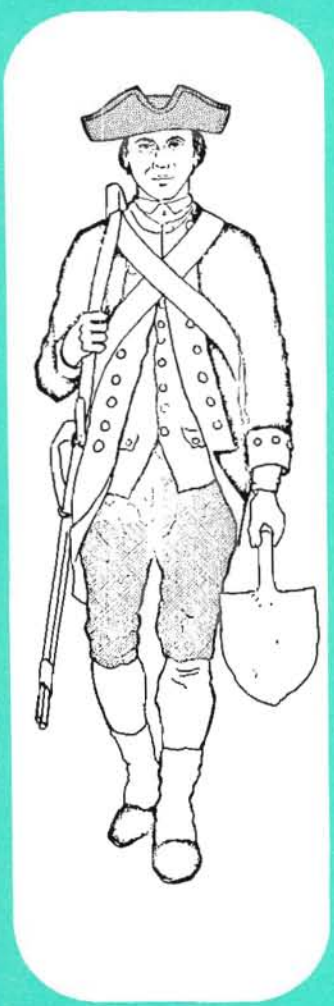
THE ENGINEER













OCT-NOV-DEC 1975

THE ENGINEER

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CHIEF'S BRIEFS

Brevet Major General Andrew A. Humphreys was born in Philadelphia, Pennsylvania, November 2, 1810. His grandfather and father were naval architects, and both became Chief of the Construction Bureau, U.S. Navy. His grandfather designed "Old Ironsides."

Humphreys entered the United States Military Academy before he was seventeen years old and was graduated July 1, 1831. After a short service in the artillery, during which he was engaged in actions against the Seminole Indians in the Florida War, he resigned from the Army, September 30, 1836, to become a civil engineer.

Upon the organization of the Corps of Topographical Engineers, he was appointed first lieutenant, July 7, 1838.

In 1850 Humphreys was directed to make topographic and hydrographic survey of the Delta of the Mississippi River. Assisted by Lieutenant Henry L. Abbot from 1857 to 1861, the Mississippi River Survey Report, translated into several languages, remains a classic in hydraulic literature.

General Humphreys was a distinguished Civil War Army Corps commander. He received brevet rank for gallant and meritorious services at the Battles of Fredericksburg, Virginia, Gettysburg, Pennsylvania and Sailor's Creek, Virginia.

On August 8, 1866, Humphreys was appointed Chief of Engineers and after thirteen years of service in that position he retired on June 30, 1879.

General Humphreys published Civil War histories, was co-founder of the National Academy of Sciences, and a member of many learned societies. He died at Washington, D.C., December 27, 1883.

Edward B. Russell
Curator, US Army Engineer Museum

United States Army Engineer School
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Engineer Magazine Telephone: (703) 664-2838 — Autovon: 354-2838

ABOUT OUR COVER

A lot of you haven't been paying our fine publication all the attention it deserves. In fact, many show us little more than a cursory, page-fanning once-over. We know. And it hurts. But we're swallowing all that. And to show there's no hard feelings, we've offered a little extra service this month — we've put all the really eye-catching pictures and artwork contained in the magazine smack-dab on the front cover! So you're spared all that finger-licking, corner-curling effort and our slick-format rag is spared its dog-eared plight. Is everybody happy?

PERSONNEL ARMOR SYSTEM FOR GROUND TROOPS (PASGT)



The combat engineer troops clearing a minefield shown in the photos above are equipped with the new PASGT Helmet and body vest. The PASGT underwent a concept evaluation test in connection with Natick Development Center and Human Engineering Laboratory with engineer troops at Fort Belvoir, Virginia, during the summer of 1975. The helmet is of a molded kelvar material and comes sized for small, medium, and large as does the knitted kelvar vest. The weight equal to that of the M-1 steel helmet provides for a 25% increase in ballistic protection. Noteable is the helmet's shock-trauma protection capabilities allowing for engineering job site utilization as a safety hard hat.

MERDC ANNOUNCES J-SIIDS HOTLINE

Is your J-SIIDS giving you the protection it should?

Information on the installation and operation or technical assistance for the Joint-Service Interior Intrusion Detection System can be obtained on a 24 hour basis by calling the J-SIIDS Hotline, Autovon 354-2085 or commercial 703-664-2085. After hour calls will be recorded and promptly responded to the next day.

This Hotline for J-SIIDS users is operated by the system's developers at the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va.

Initial application of J-SIIDS is to provide protection for arms rooms against actual or attempted intrusion and equipment tampering.

J-SIIDS consists of a family of intrusion, duress, and pilferage sensors; monitoring and display equipment; a secure data transmission system and an audible alarm. The system was type classified standard for use in arms rooms in 1973.

ENGINEER DINNER AND CASTLE BALL DATES SET:

This year's Annual Engineer Dinner should be a gala affair. The annual dinners date back to 1867 when the Essayons Club was founded the year after the Corps turned over to the Army the responsibility for . . . "conducting the Military Academy at West Point."

The dinner is a time for engineer officers, active and retired, to come together and to be brought up to date on the state of the Corps. Over the past few years it has been held in conjunction with the Castle Ball — the Castle Ball being held with the ladies the evening following the Engineer Dinner. Both will be held at the Fort Belvoir Officers Club, the dinner on Friday, 23 April and the ball on Saturday, 24 April 1976.

Additional information can be obtained by writing to the 109th Annual Engineer Dinner Committee, USAES Brigade, Fort Belvoir, VA 22060 or calling Fort Belvoir 664-4300.

ITSCHNER AWARD PREPARATION FOR CALENDAR YEAR 1975

Now is the time to start planning and preparing for the Itschner Award nominations. The Emerson C. Itschner Award is awarded by the Society of American Military Engineers (SAME) to the engineer company which best symbolizes the character, mission and performance of the Corps of Engineers. The award, presented annually at the Engineer Dinner at Ft. Belvoir, is named in honor of LTG Emerson C. Itschner, a former Chief of Engineers and past president of the society.

One of the aims of the award is to promote leadership in junior officers and to foster "espirit" in company sized engineer units. For the purpose of the competition, company sized units include all engineer numbered and lettered or headquarters companies, separate or belonging to a battalion, brigade, group or larger organization, and activated under a TOE/TDA. In the past, the award was limited to active duty units. In 1974, the competition was expanded, providing separate awards for both National Guard and Reserve units.

LINE. PIPELINE.

The 1974 winners were as follows:

Active Army: Company D, 802d Engr Bn, 2d Engr Gp, 8th U.S. Army, Korea.

Army Reserve: Company B, 458th Engr Bn (CBT), 1st U.S. Army (Pennsylvania).

Army National Guard: Company D, 145th Engr Bn, Utah National Guard.

Although the designation of a single winner from a field of highly qualified finalists is a difficult chore at best, the Itschner Award Selection Committee would like to see more units compete for this award. The key to turning out a winner, in addition to having the qualifying credentials, is to adequately document the unit's activities over the course of a given calendar year.

The necessary information should be bound in a simple three ring folder or loose leaf notebook.

The annual presentation of this coveted award provides a means of revitalizating the competition and renewing the challenge. How does your unit stand against the others? You can find out in 1975.

ENGINEER OFFICERS AND WARRANT OFFICERS DIRECTORY AVAILABLE

The Directory of Corps of Engineers Officers and Warrant Officers (1976 Edition) is available for purchase at the USAES. Mail order requests should be sent to: USAES Periodical Publications Fund, Office of the Secretary, USAES Fort Belvoir, VA 22060. Cost is $1.00 per copy (covers handling and mailing costs). Make checks payable to: USAES Periodical Publications Fund.

APPRENTICESHIP PROGRAM REGISTERED WITH DEPARTMENT OF LABOR

On 18 August 1975, the Apprenticeship Standards for Military Equipment Operators and Mechanics were registered with the Bureau of Apprenticeship and Training, U. S. Department of Labor, in a signing ceremony at Fort Belvoir. Signatories included the US Army Engineer School Commandant, MG James A. Johnson, and the Associate Manpower Administrator, Bureau of Apprenticeship and Training, Mr. Hugh C. Murphy. In attendance were the Executive Director of the Associated General Contractors of America, Mr. James Sprouse, the Assistant Commandant, and representatives from Department of Labor, Department of Army, USAES Staff and participants in the program. Registration culminated five (5) years of development effort during the period 1970-1975 and provides for national recognition of engineer training and experience thru the journeyman level. These Apprenticeship Standards became the first Active Army program registered with the Department of Labor (DOL).

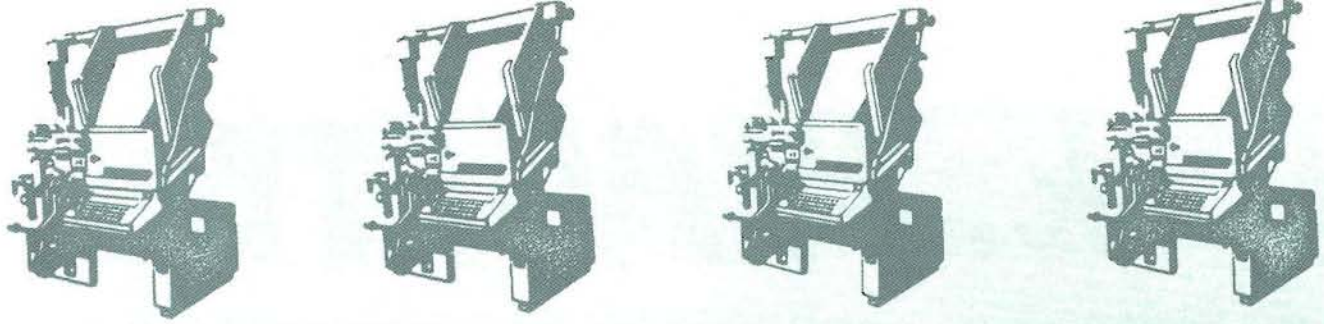
Implementing procedures and printing of the Standards will be published by DA in Jan 1976. **Look for Annex D to AR 350-40.** As an interim, the Engineer School (ATSE-TER-TM) will continue to accept applications under AR 350-14. For those personnel who are registered under this program, their records will be turned over to DOL when Annex D is published and full credit granted toward "completion of Apprenticeship" in line with the registered program.

FROM THE ENGINEER SCHOOL

At the request of the Armor School, the USAES has developed a simple device for armor personnel to evaluate bridge capacity. The device gives a "go/no-go" answer rather than a bridge classification. Four hundred copies of the "go/no-go" device have been forwarded to the Armor School for evaluation. At the end of the validation, a Basis of Issue Plan will be developed by the Army Training Services Agency (ATSA) and printing will be accomplished by DA in accordance with the Basis of Issue Plan for the armor card.

The working of the "Whiz-Wheel" is comparatively simple, the mere alignment of three wheels for (1) stringer spacing, (2) stringer code, and (3) the bridge span length, will give the "go" or "no-go" indication looked for. Instructions are imprinted on the card on how to obtain the dimensions needed.

Work is underway to expand the technique for engineers to produce a classification number and is expected to be fielded in early FY 77.



Since we first introduced ourselves in the Winter-Spring 1975 issue of this magazine, the Engineer School Learning Resources Center has acquired hundreds of new books in many subject areas. Due to space limitations we are listing here only a select few recent engineering books which may be of particular interest to our readers. These books, as well as others in such fields as military science, international relations, educational technology, management, and American history, may be borrowed through the interlibrary loan system at your closest library facility, or may be mailed directly to you. At the end of the loan period the material borrowed is returned in the original mailing envelope, using the return address label supplied by us.

We are most anxious to expand our field support program, and to that end we earnestly solicit your inquiries. We can be reached at AUTOVON 35-42524/41318, Monday through Thursday 0800-2100, Friday 0800-1700, and Sunday 1200-2100. Our mailing address is: US Army Engineer School, ATTN: Field Librarian, Learning Resources Center (Bldg. 270), Fort Belvoir, VA 22060.

Baker, Robert F. HANDBOOK OF HIGHWAY ENGINEERING. New York: Van Nostrand Reinhold Co., 1975.

Boyd, T. Gardner. METALWORKING (Goodheart-Willcox's Build-A-Course Series). South Holland, Ill.: Goodheart-Willcox Co., 1975.

Bresler, Boris. REINFORCED CONCRETE ENGINEERING. VOLUME I, MATERIALS, STRUCTURAL ELEMENTS, SAFETY. New York: John Wiley & Sons, Inc., 1974.

Brown, Walter C. DRAFTING (Goodheart-Willcox's Build-A-Course Series). South Holland, Ill.: Goodheart-Willcox Co., 1975.

Cedergren, Harry R. DRAINAGE OF HIGHWAY AND AIRFIELD PAVEMENTS. New York: John Wiley & Sons, Inc., 1974.

Dent, Joseph B. FUNDAMENTALS OF ENGINEERING GRAPHICS. New York: Macmillan Publishing Co., 1974.

Doyle, John M. AN INTRODUCTION TO ELECTRICAL WIRING. Reston, Va.: Reston Publishing Co., 1975.

Gerrish, Howard H. ELECTRICITY (Goodheart-Willcox's Build-A-Course Series). South Holland, Ill.: Goodheart-Willcox Co., 1975.

USAES ANNOUNCES TASK TRAINING PHAMPLETS

The Engineer School has developed a series of informal pamphlets to help junior leaders in training squad and platoon level ARTEP tasks. These pamphlets are designed for easy reading and provide step-by-step, easy-to-follow guidance on how to train specific tasks listed in the ARTEP. The emphasis is on training as a team.

Since the program is relatively new, there are only a few pamphlets available but more are on the drawing board. Those that are available are listed on page 101 of the USAES Instructional Material Catalog (USAES Pam 310-1) along with instructions on how to order the pamphlets. The following are currently available:

ARTEP TASK NUMBER	TITLE
4-13	Secure a Work Site
4-14	Recon Patrol
5-16	Route Recon
6-17	Disable a Bridge
6-18	Crater Roads
8-8	Layout a Bailey Bridge
9-2	River Recon

Soon to come:

7-5	Breach Minefield (Hasty Breach)

If you don't have a catalog, write to:

Director
Department of Army Wide Training Support
US Army Engineer School
Fort Belvoir, VA 22060

and we will fill your order and send you a catalog at the same time.

Once you have had a chance to look the pamphlets over, we



"AS WE GO TO PRESS..

would appreciate your views. Your point of contact for errors, omissions, or new ideas is Unit Training Branch, Combat and Training Developments, at AUTOVON 354-3531. The mailing address is:

US Army Engineer School
ATSE-CTD-DT-TP
Fort Belvoir, Virginia 22060

SKILL LEVEL DESIGNATION CHANGES UNDER EPMS

On 1 Oct 75, MOS 62B, Engineer Equipment Mechanic, became the first MOS, for which the US Army Engineer School has proponency, to be implemented under the Enlisted Personnel Management System (EPMS). This means that all personnel with this MOS will have their skill level designation changed to reflect their skill level under EPMS.

PRESENT MOS	GRADE	EPMS MOS
62B40	E7	62B4
62B30	E6	62B3
62B20, 62B30	E5	62B2
62B20, 62B30	E1-E4	62B1

Tables of Organization and Equipment will be changed also to reflect the revised skill levels. There will no longer be a direct correlation between skill level and the category of maintenance as now exists (62B20 for organizational level and 62B30 for direct and general support level). Instead, the skill level will reflect the training and experience required to perform the tasks regardless of where (in what unit) it is performed. Modification of the training program to support the revised MOS structure is underway and will be implemented this calendar year. In the meantime, the 62B20 course at Ft. Leonard Wood and the 62B30 course at Ft. Belvoir will continue. Individuals graduating from the courses will be awarded skill level designations to reflect their grade level. However, personnel records (DA Form 2-1) of those completing the 62B30 course will be annotated to show course completion.

MOBILE ASSAULT BRIDGE TRAINING

The US Army Engineer School is taking the following steps in an attempt to alleviate MAB problems identified in the field, namely; lack of trained crewmen and mechanics. Mobile Training Teams (MTT) are being formed to teach organization maintenance to USAREUR Units.

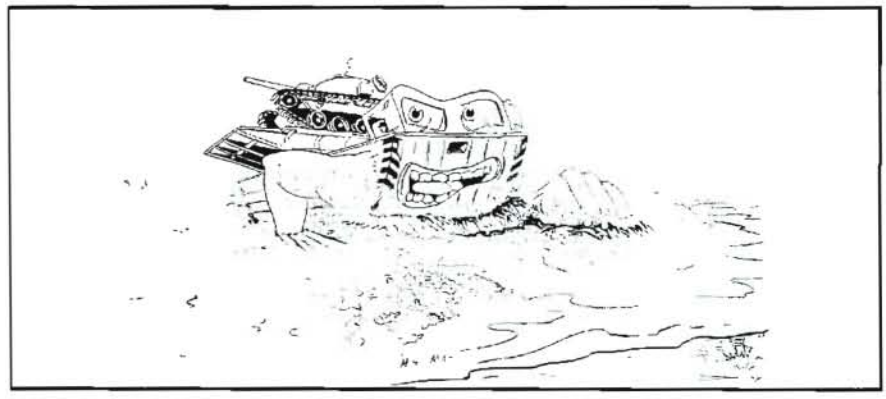
A "Mobile Assault Bridge Operator" draft text is in its final review and will be published in early 1976. This text will present to the individual soldier, as well as his supervisor, an analysis of the bridgeman's duties to include his job description (both present and EPMS revision) and a valid task list. The bridgeman will be able to see his career development pattern, thus enabling him to map out his Army Career. Supervisors will be provided with various tips on training to include:

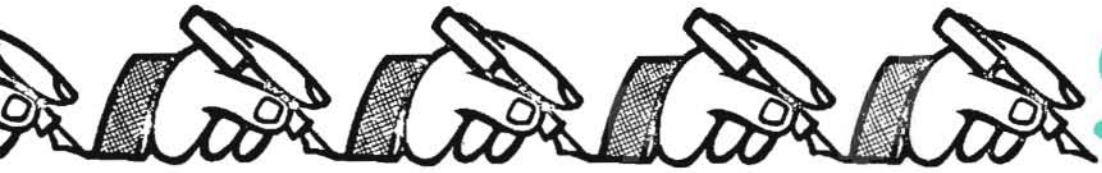
Skills Development
Training Evaluation Guide
Safety Tips
Basic Watermanship Principles

A maintenance manual, entitled "Maintenance Tips for MAB Platoon Leader," has been developed. This text addresses the maintenance items to be checked, as well as the sequence in which they should be checked.

Coordination has been made with MILPERCEN in an attempt to develop a more efficient method of coordinating and insuring that qualified MAB maintenance personnel graduating from the 612F1 Course (Mobile Assault Bridge/Ferry Maintenance Course) actually reach their intended unit of assignment.

To increase the readability of MAB texts, the Engineer School is introducing "Moe MAB" as shown here in his basic role of assault crossing. Moe will appear periodically throughout the MAB publications to pass on tips as well as introduce new sections.





