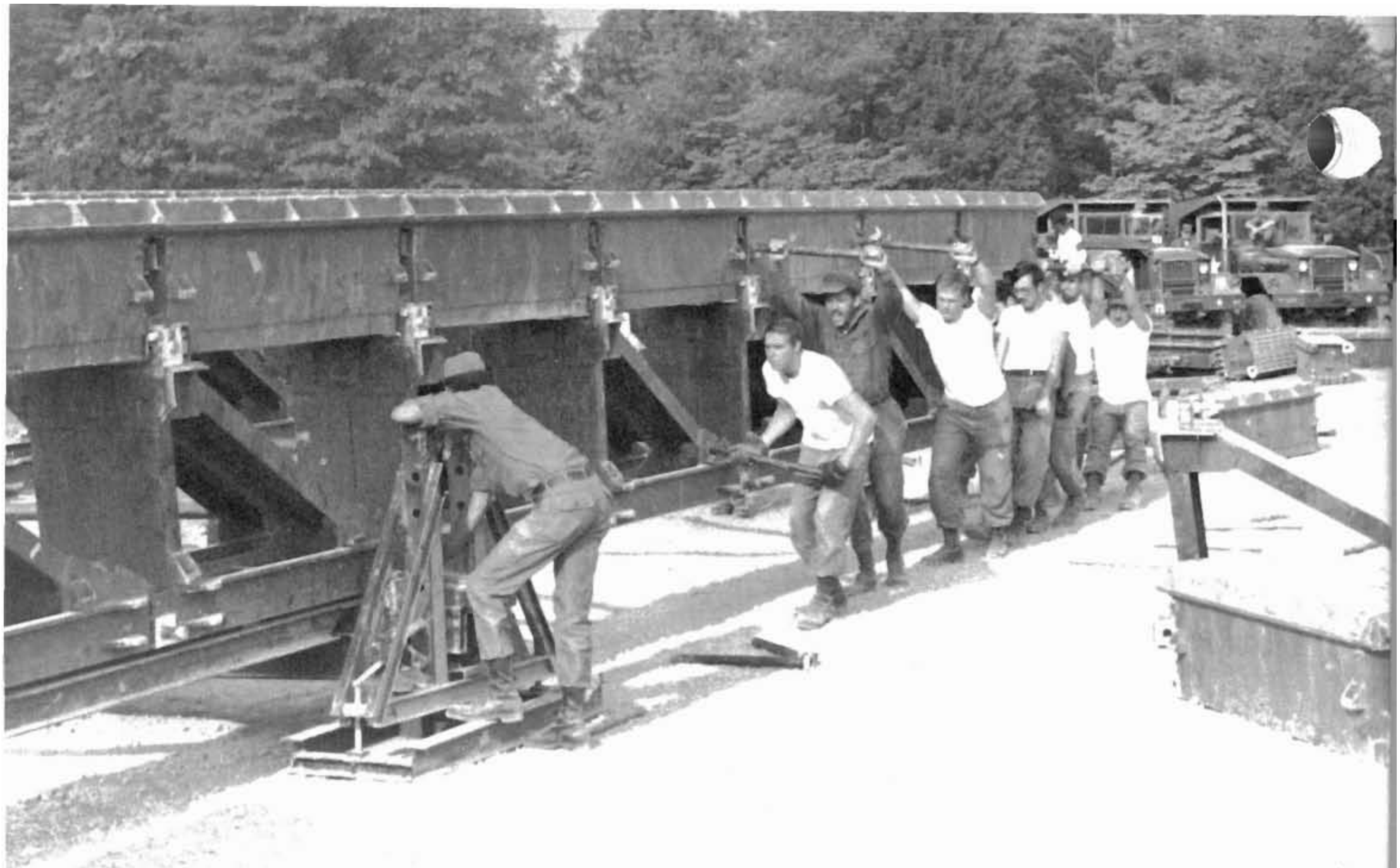
A SUB FOR THE BAILEY

Major Ralph B. Hill

Sir Donald Bailey designed his famous bridge, the Bailey, in 1936. It is still around—and during those 36 years it has been in operation, the Bailey has been used all over the world by allied Armies in all sorts of situations. This must make the Bailey one of the most versatile pieces of engineer equipment ever designed. Evidence of the bridge's usefulness can be seen from Singapore to Saigon via Sicily—all places where for want of a bridge a battle could have been lost.

The U. S. Army still has large stocks of Bailey bridging and these will continue to be used in peacetime or in combat for many years to come. Nevertheless, indispensable though it may be as a standby bridge, the Bailey is too demanding of time, manpower, and logistics efforts to provide the solution to the tactical bridging requirement in the combat zone. While the Mobile Assault Bridge and the Ribbon Bridge are answers to part of the tactical bridging requirement, because they provide two flexible and rapid ways of crossing water gaps with floating equipment, there remains a need for an equally efficient means of crossing gaps where floating equipment cannot be used.

The 100-foot gap is crucial for the military. At least [illegible] percent of all the gaps combat units encounter are 100 feet wide or less. In Western Europe the percentage is much higher—nearly 90 percent.



The photos on these two pages point up the versatility of the new MGB. In the picture above, soldiers boom the bridge forward on the construction rollers. In photo at left, soldiers add top panel to the double story bridge. Below, a soldier guides an M-60 tank across a completed double story bridge. In the photo at the top of page 15, the landing roller is in place to receive the launching nose. The photo (lower right) shows the launching nose being removed after the bridge was pushed across the gap by an M-60 tank.

It was to meet this requirement that the Military Vehicles and Engineering Establishment (MVEE), Christ Church, England, set to work and came up with the Medium Girder Bridge (MGB) for the British Army. In fact, the Royal Engineers have been using the MGB for the past 18 months. Their combat engineer units have been delighted with the ease with which the bridge copes with difficult sites—the ability to almost literally throw it across a gap in periods of time that formerly were an impossibility.

Now the U. S. Army has taken a major interest in the MGB and has been running tests on two sets. The U. S. Army Armor and Engineer Board at Fort Knox, Kentucky, has just completed a "military potential" test of one set. The U. S. Army Mobility and Equipment Research and Development Center at Fort Belvoir, Virginia, is still testing the other set. Although there are no test results yet, it is expected that the U. S. Army will soon begin procuring the bridge as a replacement for the Bailey.

The key to the success of the MGB is the use of specially developed aluminum alloys which are far lighter and much stronger than materials previously used in bridging equipment. Such an alloy will allow for the use of totally different design concepts. This will result in a bridge which is simpler and lighter with fewer components.

The refined design of the MGB will enable 24 men to install a 100-foot bridge capable of carrying a Class 60 load in less than an hour. A 30-foot MGB of the same load capacity can be built by eight men in less than 20 minutes.

A two-girder, deck-type bridge, the MGB can be built either in single or double story configuration. The single story bridge has only six components while the double story, which has deeper girders, consists of eleven.

The MGB has special pallets that were designed to permit rapid offloading of parts from their transport. These pallets enable the components to withstand any shock and strain that could be absorbed during the handling process from storage to destination. No cranes are needed in the handling of these components.

It is interesting to note that all MGBs are launched undecked with a simple, easily assembled single-girder launching nose, over roller beams that are supported on uncomplicated building frames. This is important because the bases can be individually adjusted for height to allow for irregular ground. Then, too, this feature, combined with the lack of bridge grillages and base plates, makes site preparation almost always unnecessary and saves a lot of time and effort.

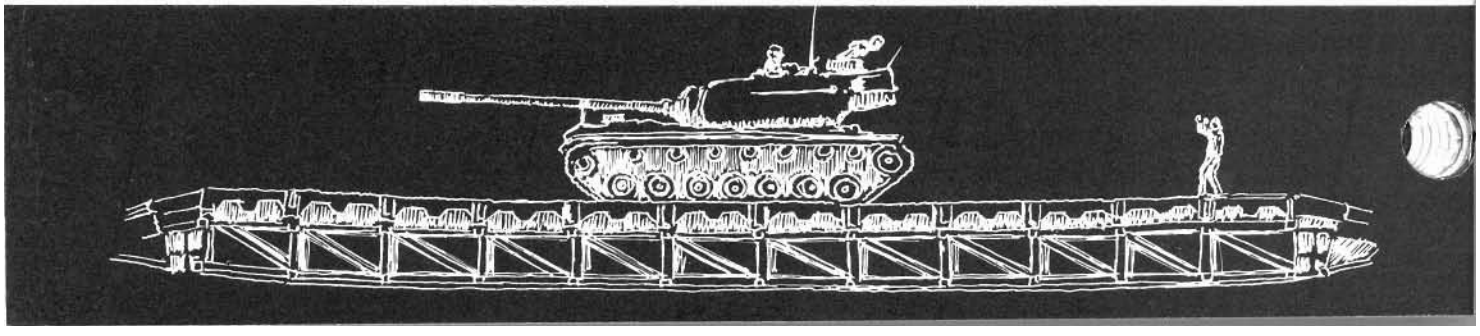
MGB designers have now developed a trestle-type pier that is similar in concept to the one used for the U. S. Army's M4T6 fixed span bridge.

The MVEE at Christ Church enjoys good relationship and close harmony with MERDC at Fort Belvoir. MERDC, for example, is designing a cable reinforcement kit for the MGB that is quite similar to the one it recently developed for the Bailey Bridge. Experts say it is likely that the U. S. Army eventually will add one or both of these devices to its bridging equipment inventory. This, of course, would enable U. S. military engineer units to use the MGB in making gap crossings of more than 100 feet wide for class 60 loads.

MVEE has made considerable progress since it succeeded the British Research and Development establishment which actually developed and produced the Bailey Bridge under the leadership of Sir Donald Bailey.

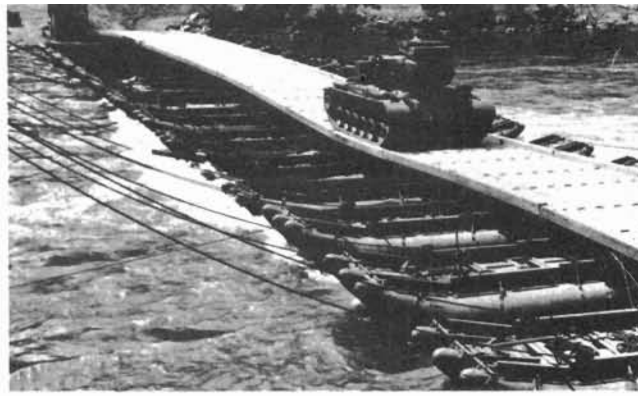
It is understood that the U. S. Army will probably accept the MGB as a standard engineer bridging item sometime this fall. Following acceptance, the MGB will begin to replace the Bailey in U. S. engineer tactical units as early as Fiscal Year 1974. This event will mark the beginning of the end of an era during which the Bailey Bridge probably has served the U. S. and many other armies better than any other bridge in history. May the MGB prove to be a worthy successor.