Stop 16

Sir

In August 1975 I was a member of a group of US Korean War veterans who were invited to revisit South Korea. For many, this was their first return to Korea since the Korean War; in my case, it had been 13 years since my last visit.

Upon my return from Korea I thought perhaps the readers of The Engineer would be interested in some observations and comments pertaining to Korea as a result of the visit.

We saw the great progress made and being made in their economy and were impressed that the South Korean people were motivated to build their country strong — economically, educationally, and militarily. There was evidence of pride, dedication, high morale, competence and a constant effort of all to improve and grow.

During the six day visit, I visited with US Army, Corps, Division and Battalion commanders, a ROK Corps commander, and former Korean Military commanders of the Korean war era. As a result of my visit, I came to realize why the South Korean, 2d US Infantry Division and other US military forces in Korea have a high state of training, discipline, and combat readiness.

The basic reason is MOTIVATION, which is created by the proximity and aggressiveness of the North Korean government, and its armed forces, the closest of which are less than 25 air miles from Soeul, and within the range of enemy rocket artillery.

Thus a viable and universally understood threat to the South Korean and US military forces, the capital, and the industrial complex of the Soeul — Inchon area provides the motivation, unity of purpose, and effort which characterizes the South Korean government and people. Upon returning home, I sense that Americans perceive no exterior military threat and consider only the threats from within.

It is reasonable to conclude that our own people's differences in threat perception as they relate to motivation affect the training readiness of our military forces stationed in places other than Korea. If the US is to maintain a high state of readiness, military leaders must provide a high standard of commandership/leadership to augment the threats facing them in order to provide the necessary MOTIVATION to produce superior units.

In a booklet, given to students at The Armor and The Engineer Schools, containing quotes attributed to me, there is this section:

ON
MOTIVATION

- All your men want to do what you want done. When they do not, you have failed to instruct and motivate them.
- Awards that motivate only the top men are of little value in raising the ability of a unit. It takes awards to motivate the lower third to do that. A unit is measured by the ability of the lower third personnel in it to carry their part of the load.
- The first step in motivating soldiers is to tell them the reason why.

In another section is this statement:

- Start off each period of instruction or training with two statements:
  - Tell them what they are going to learn today.
  - Tell them why they need to know it.

General Bruce C. Clarke,
USA Retired

Sir

Last year I wrote to The Engineer requesting a strong "what's happening now", approach in the magazine. Your Fall '75 issue is exactly what I was referring to. The Engineer Potpourri was exceptionally good. I am looking forward to the next issue.

John P. Carey
Major, Corps of Engineers
Professor of Military Science

Sir

On behalf of the cadets and cadre of the 1975 Fort Bragg ROTC Advanced Camp, I wish to express my appreciation for your thoughtfulness in providing us with copies of The Engineer.

The cadets enjoyed reading The Engineer and it certainly helped these future officers increase their knowledge of the Army.

Your thoughtfulness contributed significantly to the professional atmosphere of Advanced Camp 75.

Again, please accept my thanks; your attention to this matter is greatly appreciated.

Ray Brackett
COL, AD
Public Affairs Officer

Reorganization of the Engineers

MAJ James L Campbell

Introduction

The time between wars is the traditional time for the US Army to rethink the old theories and strategies: New force structures are postulated to meet new threats and new materiel developed to equip the new organizations. Coupled with this traditional rethinking of the past, the Army is now challenged by the all-volunteer Army concept. This concept has resulted in smaller, better equipped forces that will offset much of the personnel reductions by improving the quality of the American Forces.

The Corps of Engineers should take this opportunity to rethink our combat support methods. The basic reason for the engineers existence is to enhance the combat power of the combat arms. The engineers' mission is to enhance the combat power by facilitating ground movement of friendly forces. Enemy force movements can also be impeded by engineers. This gives the net effect of aiding the friendly combat power. Other engineer missions include providing engineer staff planning and advice on construction, facilities engineering, and any other engineer services required in the theater of operations. These missions will shape the direction of engineer force structuring in the rethinking process. All decisions must be geared towards providing a highly responsive, adequately equipped engineer force that can provide what is required by the tactical commander. The decisions made now should be tempered with the mistakes that history contains concerning post war organizations. As the Army has shrunk in size after past wars, the orientation is towards retaining combat elements and letting the combat support tail shrink. This is the correct way to curtail the Army's size. The apparent solution for the Corps of Engineers is to eliminate or curtail the construction forces. This solution prevailed after both the World Wars and the Korean War. While, at the time, this solution appears the most cost effective and oriented towards achieving maximum combat power from the least possible expenditure, it is not necessarily the most economical solution in the long run. This article suggests another way that the same funds could be spent while providing enhanced engineer capability to carry out the combat zone tasks. This "ideal" solution is possible and should be considered in designing the engineer force of the future.

The after action reports and other articles written at the conclusion of each major campaign or war contain a plethora of data concerning the engineer force problems. Each of the reports contain many platitudes concerning the engineers' role in providing combat support. That speaks very highly of the engineer combat support in past wars. These same reports are laced with accounts of the Corps' one big failing . . . lack of combat construction support. Each of our wars has required a logistical tail. Yet the forces to build the depots, hospitals, airfields that are needed to supply our fighting forces have not been fully effective. The engineers should consider the reasons for their past inability to provide adequate construction equipment and expertise. No one is suggesting that combat engineer units be eliminated. This would be folly. Combat engineers are vital to the tactical commander. Another solution does exist that will satisfy both of the requirements of having highly motivated and responsive combat engineers and also having the skills and the equipment necessary to provide the construction needed to supply the tactical commander with the logistics needed to carry out his operational plans.

Before stating this cost effective way to increase the combat engineering capabilities while retaining construction expertise, it might be best to review some of the specific facts and deficiencies of the Corps as expressed in several reports published after several past campaigns and wars.

From the practical standpoint, the value of engineers is rated in terms of their value to the tactical commander. This point was not always practiced in the Army. For instance, until the reorganization of the Army in 1876, the division commander did not have clear cut authority over where the engineers constructed their fortifications. That reorganization brought the artillery, the ordnance and engineer commanders into association with the division commander to develop a unified course of action. This action clearly made the tactical commander responsible for developing the course of combat actions.

After World War I, engineer strength dropped as did the total Army. A low point was reached in 1937, when a 175 man engineer company was the only engineer unit organic to the division. Prior to Pearl Harbor, combat engineering was the preoccupation. A new tactical concept of lean units that traveled lightly and rapidly, further focused thoughts on combat engineering. But the funds to implement the combat engineering doctrine were not adequate. The necessary equipment to overcome natural and artificial obstacles was not present in the force structure. This lack of combat engineering equipment carried over into the start of the war. During the prewar years, the emphasis upon combat engineering placed a premium on light and maneuverable construction machinery. The small equipment items did not provide adequate construction capability to carry out the major construction tasks that were required. The emphasis on combat engineering at the expense of the construction capability caused future hardship in the mobilization construction process in the early part of the war. However, one major stride forward had been taken when it was recognized that machinery could do more than manpower. The percent of the total force that was engineer during World War II was less than in previous conflicts.

One important fallacy, believed by the Corps prior to World War II, was that if a conflict occurred, commercial products such as construction equipment could be had for the asking. This was a wrong assumption. When the industrial might of the United States was, at last, directed to war production, the steel and other metals that would have been used for construction machinery were needed in higher priority items such as tanks, ammunition, aircraft and ships. Thus, the construction machinery took its place in line after the higher priority times. The gap between requirements and actual delivery of machinery was abridged by procuring used items that were pressed into service.

One of the first engineering tasks, outside the US, was in the Southwest Pacific campaigns. The Army was involved in an island hopping campaign to steadily advance the bomber line closer to the Japanese homeland. This strategy dictated significant airfield construction. The after action reports and histories written about these campaigns have many comments about engineer support. The engineer combat battalion was "grossly inadequate to meet the requirements imposed upon it by the tactical and technicological demands arising from modern warfare . . ." "The mechanization of forces had increased the dependence upon engineer construction of roads. The movement of all mobile equipment is dependent upon approach routes and bypasses around obstructions." It was recommended that the engineers be increased to regimental (two battalions) size to handle the tremendous amounts of work required.

The Southwest Pacific histories also noted that "Engineer heavy construction units were always insufficient prior to the occupation of Japan." "More often than not, engineer units, in insufficent numbers, were brought in late without the heavy construction equipment needed to meet the target dates of their high priority construction missions."

Airfield construction was not the only major task faced by the engineers in the Southwest Pacific. "The construction and maintenance of roads constituted the principal engineer problem on Leyte. Although the more important existing roads on the island were initially classed as two-way, all-weather roads, they were not properly constructed to carry continuously the heavy traffic of modern warfare. "The combat engineers devoted almost one hundred percent of their effort to road and bridge construction." "It was not unusual for an engineer combat battalion to be responsible for maintaining 30 to 40 miles of road forming the main supply routes for its division. These roads were often little more than passable."

Engineer support in the Southwest Pacific was apparently adequate because we achieved our objective of "winning the war." It is very hard to assess the impact that more adequately equipped engineers would have had in enabling better roads construction so more supplies could be made available to the combat units. Likewise, how much faster could the war have been concluded if accelerated airfield construction would have advanced the bomber lines faster?

The Italian Campaign histories had no derogatory comments regarding engineer support of the combat operations. The support provided for other activities, however, was commented upon. "Construction was delayed materially due to the lack of adequate equipment throughout the campaign. This lack of equipment was alleviated by the creation of light equipment companies to support combat battalions, by the creation of large

equipment pools located at major headquarters and by the issue of excess equipment to the engineer units." This lack of equipment also was complicated by the lack of adequately trained equipment operators and mechanics.

Currently, the major threat considered by the Army is assumed to be in Western Europe. Over thirty years ago, we fought another war over what was then the most highly developed geography and road nets in the world. The roads in Europe are still the densest of potential areas of conflict. Many of the historical comments concerning the problems of our engineers in those circumstances regarding road maintenance, equipment problems and organizational constraints are still apropos. While the road nets in Europe have drastically increased over the thirty year time interim, so have the logistical requirements needed to carry out the land and air mobile types of conflicts that are envisioned.

The Twelfth Army Group, which orchestrated a major tactical effort across Europe during the war, noted that the "only serious deficiency in the training of engineer units has been in the technique of road repair." "Operations in this theater have disclosed the inadequacy of numbers of heavy equipment operators allowed."

The final report of the European Theater Engineer echoed many of the same comments made by the Twelfth Army Group Engineer. "The most important deficiency noted was a failure to maintain the asphalt roads." "The shortage of equipment necessary for road repairs was felt severely." The personnel problems were noted again. "One of the two most serious engineer problems in ETO and one which had widespread and continuing effects on our operations was related to the lack of technically skilled specialists, both officer and enlisted men, to fill the needs for such personnel in staff and troop positions."

The message of World War II engineer deficiencies shows that there was a lack of sufficient heavy engineer construction equipment to provide combat support for the mobile warfare concept. Secondly, the personnel were not adequately trained or exposed to construction, even minor combat construction, to perform adequately to avoid adverse comments.

The problems of engineer support for tactical units is constantly surfacing. Figure 1 provides some insight into engineer support of certain campaigns that were studied. It can be noted that the ratio of engineer battalion support for each division was around 3 per division. This figure does not include the divisional battalion. Historically, we could conclude that four engineer battalions were used in the combat zone to support each division. Additionally, a number of engineer construction units were also in the COMMZ to construct the massive road networks and logistical complexes needed to supply the combat units.

The Korean and Vietnam actions necessitated somewhat different engineer support. Figure 1 shows that the ratio of combat engineer support was somewhat lower than the 3 corps battalions per division that is traditionally expected. An important point to note is that 9 of the 15 nondivisional engineer units in Korea were construction units. This indicates the equipment in the combat engineer battalions was not sufficient to carry out the construction needed to support the combat zone units.

Vietnam was a unique experience for engineers. Significant engineer construction was in support of political and nation building goals. Sixteen of the 28 nondivisional engineer battalions in Vietnam were construction battalions. Additionally, all but three of the combat engineer

ENGINEER SUPPORT RATIOS

		Actual Number of Units										Recommended Engineer Support					
					Nondiv Engr Bn			COMMZ Engineer Battalions									
Theater	Date	Army	Corps	Div	Combat	Const	Gen Svc	Nondiv Engr Bn/Div	Combat	Const	Gen Svc/ Engr Aviation Bn	Nondiv Engr Bn/Army Area		Nondiv Engr Bn/Corps Area		Nondiv Engr Bn/Div in Combat Zone	COMMZ Const Bn
												Combat	Const	Combat	Const		
ETO	1 May 45	5	15	57	147	10	12	2.96	7	7	102	9	9	8	0	3.5	
12th Army Group Europe	Apr 45	4	11	43	126	—	6	3.07	—		-	—	—	—	—	—	—
Leyte Campaign	Oct 44	1	2	4	10	1	1	3.00		3	7.15	16	—	9		3.58	
Lingayen Campaign	Jan 45	1	2	4	6	2		2.00	—	1	2.19		—	—	—		—
Volturno Campaign	11 May 44	1	3	7	9	—	10	2.71	—	—	—	—		-	-		
PO Campaign	Apr 45	1	2	6	12	—	4	2.66			—		—				
Korea	Apr 51	1	3	6	6	9	—	2.50	5	2	—	3	13	4		4.66	6
RVN	Jul 68			8	12	16		3.50	—				-	—	—	—	—

Example: ETO $\frac{147 + 10 + 12}{57} = 2.96$

Figure 1

battalions were augmented with a light equipment company to make them comparable to a construction battalion. The issue of excess equipment to these units still was not adequate to supply the capability needed to do the required construction. Over 650 items of high production construction equipment such as dump trucks, large rock crushers and rollers were provided in addition to the TO&E authorizations to achieve the road building program goals.

Figure 1 not only provides some insight into the historical allocation of engineer troops but also presents some of the requests and guidelines proposed for engineer support by the theater engineers. It can be seen that although the job got done, the senior engineers recognized that more engineer support was required to complete the job the combat commander really needed to have done to insure that the combat plans were carried out as scheduled. In each case, the stated theater requirements for engineers always exceeded available engineers.

History has provided examples to illustrate that engineers were deficient in construction equipment needed to support combat operations. The equipment was scarce because the planners thought it could be easily obtained when a war started. The personnel that were supposed to operate the equipment were not adequately trained. This is obvious because the equipment was not in the Army, and there was little construction training between wars because the focus of the army was on the combat engineering tasks. Perhaps the most significant observation coming out of the war was that a doctrine of mobility in combat dictates a vast combat engineering construction effort to support it. When one considers the improved air mobility and tactical vehicles currently in the Army inventory, it is hard to understand why more roads and other engineer construction must take place. It must be remembered that sooner or later, the tanks and helicopters need POL and ammunition. Trucks bring these items to the front. The logistical tail runs on roads. Not only has the need for highly mobile warfare created a need for more engineer construction, but the size of a divisions area has also increased without a comparable quantum jump in engineer support. In the 1944 time frame, a division area was approximately 100 square miles. Currently, the division area is 625 square miles. This is over a six-fold increase in size. This six-fold increase in area means a potential six-fold increase in road construction and maintenance, bridge construction, obstacle construction and removal, and the complete variety of engineer tasks. While the engineer equipment has become more productive, and selected items have been added to the engineer battalions, there has not been a six-fold increase in the productivity of an engineer battalion.

New Concept

In 1974, the Army took a major step towards bridging the mistakes that history has shown in the engineer organization. The Engineer Combat Battalion (Heavy) concept was introduced as a new engineer unit. The existing engineer construction battalions were converted to "heavy" battalions and given a whole new mission and training concept. These new battalions retain construction equipment and have additional small arms, communications equipment, and anti-armor support weapons. The mission of this unit emphasizes use in the combat zone in the same role as the combat engineer battalions. This was a major step forward which moved the much needed equipment

RELATIVE COMBAT CONSTRUCTION CAPABILITIES*

Task	Heavy Bn to Combat Bn	Heavy Bn (Minus One Co) to Combat Bn	Heavy Bn to One + 1/3 LE
Barriers	1.07	0.75	1.07
Roads	2.25	1.50	1.28
Heliports	2.00	1.36	1.50
Field Forts	1.20	1.18	1.07
Misc Tasks	1.10	1.50	1.07
All Tasks**	1.87	1.50	1.07

*The methodolgy and numbers presented in this figure are fully developed in "Construction in the Combat Engineering Role", ESG, Jan 74

**This row implies, for example, that a heavy battalion minus a construction company is 50 percent better at combat construction tasks than a combat battalion.

Figure 2

forward in the combat zone. The tactical commander can now count on considerably more engineer support than was previously available from the Corps combat battalion. One of the engineers most important asset — specialized equipment — is now more responsive and available.

Now, however, the engineers are facing the challenges of providing engineer support at the minimum cost. There is a powerful temptation to begin eliminating the Engineer Combat Battalions (Heavy) from the force structure because they cost more to maintain in the absolute dollar sense. This temptation must be resisted, and the heavy battalion should remain — even at the expense of the standard combat battalion.

A recent study carefully evaluated the ability of the construction battalion to fulfill the missions of the engineer combat battalions. While this study used the construction battalion as the base, the Engineer Combat Battalion (Heavy) has the same major items of construction equipment, so the comparison is still valid. A detailed requirements matrix was compared with equipment capabilities. Figure 2 compares a heavy battalion with a combat battalion in doing all of the construction tasks that the combat battalions are currently tasked to do. The figure shows that the currently organized heavy battalion has an ability to supply the tactical commander with 87 percent more combat construction support than the combat battalion does. If no costs were involved, the heavy battalions should replace the combat battalions because they provide more support for the tactical commander. However, dollars do matter.

Figure 3 shows the cost of maintaining a combat and a heavy battalion in the force structure for one year. Initial procurement costs are also shown. The heavy battalion costs over 24 percent more to keep in the force structure than the combat battalion. Although an 87 percent increase in construction capability surely merits an increased cost of 24 percent, this rationale is not directly applicable in a constrained resource environment such as the Army is currently operating in.

Figure 3 also portrays the alternative of having one third of a light equipment company augment a combat battalion to give approximately the same combat construction capability as the heavy battalion. It can be seen that a 7 percent increase in capability would cost 13 percent more, which is clearly not economical. So the solution of a light equipment company augmentation to a combat battalion is not the most economical route to obtain increased combat construction support.

Another alternative is to use the reserve force roundout concept. One of the construction companies in the heavy battalion could be eliminated from the active force structure and the battalion could become the parent unit for a reserve company in event of a mobilization. The cost for this alternative is also listed in Figure 3. The savings to the active force structures would be a savings of nearly 4 percent over the current combat battalion in the force structure and an increased capability over the combat battalion of 50 percent. This 50 percent increased capability is based on the fact that the roundout company might not be rapidly available, so it was not included in the calculation. When the roundout company is fully operational, the 87 percent increased capability of a normal heavy battalion over a combat battalion would be effective.

It seems clear that one alternative to lower the cost of maintaining the active engineer force is to take advantage of the superior combat construction capabilities offered by the heavy battalions

COST COMPARISON*

	Costs	
	Recurring	Non Recurring
Heavy Bn	$15,654,680	$15,501,553
Heavy Bn Minus D Co (Bobtail Bn)	11,973,610	11,962,823
Combat Bn	9,772,707	12,467,468
Combat Bn + 1/3 Light Equipment Co	11,511,100	13,814,799
Cost Savings of "Bobtail" vs Combat Bn		504,645
Percent Annual Cost Saved "Bobtail" vs Combat Bn		4 Percent
Percent Annual Cost Saved "Bobtail" vs Combat Bn + 1/3 LE		13 Percent
Percent Increase in Capability "Bobtail" vs Combat		50 Percent
Percent Annual Cost Saved "Bobtail" vs Heavy Bn		23 Percent

*Cost data obtained from Force Cost Information System (FCIS), Comptroller of the Army, Dec 74.

Figure 3

over the combat battalion. The savings of 4 percent in absolute costs versus an increased capability of 50 percent seems to be an alternative that should be seriously considered in the days ahead. The roundout concept would be in consonance with other activities within the US Army and also structured along the lines of other armies in the world that rely to a large extent on reserves rounding out the total force. It should be recalled that the engineers have a high percentage of their total force in the reserve structure when compared to some other branches of the active Army.

If a detailed analysis of the roundout concept proves feasible, the Corps should make the total bridge to this concept and eliminate the current Corps combat battalion from the force structure. The divisional units should remain essentially as they are, but perhaps some selected items of equipment could be placed in these units. Succintly stated, this concept seeks the designation of only one type of nondivisional engineer battalion, i.e., THE Engineer Battalion. Having one battalion in the force structure to provide nondivisional engineer support increases the engineers main resource — equipment — available to the tactical commander. THE Engineer Battalion would be the only nondivisional engineer battalion, so there could be no problem with accepting the fact that THE Engineer Battalion provided the support needed for combat operations. It would receive the same treatment by force planners as the current combat battalion does in tooth to tail calculations.

There are many advantages more significant than a clearer definition of engineer roles and missions, however. The historical examples cited document a recurrent lack of training and experience in the many facets of construction and engineering needed to construct the more massive logistical projects located in the COMMZ. By retaining the varied MOSs and specialized equipment in the force structure now, peacetime training in the use of the construction equipment would provide a base of trained people to build upon in the event of mobilization. The prospect of having readily available, specialized resources such as plumbers, carpenters, and electricians available in TO&E units during peacetime is an attractive proposition to money managers trying to stretch the facilities engineer dollars. The fallacy of readily obtaining needed construction equipment from the civilian industry would not apply. Granted that the equipment on hand would certainly not satisfy the total requirement for construction equipment for a large engagement, but there would certainly be more equipment on hand than were none to be maintained in the active force at all.

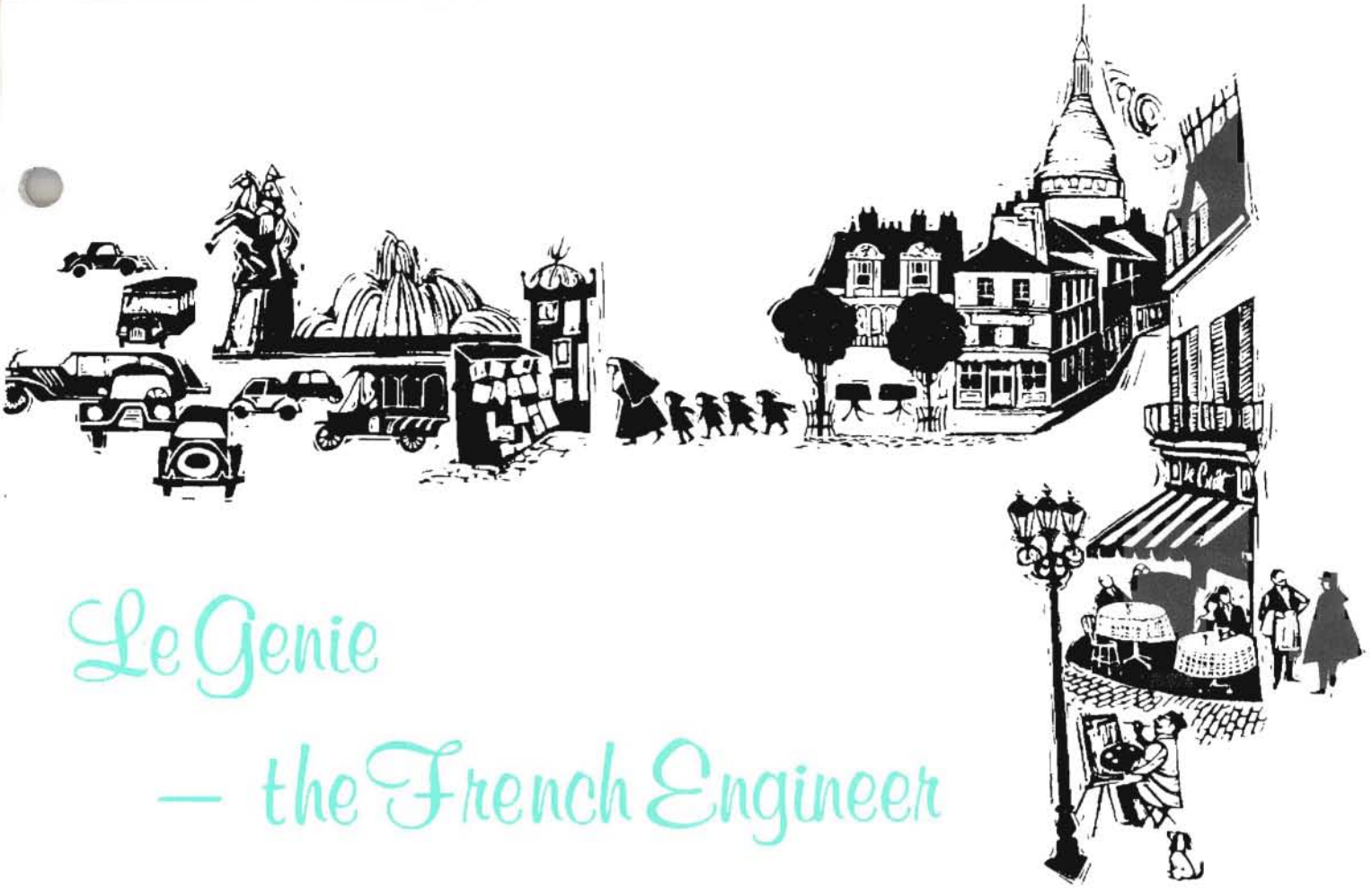
Plan Now for Future Missions

The time is now at hand to rethink the problems of engineer support to the tactical commander. One concept that appears to offer some increased capability, coupled with a decreased cost, is the idea of having just one engineer battalion. This battaion would be essentially the existing Engineer Combat Battalion (Heavy). The concepts of providing more equipment forward in the combat zone and of maintaining equipment and sparse critical skills in the force structure during peacetime, certainly merge with the lessons that have been demonstrated concerning past engineer support problems. The value of clearly placing the engineers in the role of combat support is considerable. This is not to imply that the vital tasks of logistical construction for the COMMZ will be forgotten. The same capability will exist in THE Engineer Battalions that currently exists in Engineer Combat Battalions (Heavy) which are tasked with providing construction for the COMMZ. The added benefits of the one battalion idea is that the battalion will be able to do tasks in the combat zone as well as their existing missions in the COMMZ.

History again provides us with examples of the engineers having to reorganize and re-equip after hostilities start in order to accomplish their mission. These examples should teach current force planners that the nucleus of the engineer force should be available in the active force structure. New organizations should not be developed in time of emergency but rather be planned for and developed now, based on the lessons of history. THE Engineer Battalion concept provides increased combat construction capability, decreased cost, and provides potentially available personnel for peacetime construction activities. THE Engineer Battalion concept should be "rethought" now. Reorganize now to make initial engineer equipment readily available in future combat zones. History points in that direction!

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MAJ Campbell has served as platoon leader and company commander in both construction and combat engineer battalions. MAJ Campbell received a B.S. degree from the South Dakota School of Mines and a Masters degree from Texas A&M University. He is also a graduate of the Engineer Officer Advanced Course, Command and Staff College and is a Registered Professional Engineer.



Le Genie — the French Engineer

LTC Henri C. Aiglon

Like many French institutions, the history of the French Engineers dates back to the 18th century. More specifically, in 1776, the Engineers were reorganized to consititure an integral branch of the French Army. Prior to this reorganization the Engineers were not regarded as military officers but were considered as technical advisors for fortifications and during siege wars. These engineers were trained at the only engineering school in France at the time — the famous Royal Military School of Engineers at Mezieres.

Despite these humble origins, the French Engineers have provided many notable leaders. For example, Sebastien Vauban, who became a Marshal of France, and Major General du Portail, who was accorded the honor of being the first commandant of the US Corps of Engineers.

However, since the above reorganization, the French Engineers have undergone numerous changes with respect to organization, training and functions. Some of the major characteristics of the present Engineer Corps are as follows:

- **ORGANIZATION AND RESPONSIBILITES**

At present, the strength of the French Corps of Engineers is about 38,700 men (including 2,500 officers), this is, about 10% of the Army, and it is organized into two parts:

L'ARME (i.e., the units: either combat or multi-purpose) with a mission defined basically as "to organize and improve the ground with the object of facilitating the maneuver of friendly forces and to restrict that of the enemy." In general, the missions are similar to those of the US Corps of Engineers with the following differences:

- **It is not responsible for:**

Topography (Artillery) and Mapping (Service Geographie de l'Armee = Army Mapping Agency).
Pipeline construction (Defense Petrol, Oil and Lubrication Agency).
Smoke Mission (Artillery).

- **It is responsible for:**

Flame mission.

Le SERVICE (Military Construction) is responsible for building and maintaining all barracks and facilities, quarters, hospital and training areas necessary for the proper functioning of the Army, and at times for the Air Force and Navy. However, it must be noted that "le SERVICE" is not responsible for "civil works."

- **COMMAND AND CONTROL:**

At Department of Army level, command and control is divided between:

The "Inspecteur du Genie" (The Inspector). This general officer and his staff are responsible for elaborating and formulating the policy on Engineer affairs: doctrine, tactics, equipment, training, combat readiness, and so forth, including technical matters. He is also charged with the inspection of all Engineer units, organizations and installations. He is the head of the Corps and is normally a Lieutenant General.

The "Directeur Central du Genie" (The Director), usually a senior Major General, holds the number two position in the Corps. He and his staff are responsible to:
The Inspector for the implementation of his policies.
The DA for the management of Engineer personnel matters, promotions, and assignments.

Below DA level:

At the military region level (France is divided into 7 military regions, plus French forces in Germany), we have a "Commander and Director of Engineers" and a staff. This officer, normally a Brigadier General, and sometimes a Major General for the more important regions (for example, Military Region 6 in Eastern France) is the Engineer advisor to the Commander of the region, and is the Commander of all Engineers stationed in the region (Engineer units and districts).

- **L'ARME: (the Units):**

These consists of twenty-three regiments, plus the "Brigade des Sappeurs Pompiers de Paris" (Paris Firemen Brigade — 5,000 personnel), and one school located at Angers — equivalent to the US Army Engineer School at Fort Belvoir. The Army Engineer units are organized in terms of Force Systems. There are three different types:



Main Combat Force
Territorial Defense Force
Overseas Intervention Force

Engineer units are often stationed overseas, and there are also Engineer officers and NCOs serving as advisors overseas, mainly in Africa. The characteristics of the most important units assigned to the **Main Combat Force** are:

At Brigade level: 1 separate Combat Company (171 persnnel).

At Division level: 1 Regiment (749 personnel) consisting of:
Headquarters and Headquarters Company
1 Equipment and Bridging Company
2 Combat Companies

Thus in a Division of 3 Brigades, the Engineers constitute 1262 personnel, and 5 Combat Companies. All Combat Squads are equipped with the French Combat Engineer Vehicle (CEV). (This is a type of Armored Personnel Carrier with a dozer blade, a foldable boom, a winch, a 20mm automatic gun, and is capable of carrying 10 personnel). The bridging equipment consists of the Gillois Amphibious Bridge (named after its French designer) which is equivalent to the Mobile Assualt Bridge — in US terminology it is known as the Amphibious River Crossing Equipment — the AMX 30 AVLB (63 foot span, Class 60). There are 8 AVLBs and 4 launchers at the Divisional Combat Battalion level and 4 AVLBs and 2 launchers per Brigade Engineer Combat Company.

At Corps level (2 or 3 Divisions):

One Combat Regiment, Corps type (888 personnel) with 1 HHC and 4 Combat Companies

Two Combat Support Regiments (1352 personnel each) with 6 Companies:
1 HHC, 1 Light Equipment Company, 1 Floating Bridge Company, 1 Transportation Company, 1 Amphibious Bridge Company and 1 Firemen Company.

In other words, a Corps of 2 Divisions has a total of some 7,500 Engineers.

The other Force Systems consist mainly of:
One Combat Battalion (Airborne), Territorial Combat Battalions and infrastructure units such as: Railway Battalion and 4 Airfield Battalions capable of constructing, maintaining and repairing airfields of all types.

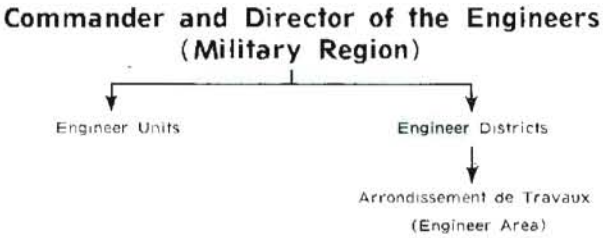
Equipment: At present, with the exception of some old US bridging equipment (Bailey and M4T6), French Engineers are equipped with French designed and built equipment. The most famous of these is the Gillois am-

phibious equipment consisting of 3 different models built on the same chassis and basic mechanical unit:

The ferry: Class 30 or 60 when coupled
The amphibious bridge: Class 60 to 100
The self-propelled bridge (scissor type bridge, 66 foot span): Class 30 or 60 when coupled.

- **Le SERVICE: (Military Construction:)**

It is under the direct control of the Director (Directeur Central). The detailed control of building and maintenance is vested in the "Commander and Director of the Engineers" of the military regions (almost equivalent to the US Engineer Divisions, for the construction aspect only). Within every military region further subdivision of control is made and a typical lay-out would be:



An 'Arrondisement de Travaux' is similar to an Area Engineer in the U.S. Army Corps of Engineers. He is in charge of either a large garrison town or a georgraphic group of smaller military installations.

At the "Commander and Director" and at the "District" level there is a technical department in charge of the design of new buildings and construction. The other administrative departments handle real estate, finance and contracts.

These departments are responsible to the higher level of the Engineer chain of command and to a larger technical department of the 'Directeur Central" called 'Section Technique Batiments Fortifications et Travaux (STBFT). The STBFT deals with the evaluation and approval of all new important designs submitted by the military region level and at times produces designs for major porjects.

Before concluding, it would be appropriate to mention another Engineer school — "the Ecole Superieure du Genie" at Versailles. This is a technical school for officers and non-commissioned personnel assigned to military construction. For example, it offers an 18 month course for young Engineer Captains (college graduates) which leads to the equivalent of a Masters degree in Construction.

- **CONCLUSION**

The French Engineers have a long and proud military engineering tradition in both war and peace. Since its inception in 1776, the traditional 'black and red' colors of the Corps and its Crest — the steel plate and helment, have been in the forefront of major scientific and technical developments and have "led the way" for the French armies involved in wars all over the world.

A brief review of the roster of those who have passed through the ranks of the Corps reveals many famous names in French military and scientific history. Some of the prominent figures and their contributions are:

MARSHAL VAUBAN: Known as the 'father' of the French Engineers, he was a world renowned expert in both construction and fortification techniques.

GENERAL CARNOT: A member of the French Revolutionary Committee at the time of the Revolution, he was named "the organizer of the victory."

NICOLAS CARNOT: Son of the above, a mathematician and physicist (thermodynamics).

GENERAL BERTHIER: Chief of Staff of Napoleon's armies.

CLAUDE ROUGET de LISLE: Composer of the 'Marseillaise' — the National Anthem.

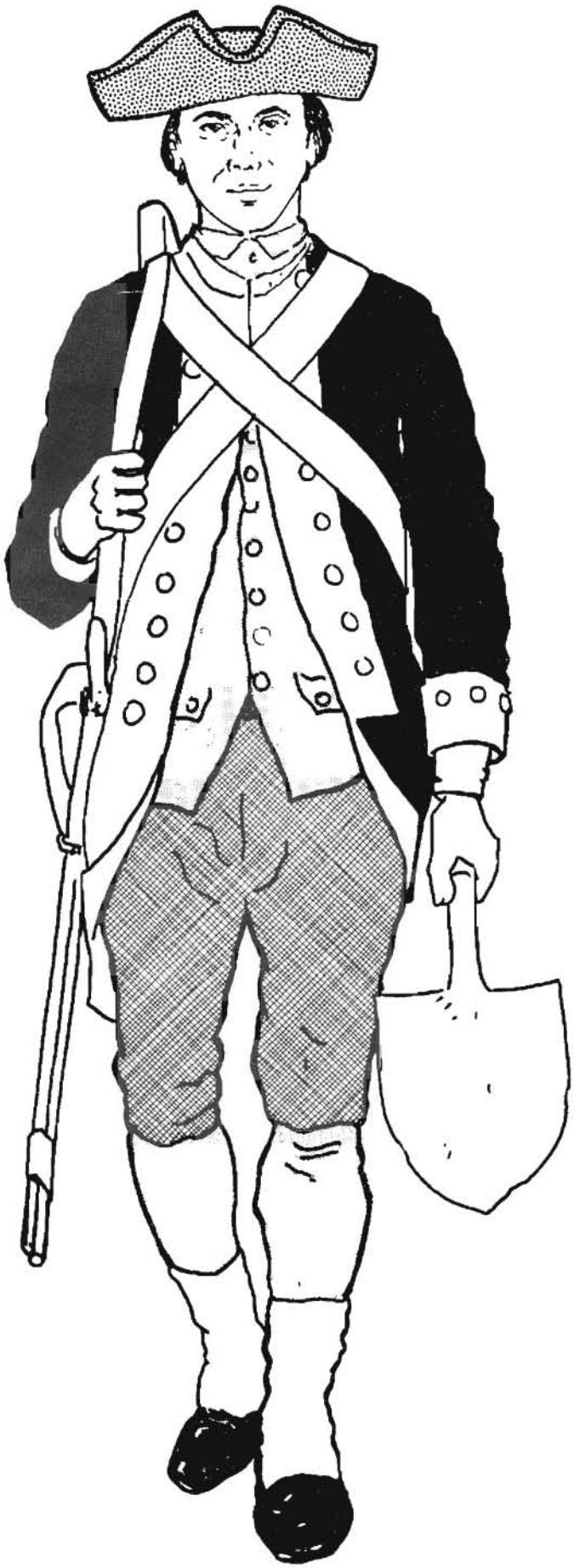
CHARLES COULOMB: Electricity.