Major Ralph B. Hill, Royal Engineers, is the British Exchange Officer with the U. S. Army Engineer School at Fort Belvoir, Virginia. The major, who has been stationed at the school since March, 1971, is Chief of The Field Engineering and Bridging Division in the Department of Applied Engineering. Commissioned into the Royal Engineers from the Royal Military Academy at Sandhurst in 1953, he holds a Master of Arts degree in Mechanical Engineering from the University of Cambridge and is a graduate of the British Army Staff College at Camberley. After serving in units as a troop commander and second in command on several occasions, Major Hill commanded a Field Squadron in Germany during his last tour of duty. He also has served as a staff officer on the Royal Engineer Combat Development Staff.



THE M4T6 GOES UNDER

Captain David E. Peixotto



How far back does your memory take you? Can you remember World War II, the Korean War, or the war in Vietnam? If you do remember any of these wars, you must remember the Rhine River in Germany, the Imjin River in Korea, or the Mekong River in Vietnam. What these rivers all have in common is that, at one time, each was bridged by U. S. Army engineers using the M4T6 Floating Bridge. Fix that memory in your mind. You may never again see the long, graceful line of black pontons connecting two green shores lined with scores of our exhausted engineers.

The M4T6 Float Bridge reminds one of the old soldier who never dies but merely fades away. In this case, the antiquated M4T6 Float Bridge is not sinking rapidly but it is slowly going under. An improved version of the float concept soon will replace the M4T6 Float Bridge in the inventory of the Army engineer bridge units. This "Improved Float Bridge" is more commonly called the Ribbon Bridge (see "This Ribbon Floats" beginning on page 21). A comparison of the physical characteristics, capabilities, and required assembly efforts of the two float bridges will demonstrate the understatement in the use of the word "improved" in labeling the Ribbon Bridge.

Both the M4T6 and the Ribbon are float bridges but there the similarity ends. Each set of the M4T6 has 688 separate parts that must be hand-assembled to give it an effectitve length of 141 feet. The Ribbon Bridge, on the other hand, has 12 parts per set which gives it an effective length of 290 feet. It takes nine modified five-ton trucks to carry the M4T6 while the Ribbon Bridge is transported on 12.

The capabilities of the two float bridges vary as much as the physical characteristics—

- The M4T6 can cross Class 45 tracked vehicles in a current velocity of eight feet per second.
- The Ribbon can cross Class 60 tracked vehicles in a current velocity of eight feet per second. This is the heaviest load that can be found in a combat division.
- The M4T6 can cross Class 61 tracked vehicles in still water.
- The Ribbon can cross Class 80 tracked vehicles in still water.
- The M4T6 must have an external anchorage system to keep it from being swept away by the river current.
- The Ribbon Bridge may be held in place solely by bridge boats in currents up to eight feet per second while crossing a Class 60 vehicle.
- The M4T6 can carry tracked vehicle Class 45 loads when it is assembled as a raft in the normal five-float configuration with a river current of 10 feet per second.
- The Ribbon can carry tracked vehicle Class 60 loads when it is assembled as a raft in the normal five-float configuration with a river current of 10 feet per second.

Perhaps the most startling comparison of the two float-type bridges is in the time it takes to assemble them and in the effort that is required to get the job done. Try using a bridge length of 300 feet as a comparative vehicle. This is the approximate length of two sets of M4T6 Floating Bridge or one set of the Ribbon Bridge. It would take the services of two combat engineer companies (384 men) plus three float bridge platoons (60 men) four hours to assemble the bridge. The Ribbon Bridge can be assembled in less than an hour by one float bridge company (60 men).

When the Ribbon Bridge finally reaches the production stage and gets in the hands of the user, there will be a great savings in time and manpower. The M4T6 has done its job but changing requirements in an era that stresses greater mobility in future warfare dictates that a change is in order. The new bridge, the Ribbon, will exhibit superior physical characteristics, load bearing capabilities, and required assembly efforts.

The M4T6 Floating Bridge may be going under but it still will be etched in the memories of the engineers who assembled it and relied on it for countless successful river crossing operations long after the Ribbon Bridge becomes just another household word in the vocabulary of the float bridge companies throughout the Corps.

Captain David E. Peixotto is attending the Engineer Officer Advanced Course at Fort Belvoir, Virginia. A 1967 graduate of the United States Military Academy at West Point, he has served a tour of duty as company commander of an Engineer unit in Vietnam.

AN ASSESSMENT OF OUR BRIDGING FUTURE

ENGINEER STAFF

Military bridging has been a low-priority item in the research and development scheme of the U.S. Army for many years now, taking a backseat to smarter bullets, main battle tanks and the like. The portion of the research dollar remaining after assaults by sophisticated weapons systems is hardly enough to cover the olive drab paint used to camouflage the British and Soviet contributions to our inventory of life-sized erector sets.

The U. S. Army, because of these research and development priorities, has adapted and adopted Sir Donald's Bailey and Medium Girder and Ivan's own Ribbon Bridges, the latter "reverse engineered" from an item in the Soviet inventory. This is not to say, however, that these bridges do not just happen to be the most sophisticated and thoroughly proven types available, or that the U. S. Army Combat Developments Command Engineer Agency (USACDCEA) has a better idea waiting in the wings.

But have we got ideas—ideas like the one below, detailed by the Engineer School's Office of Doctrine and Training Development at Fort Belvoir, Virginia, in a letter to CDCEA. Let's follow that idea from its inception through its first series of hurdles.

"The purpose of this letter is to propose that your agency initiate action that will produce a new family of tactical bridging timed with the introduction of the Heavy Lift Helicopter.

It is suggested that this family supplement and eventually replace the Ribbon Bridge and Medium Girder Bridge, and that it should have the following characteristics:

- Designed primarily for transport, emplacement and removal by the Heavy Lift Helicopter.

• Desirably capable of transport, emplacement and [re]moval by the CH54 Skycrane.

• Capable of transport by rail, sea, air and highway, in disassembled configuration.

• Capable of erection and removal by crane, when helicopters are not available.

• Capable of carrying future main battle tanks over dry spans up to fifty meters and in floating configurations of various lengths.

• Have a maximum of parts interchangeable between floating and fixed-span versions.

"It is suggested that bridge components be stocked only in bridge parks at Army or Corps supply points as Class IV items, and not be organic equipment or individual units. Bridges could then be pre-assembled in several configurations based on stream and gap characteristics in the area of operation and into loads close to the 224 ton capacity of the proposed HLH.

When a bridge is needed, an emplacement crew can be flown in by helicopter, with equipment for site preparation and bridge erection boats as required. A small assembly crew at the bridge park would prepare the bridge for helicopter lift to the site.

"Advantages are foreseen as:

• Greatly reduced reaction time.

• Avoidance of traffic and ambush problems enroute [to] site.

• Elimination of dedicated wheeled transport, and associated needs for drivers, fuel and maintenance support.

• Ability to pre-assemble bridges for specific sites when offensive operations are planned, enhancing the element of surprise.

• Peacetime disaster-relief capability that no civil authority could provide.

Disadvantages would include:

• Dependence upon helicopter support, undoubtedly critical in operational areas.

• Vulnerability of helicopters to enemy fire enroute.

"The advantages seem to outweigh the disadvantages. This future family of bridging is feasible and development should begin without delay. Such a concept should be fully considered so that future engineers will have for once, equipment that is not a generation behind the times."

The Engineer Agency response was prepared with a characteristic thoroughness:

"A new family of tactical bridging timed with the introduction of the Heavy Lift Helicopter is a concept which, as proposed, has several salient features which [w]ill be evaluated and studied. These are being examined [no]w in three on-going studies.

"The Engineer Agency is currently involved in several bridging studies. These studies will address and consider many aspects, to include those which are proposed in the HLH-oriented family concept. The results of these studies should lead to a family of bridging and doctrine to provide future engineers the best possible methods of accomplishing their bridging mission.

"At the present time there is a possible requirement for a tactical bridge capable of being emplaced and returned by helicopter. It is highly speculative that this requirement necessitates development of an entire family of such dedicated bridges.

"All means which allow for rapid employment of tactical bridging should be investigated; however, dedication of an entire family of bridging, geared to the Heavy Lift Helicopter appears too restrictive and would surely meet with the official disapproval of Combat Developments Command and Department of the Army.

"The matter of economics plays the heavy role in this picture because bridging by definition is a non-expendable item with a long inventory life. And the Army is committed in that sense to the Medium Girder and Ribbon Bridges which will remain in the inventory into the '80's and beyond.

"Development of the Heavy Lift Helicopter, although its capabilities are considerable and exciting, will produce an item whose availability to the engineer is inversely proportional to its cost, its maintenance requirements and the number of its other basic logistics missions. This availability factor, because the HLH is the key constant in the proposal, must be carefully considered. An alternative and more practical solution might be a more versatile bridge designed for transport and erection by tracked, wheeled and aerial platforms.

"Recent bridge emplacement tests as part of the joint helicopter trials being conducted in England have confirmed that while short bridges could generally be emplaced speedily and accurately by helicopter, emplacement by night was not predictable. In addition, the external bridge load significantly affects the performance of the aircraft.

The trials also disclosed that fins attached to the bridges will be necessary to reduce the mean areodynamic load when the aircraft is in forward flight. A considerable amount of money and research effort is required to solve these problems.

"The way the total bridge picture looks right now, it is apparent that there is a need for three basic types of bridges for 1980 and beyond. The first is an armored vehicular launched bridge type to maintain momentum in the attack. In addition, a tactical bridge for both wet and dry spans is needed beyond the capabilities of the AVLB. Currently, this is handled by both the Mobile Assault Bridge and the Ribbon Bridge for the wet gap requiring floating equipage, and by the Bailey and the Medium Girder where span length permits over wet and dry gaps. The third type is the Line of Communication (LOC) type of semi-permanent bridging.

"Although some of the bridges in or about to be added to the Army inventory are certainly innovative and adequate, there are concepts being developed presently that merit serious consideration. For example, the German "ASB" concept has attractive possibilities and, if successfully developed, could combine the needs of the AVLB, the MAB and the Ribbon Bridge into one concept that is cheaper, quicker to erect and less costly in manpower resources. It would permit a bridge unit to haul, maintain, erect and disassemble without assistance or augmentation.

"Bridging operations cannot be viewed in isolation or as a specialized operation. They should become routine maneuvers for all the combat arms and should be examined in the context of the overall land combat system. In that sense, although airmobility is an essential factor, bridging must be oriented around ground transport and emplacement.

"A tactical bridge such as the M6B for short, dry gap application, while a significant improvement over the M2 Bailey, still falls short of all that is desired. It is hand erectable, but it is expensive. It is fine for short gaps but will have to rely on the cable reinforcing kit for gaps approaching 160 feet that cannot be abbreviated by a pier and a multiple span. Additionally, it does not appear to be helicopter transportable in any meaningful lengths.

"Our doctrine will have to be re-examined. While we now classify bridging as either assault, tactical or LOC, it is hoped that there will be a consolidation down to two types—perhaps just tactical and support. The tactical might include the AVLB, the MAB and the Ribbon Bridge for floating equipage requirements and the Bailey and MGB for limited wet and dry spans. There seems to be no good reason why an improved M6B type of bridge couldn't also fill the support or LOC requirement if procurement and erection costs do not prove prohibitive.