GENERAL PONCELET: Mathematician and physicist.

MARSHAL JOFFRE: Commander, Allied Forces in World War I.

Now, 199 years after their 'refounding,' the motto the French Engineers — CONSTRUCT OFTEN, DESTROY SOMETIMES, SERVE ALWAYS, constantly serves to remind the Engineers that as in the past, so in the future, they will continue to constitute an integral force in the nation's defense system.

Army Lieutenant Colonel Henri C. Aiglon, Engineers (FRANCE), is presently District Engineer, Tours, France. He was the French Liaison Officer to the US Army Engineer School, Ft. Belvior, Virginia from 1972- August 1975, served as a combat engineer in North Vietnam (1954) and Algeria (1961), and was an instructor at both the French Armor School and the French Military Academy. He is a graduate of the French Military Academy, St. Cyr and holds the French equivalent of a Masters degree in engineering.



The Forgo

Present day officers of the Corps of Engineers are very familiar with the currently used "Essayons" button. This button has been definitely identified as being used in 1814 and may have been used in modified form as early as 1802 when a Congressional Act authorized the now familiar Corps of Engineers. But what, if any, did the Army Engineer officer wear as a uniform button prior to 1802?

Records of the Revolutionary War Period (1775 to 1783) do not reveal any distinctive type of button being worn by the appointed engineer officers. Engineers of that period wore either the button of their parent state with a state identification or the general service button. The regular Continental Army uniform button was either white or yellow in color with "USA" on the face.

In November of 1783, by act of Congress, the existing Corps of Engineers was mustered out of active military service along with the majority of

MAJ Francis Nataluk



FIG 1

tten Engineer Buttons

the remaining Continental Army. Regular forces by June 1784 (including engineers) consisted of two small "caretaker" detachments, one 25-man group at Fort Pitt and one 55-man group at West Point, and one commanding officer. However, in the same month, Congress authorized a small standing Army. This regular Army consisted of eight companies of Infantry and two companies of Artillery (no engineers were indicated in the organization).

By 1793, relations between Europe and the United States had deteriorated to the point where President Washington asked Congress for the authority to begin fortification of principal harbors along the East Coast. Congress granted this request in March 1794, and Washington appointed several engineers to supervise these coastal districts and the construction of forts and artillery emplacements. The uniform, and specifically its buttons, worn by these first "District Engineers" is not recorded. It is assumed by military uniform historians that these men wore the Artillerists uniform with some modification to designate them as engineers.

In May 1794, a Corps of Engineers arm was added to the Artillerist Corps and the resultant "Corps of Artillerists and Engineers" (USA&E) was formed. Initially, these Corps officers wore the then existing Artillery uniform and a button (Fig 1) consisting of an eagle facing to the left, standing on a field piece which pointed away. This button was quickly replaced in the same year. The button worn by the USA&E can be found in four variations involving the absence or appearance of regimental markings above the field piece. Shown here is the third variation, inscribed with the markings of the 1st REG to set apart the wearer from the 2d REG, similarly marked. Of the other two Corps of Artillerists and Engineers buttons, one had only the USA&E in script below and the other was similar to Fig 2 except for the absence of the designation "1st" or "2d" before the word Reg't. The second regiment and consequently the 1st and 2d Regiment identification were authorized in April 1798.

Buttons of the general design of Fig 2 were worn by Engineers until 1802 when the Corps of Engineers was separated from the Corps of Artillerists. From then until 1814, the records do not identify any distinctive buttons on the engineer's uniforms. Uniform historians surmise, because of the small number of affected officers (20), these men wore the current Artillery button or the older USA&E button. By 1814, the Essayons button was being worn by officers at West Point Academy as noted by General D. Ramsey. In 1902, when the Army adopted regulation buttons, the Corps of Engineers alone was allowed to retain the distinctive button. It has remained essentially unchanged in appearance since 1814.

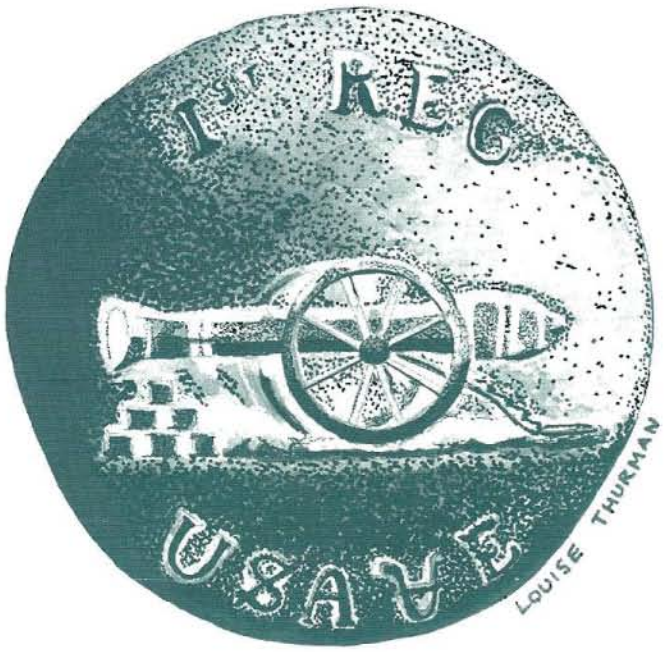


FIG 2

Major "Mike" Nataluk is a USAR officer on a STEADFAST tour of duty with the US Army Engineer School at Fort Belvoir. He has served in a number of Engineer units, both active and reserve and is a graduate of the Command and General Staff College at Fort Leavenworth, Kansas. His interest in early Engineer history came as a follow-on to working with Reserve and National Guard units, many of which have lineage dating back to Revolutionary and pre-Revolutionary days.

Combined Arms team River Crossing Operations

Working under the cover of darkness and following the philosophy "if they can see you, they can kill you", engineers of the 7th Engineer Brigade and members of the VII Corps combined arms team learned that river crossing operations can be conducted successfully and without major difficulties.

In a series of exercises during April 1975, the 7th Engineer Brigade conducted river crossing training and four, 3 day combined arms retrograde river crossing FTXs on the Main River near Kitzingen, Germany. The exercises provided a unique opportunity for engineers and members of the combined arms team to practice and develop techniques for conducting night river crossing operations in hostile environment. While some new concepts resulted, many of the lessons reaffirmed established techniques and doctrine.

The objectives of the exercises were threefold; one, to allow the engineers to train with all the Corps' float bridge equipment; two, to exercise the combined arms team in a situation requiring limited daytime movement and a night retrograde river crossing; three, to develop experience and lessons learned to expand current retrograde river crossing doctrine.

The Admin Portion

In preparation for the FTX, each of the four combat engineer battalions of the 7th Engineer Brigade underwent three days of refresher training with river crossing equipment. The training days were long and allowed for both day and night training. To prepare for the FTX, each unit made maximum use of integrated training and devoted its major effort on the heavy bridging — CL 60, M4T6, and the M-2 Bailey Bridge.

Each unit realized early in its training cycle the importance of cooperation between "supporter and supported." The close coordination thus fostered during the training cycle helped each unit to accomplish its FTX missions with minimum delays.

The FTX Portion

The FTX was designed to force intense but realistic utilization of the entire spectrum of river crossing capabilities. The engineers were required to support combined arms tactical crossings in "real" time based on realistic enemy and friendly situations. The bridging and crossing sites available were matched to the actual number of vehicles and tactical plans of the crossing area commander. Controllers did, however, limit the bridging available to that which would normally be available to a crossing area in the Corps zone.

Each scenario was tailored to the specific tactical crossing unit. Because the crossing units varied from a Pershing artillery battalion, to a cavalry squadron, to mechanized infantry, each river crossing scenario was tailored to the crossing unit. Each scenario assumed the loss of air-superiority shortly after the outbreak of hostilities, and each involved a retrograde river crossing. Tactical commanders functioned as crossing area commanders (CACs) and were required to prepare crossing plans for bridging on the first night and rafting the second. The rafting operation was

forced through a withdrawal of heavy bridging to the rear plus the proximity of enemy forces. Every CAC was supported by a combat engineer battalion of the brigade plus float bridging from the 565th Engineer Battalion (Composite). In addition, each CAC had MP support for traffic control, ADA (Chapparal/Vulcans), and smoke from a section of a labor service smoke generator company. To realistically portray the lack of air superiority, the CAC was opposed by high performance aircraft and attack Cobras from the 3d Combat Assault Bridge.

Reaction to the Loss of Air Superiority

Of all the lessons learned, the reaction to the loss of air superiority was the most interesting. The initial reaction by the engineer units was to refrain from any movement or activity whatsoever during daylight hours for fear of enemy air attack. However, time restraints and pressure to accomplish the mission forced a re-evaluation. As a result, work proceeded by limiting vulnerability and presenting only small targets (targets which the enemy would not risk a million-dollar aircraft to destroy). Further, the effectiveness of the Chapparal/Vulcan battery against enemy air was sufficient to provide increased confidence to all the crossing elements and mission work progressed with few delays. After the bridge crossings were completed the first night, the engineers were required to remove the bridge completely or place it along the river bank. Each engineer unit elected to disperse the bridge; however, the dispersion undertaken was usually insufficient. Due to the large bomb load capability of enemy aircraft and their ability to bomb at set intervals, the bridge parts should have been spread at least 100 meters apart and at uneven intervals. Other options were to tie sections together and camouflage to represent an island or beached debris.

The engineer units soon learned the value of clearing the bridge construction site of all unnecessary vehicles. Besides presenting a much smaller target, operations were greatly improved by reduced congestion. In most cases, vehicles returned to the bridge park. An alternate course, suggested by the Air Force participants, was to park the vehicles in geometric patterns next to a village. Infared detection devices would easily spot the hot exhausts against the cool background of woods, but the image would be indistinquishable from the village itself. However, such vehicles had to be moved or well camouflaged before daylight.

Constructing the bridge and conducting the crossing under blackout conditions disturbed several commanders from a safety and operational point of view. Their fears were unfounded as all four crossings were successfully conducted with little lighting. Crane lights and hand-held flashlights were the only lights used to construct the heavy bridge and rafts. Light tactical raft and footbridges were installed using only covered flashlights. As a illustration of the light discipline achieved, aggressors who were less than one kilometer away were unaware of the light tactical raft and footbridge construction. While some crane lights were visible from that distance, the type activity remained unclear.

With a smoke generating capability available, each unit was quick to request its maximum utilization. Unfortunately, administrative restrictions limited the use to one or two hours during the morning and evening. The smoke generating units capability to "haze" an area proved as effective as dense smoke and created better construction working conditions within. Smoke, in general, has an adverse effect on the Vulcan/Chapparal unit which is dependent on visual observation for target detection. Lastly, an interesting observation was made by Air Force representatives concerning the use of smoke and terrain analysis. As the valley utilized for the crossing was very similar to an adjacent valley, smoke could have been used solely in the unused valley as a deception. Such a deception would have allowed the ADA to operate with unlimited visibility as a bonus to the ruse.

Retrograde River Crossing Doctrine

The exercise clearly demonstrated that a retrograde river crossing is NOT simply a hasty or deliberate assault river crossing in reverse. A noticeable distinction arises in the area of command and control, since the crossing area commander (CAC) will change depending on the location of the crossing area on the battlefield. A few items should be highlighted:

- Crossing area forward of the brigade rear boundary. Uncertainty as to the specific identity of the CAC in a retrograde is thus introduced by enemy action and friendly response through maneuver, an element missing in the assault river crossing. This situation more closely represents the current doctrinal approach where the senior tactical commander is the logical person to control the crossing. To prevent his tactical plan from being subordinate to the crossing plan of another commander, he must be the CAC. Considering the nearness of enemy action, the crossing plan must be closely integrated with the tactical plan and the placement of crossing area control under one commander is paramount. The CAC retains this control until the area is cleared of friendly troops and removal or destruction of the bridges/rafts is complete. Support elements (engineers, MPs, ADA, smoke) are in direct support of or attached to the CAC during the crossing.
- Crossing behind the brigade rear boundary.

Unlike the situation described above, these areas will probably undergo several changes in crossing units throughout their existance. Furthermore, there may be numerous units crossing in both directions which may or may not belong to the local senior tactical commander. Therefore, it seems that the local senior engineer should be the CAC for the duration of the crossing or until the crossing area falls within the brigade rear boundary. Support elements should thus be attached (MPs, smoke) or in direct support (arty, ADA) for the life of the crossing area. This degree of permanency allows the CAC to establish a crossing area to accommodate multi-sized units crossing in both directions. The tactical commander then merely communicates with the engineer CAC when he wants to cross. The actual movement must be cleared with the Corps MCC (Movement Control Center), but the specific crossing time should remain the preogative of the engineer CAC. Location of CAC headquarters and radio frequencies must be given wide dissemination to units expected to cross.

• Location of the CAC. Proper location of the CAC and the support element commander, to include the engineers, is important for the overall control of the crossing area. In general, all CACs involved in this series of exercises located their CPs at the staging area or near the crossing site. During the crossing, most moved to a location directly on the river. Since most crossings occurred at one site, this was best. However, this would have been unadvisable had more than one site been operational. The support commanders tended to stay too near their headquarters and allow liaison officers to effect the close coordination. In only one case did an engineer commander elect to move a jump CP to the same area as the CAC. Coordination would have improved had the unit possessed sufficient communications equipment to remain in close contact with its own subordinate elements. As it was, the overall effect was disruptive to control. Therefore, unless the engineer is the CAC, movement of the engineer and support CPs to the vicinity of the CAC is not recommended.

• Artillery support. Artillery support was included in the exercise, but crossing commanders failed to include the integration of artillery support in their crossing plans. Artillery support in a retrograde crossing is essential, particularly during the latter phases of the crossing in the brigade sector. Artillery and ground dispensed scatterable mines could assist considerably the last elements in crossings and could delay the enemy while engineers move tactical bridging or destroy the remaining bridging and equipment.

• Communications and electronic warfare (EW)

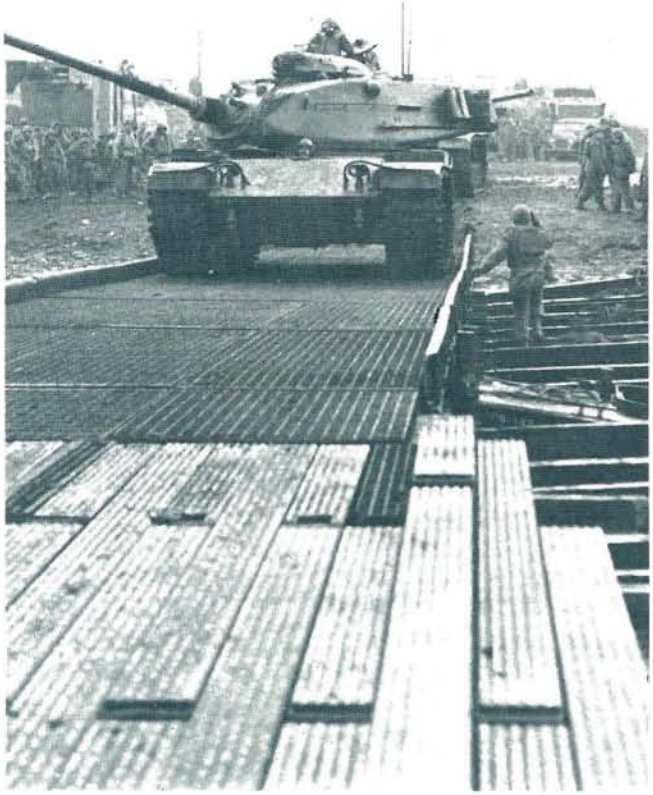
During the administrative phase, engineer troops integrated CBR with Bailey Bridge construction.





The exercises proved several firsts, including the first Pershing Missle erector-launcher to cross a tactical bridge (7 April 1975.)

The first M-60 Tank crosses a combination M4T6-Class 60 bridge during the pre-dawn hours.





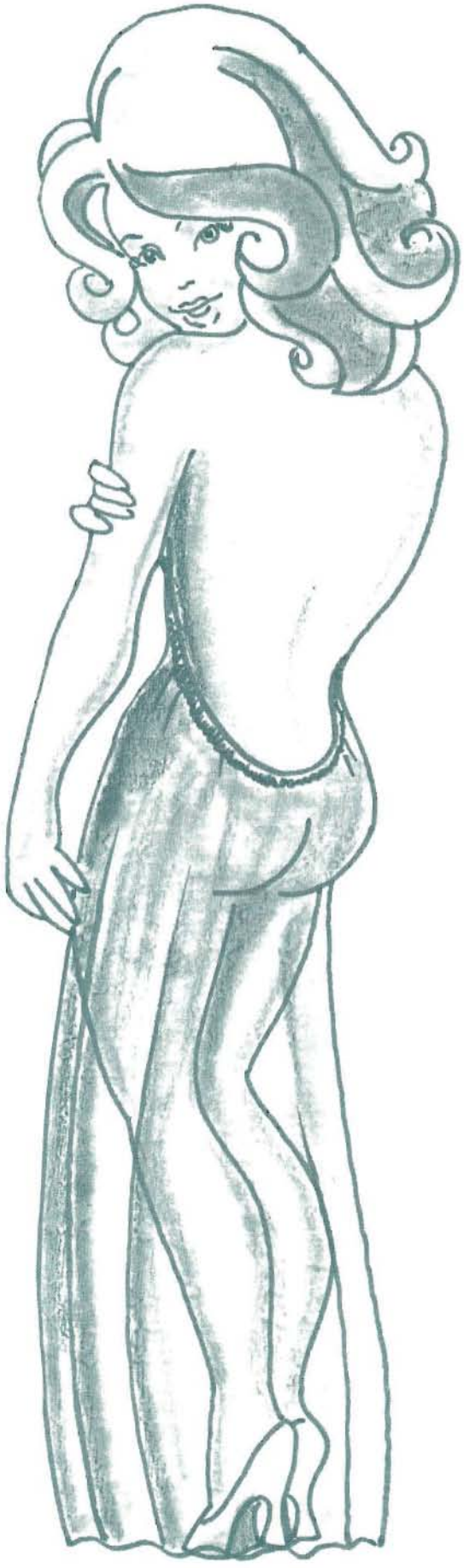
Class 60 Raft still plays and important role in vehicular movement.

considerations. The high number of radios utilized during the crossing caused a definite EW problem which was never solved during the exercise. The concentration and frequency of use was controlled somewhat, but not to any large degree. However, several actions taken by the units in an attempt to reduce emissions were significant. In one case, a separate and specific CEOI (communications-electronics operating instructions) was prepared and insured the assignment of all call signs and frequencies to all assigned or attached or DS elements. Another approach was to utilize listening silence during the crossing. The tactical units conceivably could comply with this arrangement, but the military police had to sacrifice traffic control for fewer emissions. As a result, the MPs disregarded the direction and accomplished their traffic control mission. A third approach is to direct radios to low power sufficient to cover only the area of operations. Low powered radios were also needed at the raft sites during the hours of extreme darkness, as traffic tended to be unevenly distributed. A low powered radio at each site, controlled centrally by the engineer-in-charge, would have contributed significantly to even traffic flow. Lastly, the use of wire and field phones was never considered due to the large number of tracked vehicles and the administrative problems of laying wire. The use of wire remains a reasonable solution to the problem, particulary at rear area crossing sites.

The exercise was instrumental in emphasing the role of the engineer on the combat combined arms team in VII Corps. It forced the combined arms objective and provided realistic bridge/rafting construction and crossing experience for a large number of units, including the "first" Pershing missile erector-launcher to cross a tactical bridge. The April Bridge Training Exercise was indeed river training — European style, a style to be repeated often with new and better equipment and concepts.

Major Wain W. Stowe is presently S-3, 7th Engr Bde. He attended the Command & General Staff College in 1974 and has since been assigned to Europe. Previously, he was the Operations and Training Officer of the brigade. The FTX portion of the exercise outlined in the article was authored by him.

Captain William F. Greene is currently S-3, 565th Engr Bn. He has been in Europe since 1973 and was responsible for the Administrative portion of the exercise outlined in the article. He has authored several articles in other publications describing innovative approaches concerning the utilization of Class 60 and M4T6 bridges.



ADVANCED
GETS INVO

MAJ William L. Jones

For the past year and a half, officers attending the Engineer Officer Advanced Course (EOAC) at Ft. Belvoir, Virginia have participated in numerous combat-development, doctrine-development, and training-development group seminars for elective credits. The goal of the elective program has been to provide meaningful problems to expose students to the Combat and Training Development (CTD) process and to capitalize on the students' past experiences.

Projects were selected from a list of critical sujects being worked on by the resident CTD staff. Over 50 projects, running the gamut of the CTD mission from conceptual studies for the near future to training program design have been initiated or completed. All projects are original work and only general guidance is provided by CTD staff advisors.

The unstructured format, internal organizational requirements, and problem definition posed a challenge and provided a change of pace from the usual structured classroom environment. For many officers, this was the first opportunity to participate in a staff working group where results were expected and the work group had to collectively detemine what should be done.

The following are a few of the projects the EOAC students have worked on:

COURSE
LVED

Task Analysis of the Construction Battalion: The analysis laid much of the ground work for what later became a concept for employment of the engineer combat battalion (heavy). In addition, it provided the foundation for ARTEP 5-115, which was printed as a test document in April.

Camouflage Move Script —Two scripts were written and color TV tapes prepared, published and distributed.

Scenario Oriented Recurring Evaluation System (SCORES) Participation: The student group was required to make a terrain analysis of a specific 100 square kilometer area in a selected part of the world. The group found that current map products were inadequate. Shortfalls in the Army Terrain Intelligence System were surfaced. System changes were proposed to reduce the problem.

Engineer Squad Vehicle (Mech): What vehicle can best fill the needs of the mechanized engineer squad? Students examined prototypes and the full family of vehicles used. Size, crew production, capabilities, and maintenance were evaluated and the group recommended the M548. Substitution in part for M113s is being recommended by the Engineer School based on this analysis.

Universal Brigades and Group Headquarters: Now that the construction battalion takes on a combat mission, can construction and combat headquarters be made common? If so, what should the organization contain? A student group conducted the analysis, briefed the Engineer Center Team, and actively participated in the TOE 5-52 and 5-101 design. Both are currently undergoing review. Concurrently, an ARTEP for each headquarters is being developed by USAES to more clearly delineate the functions of each headquarters.

Training Packet Design: There is a need in the field for support of ARTEP task training that will reduce lesson preparation time and facilitate decentralized training by junior leaders. Students developed a highly illustrated pamphlet aimed at the squad leader including a "Tips to the Trainer" section with instruction for the leader in conducting effective and efficient training. The pamphlets are printed locally at the Engineer School and are available through the Department of Army-Wide Training Supprt (DAWTS), USAES, Fort Belvoir, VA. 22060.

Winterization of Civilian Construction Equipment (CCE): What modifications in equipment or procedures will best support units employing CCE in artic regions such as Alaska? Student research of civilian practices revealed in many cases that training or cold weather procedures combined with minor equipment modification often were more cost effective than more complex equipment modifications. Results will be staffed and programmed into future procurement actions.

Engineer Sets, Kits and Outfits: How adequate are engineer tool sets? What changes need to be made in procedures to routinely modernize components? Students recommended significant changes in procedures for review of sets kits and outfits (SKO) to TRADOC. Subsequently the Logistics Center developed and sent to various schools a comprehensive list of SKO s for review and comments. The majority of the student recommendations are expected to be adapted in new procedures being written now.

The above samples show the range, depth and utility of the EOAC seminars. Different groups receive different exposure, but collectively they gain an appreciation of the complex problem of enhancing the Army in the field. The fresh ideas and challenging attitudes of the EOAC students provide positive stimulus to the CTD community, and, above all, bring to bear on this problem the perspective of the company leader. The students also learn what CTD does and how the service school model works, thus better understanding how change can be accomplished. Further, students learn how to work within non-structured peer groups with only general direction and ultimately deliver a formal decision breifing.

Major William L. Jones is currently Chief of Regulatory Functions, Baltimore Engineer District, Baltimore, Maryland. He is a graduate of Norwich and Missouri Universities and of the Engineer Officer Advanced Course. He has served as a Combat Engineer Company Commander and as a Battalion Executive Officer in both Germany and Vietnam. His last assignment was as Chief of Unit Training for ARTEPS, Doctrine and Training Developments Division, USAES, Ft. Belvoir, Virginia.



CPT Charles C. McCloskey III

The BEST Way to Train

The basic fighting engineer unit in the United States Army is the combat engineer battalion. A combat engineer battalion is organic to every Army division, present in Army corps, and found in theater armies. The value of the combat engineer battalion to today's Army is proved not only by this inclusion in division, corps, and army TO&Es, but by the fighting combat engineer heritage and outstanding combat engineer performance record in past American wars. The basic premise is that an effective Army must have combat engineers. The corollary is then that the combat engineers must also be effective. To be effective they must be well trained.

In today's Army, how should this be done? Recent years have seen the Department of the Army promote decentralized training; intended or not, the training load was put squarely on the shoulders of the company commander. The Army in the field was told that the company commander, because he is so close to his unit, can best determine the training needs of his men, can best plan training, can best execute training, and can

best evaluate training. Although these statements have much validity, they gloss over three very important facts:

- The company commander has many other mandatory demands on his time which limit the time he can devote to planning and executing training.
- The battalion commander bears primary responsibility for his command's combat readiness, training being a major if not the most important factor in this readiness.
- A full-time battalion staff, particularly the S-3 section, exists to serve the company and battalion commanders.

So while not diminishing the primary importance of the company commander's role and judgment, means do exist within the combat engineer battalion to assist him in training his unit better than he could do it by himself, namely the experience and guidance of the battalion commander and the expertise and time of the battalion staff.

An Army cliche which is probably said, in a negative way, several thousand times a day is "reinventing the wheel." Before continuing, it should be stated that the training system proposed here is not novel or pioneering. But rather than "reinventing the wheel," more correctly it gets back to fundamentals. Under this system, tasks outlined for commanders and staffs in FM 101-5, "Staff Organization and Procedure," and similar doctrinal publications are done by the personnel designated to do them. The company commander is not forced to do everything himself. And the guidance found in TC 25-5-1, "Training Management: An Overview," is followed. The battalion commander functions as the training manager for his battalion.

Definition

The BEST way to train a combat engineer battalion is a Battalion-administered, Economic, Systematic, Testing Program. This program is formulated by the battalion commander and staff, developed and directed by the battalion operations section, and implemented by company personnel and the battalion staff. The BEST program economizes on company time, leaving the company commander free to set priorities among conflicting missions while insuring him that his unit will be periodically tested on its ability to perform basic individual and combat engineer missions. The BEST program is systematic, built on a cyclical time frame and progressing in scope from the individual level to squad, platoon, and company. The BEST program is a testing program which evaluates each element of the command on its ability to accomplish its mission and provides the battalion and company commanders alike feedback on training strengths and weaknesses.

How To Implement The BEST Program

The first step in implementing the BEST program is to allocate time. A training cycle must be selected — say 6, 12, or 18 months, or whatever the battalion commander feels is appropriate. Having selected the cycle, it is next divided into four phases: individual, squad, platoon, and company. Next, specific time periods at the end of each phase are set aside for testing, scheduling around known future requirements.

The second step is for the battalion commander to determine the training needs for each phase. He meets with the battalion S-3 and together a determination of needs is made based on:

- Wartime mission requirements;
- Army training requirements as specified in FMs, TMs, ARTEP 5-35, command directed training, and other appropriate training references;
- Special mission requirements; and
- The battalion commander's evaluation of the training status of the battalion.

The cyclical training program has now been blocked out, and the training needs identified. They are published and distributed to company commanders and the battalion staff for use in their planning.

The next step is to plan each test. The planning should begin at the conclusion of the previous phase's testing or earlier. The scope of the test is developed — how many missions, how long, what support will be required, the type and number of training sites. Then coordination is done, primarily in the S-3 section, to bring the concept to reality.

Out of this work comes a **letter of instructions** (LOI) to company commanders and the battalion staff. The LOI gives details, requirements, and time schedules of the test. Assignments as test site evaluators are distributed evenly among all line units, with the battalion staff supporting as necessary.

The detailed planning of each test station, to include lesson plan, scenario, and score sheet, is done by the evaluator and monitored by the S-3 section. This is significant because it not only greatly expands the capability of the battalion to conduct a comphrehensive test; it also broadens the military education and experience of all evaluators by charging them with the development and execution of a test.

What is the company commander doing in the meantime? He is setting priorities among all assigned tasks and accomplishing them in the best manner possible. He is training his company in

accordance with the battalion commander's guidance and based on his own assessment of the company's training needs. In the back of his mind he knows that company training must have a high priority so that the company is ready for the test which comes at the end of the phase.

The next step is execution, the taking of the test by individuals or units. Test progress is monitored by the battalion commander and his staff. Results are collected and tabulated by the S-3 section and high scoring individuals and units are recognized and rewarded. A side benefit of the testing is that it often turns out to be the best training the individual or unit has had during the phase, for conflicting priorities often prevent training in certain subjects during the phase.

The final step is evaluation. Both the test results and the test are studied to determine the training status of the tested units and the effectiveness of the test. Recommended improvements for training of units are passed on to the company commanders for incorporation into their training programs; recommended improvements for testing go back to the S-3 for incorporation into future tests.

Why The BEST Program?

What makes the BEST program better than fully decentralized (company controlled) training? There are many reasons.

First, the battalion commander best understands the battalion's mission. He, better than anyone else in the battalion, knows what particular missions his units must be capable of performing. He knows, for example, whether it is more important to concentrate on bridging, demolitions, reconnaissance, or infantry tactics and the relative weights to assign to each. Thus he can tailor training for combat readiness better than the company commander.

Second, the battalion commander has a better grasp of the total training situation. He knows what conflicting missions — such as construction projects, major field problems, and guard commitments — are expected and can schedule the testing around them. The company commander frequently cannot do this and the consequence for him is cancelled company training.

Third, the battalion commander, through his staff, has better access to the resources essential to good training. These include training areas, training ammunition, special equipment (such as bridging, assault boats, or cranes), and support personnel (such as equipment operators, special skills personnel, and other military units). The staff has this access as part of their normal duties and it is far more economical for one staff section to gather training resources than four or five company commanders.

Fourth, the staff can devote the time necessary to develop sound, thorough, and meaningful tests. Compared to the company commander, the S-3 section has far fewer competing time demands and thus can stay with the BEST program from beginning to end without interruption. This, too, economizes on company commanders' time.

Other factors which are significant in recommending the BEST program are:

- Training standards can be set and enforced uniformly throughout the battalion;
- The majority of the coordination is done at the battalion level;
- The maximum number of units receive at least the minimum essential training;
- The company commander is still free to train his unit as necessary — only four training weeks of a yearly cycle are set aside for testing.

Alternatives

Major alternatives to the BEST program are fully decentralized training (training planned and executed strictly at company level) and committee training (training conducted by selected individuals detached from their normal duties in order to plan and execute training for the battalion).

In favor of fully decentralized training is the fact that the company commander best knows the current status of his unit and can tailor training to counter its weaknesses and exploit its strengths. Also, fully decentralized training promotes self-education by chain of command members. Further, fully decentralized training must be employed in certain situations such as separate combat engineer companies and widely dispersed companies within battalions.

On the other hand, companies do not have easy access to all resources necessary for good training; they lack the training expertise and experience found in the battalion staff; and they do not have the overall picture of the mission requirements of the battalion.

Committee training has the advantages of providing well-planned, well-rehearsed training for all units of the battalion. It, too, removes much of the training burden from the company. Also, it allows the battalion commander to set and enforce standards of training throughout the battalion.

The major disadvantage of the committee system is that it disrupts the chain of command by taking key personnel (platoon leaders, platoon sergeants, squad leaders, and section leaders) out of their normal jobs for extended periods of time and thus renders and company chain of command less than fully effective.

Of course, in certain situations, the committee system is the best possible system. The best examples of this are basic training, advanced

individual training (AIT), and initial unit training after activation. In these cases, however, the training is accomplished prior to the individual or unit having an operational mission.

Case Study — The 237th Combat Engineer Battalion

Does the BEST program work? Indeed it does. The 237th Combat Engineer Battalion, a VII Corps unit belonging to the 7th Engineer Brigade and stationed in Heilbronn, Germany, has been using this system since October 1973 with outstanding results.

In 1973, the battalion commander of the 237th was faced with the problem of keeping his battalion combat ready while simultaneously having all troop barracks and the dining facility rehabilitated, accomplishing many construction projects for the community, performing security missions at ammunition supply points, and participating in several brigade and higher directed projects, programs, and field problems. Company commanders routinely saw their well-prepared training schedules go out the window with last minute priority changes and crash projects. The only way the battalion commander could systematically accomplish all assigned missions and maintain combat readiness was through a well-planned training program which took into account the other requirements levied on the battalion. This then was the impetus for the BEST program.

The initial cycle was set as the calendar year. The year was divided into phases as follows:

Jan-Feb - Individual
Mar-Apr - Squad
May-Jul - Platoon
Aug-Dec - Company

The longer phase for company testing allowed for slippage in the other phases. Training guidance and goals were established and the program was published and distributed to all units.

Individual, squad, and platoon testing were all accomplished with outstanding results. Company testing was combined with REFORGER 74, a major U.S. Army Europe exercise, and likewise produced outstanding results. An almost tangible change came over the battalion as combat readiness and morale picked up. The chain of command was strengthened, and the company commanders were better able to set their priorities and train their companies.

Minor problems in implementation the first year were in developing the tests, securing necessary training areas and waterways, and scheduling around large construction projects. Unfortunately, all units did not receive all the testing because of higher priorities on some construction.

Planning for the 1975 BEST program began in fall 1974 with the formulation of revised testing concepts and goals and the submission of proposed dates for testing. The program was again published, this time with better information on training facilities and resources available, training standards, and well-defined training goals.

The succeeding battalion commander modified the testing program to incorporate the lessons learned of the previous year and to reflect his assessment of the battalion's state of readiness to accomplish its assigned missions. With the experience of 1974, test results in 1975 improved dramatically. Competition among participants was keen, morale continued to rise, and the combat readiness of the battalion steadily improved.

Results of the BEST program in the 237th Combat Engineer Battalion based on almost two years of experience are as follows:

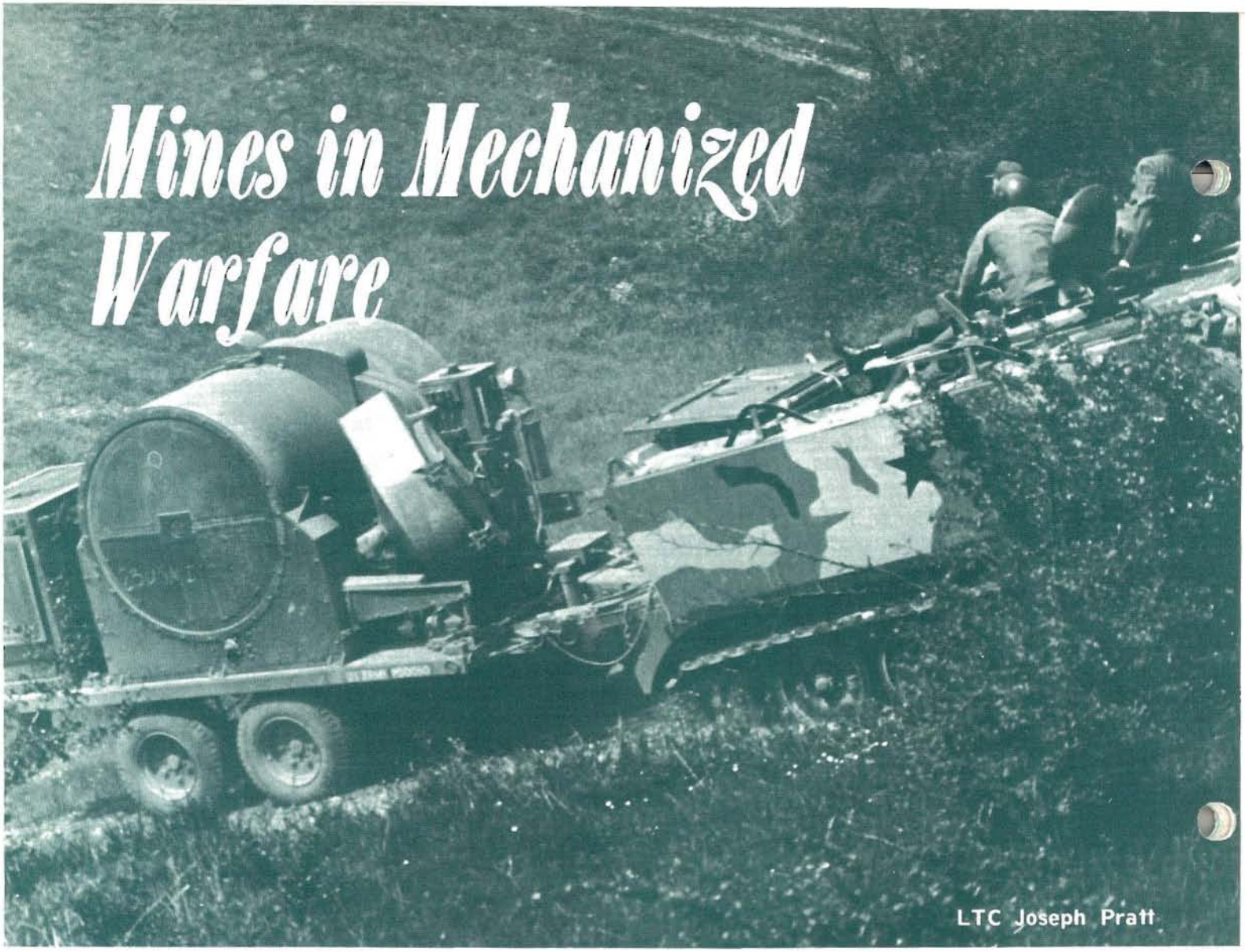
- Continual combat readiness appropriate to the assigned wartime mission.
- Excellent testing programs which provided for at least a minimum standard of training.
- Increased individual and unit skills.
- Increased staff and section competence through realistic support.
- Accomplishment of other assigned missions without disruption of the training schedule.
- Recognition of outstanding individuals and units.
- Identification of areas of training weakness.