The ideas and potential variations on the proposed concepts are endless and exciting—and endorsed by the British counter-part of CDCEA, the Military Vehicles and Engineering Establishment at Christ Church, England.

The Britishers in response to the Heavy Lift Helicopter family proposal, say:

"The relationship of helicopter emplacement of bridges to the conventional methods of bridging is much the same as that of swimming armored vehicles to the Sappers bridges and ferries; that is to say, there is a very definite role for both of them but both the helicopter emplaced bridge and the swimming armored vehicle are essentially opportunity weapons, whereas the conventional bridging in both cases is the normal method of crossing.

"The rationale for this statement is three-fold. First, it is very hard to believe that there will ever be enough large capacity helicopters, even in the USA, to cover all the bridging requirements. Second, we believe there will always be some sites which will defeat helicopter emplacement of bridges. Third, it is doubtful if we will ever, and certainly not for a very long time, be able to undertake the work under all weather conditions by day and by night.

"On the other side of the coin, the capability of helicopter emplacement of bridges is a most valuable additional method of getting the bridges there very fast, and we should study all its implications. Therefore, all aspects of the basic concept except the suggestion that this family of bridges should be for helicopter emplacement exclusively, have merit.

"The United Kingdom has been doing quite a lot of work recently to study scientifically the problem of flying these bridges.

It has already been determined that very worthwhile lengths of our new bridging equipment can be carried with existing helicopters. There are, sadly, no current plans for a future United Kingdom Medium Lift Helicopter.

"It is important that current and future bridges incorporate any necessary features to enable them to be helicopter emplaced and that the necessary procedures and air clearances are established. Another most important requirement is that the technique is studied tactically as well as technically.

"A specifically designed bridge would have to be lighter in weight (possibly at considerable cost) and would also probably be constructed in larger sections. It would undoubtedly be interesting to have a comprehensive study to establish the parameters which would govern such a bridge and then to compare these in detail with more conventional designs. It is fairly certain that, in fact, a compromise which will not sacrifice very much in either the conventional or helicopter-carried role can be achieved." e

We encourage the exchange of ideas as illustrated above. It is this sort of stimulation that our R&D people need to develop and refine doctrine and attractive concepts hidden in the field. With new emphasis on bridging in the R&D budget, ideas introduced into an open forum such as **"the engineer"** *may soon give our own bridge experts the wherewithall to thrust us into the developmental limelight.*

So eat your heart out, Donald Bailey. We're on the way!

THIS "RIBBON" FLOATS

Lieutenant Colonel Clifford C. Lussier, Jr.

The U.S. Army has long needed an improved floating bridge system that would increase its capability to rapidly cross non-fordable wet gaps.

It is a well-known fact that the current military float bridge equipment in the engineer inventory, with the exception of the Mobile Assault Bridge/Ferry (MAB), does not provide the speed of assembly that is a "must" requirement to enhance the mobility of today's rapidly moving ground forces.

To alleviate this problem, the Army has developed a bridge that can be emplaced at least five times faster and with fewer personnel than our present float bridge equipment. The bridge that can do all these things—the Ribbon Bridge—has come through the pre-production tests with flying colors. So, with the testing out of the way, the Army's newest military floating bridge is almost in the hands of the engineers.

The service test, last of the pre-production series, was completed early this year. This test, which was conducted under the direction of the U. S. Army Armor and Engineer Board from Fort Knox, Kentucky, was carried out over a period of some five and one-half months in Washington State. The fast water portion of the testing was conducted on the Skagit River in the vicinity of Lyman, Washington, some 125 miles north of Seattle. There the stream velocities were recorded at more than eight feet per second. The still-water portion, to test the bridge's ruggedness and durability was carried out on Lake Sequalitchew at Fort Lewis, Washington. Many agencies conducted engineering tests before the service test to establish the structural adequacy of the equipment and the feasibility of the ribbon bridge concept.

In the case of the Ribbon Bridge, the service test was conducted by the Armor and Engineer Board and the support was provided by the 18th Engineer Company (Panel Bridge) of the 864th Engineer Battalion (Construction) at Fort Lewis. To enable the unit to test all characteristics of the Ribbon Bridge, the 18th Engineer Company was augmented with power boat operators, vehicle repairman, engineer equipment repairmen, and medical personnel. The 3rd Armored Cavalry Regiment of Fort Lewis provided the tracked vehicles and personnel that were needed to perform the required trafficking on the assembled bridge.

The service-type test, of course, helps the Army determine whether a new piece of equipment is "suitable" prior to being type classified as standard. In addition, this test is conducted to determine the degree that the system and its complete maintenance package meet the characteristics described in the appropriate requirements document. Scientific methodology is employed, and, insofar as possible, a realistic tactical environment is maintained through the use of military personnel representative of those who will operate and maintain the equipment in the field.

Since the fast water portion of the test was conducted on the Skagit River, complete field facilities were established at the site. Maintenance facilities up to and including direct support, and billeting and messing arrangements for more than 150 personnel were set up on Army-leased land.

Test operations on the Skagit began more than a year ago to obtain the data that was required to determine the reliability, durability, and functional suitability of the Ribbon Bridge system. During these tests, the Ribbon Bridge system was emplaced through 100 erection and disassembly cycles and subjected to a total of 29,077 vehicular crossings. Included in the latter total were 5,963 Class 60 crossings.

The Ribbon Bridge performed exceptionally well under all test conditions. Some of the more important test results included—

- Swift bridge erection—Engineers achieved a construction rate of 550 feet per hour in a stream velocity of 6.2 feet per second.
- Reduced manpower—It took only 53 engineers 39 minutes to erect 357 feet of bridge, including anchorage.
- Conventional anchorage unnecessary—Only transporters and bridge erection boats were used to anchor 357 feet of bridge in a stream velocity of 8.0 feet per-second when crossing Class 60 vehicles.
- Rafting capability—Engineers were able to raft with Class 60 loads in stream velocities up to 6.4 feet per second.
- Air transportable—Ramp and interior bays were successfully transported, launched, and retrieved by a CH-47B helicopter.

The Ribbon Bridge is a Class 60 tactical floating bridge system consisting of three major elements—interior bays, ramp bays, and transporters. The interior bay consists of a four-ponton, folding module with the necessary locks and hinges that enable it to be transported in a folded configuration and to unfold flat to form a 22-foot section of bridge.

The ramp bay also is composed of a four-ponton, folding module. This bay has tapered pontons and has a 6½-foot approach ramp hinged to the thin end. In addition, the ramp bay contains an adjustable hydraulic cylinder which allows the ramp to be articulated. This joint provides a range of angles up to 20 degrees between the ramp and interior bays to meet varying conditions at river banks. The ramp bay provides a total length of about 25 feet of bridging. The transporter used in the service test was an M139A1 truck modified to provide a unit for transporting, launching, and retrieving the bridge bays. (For future models an M812 series chassis will be used as a transporter.) A hydraulic-powered boom and winch provide the means for moving the bays on and off the transporter. Rollers support the bays during on and off loading and locks secure the bays to the transporter during travel. Each transporter carries a single bay.

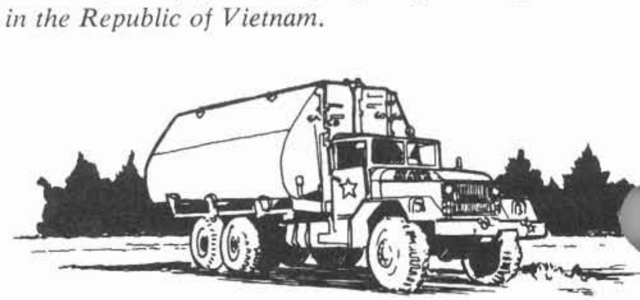
When folded for transport, the single interior bay is 22.5 feet long, 10.7 feet, wide, and 7.7 feet high. When unfolded for installation in the bridge, each floating interior bay is 22 feet long (effective bridge length), 26.5 feet wide (13.6-foot roadway), and 3.5 feet deep. The weight of each interior bay is approximately 11,000 pounds or 500 pounds per foot of bridge. When folded, the ramp bay is 18.4 feet long, 9.8 feet wide and 7.8 feet high. When unfolded, the ramp bay is 25.3 feet long including the ramp approach which is 26.5 feet wide and 2.4 feet in depth. The weight of each ramp bay is approximately 10,000 pounds.

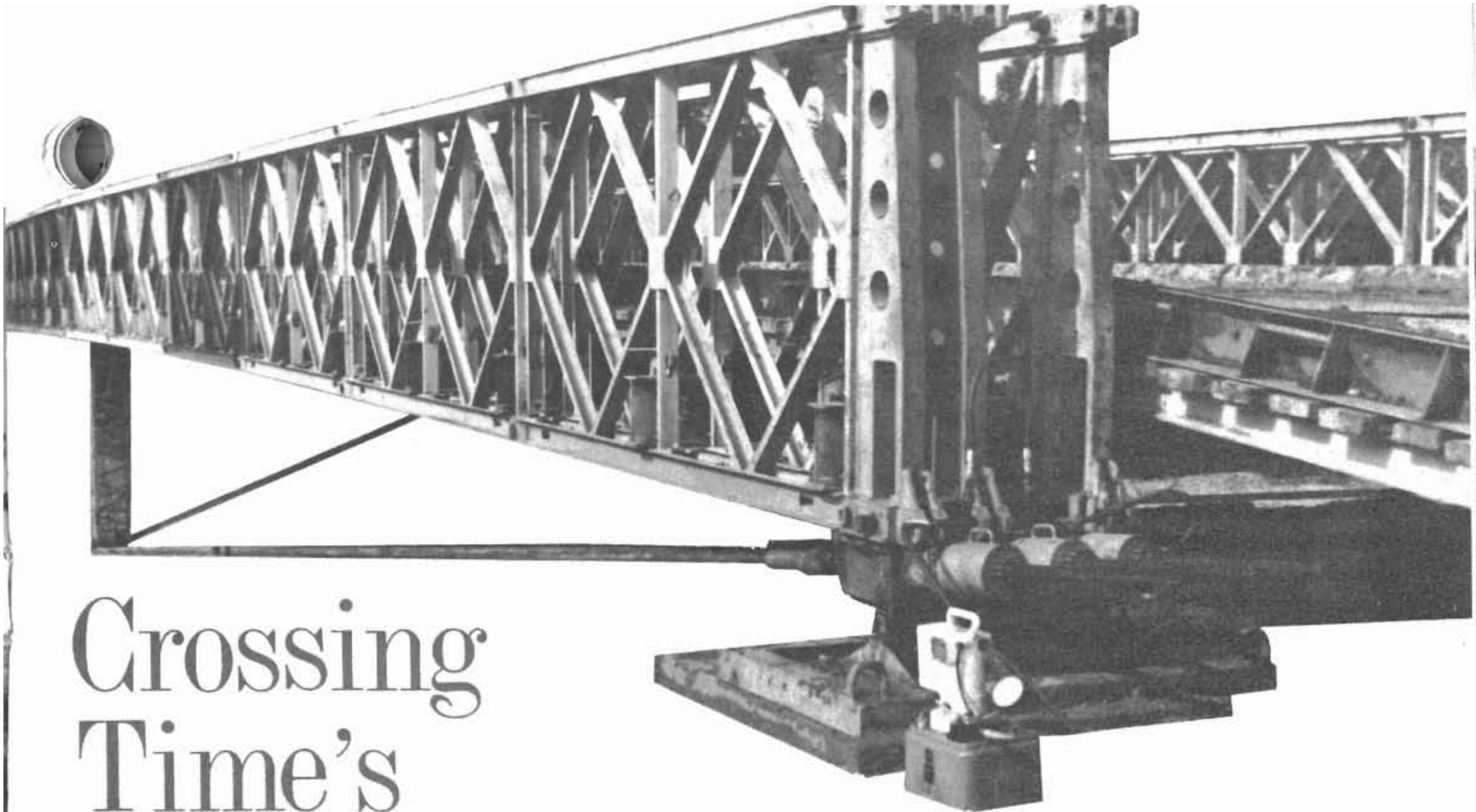
A Ribbon Bridge can be erected swiftly. The transporters are backed to the water's edge; and, as the vehicle stops, the bridge elements are released and roll off directly into the stream where they unfold and are secured in this condition. Then, the elements are pin-connected to form the required bridge span along the shore. It is then swung across the stream using bridge erection boats to maneuver and anchor the assembled bridge. The bridge can be held in place in a moving stream without anchorage through the use of transporters and bridge erection boats. A conventional system can be used when the conditions of the period of emplacement of the bridge justify it.