The BEST program is a viable means to achieve and maintain combat readiness in a combat engineer battalion. It is based on a planned training cycle, divided into phases, and integrated with the battalion's other missions and requirements. It is administered primarily by the battalion S-3 and executed by personnel of the companies and the battalion staff. It allows the battalion commander to bring his experience and knowledge to bear on the training of the battalion and it allows the battalion staff to effectively assist.

Remember, the basic engineer fighting unit is the combat engineer battalion. To keep these battalions and thus the Army combat ready, BEST is best!

Captain Charles C. McCloskey III was the Operations Officer of the 237th Engineer Battalion (Combat) from 1973 to 1975. He is a USMA graduate and obtained an MS degree in Civil Engineering from Cornell University in 1971. He commanded a combat engineer company in Korea, served as an aviator in Viet Nam, and was a Resident Engineer in the Baltimore District. He is a graduate of the Engineer Officer Advanced Course and is a registered professional engineer in Virginia. Captain McCloskey is presently assigned as Assistant S-3, 7th Engineer Brigade.

Mines in Mechanized Warfare



LTC Joseph Pratt

Throughout the history of mechanized warfare, landmines have played a significant role in assisiting a numericlly inferior force to fight an effective battle. Mines are the primary means of creating artificial obstacles in the battle area and are a key component in the combat capability of the Combined Arms Team. The key function of mines is to enhance the effects of friendly fire by disrupting and inhibiting an enemy force. The development of optically-guided antitank missiles has further increased the requirement for and the potential effectiveness of minefields. The TOW or DRAGON tracker must remain "locked on target" for a definite period during missile flight, thereby increasing the need for an obstacle such as a minefield to delay the tank in the "window." The minefield; therefore, must not be considered in isolation, but viewed in concert with other weapon systems and its ability to improve the effectiveness of the Combined Arms Team.

The procedures and organizations for employing conventional mines have not changed significantly since World War II. Generally, mining has been an engineer function, assisted by the other combat arms. Tactical units at the company or troop level have capabilities for hasty protective mining for close-in unit defense. Larger scale mining is normally planned and directed at brigade or division levels and usually consists of a series of small-point minefields around craters and tactical minefields hundreds of meters wide. However, this large scale use of conventional mines requires extensive expenditures of manpower, creates a significant logistical burden and must be planned and emplaced well before the battle develops and the enemy commits his forces.

The introduction of the family of scatterable mines (FASCAM) will produce significant changes in mining procedures and U.S. mine capabilities and should eliminate or reduce many of the problem areas indicated above. Throughout the FASCAM development program, a primary objective has been to identify and develop a variety of delivery means for scatterable, self-destructing (SD) mines which permits the widest application of combat power enhancement.

The XM128 Ground Vehicle Dispensed Mine System (GVDMS) and the M-56 Helicopter-Delivered System are being developed to provide a rapid means of mining in friendly areas to strengthen defensive positions and deny key avenues of approach. These systems will provide a rapid method of emplacing the pre-planned minefield in friendly territory, using a mine with a long self-destruct period (e.g., greater than 24 hours). The GVDMS mines are approximately a fifth the size of the M-15 and will be packaged to simplify loading and handling.

The Artillery-Dilivered Mine System, XM718/741, is being developed to provide an indirect fire means for emplacing mines dynamically in response to enemy movement. The mine round will be fired by the standard 155mm Howitzer ranges up to 17km. Artillery-delivered mines offer a significant increase in mining capability and flexibility to the maneuver commander; however, competition for artillery tubes and the firing rate limit the number of mines which can be emplaced in a short period of time.

To provide a very rapid, short-range, indirect delivery system, a mine round is being developed for use in the rocket launcher of the Surface Launched Unit, Fuel Air Explosive (SULFAE) countermine system. This rocket system will be capable of delivering 700 to 800 mines a range of three to five kilometers in less than a minute. It will be assigned to the divisional engineer battalion with a required capability of delivering a minefield within 10 minutes. In order to be this responsive, the combat engineer company supporting the brigade will employ the system.

These systems will be augmented by U.S. Air Force Tactical Air-delivered mines for interdiction mining and close support of ground forces.

Dynamically-delivered mines will have a variety of self-destruct times ranging from a few hours (artillery, rocket) to several days (artillery, Tac Air).

Minefields, both conventional and self-destructing, are a part of the overall concept of the operation and are the tactical planning responsibility of the G-3 or S-3 of the appropriate headquarters. The engineer supporting this unit will normally undertake the detailed planning and act as advisor to the commander for mine warfare. The introduction of the family of scatterable mines will create significant changes in operating procedures. The engineer will remain the primary planner, but the mines may be delivered to the battle area and emplaced by a variety of delivery means allocated to non-engineer units.

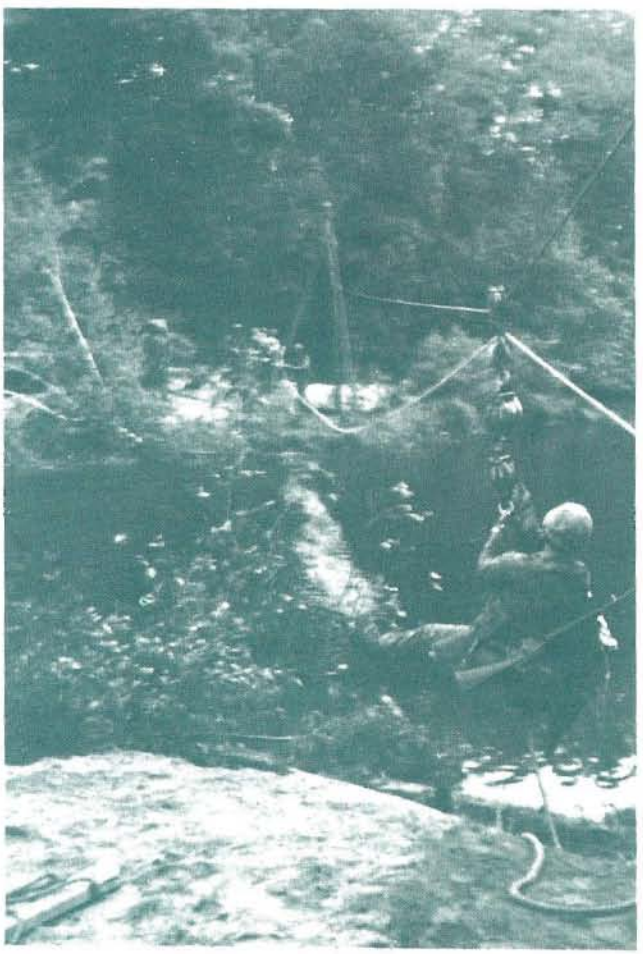
While this will greatly increase the mining capability available to the tactical commander, it will create operational problems in the allocation of delivery assets, and control of the mined areas through marking, reporting and recording. During normal operational testing a variety of employment procedures will be evaluated to detemine the most efficient method for each system. Conventional minefields will still be marked by barbed-wire fences. Since scatterable mines self-destruct, less permanent means of marking should be adequate. The XM133 Rapidly emplaced Minefield Marking System is being developed for the purpose of marking minefields emplaced by the Ground Vehicle and the M-56 Mine Systems. Mines delivered into hostile or disputed territory by artillery, rocket or Tac Air will not be marked, but the mined area will be recorded at division or brigade headquarters on the operations map. This information will be provided to lower levels as appropriate.

It is evident from testing performed by the Scenario Oriented Recurring Evaluation System (SCORES) and gaming done in support of anti-armor doctrine that scatteable mines are adding a very significant new dimension to mechanized warfare. All combat engineer leaders must be prepared to fully exploit this dimension and improve the effectiveness of the Combined Arms Team in "winning the first battle."

LTC Joseph Pratt is assigned as the TRADOC Mine/Countermine Coordinator, Concepts and Studies Division, DC/CTD, USAES, Fort Belvoir, Virginia. He has undergraduate degrees in Chemical and Civil Engineering from Clarkson College and The University of Missouri at Rolla, and an MS (System Science) from Michigan State University. He is a graduate of the Engineer Officer Advanced Course and the Armed Forces Staff College. He has served as Company Commander and S-3 in combat engineer battalions in Korea, USAREUR, and RVN; and as a Redeployment Plans Officer in USARV.

Platoon Proficiency Training

Captain John J. Connor



PROFICIENCY AT THE CUTTING EDGE was the theme of a recent letter on training issued by General Bernard W. Rogers, FORSCOM Commander. The letter directed that this theme be the central thrust of all training during FY 76. In response to his training guidelines, the 39th Engineer Battalion (Combat) set out to determine the proficiency of its line platoons by conducting a series of six 8-hour graded practical exercises based on ARTEP 5-35.

The exercises were completely tactical throughout, and the platoon leaders were graded in several areas which included leadership, work force organization and technical proficiency. Reference material was allowed. Six areas were chosen for testing: Bridging, Rigging, Field Fortifications, Demolitions, and Tactics, plus a "Composite Station" which included Communications, Maintenance, and eight other subjects.

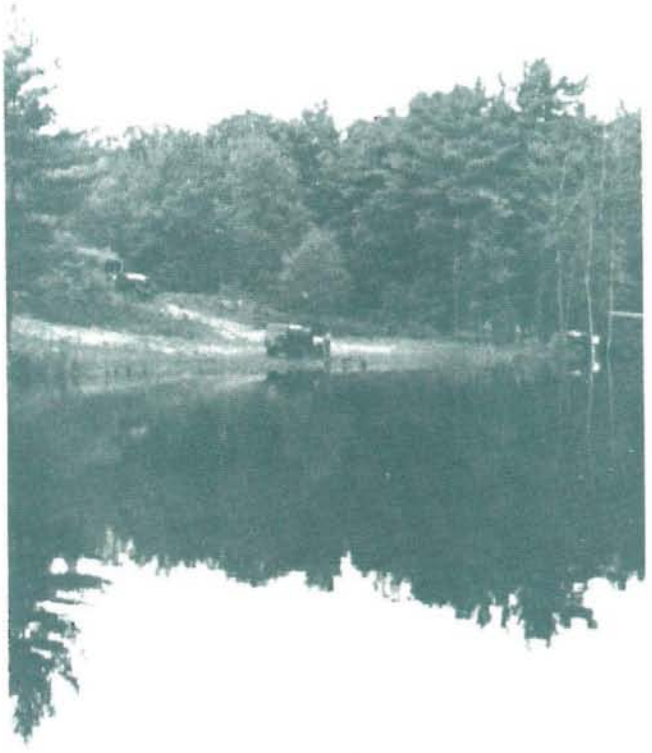
The six stations were directed by members of the battalion staff, with support personnel from the Headquarters Company. Unit commanders had no active role, but kept busy observing and discussing their platoons' performance with the graders.

Prior to the start of the exercise, the Battalion Commander summed up what he hoped PPT would accomplish: "When we evaluate the results, it will allow us to tailor the training of each platoon to strengthen its weak areas. We can then

run a second cycle to provide much keener competition among the platoons."

Of course, the format used by the 39th can be modified to accomodate other units' needs and local training facilities, but here is a look at PPT as conducted by the "BLUE BULLS."

STATION 1— BRIDGING. Here the platoon leader was faced with three tasks. First he had to **design** a timber trestle bridge, including the substructure; second he had to **construct** it; and third, he had to layout and construct a Bailey

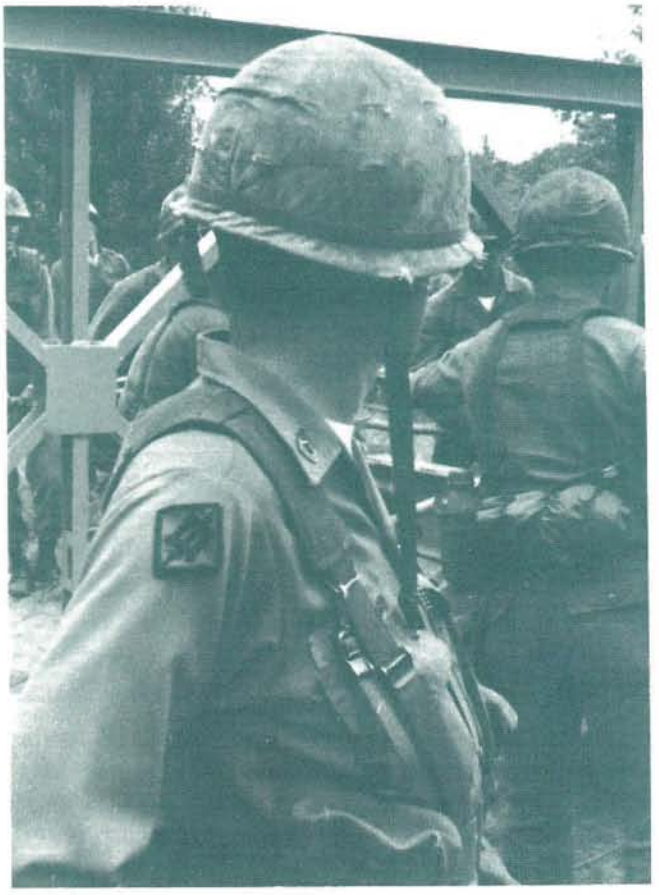


Bridge across a dry gap. The station also intregrated camouflage, security and NBC training into the exercise.

The timber trestle bridge was a Class 50, single lane with three bents. It was to be constructed with native deck and posts, cut stringers, caps and sills. At this station, work force organization was the key grading factor.

STATION 2 — RIGGING. The purpose of this station was to make the platoon leader "think rigging." The central project was the erection of shears on both sides of a pond, with a high line to ferry equipment and personnel across. Each platoon accomplished the mission differently. Several minor tasks were also given, and it was here that the strengths or weaknesses of a platoon became evident. The utilization of manpower and material in an efficient manner to accomplish multiple missions simultaneoulsy was perhaps the most valuable lesson learned.

STATION 3 — FIELD FORTIFICATIONS. At this station, the platoon was required to accomplish 18 separate missions related to defensive operations, such as mine counter-mine operations, emplacements, camouflage, fences, ADM and barriers. The platoon leaders were given little specific guidance from the station OIC and were expected to choose the best types of and locations for effective obstacles. These multiple tasks again strained the chain of command and spotlighted the squad leaders and assistant squad leaders.



When asked what he thought of this station, one soldier said he "liked the variety of missions." His platoon leader might not have shared that sentiment!

STATION 4 — DEMOLITIONS. Both inert and live demolition problems were assigned in a scenario which required the platoon to deny enemy access to a road net. Camouflage and reconnaissance were also graded. The first major task was to calculate and place inert demolitions for a 100 meter abatis. This allowed for maximum utilization of personnel. Several minor tasks were also assigned, including ones employing inert shaped charges and cratering changes. A fuel tanker also had to be rigged for destruction. The final mission called for the platoon to use live explosives to destroy a timber trestle bridge.

The demonstrated profiency in demolition techniques was uniformly good, but all platoons showed their lack of practice with live explosives by a much slower work rate than with the inert material.

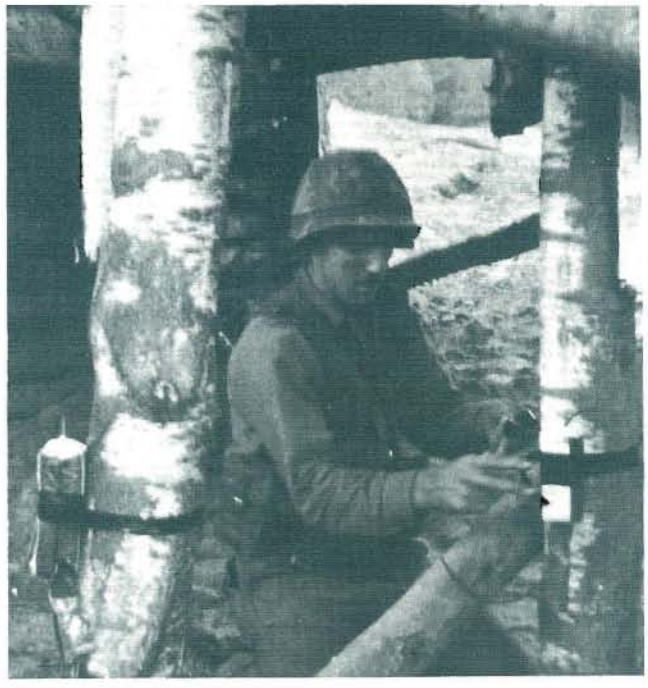
STATION 5 — TACTICS. For most of the platoons, this was a form of **adventure training**, as it marked the first time many of the soldiers had flown in a helicopter. The stated objective of this station was to **determine if the platoons are**



combat ready. It also gave the Battalion's Aviation Section some very beneficial training. In spite of some unseasonably cold evenings, most of the soldiers interviewed agreed that this was one of the most enjoyable stations.

STATION 6 — COMPOSITE. The station was conducted in two distinct phases, with two different objectives. The morning phase tested the platoon's organization and its capability to accomplish multiple tasks. The afternoon phase was designed to evaluate platoon readiness. Overall, the platoon was tested and graded in eleven categories: reconnaissance, work site security, target folders, NBC, adjustment of artillery fire, mine detector opeations, vehicle maintenance, communications, vehicle recovery, property accountability and physical fitness.

An undelaying **philosophy,** at all six stations, was to permit the problem to take its own course as directed by the platoon leader. Flexibility was the key element; none looked for one **school solution,** but rather for feasible, workable solutions.



Three days after completion of the last round, a critique was held during which each station OIC summed up common deficiencies and briefed the Battalion Commander. Company Commanders were given a written critique from each station for each of their platoons.

Each station was scored with an equal value of 100 points. When the six stations were tallied, the total scores were very close, whereas the scores at the individual stations showed a wider variance. In fact, the platoon with the highest overall point total actually scored lowest on one station. These results seemed to confirm the PPT had accomplished its prime objective, namely, identifying areas need additional training.

One Lieutenant, whose platoon scored high, stated, "There were a lot of things we didn't know. Some of my Squad Leaders have never been assigned some of the tasks before". His platoon sergeant agreed and added, "The privates have learned a lot and their leaders should have too. Some of the squad leaders haven't done some of these things in a while and have found that they've forgotten a few things."

One private was less introspective; he simply said, "It's been a lot of fun."

A 1972 EOAC Graduate, Captain Conner is presently serving as the S-2 and Information Officer for the 39th Engineer Battalion, (Combat), Fort Devens, Massachusetts. He has also received his BS in Geology from Boston College.

THE ENGINEER SOLDIERS MANUAL

CPT Robert A. Formo

The Soldiers Manual is a new training manual, being developed by the Engineer School, which provides guidance for the administration and evaluation of training for a given MOS. It also provides a uniform training base for each MOS so that the soldier will receive the same instruction for each skill level, whether the instruction is through institutional (such as Advanced Individual Training) or extension (such as unit/on-the-job) training. The manual contains all the MOS related information a soldier will need to know to perform his duties or will tell the soldier exactly where to look up the information in current Technical or Field Manuals or other related sources.

The Soldiers Manual for Engineer proponent MOSs is very similar to those being developed by other Schools. For example it:

- Belongs to the individual soldier.
- Is written in the second person to give the manual a personal flavor.
- Clearly defines the soldier's responsibilities, MOS duties, and shows the actions he must complete to be eligible for promotion.
- Defines the minimum acceptable standards of performance for each task the soldier is responsible to perform.
- Lists references for each task the soldier must perform.
- Establishes conditions under which the soldier must be able to perform his critical tasks.
- Describes standards the soldier must achieve to pass his/her Skill Qualification Test (SQT).

The Engineer Soldiers Manual will serve a variety of different functions:

- The manual provides an accurate and realistic job and task analysis for each MOS.
- It provides a record of the soldier's performance which can be evaluated by each Commander if the need arises.
- It supersedes the requirement for MOS test study guides, since all the material listed in the study guide will be incorporated into this manual.

As shown above, the Soldiers Manual will have a great impact on training the individual soldier in his MOS, whether that training will be in a formal school, on-the-job training, or by self-study.

The Engineer School is currently working on various formats for Engineer Soldiers Manuals. One such format can be seen in SM 5-81E (Draft). This is the draft Soldiers Manual for the Illustrator (MOS 81E). In September 1975, this draft was sent, worldwide, to 250 selected Illustrators, asking them for comments.

Another draft manual will be published and distributed very shortly. This manual will contain the tasks in which the Mobile Assault Bridge Operator must perform to successfully operate the MAB.

When published in a final format, Soldiers Manuals will be distributed in accordance with DA Form 12-12, Section III. The first finalized Engineer Soldiers Manual will be on the Combat Engineer Career Management Field and is expected to be distributed in FY 1977.

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A Helping Hands Story

TRADING BAN



SPEC-4 Daniel Blubaugh, 23, Brinkhaven, Ohio and brother, Ronald (Right), 24 of Danville, Ohio, man a hose during firefighting training on a typical weekend drill of the 569th Engineer Detachment, 16th Engineer Brigade, Shreve, Ohio. The Ohio Army National Guard unit is the only OARNG firefighting unit. It is only onw of a handful in the nation.



SGT Jerry Condo



Firefighter-guardsmen show their stuff while manning one of the fire trucks of the 5694th Engineer Detachment, 16th Engineer Brigade, Ohio Army National Guard. The action takes place just outside the unit's hometown, Shreve, Ohio.

They have traded bandages for fire buckets.

The members of the 5694th Engineer Detachment, 512th Engineer Battalion, 16th Engineer Brigade, Ohio Army National Guard, are now firefighters. The big change came June 1, 1974 when the 686th Medical Co. (ambulance) was reorganized as the 5694th Engineer Detachment. Since that time, the unit, which is located at Shreve, Ohio, has given up 36 ambulance trucks and has been acquiring fire trucks.

For the 2 officers and 58 enlisted men (there are no women) of the 5694th, the change over has meant learning a new trade, complete with fire helmets, hose, and big boots. It's something new — and fairly unique. The National Guard Bureau reports that the 5694th is one of only 5 Army

DAGES FOR FIRE BUCKETS

National Guard firefighting units in the nation. Two of them are located in South Carolina, one in Idaho, and one just formed in Montana.

The unit was at annual training at Ft. Sam Houston, Texas in May 1974 when word was received that a different job was awaiting the troops when they got back. The men were not too happy. Subsequently, however, the mood of the Guardsmen changed as they learned more and more about their new role.

Several of the guardsmen found that firefighting is "more interesting" and found the annual training stimulating.

The 5694th went to Chanute Field, Ill. in two sections in July and August to learn about firefighting from the U.S. Air Force which operates a fire school there. The men were taught how to fight structural fires, aviation fires and chemical fires, among other things.

Brig. Gen. Jean G. Peltier, commander of the 16th Engineer Brigade which has headquarters in Columbus, Ohio, shares the enthusiasm of the 5694th about the annual training and the unit's mission. He stated that a firefighting unit is an ideal type of organization for dynamic training because the work is all "hands on."

Firefighting, while new to the 5694th, was old hat to some to the Guardsmen in the unit. One First Sergeant, for instance, has been a member of the Shreve Volunteer Fire Department for 22 years and the captain, commanding officer of the 5694th, is a 13-year veteran of the Wayne, Ohio Volunteer Fire Department. There are also others in the Shreve-based unit who are affiliated with volunteer fire companies.

The equipment the unit is drawing is top of the line. All told, the unit will receive more than $177,048 in rolling stock when all is delivered. The 5694th has received two brush fire vehicles, four pumpers, and three water trucks. The size of the equipment poses a problem for the Shreve Guardsmen. The armory has no place to house the fire trucks, and as a result, the Ohio National Guard has had to store them in nearby Wooster, Ohio.

A visit to Shreve and the 5694th during a recent weekend drill found the citizen-soldiers busy learning firefighting — and enjoying it. A few hundred yards below the armory the Guardsmen were drawing water from a small creek using two of their new fire trucks. As the pressure shot up and water sprayed out, Guardsmen manned the hoses and trained the hose on targets in the creek. It was noisy, exciting work. The fire trucks looked much like any vehicle in a typical small-town fire department — except the vehicles were olive drab in color.

The First Sergeant admits his Guardsmen are not yet as good as a volunteer fire department, but adds that they're progressing fast in their training. Despite the fact that the unit has been reorganized only about 18 months, 49 out of the 59 enlisted personnel are MOS qualified.

Reception has been good in the Shreve area for the medic-turned-Guardsmen. The 5694th is 108 percent overstrength, according to 1st SGT Peebles. The unit draws personnel from a wide area in north central Ohio. Because of that, some of the Guardsmen spend overnight Saturday on a drill weekend rather than drive to and from home. It is not unusual for the Shreve-based unit members to see horse-drawn vehicles go past the armory. Shreve is located in the midst of Amish country in Ohio.

The Shreve unit has had a long, colorful history and is no stranger to reorganization. Since organized in 1919 in the Ohio National Guard as Company H, 3d Infantry, the unit has seen several redesignations and reorganizations through the years. Prior to being the 686th Medical Company, the Shreve unit was known as "Battalion Reconnaissance, Mortar Davy Crockett and Anti-Tank Platoons, and Battalion Medical Section, Headquarters Company, 2d Battalion, 145th Infantry."

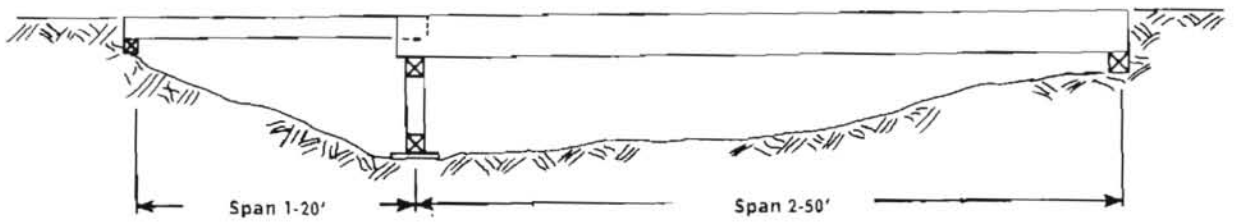
SGT Jerry Condo is the information NCO for the 16th Engineer Brigade, Ohio Army National Guard. SGT Condo is a City Hall reporter for the Columbus, Ohio Citizen-Journal newspaper in civilian life. He lives in McArthur, Ohio.

Bridge Classification Wheel

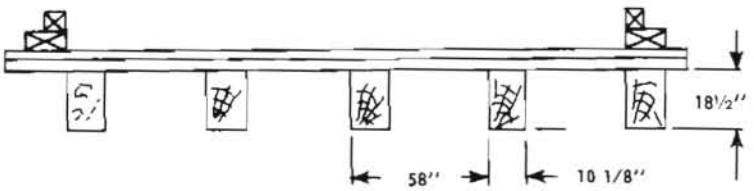
Bridge classification has traditionally been a difficult and time-consuming task. It is also one of the most important tasks undertaken by the military engineer. Yet, little has been done in recent years to simplify or shorten the present cumbersome and complicated classification procedure — that is, until now.

The Fixed Bridges Branch, US Army Engineer School, has recently completed development of a device that should revolutionize bridge classification. The new device, called the "Hasty Bridge Classification Wheel," is a simple, pocket-sized, easy-to-use, circular calculator which can, in seconds, classify a steel or timber bridge — based on stringer size, spacing, and length. The device is not intended to replace the analytical classification procedures. Instead, it augments them by assisting the soldier in the field when the need for haste overrides the increased accuracy gained by more through analytical classification procedures.

Example Problem: Determine the tracked vehicle class of the following bridge.

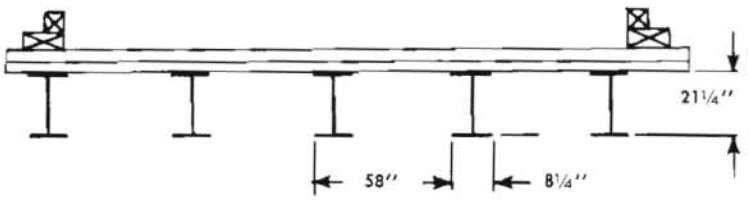


cross section span 1



Stringer size: 10x18
Stringer codes: 5.52
Stringer spacing: 4' - 10"
Class: 27 (lower of 27 & 44)

cross section span 2



Stringer size: 21WF 73
Stringer code: 15.0
Stringer spacing: 4' - 10"
Class: 22

Final Bridge Class: 22

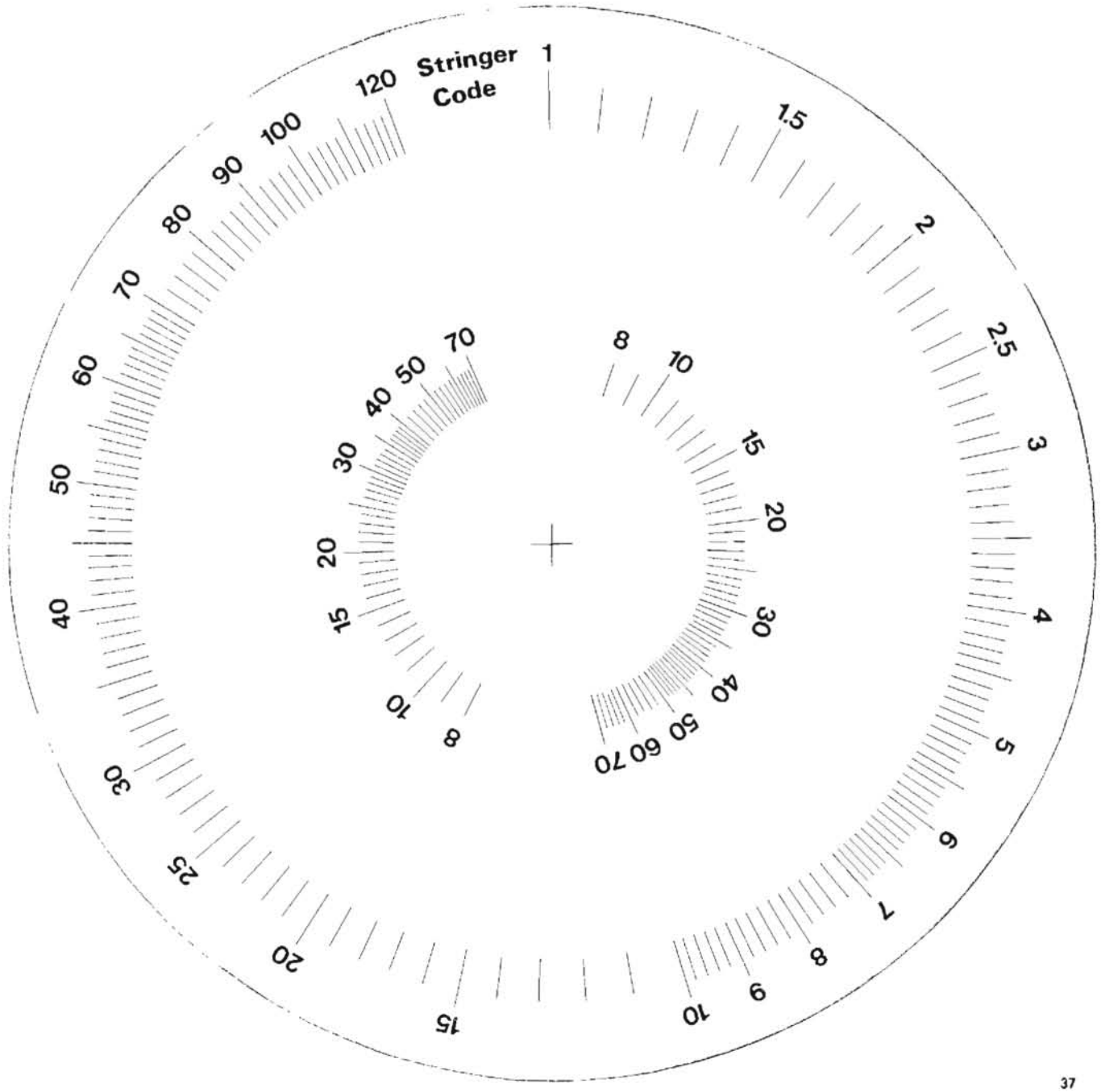
The convenience of the Hasty Bridge Classification Wheel (HBCW) is easily seen when compared to the classification procedures outlined in FM 5-34 (the simplest analytical classification method).

	FM 5-34	HBCW
Number of Steps	17	4
Recon Measurements Required	6	4
Charts Used	4	1
Graphs Used	3	0
Calculations	12	0
Arithmetic Operations	20	0
Time Required (minutes)	30	2

One must keep in mind that the HBCW utilizes certain assumptions which limit its use. The most notable of these are:

- Device can only be used on timber or steel simply supported bridges (or spans).
- Final classification is for one-way traffic.
- Classification is for tracked vehicles only. (It should be noted that from spans of approximately 14-60 ft, tracked vehicle bridge class would be the limiting case. This restriction will be removed in the final version of the device).
- Bridge deck is assumed adequate for all tracked vehicular traffic.

As far as accuracy is concerned, the HBCW is generally accurate to within 5% of the actual bridge class as determined by detailed analytical procedures, in many cases more accurate than the FM 5-34 procedure.



A copy of the HBCW is provided for cutting out and assembling. The Fixed Bridges Branch, US Army Engineer School, is interested in any comments, observations, or suggestions on the device or ways to improve it. The device has been analytically tested and upon completion of its field testing, may eventually be adopted as a bridge classification tool.

A similar device, "Armor Bridge Classification Wheel," was produced at Fort Belvoir for the US Army Armor School and is currently undergoing field testing by the Armor community.

Please address comments to:

Fixed Bridge Branch, D/ES
US Army Engineer School
Fort Belvoir, VA 22060

The classification wheel was developed as a joint effort by personnel from Fixed Bridges Branch, Engineer Design Division, Dept of Engineering Science, USAES, Ft. Belvoir. It is currently undergoing tests and is expected to be in the field within the next three months.

IMPORTANT

IF ANY PART OF THE BRIDGE IS DAMAGED OR EXCESSIVELY WORN, DO NOT ATTEMPT TO USE THIS CARD. CALL YOUR LOCAL ENGINEER UNIT.

INSTRUCTIONS FOR USE

1. Obtain the following information for each span of the bridge:

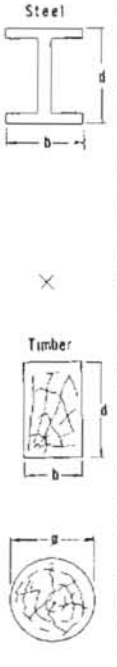
a. Stringer Dimensions. Measure b & d to the nearest inch for timber and 1/8 inch for steel.
b. Stringer Spacing. Measure center to center to the nearest inch.
c. Span Length. Measure from center of support to center of support to nearest 1/2 ft.