This Ribbon Bridge is actually the American version of the PMP Ribbon-type Bridge now being used successfully by the Soviet Union. During the 1960's the USSR developed and deployed the Ribbon-type Bridge that consists of integral float-deck elements connected longitudinally to form a continuous floating roadway. The MPM demonstrated erection speeds up to 10 times as fast as comparable U. S. float spans and a crew size half as large.

Now, the U. S. has its own Ribbon-type Bridge and, as with all newly developed items, there are some bugs remaining to be resolved. Fabrication techniques must be employed to minimize weld failures, and the improved transporter must be checked out. Weighed against the capabilities, the defects appear minimal. For the first time, an engineer float bridge company can, without support, transport and erect a float bridge —and do it in minutes instead of hours. When fielded the Ribbon Bridge will substantially increase the engineer's capability to span wet gaps and will ensure that we keep our tactical ground forces on the move.

Lieutenant Colonel Clifford C. Lussier, Jr., is presently assigned to the Armor and Engineer Board at Fort Knox, Kentucky. He holds a Bachelor's Degree in Management and Economics and is a graduate of the Engineer Officer Candidate School and the Officer Advanced Course at Fort Belvoir, Virginia. The colonel has served with engineer construction battalions in CONUS, Europe, and on group staffs during two tours in the Republic of Vietnam.





Crossing Time's Bridges

ENGINEER STAFF

U. S. Army bridging is beginning to take on a svelte, new shape, tailored to meet the rapidly changing needs of our military requirements on the ground in the years just ahead.

The new bridging equipment, which is expected to give the Army much greater mobility than in the past, has been a long time coming, according to Engineer experts. They claim that for many years now, the Army has been developing exotic new weapons, vehicles, and equipment, while its bridging requirements have been neglected.

It is no secret that success in battle usually stems from superiority in mobility and its employment for effective maneuver. An Army, of course, needs many different capabilities if it is to have total mobility. One of those capabilities—an Army's ability to cross dry gaps and rivers during combat has more often than not determined its success or failure. Bridging, or the lack of it, has had decided effects on the outcome of many history military conflicts.

It is to this end that the U. S. Army has again begun taking a closer look at its bridging capability and beefing up the requirements. Time has almost stood still [illegible] U. S. Army bridging through three wars. For example, the Bailey Bridge, named after its British designer, Sir Donald Bailey, was adopted by the U. S. Army during World War II. Throughout the "big war" it was the principle tactical fixed bridge of the allied armies. The Bailey has continued to be the bridging workhorse for the U. S. Army in two subsequent wars—Korea and Vietnam.

Today, though, it looks like the days the Bailey will remain in the U. S. Army inventory as a tactical bridge are numbered. It is expected to give way to another British designed, developed, and produced bridge—the Medium Girder Bridge. Also, a new Improved Float Bridge called the Ribbon is expected to supplement and eventually replace another World War II relic—the M4T6 Floating Bridge. Actually six new bridges are programmed to give the U. S. Army a sleek, "erector set-like" gap crossing capability second to none. They are—

- **Mobile Floating Assault Bridge/Ferry (MAB)**

Description: *The MAB consists of three major components—a transporter and two types of bridge sections. The transporter, which serves as a self-powered vehicle on land and a self-powered boat in the water, can carry either type of bridge section. The interior bay bridge superstructure forms a center section of bridge or ferry roadway while the end bay bridge superstructure provides a hydraulically adjustable ramp or end* *section to form a roadway from the river bank to the MAB deck roadway. Amphibious MAB units can travel overland at speeds up to 40 mph and enter the water directly from the approach march. Upon entering the water, the power is transferred from the wheels to the marine propulsion unit and the wheels are hydraulically retracted upward into wheel wells. When the MAB is afloat in the water, the superstructures are raised and rotated to the bridging position and successive units are joined to form either a bridge or a ferry capable of carrying 60 ton Class 60 loads.*

Status: *The first MAB's (riveted aluminum hull construction) were type classified Standard A in October, 1969 and issued to Army units in Europe. Since then, however, the MAB's transporter, hydraulic, and electrical systems have been improved, tested and approved for production by the Department of the Army. A multiyear quantity procurement of the welded hull MAB (in lieu of riveted construction) is now being accomplished. This procurement will result in the fielding of 184 new MABs during Calendar Years 1972, 1973, and 1974.*

Item Replaced: *The MAB provides a more rapid means of tactical floating bridge and ferry deployment and operations in the Class 60 capacity range. It replaces the French designed, German manufactured Amphibious River Crossing Equipment (ARCE) and supplements the World War II M4T6 bridge.*

• Lightweight Armored Vehicle Launched Bridge, Class 60, 60 Foot Span

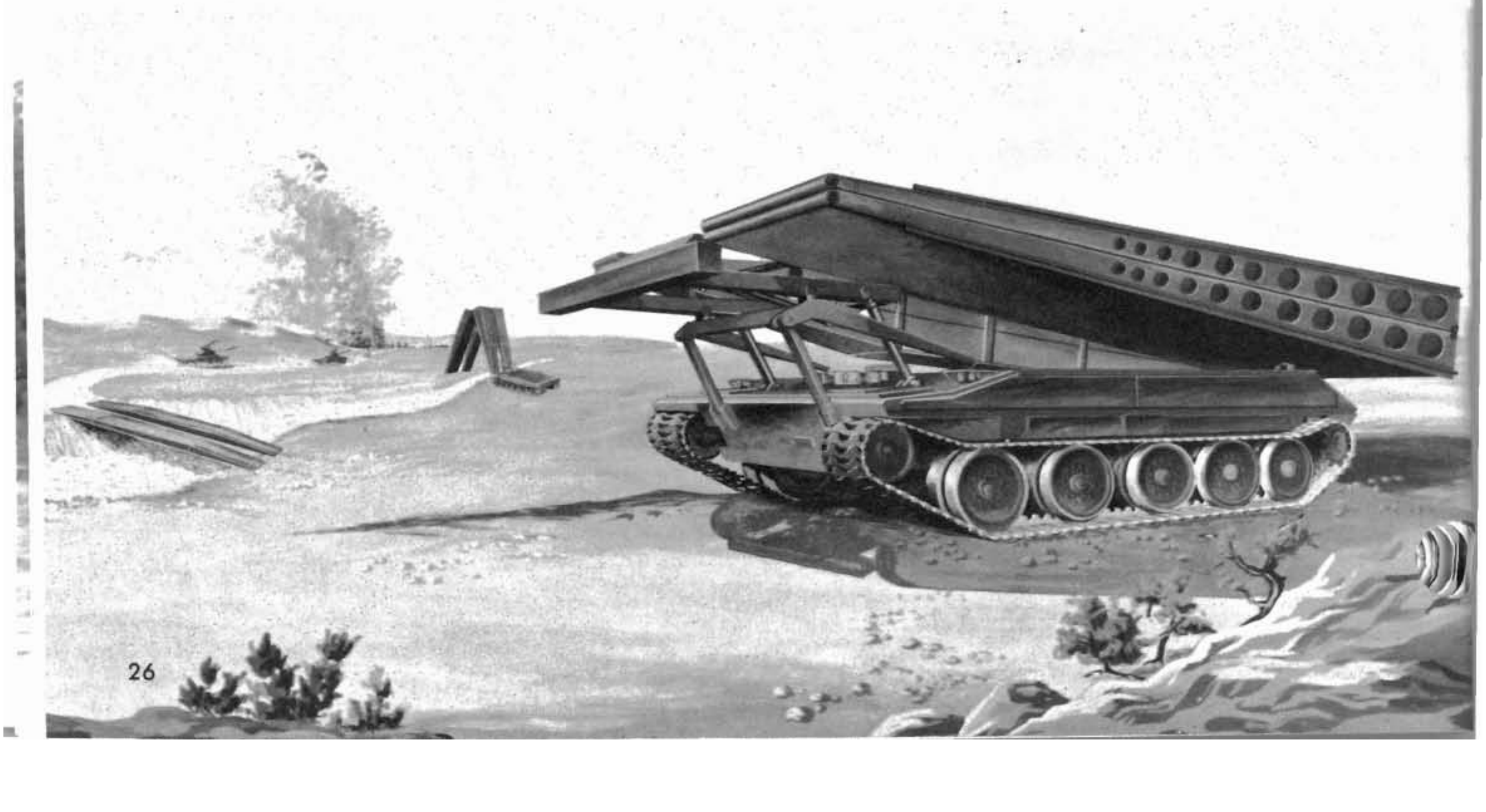
Description: *The Army has tested a first generation unit and it shows great promise for a successful bridge. The bridge, which is all-welded type construction, utilizes the new, high-strength 7,000 series of aluminum alloys. This lightweight bridge weighs approxima 14,000 pounds as compared to 29,000 pounds for current standard AVLB. The bridge is launched and retrieved by the standard M60A1 launcher. It is intended that it will have essentially the same performance characteristics as the current standard. It is also intended that the sections of this lightweight 60-foot span bridge become the end ramp sections of a follow-on 90-foot span AVLB.*

Status: *A contract has been awarded for a second generation bridge. The U. S. Army's Mobility and Equipment Research and Development Center at Fort Belvoir, Virginia, was preparing to test it as* the engineer *went to press.*

Item Replaced: *Eventually this second generation bridge will replace the current standard 60-foot span AVLB.*

• Medium Armored Vehicle Launched Bridge (M-AVLB)

Description: *The M-AVLB is a hydraulically operated, single-folding bridge that is designed for multicellular box beam construction with an orthotropic truss web panel deck in high strength, weldable aluminum alloy. The bridge consists of four tapered ramp sections which are pin-connected through a non-eccentric (two-center) hinge to form two treadways. Horizontal vertical bracing join the treadways to form a comp bridge. The bridge is folded and unfolded through the operation of a hydraulically controlled three link mechanism. The bridge is 63 feet long, 10 feet, 8 inches wide, and provides a 10-foot roadway, 2 feet 6 inches deep. The estimated weight of the bridge is 7,500 pounds. The M-AVLB is being developed for transport*



and deployment by the currently standard M551 (Sheridan) tank and will support Class 30 combat loads over gaps up to 60 feet. It will be launched from either end without exposure of personnel, in less than two minutes and retrieved from either end in less than 10 minutes.

Status: *Type Classification 4th Quarter, FY 1977.*

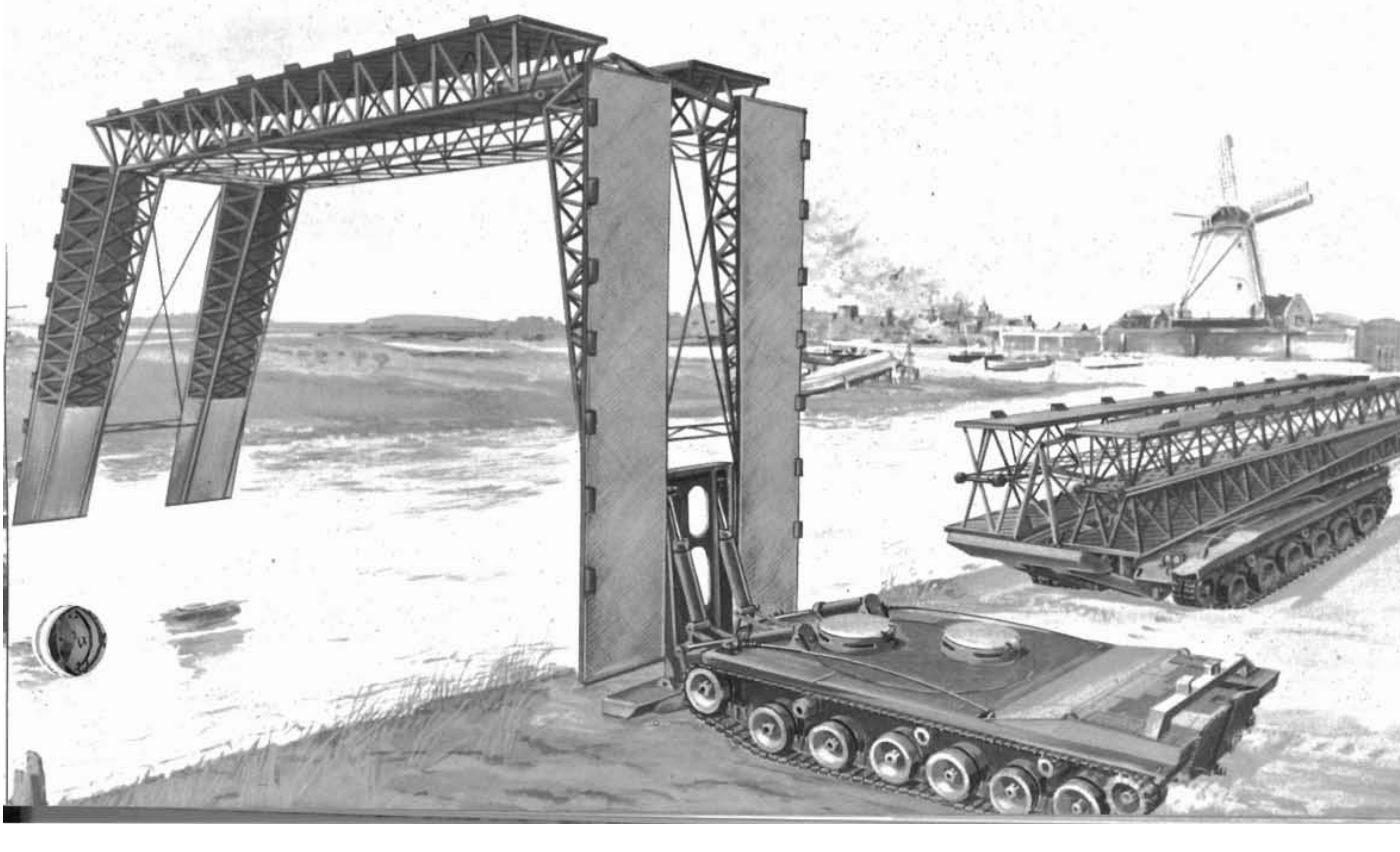
• 90-Foot Armored Vehicle Launched Bridge (AVLB)

Description: *The 90-foot AVLB is a hydraulically operated, double-folding bridge with orthotropic plate deck and space frame truss structure in high-strength, weldable aluminum alloy. The bridge consists of four tapered ramp panels and two center panels which are pin-connected through a non-eccentric (double-centered) hinge to form two treadways. Horizontal and vertical bracing join the treadways to complete the bridge. A new folding and unfolding system using two hydraulic cylinders eliminates the conventional quadrant and cable system used on the present 60-foot bridge. The bridge—95 feet long and 13 feet, 4 inches wide—provides a 12-foot, 6 inch roadway, 3 feet deep. The estimated weight of the bridge is 19,000 pounds. The extended span AVLB is being developed for transport and deployment by the currently standard M-60 Launcher and will support divisional combat loads (Class 60) over gaps up to 90 feet. It will be launched from either end, without exposure of personnel, in less than five minutes and retrieved from either end in less than 10 minutes.*

Status: *Type Classification 4th Quarter, FY 1977.*

• Improved Float Bridge (Ribbon Bridge)

Description: *The Ribbon Bridge, an American version of the PMP Ribbon-type Bridge now being used successfully by the Soviet Union, consists of integral float-deck elements connected longitudinally to form a continuous floating roadway. There are two basic bridge elements, interior and ramp bays, and a companion transporter, which also serves to launch and retrieve individual bays. Folded for transport the single interior bay is 22½ feet long, 10-feet, 6 inches wide, and 7 feet, 7 inches high. When unfolded for installation in the bridge, each floating interior bay will be 22 feet long (effective bridge length) 26½ feet wide, (13-foot, 6 inch roadway) and 3 feet, 8 inches deep at its bows and 29 inches deep at the roadway. Folded for transport, the single ramp bay is 18 feet, 7 inches long, 10 feet, 2 inches wide, and 7 feet, 7 inches high. When unfolded each end bay is 18 feet, 4 inches long and has a 6-foot, 5-inch approach ramp hinged to the roadway sections. Its roadway is 29 inches deep at the bridge end and tapers to 15 inches at the shore end. The configuration is the same as the interior bay, except for an adjustable joint at the interior bay connection and the tapered end section. Controlled by two hydraulic cylinders, the joint provides a zero degree to 20 degree range of angles between the ramp and bank to adjust automatically to the variety of conditions that exist at river banks. The weight is approximately 500 pounds per foot of bridge. The Ribbon Bridge will be transported on a modified M812 truck chassis in the folded*



condition. The transporters will be backed to the water's edge; and, as the vehicle stops, the bridge elements will be released and will roll off directly into the water where they will unfold and be secured in this condition. (The elements will then be pin-connected to form the required bridge span along the shore and then swung across the stream using bridge erection boats to maneuver and anchor the assembled bridge, or it can be constructed by using the method of successive bays or rafts.) This bridge will be capable of construction at a rate of 22 feet per minute to cross Class 60 vehicles over streams with currents up to 8 feet per second.

Status: *Type Classification Date—4th Quarter FY 1972*

Item Replaced: *Supplements M4T6 and Class 60 Floating Bridge.*

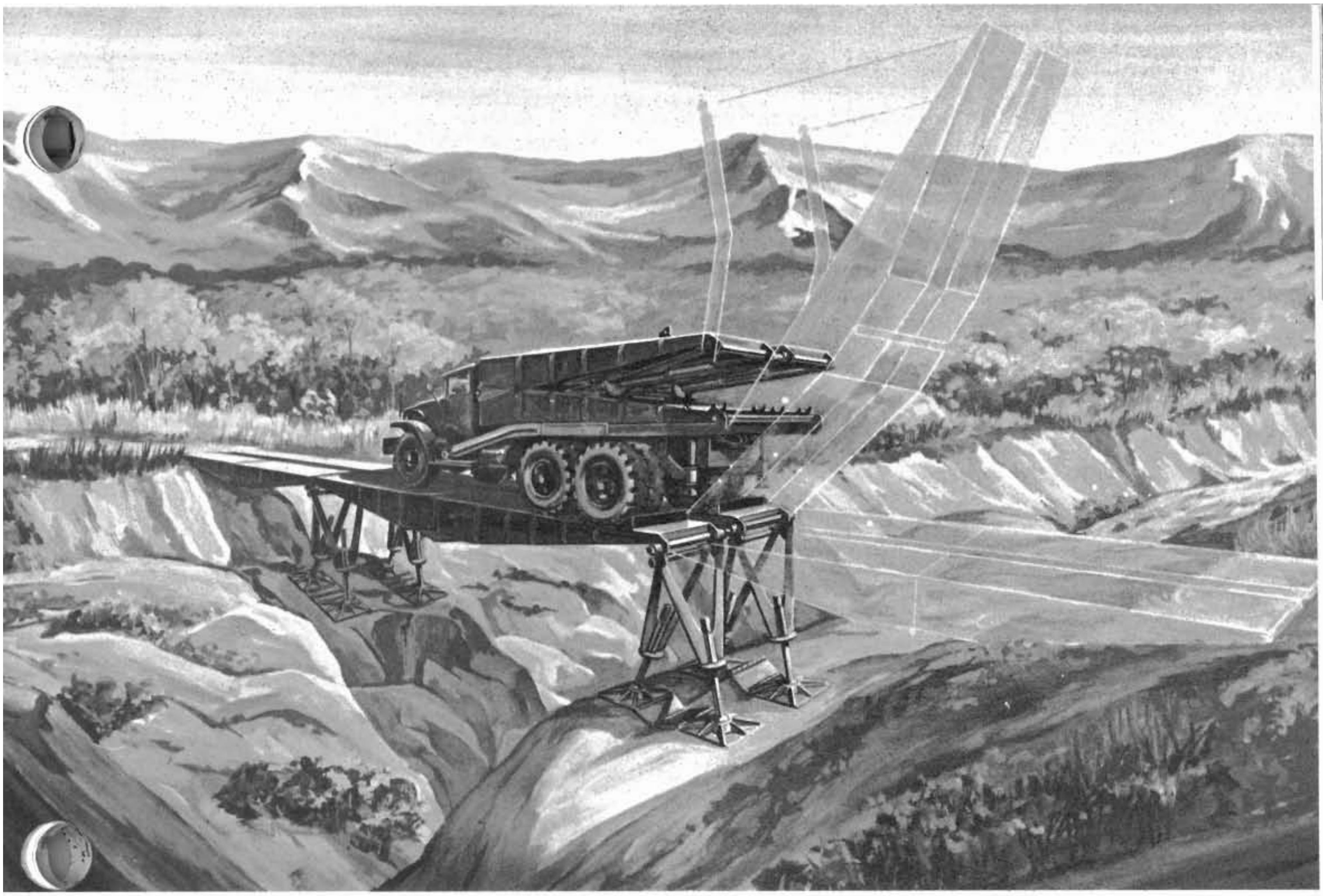
• **Medium Girder Bridge (MGB)**

Description: *The British MGB is an aluminum alloy structure capable of spanning gaps up to 100 feet. Longer gaps may be spanned using the intermediate supports every 86 feet. There are three primary components—the upper girder, the lower girder, and the deck panel. Girders are six feet long and the deck panel is about 10 feet long. The bridge may be assembled in either a single (30-foot Class 60) or double story (100-foot Class 60) configuration. The construction crew is comprised of 24 men and a noncommissioned officer. Work crews normally consist of four men carrying a maximum weight of 370 pounds. All panels are self-aligning. The site preparation is minimal as the bridge is capable of construction on the ground with slopes not to exceed one-in-ten both longitudinally and laterally. Bridge parts are carried as palletized loads, 7,800 pounds maximum, for rapid unloading and easy movements by ground or air.*

Status: *Two sets were delivered to the U.S. Army in FY 1972 so it could make engineering and service tests and determine the feasibility of extending the MGB's Class 60 capability for spans over 100 feet.*

The introduction of these new bridges into the Army's system is bound to produce positive results. Changing technology and doctrine has forced the Army to replace much of its antiquated bridging equipment.

Looking back, military leaders as early as the Civil War fully realized the advantages of being able to quickly surmount physical obstacles and consequently have carried a bridging capability as an integral part of their armies. The importance of military bridging is indicated both by the emphasis our former great leaders have placed on it, and by its effect tin combat.



The Federal Army, for example, was supplied with wooden bridging materials and equipage to use in its operations during the Civil War. The crossing of the James River by General U. S. Grant was an outstanding lesson of Civil War engineering. The crossing proved to be one of the key factors that enabled General Grant to cut off the flow of supplies to General Robert E. Lee, forcing the Confederate Army to abandon Richmond and Petersburg. It took the Union Army only five hours and 50 minutes to assemble approximately 2,200 feet of bridge for the crossing.

The Union Army also had its own floating bridging during the Civil War. It was simple but effective. Pneumatic pontons were made of India-rubber cloth, inflated by a special bellows, and transported by horse and wagon. Each ponton consisted of three cylinders, 20 feet long and shaped at the ends like a canoe. These supported a roadway 11 feet, 8 inches wide, which was considered "sufficient for ordinary purposes." Holes in the cylinders were mended by rubber cloth patches, which the pontonier sergeants were supposed to carry in their pockets at all times, and a cement made of improvised ingredients.

Time almost stood still for U. S. Army bridging equipment from the Civil War to World War I. Much of that old float bridge equipment of the Civil War was still employed by American Expeditionary Force engineers during WWI. At the same time, the Germans had a floating bridge which utilized metal pontons. It was the forerunner of similar bridges of today.

The floating bridge, which is of utmost importance to military operations, really came into its own during WWII when metal pontons and pneumatic float-type bridges were developed in order to carry heavy loads across such formidable rivers as the Volturno in Italy and the Rhine in Germany.

Chief among the pneumatic float bridges was the M2 Steel Treadway which crossed victorious Allied Armies over many of Europe's rivers. Some of the floating treadways were more than 1,000 feet long. Floating bridge equipage also was used extensively in Korea and Vietnam.

Float and fixed bridges, which complement each other during military river crossing operations, proved their importance to organized military operations as far back in history as 600 B. C. when Herodotus, a historian, wrote about a bridge across the Euphrates River to the city of Babylonia. According to Herodotus, the queen planned to have an artificial lake built upstream from the city. So, the engineer decided that while the lake was being filled, and the stream was dry, he could construct 100 stone piers for the proposed timber bridge that would be erected across the water bed. It was noted that as an extra precaution against invaders, the bridge's flooring could be removed at night. Not bad thinking for those days.

First mention of the use of the floating bridge in military operations was a 100 years later. The Persian Emperor Darius introduced this revolutionary gambit back in 500 B. C. He used an expedient floating bridge to cross the Bosphorus and later the Danube with 700,000 men. Although Darius' attack on European Scythia was not successful, the bridge was instrumental in aiding his retreat from the Scythians and the Greeks. Later, after Darius died, his son, Xerxes, attacked the enemy again by using a similar type of bridge. He successfully crossed 3,500,000 men over the Hellespont in seven days and nights.

Alexander the Great used both fixed and float bridges to fulfill his military operations. One of his most famous fixed bridges was the one he had his engineers build across the narrow arm of the sea that lay between the coast of Syria and the strongly fortified island city of Tyre about 330 B. C. The channel was a mile and one-half wide and the causeway was constructed by driving rows of piles and filling between the piles with earth and stone, using logs and brush along the outer piling to retain the material in place. His Army destroyed an entire city and a forest to procure the materials for the construction of this bridge. The causeway was 200 feet wide and had defense towers at regular intervals. When the roadway was nearly completed, the defenders of Tyre sent out a ship carrying bitumen and other inflammable material, rammed it into the side of the causeway, set it afire and tipped naptha and oil off the yardarm. The causeway was so damaged that it was never completed. Even so, Alexander, built a new, wider, and more fortified causeway from another point and captured the city. The entire effort took seven months. The causeway was gradually widened and strengthened later and remained a permanent isthmus connecting the city to the mainland. Alexander also included a ponton train as an integral part of his army, and by using easily transportable half-pontons that could be joined together at the stern, he assembled many floating bridges during the course of his campaigns. All of these bridges proved more successful than the older type of land causeway which he used against Tyre.

Hannibal should have learned something about bridging from Alexander but he did not. He did not include ponton trains in his army and had to rely on large expedient rafts of his river crossing operations. History records that it was the destruction of a bridge that prevented Hannibal from capturing Rome.

Of all the great military leaders, Caesar was probably the first general to have a distinct Corps of Engineers with trained officers and men. He is credited with introducing the timber trestle bridge. He is said to have built this type of bridge somewhere near Bonn where the river is 25 feet deep, 1,500 feet wide, and has a four mile per hour current. The bridge was a series of pile bents, each bent consisted of two pairs of piles, each pair being timbers 18 inches square, well fastened by cross pieces, the timbers parallel and two feet apart. The pairs of piles were driven by use of a pile driver, each pair inclined toward the centerline of the bridge and the pairs were 40 feet apart—presumably at the waterline. A cross-beam, 20 inches square, its ends passing between the piles of the pairs and fastened to make the bent secure, rested upon the uppermost transoms. Longitudinal beams, planking, and earth finished the surface. For additional strength against the current, piles were driven down stream and braced against the bents. Upstream from each bent, a cluster of piles were driven to serve as pier fenders. The construction of Caesar's bridge, including the timber cutting, took 10 days.

Napoleon was another field general who saw the necessity for good military bridging in battle. He made sure that his engineers were well supplied with ponton equipage and other military bridging materials. During his war with Emperor Charles of Austria in 1809, Napoleon built two ponton bridges across the Danube connecting the shores with an island in the middle of the river from which he launched attacks against the mainland.

It is obvious from this brief and sketchy history of bridging feats that the military engineer has striven to design bridges with greater capacity, transportability, and ease of assembly from the earliest wooden rafts or boats and earth bridges to the most recently developed pneumatic, steel, and aluminum bridges. Modern heavy equipment has made possible the handling of heavier and larger sections which facilitate longer bridges using fewer parts than was formerly possible. Thus, with each new development in bridge material, the great rivers of the world have become less of an obstacle to the advance of modern armies.

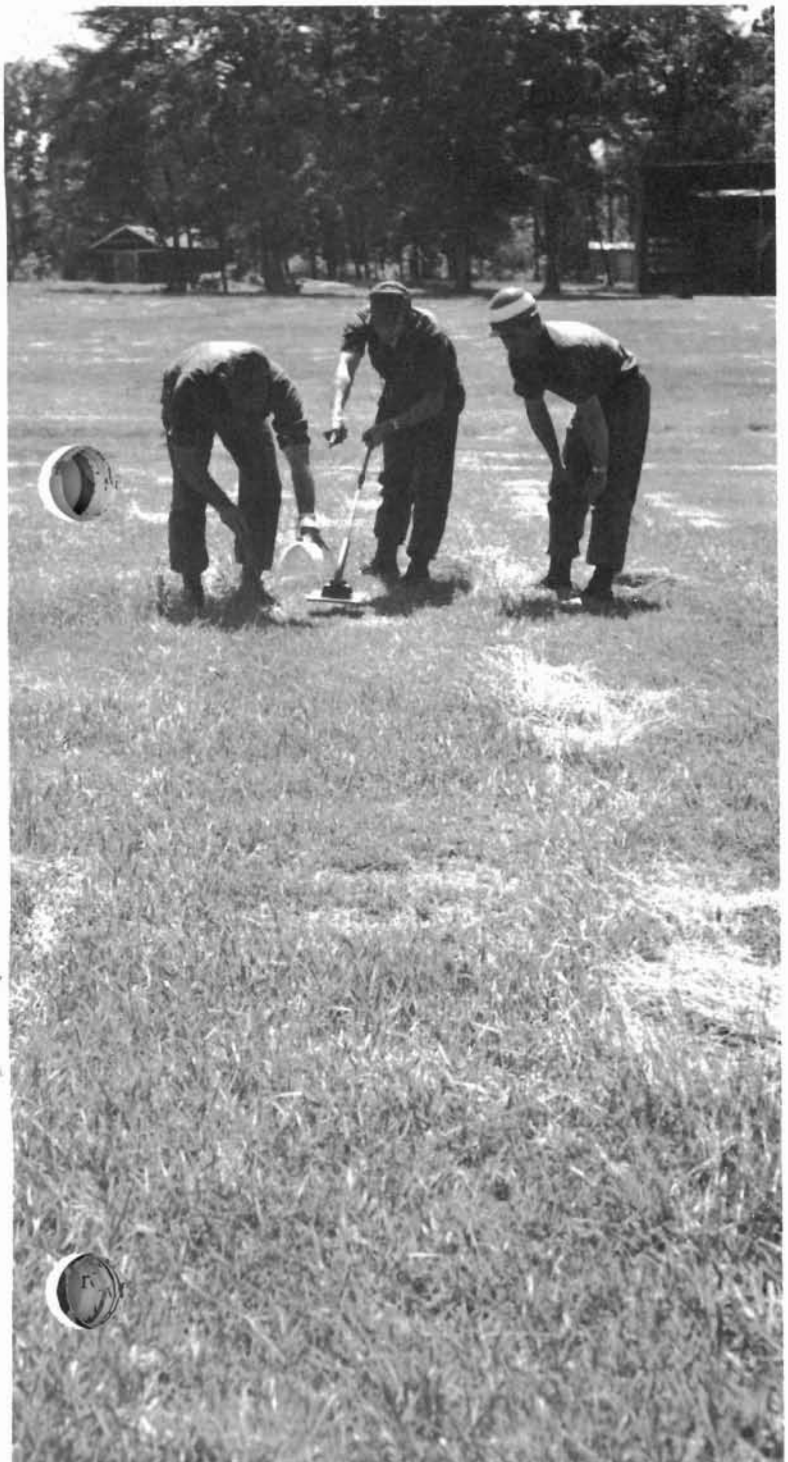
But there still is a major haunting question regarding the future of bridging in the U. S. Army. When will our own bridging experts develop a bridge that is entirely of U. S. concept and design? The Russians already are testing an underwater bridge. So, about all that is left is an air cushion-type bridge. Will that be the bridge of the 21st century? If so, will it bear our stamp—U. S. all the way, from state-of-the-art to production? Only time will tell.

The Editor

ERCSP–STRUCTURED FOR SUPPORT

A MONUMENT A'BUILDING

Major Jerry M. Lowrance



The "One-Army Concept" is no longer just a figment of the imagination at the U. S. Army Engineer at Fort Belvoir, Virginia. The concept is now a reality.

Although the Corps of Engineers has always looked upon the Reserve Components as vital to the "total" Army picture, there has been a tendency to forget about their role in the Defense posture of this nation until all the "marbles" are up for grabs.

Engineer planners have had contingency plans for many years that call for the bulk of the combat support and combat service support engineer units which would be needed in the event of a national emergency to come from the Reserve Components.

In keeping with the Army Chief of Staff's policy of support and recognition of the Reserve Components mission within the Army establishment, the Chief of Engineers has had a long-standing program whereby members of the staff make annual visits to observe Reserve Component training. The Chief is continually encouraging mutual support between Active Army and Reserve Component engineer units.

The USAES, based on the desires and policy of the chain-of-command, has placed support of Reserve Components high on its list of priorities in the months just ahead. Both USAES and Fort Belvoir have chalked up a fair amount of support for the Reserve Components each year. For instance, the yearly support in the past has included individual and unit training at the post; support of U. S. Army Reserve (USAR) schools at their home stations and Annual Training of selected USAR schools at the "Home of the Engineers." Also, Belvoir has prepared and issued some 148,000 pieces of instructional material each year to Reserve Component units. This is in addition to supporting the 6,800 Reserve Component students that have been enrolled in the school's Correspondence Course Program through the years. The Correspondence program includes the Engineer Officer Basic and Advanced Courses, the Noncommissioned Officer Courses, various Military Occupational Specialty (MOS) Courses, and the Professional Engineer Preparatory Course.

When the stated national policy revealed that a high reliance would be placed on the Reserve Components in any future missions and commitments of our strategic forces, the USAES needed to make few changes in its current support program to get on the bandwagon. And when the chain of command from the Secretary of Defense on down, began placing heavy emphasis on Reserve Component training, the USAES was able to take this new requirement in stride.

Does this mean that USAES is going to rest on its past laurels? No it does not. It simply means that the USAES has a strong base upon which a better structure of support may be built for the Reserve Components. This structure is expected to reflect the efforts of the USAES staff, faculty, students and members of the Reserve Components when current plans are implemented this fiscal year.

Since the beginning of 1972, the stones in the structure have begun to stack up and it is taking the form of a monument dedicated to USAES support of the Reserve Components program. One of the larger stones, for example, would have to be credited to the two weeks of training that was given this past May to the officers and "noncoms" of the 105th Engineer Battalion of the North Carolina National Guard. Its parent unit, the 20th Infantry Division (Mech), is spread out through both North Carolina and Georgia.

At the USAES, the 105th received the "full bore" treatment—training that included complete current doctrine and practice of engineers in combat support of tactical units. The instruction began with a refresher on current offensive and defensive tactics by the Combined Arms Division of the Department of Military Science. This was in keeping with the theory that engineers must know what the tactical commander is doing if they are to provide the best possible support to his operations. Then, the instruction shifted to what the engineers are expected to do to support these tactics. The Combat Support Branch handled this instruction that covered all facets of engineer support in combat operations. Heavy emphasis also was placed on the engineer's role in river crossing operations and barrier planning.

After the "how-to-do-it" was absorbed by the students from the 105th, the Department of Applied Engineering exposed them to the tactical equipment that is available to handle any eventuality. There was instruction in mine warfare, demolitions, tactical bridging, and field engineering. Nothing was left to chance and when the students from the 105th departed Fort Belvoir, they felt—to a man—that they had gained up-to-date knowledge that would help them better support the 30th Infantry Division in any future role.

The former Department of Topography (renamed the Defense Mapping School on July 1), also has contributed some big stones for the structure of the monument. Enlisted personnel from six Reserve Component Engineer Topographic Units have received MOS instruction that includes Platemaker, Multiplex Map Compiler, Senior Topographic Instrument Repairman, Offset Pressman, Intelligence Terrain Analyst, and Soil Analyst. Also, officers of those units have received instruction in such chosen fields as Geographer, Geologist, Hydrologist, Utility Engineer, Highway Engineer, and Soils Engineer.

Most of the students in the aforementioned programs received the same instruction and, in some cases, were in the same classes as their Active Army counterparts. This way both Active Army and Reserve Components personnel were given the opportunity to exchange knowledge and views and gain a renewed respect and confidence in the important part each play in attaining the common goals of "One Army."

Resident instructors have not given all the instruction at the USAES. Four USAR schools, the 2077th from Cleveland, the 2074th from Louisville, the 2091th from Scranton, Pennsylvania, and the 1154th from Jamaica, New York, handled the instruction of Phase VI of the Engineer Officer Advanced Course. The four USAR schools presented Phase VI in four two-week periods. Phase VI, which actually kicked off the summer training program at USAES, also had 369 officers from the Reserve Components enrolled as students.

Although the USAES did not present the actual instruction, it did support the USAR instructors by providing classrooms in Humphrey Hall, Lesson Reference Files, and Training Aids for each subject—Geology, Soils, Drainage, and Pavements. Also Department of Engineering Science instructors assisted their USAR School counterparts in preparing for their classes. This exchange of ideas and methods between the two groups provided still another opportunity for both to recognize mutual goals and to work together toward accomplishing them.

Although the stones have been stacking up regularly, the monument is far from completion, according to the Assistant Commandant of USAES, Brigadier General Richard L. Harris. The general is not satisfied with resting on past accomplishments but wants to continue to march. He has displayed a keen interest in Reserve Components and the support they receive from the USAES. His interest also was evident to Colonel Irving Atlas, Commandant of the 2091 Scranton USAR School. In his Report of Annual Training to First Army, the colonel said, "This unit has been conducting Annual Training Tours since 1952. This unit has never received the benefits of intense and repeated interest in the mission as has been given by Brigadier General Richard L. Harris, Assistant Commandant, U. S. Army Engineer School, Fort Belvoir, Virginia. This extreme interest and desire to be of service was felt throughout the command and made this unit's Annual Training period in 1972 the most rewarding ever."

General Harris is providing some stones himself. He made sure that beginning this fiscal year the Expanded Reserve Components Support Program is a part of the overall Engineer School Operating plan. The purpose of the Expanded Reserve Components Support Program is to improve resident assistance and to extend the assistance to the troops in the field. The program calls for continued resident support, the development and issue of training materials to support unit instruction, and the use of Mobile Training Teams to help the Reserve Components stay abreast of new developments in doctrine and equipment.

Responsibility for the Expanded Reserve Components Support Program has been given to the Department of Nonresident Instruction. However, all departments of the USAES will have an opportunity to contribute to the program. Major Matthew J. Jones, Jr., has been named the USAES Reserve Components Support Officer and will operate the nerve center.

The initial stage of the new program will require coordination with the Chief of Reserve Components at Department of the Army, Continental Army Command, the CONUS Armies, and the eight major Engineer Commands and Brigades of the Reserve Components to determine the types of assistance that will be required from the USAES. Then priorities will be set for the requirements. The assistance could be resident—students attending instruction at the USAES. It could be non-resident—USAES develops training materials for issue both to instructors and students in the field. It could be field assistance—where mobile training teams actually move out and present their instruction in the field. It also could be liaison—the exchange of ideas, requirements and assets between the USAES, other service schools, major installations, and major Reserve Components Engineer Units.

The second stage of the program is geared to satisfy the requirements identified in the first stage in the priority set by the Reserve Components Support Officer. General Harris has stressed that all assets of the USAES will be employed to satisfy these requirements. However, most of the requirements can be satisfied simply by providing necessary instructional material to the units.

Great care is expected to be taken to insure that the USAR schools are not bypassed. They will be utilized to the fullest extent in meeting the requirements of the units in the field.

The bulk of both the resident and field instruction given by members of the USAES will be performed under the supervision of the Core Mobile Training Team. This team will consist of the Reserve Components Support Officer and two "noncom" instructors. The Core MTT will become expert in the top two or three subjects on the priority list. Members of the USAES staff and facility will be required to augment the team's participation in other areas. Also students at the USAES will have an opportunity to augment the Core MTT instruction. For example, students of the 2nd Engineer Noncommissioned Officer Advances Courses presented two days of demolition training to the Demolition Specialists of the 121st Engineer Battalion of the Maryland National Guard during annual training at Camp A. P. Hill last June.

There is a saying at the USAES that its monument of support to the Reserve Components could one day be as high as Mount Olympus if the stones keep stockpiling. The stones representing the implementation of new methods may soon outnumber the ones that were used to lay the foundation of the monument—continued traditional support.

Today, questions directed at a member of the USAES concerning the "One-Army Concept" draw a blank stare. Personnel who were around when it was a "concept" are long gone. In other words, at the USAES, "one-Army" is really a reality.

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DYNAMIC

The Engineer Dynamic Training Council at Fort Belvoir, Virginia, our own professional variation on the Army-wide Board for Dynamic Training recently constituted at Fort Benning, Georgia, has been active since its inception in late 1971 studying small unit training. The Council began its work by conducting a local survey of 400 officers, warrant officers and non-commissioned officers to identify problem areas common to their experience and therefore pertinent to units in the field. Using the results of the survey as a point of departure, the Council developed a questionaire for distribution to select units worldwide and began collecting and refining data to reinforce survey findings.

In the interim, while the Council has been awaiting the return of outstanding questionaires, Army Training Plan (ATP) 5-35T has been drafted for testing in the Engineer Combat Battalion in both Active and Reserve/National Guard configurations. It is designed to fill in the gaps left in the Army's training and testing system where the cyclic annual training scheme is concerned.

Units in the field have been screening training ideas and forwarding some interesting examples of home-grown dynamic training in response to the questionaires. The Engineer Command, U.S. Army Europe, has responded with the following:

- Assign combat engineer units an increased construction role under the supervision of the Director of Facilities Engineers.
- Encourage an increase in civic/domestic action projects through decentralization of approval authority.
- Assign U. S. construction units to work shoulder to shoulder with civilian labor to help increase skill levels.
- Provide concurrent training with aviation units that have a heavy lift capability for bridge construction in addition to troop lift capability for engineer reconnaissance, demolition projects, clearing landing zones, etc.
- Use competitive training with side-by-side construction of different types of tactical bridging.
- Promote truck ROAD-E-O's to develop proficiency in handling, loading, unloading, towing, backing, driving, of general purpose vehicles and engineer equipment.
- Use a group marksmanship concept in place of standard individual markmanship training to develop teamwork.
- Increase the use of non-divisional engineer units in a general support role during divisional field training exercises.
- Use construction units for repair and rehabilitation of troop and family housing facilities.

There also was individual response to the questionaire from the United States Army Engineer School, the 18th Engineer Brigade, the 147th Engineer Battalion, the 844th and 871st Engineer Battalions and several overseas headquarters. Some of those personal contributors include:

—Captain E. M. Harris of the 18th Engineer Brigade, who suggested that engineer units assist in improving their local environments through ecology oriented clean-up projects;

—First Sergeant J. W. Wisnewski, 113th Engineer Battalion, who wants to combine engineer missions with combat arms operations. The troops will be able to see the end product of their labors put to practical use instead of having to tear down that item in the manner of the usual post-mortem drill.

—Colonel W. R. Hylander, who proposes that competition between combat and combat support troops be encouraged by, let's say, having the engineers build a tank obstacle and challenging a tank unit to break through.

—Sergeant First Class C. R. Watts of the 147th Engineer Battalion, who suggests week-long squad missions led by Squad Leaders to cultivate teamwork and promote leadership skills in engineer reconnaissance, orienteering, and demolitions.

—Lieutenant Colonel R. H. Carver of USARAL, who would use VOLAR and other funds to hire technically qualified instructors to work with and train personnel in engineer hard skills, an idea used successfully by the 808th Engineer Battalion.

—Lieutenant Colonel J. W. Martin of III Corps, Fort Hood, Texas, who wants to arrange with local contractors for visits at their work sites and on-the-job discussion of the latest construction techniques.

—Captain R. R. Gentry of 871st Engineer Battalion, Austin, Texas, who will substitute more team sports in the standard Army physical fitness program.

—Others have suggested additionally that reserve

TRAINING

component units replace active units on on-going projects for the Summer training period, and that road rallies for drivers of organic vehicles be encouraged as driving and map reading exercises.

One unit, the 52nd Engineer Battalion at Fort Carson, Colorado, described what it is already doing in the civic/domestic action area and on post support projects to give some meaning to training:

—Construction of an outdoor recreation area for the Colorado School for the Deaf and Blind, including the hauling of fifty thousand cubic yards of fill, preparation of drainage structures, designing and installing an underground sprinkler system and laying out a two hundred meter athletic track.

—Construction of a two hundred foot-long earth-fill dam.

—Construction of athletic facilities, including a base-ball field and basketball, volleyball and tennis courts, to a local church.

—Repair of Boys Club camp facilities.

—Construction of cubicles within troop barracks through the use of VOLAR funds.

A high point of Dynamic Training activity has been experienced with ATP 5-35T which was introduced by Colonel W. R. Hylander in the Summer issue of **the engineer.** The colonel, who is Director of the Office of Doctrine and Training Development at the U. S. Army Engineer School and also head "honcho" of the Engineer Dynamic Training Council, explains that the response to ATP 5-35T has been heavy. He encourages additional response and promises that all requests will be filled, explaining that the concept is felt to provide better and more up-to-date information than is presently available in other engineer training publications.

The engineer training questionaire itself, designed to help identify problem areas that have become barriers to development of innovative training programs, provides some preliminary insight into attitudes in the field. And some people, it would seem, are not happy with the training status quo.

Many company and field grade officers, from both active and reserve component units, complain that the ever-present training inspector from a higher headquarters does little more than promote eyewash. They wonder what ever happened to emphasis on a better, more rewarding training experience for the troops. In fact, many of those same officers rated the small unit type of training at prestigious institutions such as the Military Academy at West Point and other service schools poor, with too much emphasis on the same kind of theatrics. To say the least, a majority of those responding indicated that they did not rate their current training programs as "dynamic."

Serious problems seem to be those endless requirements for non-mission support to higher headquarters and that old pain-in-the-neck personnel turbulence. Lack of sufficient time to conduct meaningful training and rigidly mandatory training programs are additional gripes. Unavailability or inadequacy of training facilities, surprisingly, has not been cited as consistently as might be expected, except in response from Europe and Korea.

Many active and reserve units had interests in common. For example, many expressed a desire for a consumable materials allowance earmarked for training purposes. All seem interested in increased participation in civic/domestic action type projects.

Testing, of course, was an issue in itself, with nearly 20 percent of the respondents indicating that they had never participated in a unit test or exercise, nor had most of them seen company, platoon or squad tests anywhere outside of the European theater.

Construction units in particular seemed to have been particularly neglected in the testing area. They simply had not been tested with the same frequency or in the same circumstances as had combat and other type engineer units.

What has been presented in the preceding paragraphs is only a progress report from your friendly neighborhood Dynamic Training Council. Final results and conclusions drawn from the survey and questionaire will follow in a forthcoming issue of **the engineer.**

In the meantime, the Council needs your help. Send in an accounting of your pet training peeves and suggestions. There has to be a "better idea" out there somewhere.

Write to the Engineer Dynamic Training Council, U. S. Army Engineer School, Fort Belvoir, Virginia 22060. e

Bridging

WHITE HOUSE FELLOWS 73-74 PROGRAM ANNOUNCED

THE WHITE HOUSE FELLOW PROGRAM offers a unique career opportunity for a young person between the ages of 23 and 36 years. Each year the President's Commission on White House Fellows selects approximately 15-20 individuals from industry and the military to serve for a one year period as special assistants on the White House staff or with cabinet officers. These gifted and highly motivated young Americans gain some firsthand experience in the process of governing the Nation and a sense of personal involvement in the leadership of society. Since the program began in 1965, nine Army officers have been chosen as White House Fellows. Personnel desiring to participate in this program must first request permission (through channels) to compete, in accordance with AR 621-7, "Acceptance of Fellowships, Scholarships, or Grants," July 1, 1969. Given HQ DA approval, individuals should submit their White House Fellows application directly to the Commission on White House Fellows, The White House, Washington, D. C. 20500. Official application forms and full particulars may be obtained by writing to the Commission. The deadline for submission of applications for the 1973-1974 program is 15 December 15, 1972. Final selection of the winners will be made in May, 1973. The year long (1973-1974) Fellowship begins in September, 1973. Interested Army personnel are encouraged to submit their "request to compete" to DA early in the fall of 1972.

DA PUBLISHES CHANGES IN FLIGHT TRAINING PREREQUISITES

OPO DA HAS ANNOUNCED that a new edition of AR 611-110, "Selection and Training of Army Aviation Officers," has been published and distributed to the field with an effective date of 1 August 1972. Pending revision of Operating Instructions 611-110(1), interested personnel should be aware of two significant changes in the prerequisites for flight training—(1) applicants now need only be a high school graduate or the equivalent but preferably have two or more years of college; and (2), graduates of the AROTC Flight Training Program may be entered into flight training under Class 2 medical fitness standards *only* if applying prior to completing 36 months of AFCS—later applicants must meet Class 1A standards.

ARMY ESTABLISHES WARRANTS' INTERMEDIATE COURSE FOR MOS 621A

A MAINTENANCE WARRANT OFFICER Intermediate Course, comparable to an officer's advanced course, was established recently through the combined efforts of the U. S. Army Engineer School and the U. S. Army Ordnance School. The course is conducted in two phases. The first, approximately 11 weeks in duration, consists of general military subjects and is taught at Aberdeen Proving Grounds, Maryland, to both Engineer and Ordnance Warrant Officers. The second phase lasts for approximately five weeks for MOS 621A, and consists of engineer technical subjects taught at Fort Belvoir, Virginia. Since the entire course is less than 20 weeks duration, it must be funded as TDY from local training funds. All officers eligible to attend were considered in light of their manner of performance, potential value to the Army, education and type of assignments in which the individual had served.

the Gap

SPECIAL MAG OR MISSION ASSIGNMENTS AVAILABLE FOR QUALIFIED PERSONNEL

SPECIAL ASSIGNMENTS with one of the Army's Military Assistance Advisory Groups, or Missions require a real and practical sense of responsibility, capability and initiative. Such requisites apply also to duty with an International or Joint Headquarters, and to service at any of the Department of the Army or Department of Defense Staff Agencies. Qualifications for these assignments are set forth in Tables 11-2 and 11-3 in AR 614-200. If you are interested and qualified, OPO DA will welcome your application. See your Commanding Officer for DA Form 2250 (Application or Nomination for Special Assignment). OPO advises that special requisitions are filled by eligible applicants who apply for special assignments, and by the selection of personnel for screening under the provisions of AR 614-200. The applications (DA Form 2250) are maintained on file at DA for one year, or until requirements exist that the individual may be applied against.

OPO NEEDS INFORMATION FOR NEW CORPS DIRECTORY

OPO DA REPORTS that it is once again time to compile the Corps of Engineers Officer Directory. For those of you who are Professional Engineers or an Engineer In Training and want your qualifications to appear in that new directory, you should check your personnel officer to insure that proper annotation is made on your DA Form 66. Engineer Branch, OPO, advises they have received many calls asking that this information appear, but they cannot make the change without a properly prepared report of change submitted by a personnel office through appropriate channels.

COMMANDER'S UPDATE PACKET IS NOW AVAILABLE FROM USAES

FEW WOULD DENY THAT assumption of command imposes certain responsibilities, and that the larger the command the greater are those responsibilities. Those of you who may be in line for such assignments have probably given considerable thought to the amount of time you will have to devote to becoming current on various subjects with which you would want to be familiar before taking command of a battalion, a group or a brigade. If you feel a bit rusty after that last staff assignment and want to reorient your thinking, the "Commander's Update Packet" may well be your answer. The Engineer School's Department of Nonresident Instruction, in the best interest of those who are unable to make it to Fort Belvoir for instruction—or in this case, the commander's orientation—has put together a packet of instructional material designed to assist the prospective commander in preparing for his command assignment. The temptation to make the packet completely comprehensive or all-inclusive was deliberately avoided to keep the material within manageable proportions. A loose leaf binder format was used to facilitate possible changes, additions or deletions as new information becomes available. Some "nice to have" material has been omitted, but the packet is concise, easily read and includes a wealth of informative material on subjects which occupy most commanders in the early stages of their assignment. If you are on orders to take command of a battalion or higher unit and would like to obtain the "Commander's Update Packet," forward your request to Commandant, U. S. Army Engineer School, ATTN; DNRI, Fort Belvoir, Virginia 22060.

It is believed that military bridges existed in prehistoric times. Why? Because neolithic man had sharpened stone implements with which he could fell trees as far back as 15,000 B. C. The first bridge, per se, was probably a tree he felled to cross a ravine or river that held up the capture or destruction of a village. Some neolithic man became the first military engineer by felling a tree or employing the use of vines to surmount the obstacle that was holding up the advance of his party. To get a better insight on bridging through the years, read "Crossing Time's Bridges," beginning on page 25.