NOTE: If deck is less than 6 inches thick, ensure vehicle tread rides over stringer

2. Identify the bridge stringers from the following charts and determine proper stringer code.

Timber		
b×d	Codes	
6×12	12.0	1.47
6×14	14.0	2.00
6×16	16.0	2.62
6×18	18.0	3.31
8×12	16.0	1.96
8×14	18.7	2.67
8×16	21.3	3.49
8×18	24.0	4.42
8×20	26.7	5.45
8×22	29.3	6.60
8×24	32.0	7.85
10×10	16.7	1.70
10×12	20.0	2.45
10×14	23.3	3.34
10×16	26.7	4.36
10×18	30.0	5.52
10×20	33.3	6.81
10×22	36.7	8.25
10×24	40.0	9.81
12×12	24.0	2.94
12×14	28.0	4.01
12×16	32.0	5.23
12×18	36.0	6.62
12-20	40.0	8.18
12 22	44.0	9.90

Steel	d	b	Code
39WF211	39	11¾	79.7
37WF206	37¼	11¾	73.8
36WF300	36¼	16¾	109.7
36WF194	36	12	64.7
36WF182	36¼	12	62.1
36WF170	36¼	12	57.9
36WF160	36	12	54.1
36WF230	35¾	16	83.5
36WF150	35	12	50.3
36WF201	35¾	11¾	68.3
33WF196	33¼	11¾	63.7
33WF220	33¼	15¾	71.6
33WF141	32¾	11¾	44.7
33WF130	33	11¾	40.5
33WF200	33	15¾	64.4
21WF180	21	11¾	59.0
30WF124	30	10¾	35.4
30WF116	30	10¾	33.6
30WF108	29¾	10	29.3
30WF175	29¾	11¾	51.4
27WF121	27	11¾	47.1
27WF102	27¼	10	28.6
27WF94	26¾	10	24.3
26WF152	25¾	11¾	40.7
24WF94	24¼	9	20.1
24WF84	24	9	19.6
24WF100	24	12	24.9
241120	24	8	25.1
241106	24	7¾	23.4
24180	24	7	17.4
24WF76	23	9	17.5
24WF133	23¾	11¾	36.8
241134	23¾	8¾	28.2
22175	22	7	19.7
21WF139	21¾	11¾	31.1
211112	21¾	7¾	22.5
21WF73	21¼	8	15.3
21WF68	21¼	8	14.2
21WF62	21	8¼	14.6
20185	20	7¾	15.0
20165	20	6	13.4
20WF134	19¾	11¾	27.5
18WF60	18	7¼	10.3
18186	18¼	7	14.4
18WF55	18¼	7	9.78
18180	18	8	13.0
18WF50	18	7¼	8.59
18155	18	6	8.64
18WF122	17¾	11¾	28.8



Steel	d	b	Code
18162	17¾	6	9.8
18177	17¾	9¼	12.5
16WF112	16¾	11¾	30.0
16170	16¾	8	10.6
16WF50	16	7	4.04
16WF45	16¼	7	3.24
16WF64	16	8¼	10.4
16WF40	16	7	6.44
16150	16	6	6.85
16WF36	15¾	7	5.64
16WF110	15¾	11¾	17.7
16162	15¾	6¼	8.89
16145	15¾	5¾	6.67
15WF103	15	11¾	16.4
15156	15	5¾	7.89
15143	15	5¾	5.97
14WF101	14¼	11¾	15.3
14140	14	5¾	5.25
14151	14¼	5¾	6.67
14170	14	8	9.57
14157	14	6	6.80
14140	14	5¾	5.38
14WF34	14	6¾	4.84
14WF30	13¾	6¾	4.16
14WF92	13¾	11¾	13.2
14146	13¾	5¾	5.60
13135	13	5	3.78
13141	12¾	5¾	4.80
12WF36	12¼	6¾	4.58
12165	12	8	8.09
12WF27	12	6¼	3.38
12150	12	5¾	4.02
12133	12	5	3.60
12134	11¾	4¾	3.60
11WF76	11	10	8.98
10109	10¾	4¾	2.98
10WF25	10¼	5¾	2.62
10140	10	6	4.09
10135	10	5	2.89
10125	10	4¾	2.44
10WF21	9¾	5¾	2.13
10WF39	9¾	9¾	5.57
9125	9¾	4¾	2.27
9150	9	7	4.36
8135	8	6	3.63
8128	8	5	2.18
8WF31	8	8	3.71
8WF44	7¾	7¾	3.60
7WF35	7¾	7¼	2.68
6WF31	6¼	6¼	1.90

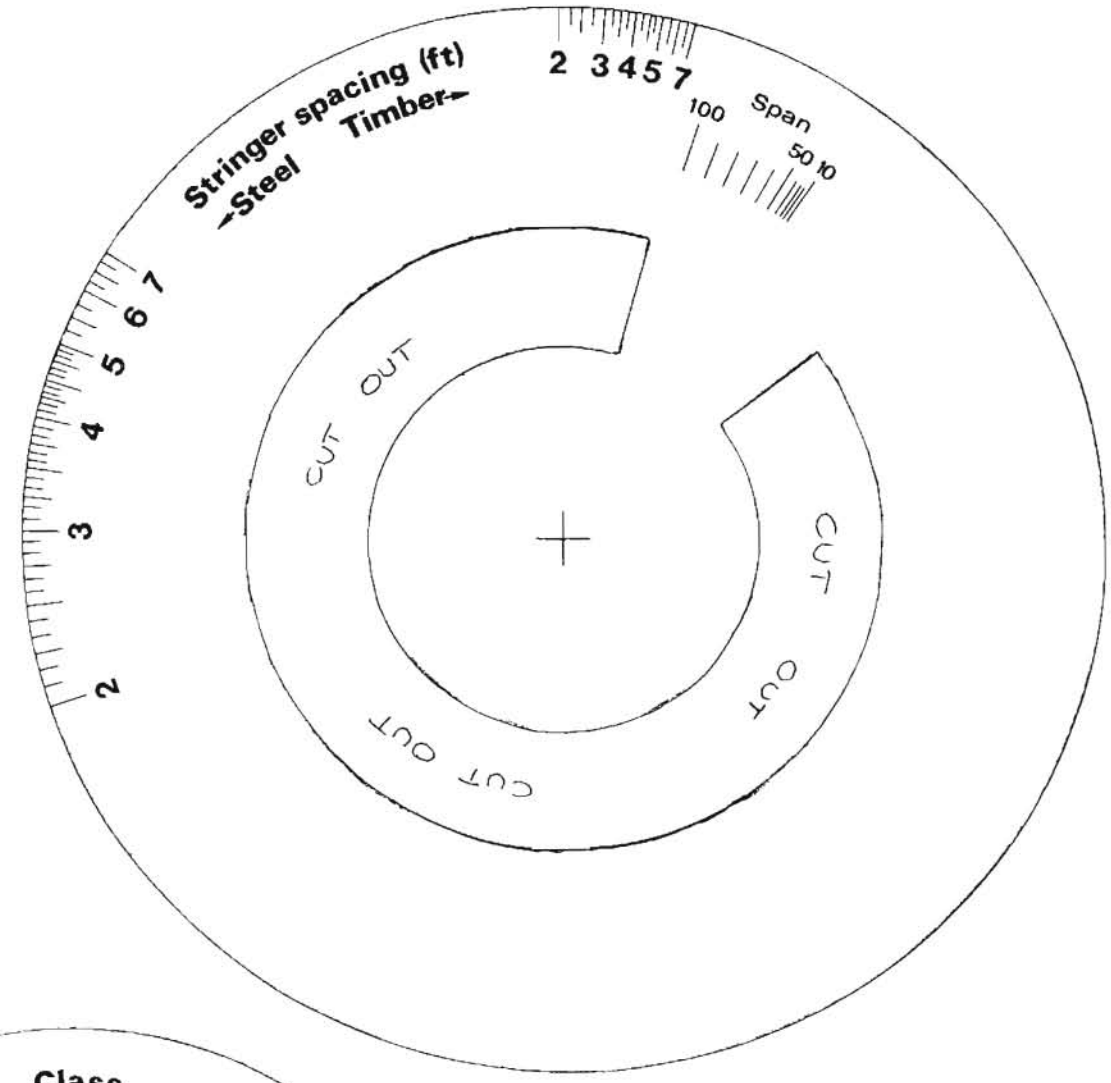
Timber		
b×d	Codes	
12-24	48.0	11.8
14-14	32.7	4.67
14-16	37.3	6.11
14-18	42.0	7.73
14-20	46.7	9.54
14-22	51.3	11.5
14-24	56.0	13.7
16-16	42.7	6.98
16-18	48.0	8.83
16-20	53.3	10.9
16-22	58.7	13.2
16-24	59.1	15.7
18-18	54.0	8.94
18-20	59.0	12.3
18-22	59.5	14.8
18-24	59.9	17.7
128	21.2	1.74
138	75.0	2.20
148	29.0	2.75
168	37.7	4.11
188	47.7	5.86
208	59.0	8.03
228	59.5	10.7
248	59.9	13.8

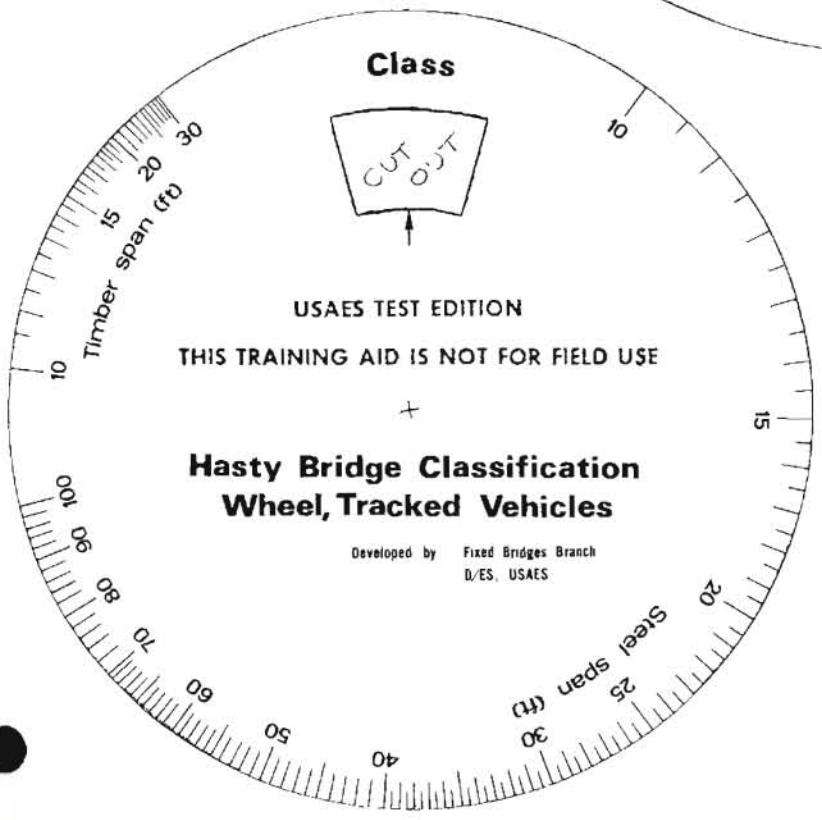
3. Steel Stringer Classification Procedure.

a. Locate bridge stringer code on outer wheel.
b. Rotate middle wheel until the steel stringer spacing is alined with it.
c. Rotate the inner wheel until the steel span length of the bridge is alined with the span on the middle wheel.
d. Determine bridge class from window.

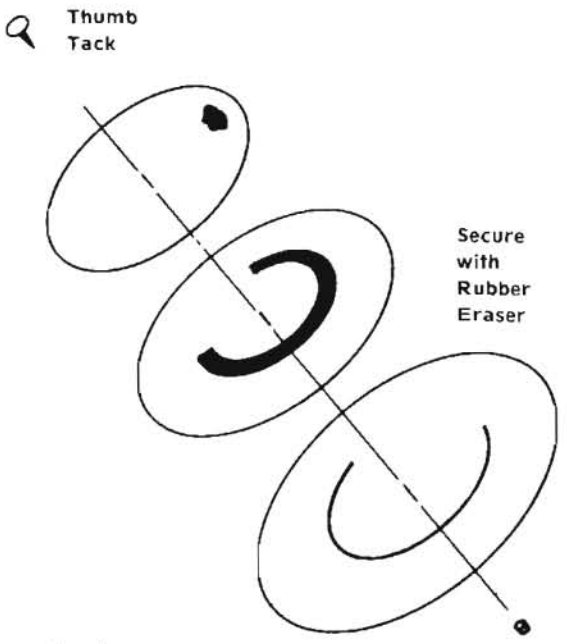
4. Timber stringer classification procedure.

a. Classify the bridge in accordance with the procedure outlined in para 3. Use the first stringer code, timber stringer spacing, and timber span length.
b. Reclassify, using the second stringer code as if it were steel (use steel stringer spacing and steel span length).
c. The lower of the above classes is the final bridge class.





Cut out and assemble as shown below:



Center point must match up exactly with center point on large wheel.

Current Status — Foreign Area Officer Specialty

In November 1974, the Foreign Area Officer (FAO) Specialty Program came to an end and FAO became one of the Officer Personnel Management System (OPMS) advanced entry specialties. As has been the case in all specialties, much analysis and study has been, and continues to be made to more precisely define position, personnel, and training requirements. The following relevant statistics will serve as a base for further discussions.

	GRADE				
	COL	LTC	MAJ	CPT	TOTAL
Total FAO Positions	204	344	261	262	1,071
Total Army FAO Officers	35	677	945	655	2,312
Total EN FAO Officers	1	66	71	60	198

A rapid comparison of positions and officers reveals a major shortage problem at the rank of Colonel while other ranks are adequately filled with personnel. Shortage of FAO qualified colonels is being alleviated to some extent by "out of specialty" assignments and grade substitutions. An additional problem, not obvious from statistics, stems from the fact that many of the officers identified above are designated as Foreign Area specialists, but are not yet trained assets. This presents a major professional development challenge. The bright spot in the overall picture is the fact that we now have FAO requirements well defined and personnel have been identified for training and repetitive utilization. Intensive management is particularly essential in FAO because of the heavy colonel requirements. While it would be ideal to designate sufficient officers in each grade to insure a steady flow to the grade of colonel and maintain a 50% utilization rate (ie: 2 officers for each position), this solution would create undue stress elsewhere in the system. While it is fully realized that the training required for FAO is more time consuming and extensive than for most other specialties and while every effort will be made to develop the most capable and qualified officers, it must be clearly stated that the FAO specialty designation is not an automatic ticket to lengthy schooling and training. The perception that the training package which included the FAO Course at the Institute of Military Assistance, Graduate School, language training, and in-country training, that was associated with the Foreign Area Officer Special Career Program is to be provided to all officers designated in this specialty is incorrect. It must be understood that 20% of the FAO positions are "area unspecified" positions which reduces the training requirement for officers filling these positions. Also, the requirement that an officer's overall manner of performance be in the upper ⅓ in comparison with his contemporaries applies to all graduate studies, including FAO related schooling. Additionally, maximum utilization will be made of previously trained assets so as to avoid unnecessary retraining or duplicative type assignments. The timing or sequencing of FAO related training raises many questions. Basically, FAO officers should begin training as soon after designation as is possible and in some cases selected officers may begin training prior to the designation process. Delays in formal training will most commonly be related to the non-availability of the officer (i.e. committed to other assignments), requirements for further experience and development in the primary specialty or a low manner of performance which would make costly training and unrated time prior to O4 promotion unwise both from the standpoint of the Army and the individual. As to the sequence of training, almost any order is acceptable as long as language training is closely followed by a utilization opportunity. The training of each FAO officer will be carefully planned and coordinated between the appropriate OPD Division and the individual officer. Each officer is enjoined to improve his qualifications through self-study whenever the opportunity presents itself.

Officers who have yet to reach the alternate specialty designation point, but who are interested in the FAO specialty can enhance their chances by insuring that all FAO related qualifications are

made known to their career division and also that they have a Defense Language Aptitude Test (DLAT) score recorded on their Officer Record Brief (ORB).

This specialty combines effectively with almost any other specialty and offers an excellent career in peacetime as well as wartime. A wide variety of assignments ranging from military assistance and advisory duties to psychological operations assignments to strategic intelligence and attache functions are available in this field. The repetitive use of trained personnel in these assignments will create better qualified personnel and enhance cost effective operations. While the statistics shown above do not reflect an exceptionally large number of Engineer officers participating in FAO, the specialty combination of Engineer (21) and FAO (48) is deemed very acceptable and any interested officer should carefully consider the opportunities and challenges presented by such a combination.

Project Manager Development Program (PMDP)

The PMDP was established for the professional development of officers pursuing a career in managing the acquisition of major defense systems. Unlike an OPMS specialty, which is a distinct grouping of similar positions in which officers receive professional development, the PMDP encompasses a variety of positions in a number of specialties. Chapter 30, DA Pamphlet 600-3, currently under revision, prescribes the policies and procedures for the identification and management of officers in the PMDP.

The purpose of the PMDP is to identify and develop qualified commissioned officers to support future requirements for project managers and other senior officers within materiel acquisition activities in the Department of Defense. The PMDP is applicable to all commissioned officers serving in the grade of captain through colonel on active duty except officers of the Judge Advocate General's Corps, Chaplains and the Army Medical Department. Potential project managers will receive development in materiel acquisition related functions, namely, Research and Development, Procurement, and General Logistics; development in skills related to a particular type of materiel, such as missiles, armaments, or munitions; and development in basic management skills, such as program planning and control, needed by all project managers. This concept of professional development is referred to as interspecialty development. For most officers in the PMDP, the application of this concept will entail them spending most of the remainder of their career in program related duties. In practice, interspecialty development builds on an officer's qualifications in his primary and alternate specialties and provides the opportunity for the potential project manager to round out his background through assignments to developmental positions and appropriate schooling.

The eligibility criteria for participating in the PMDP are:

- Completed six years Active Federal Service.
- Posses specialty related to project manager functions (i.e., Research and Development, Procurement, a technically oriented specialty such as C-E Engineering, one of the materiel management specialties, Comptroller, ADP or ORSA) or have project manager related experience.
- Have a military education appropriate to grade and length of service.
- For civil schooling have a Bachelor's degree with discipline in Business, Engineering, Physical Science, or have any Bachelor's degree if officer has project manager related experience.
- By manner of performance have demonstrated high level of intelligence, initiative, imagination, judgement and potential for project manager development (to grade of colonel).
- Indicate desire to participate.

- Have six years Active Federal Service remaining.

An officer who meets the above criteria may apply for participating in the program by submitting a letter of application. The applicant's immediate military superior will indorse the application and forward it directly to HQDA (DAPC-OPF-D), 200 Stovall Street, Alexandria, Virginia 22332. The current status of the PMDP and the participation of Engineer officers in the program is indicated below:

	GRADE				
	COL	LTC	MAJ	CPT	TOTAL
Desired Strength	202	342	459	280	1,283
Current Army Wide Strength	2	160	159	41	362
Current EN Br Participating	0	8	17	4	29

Many Engineer officers possess the unique skills outlined in the eligibility criteria and may well consider this program as they plan career objectives. The importance of this program to the efficient operation of the Army cannot be over emphasized. All officers with experience, training or interest in participating in this growing effort are urged to submit an application for consideration.

Contracting Officer

If you have served in an assignment within the OCE family and have been awarded the "Contracting Officer Certificate" (DD Form 1539), we have made provisions for this to be reflected in the data printed on the Officer Record Brief. Knowledge of this qualification will materially assist the assignment desk officer in assignment management and will provide an identification of officers required in crisis situations. If you possess this certification, send your assignment officer a copy.

Assignments

With personnel management fully under OPMS, the assignment of officers within the primary/alternate specialty framework requires several actions by each officer to insure we and you are able to effectively develop you professionally, meet your preferences, and, above all, support the mission of the Army. Officers who have already received alternate specialty designation (or who have not yet been designated) and desire to be considered for an assignment within that field should make your desires known a minimum of twelve months prior to your date of availability for reassignment. Officers eligible for overseas assignments will be screened nine months prior to reassignments and officers returning from overseas or moving within CONUS will be considered approximately six months prior to availability date. With requirements to program so far in advance it is most important for those going on an unaccompanied overseas tour or to short duration courses (e.g. EOAC) that you pay considerable attention to the succeeding assignments. Of course, one way to insure that your preferences are always documented is to maintain an up-to-date preference statement is your Career Management Individual File.

POTPOURRI

Current Locations of Active Engineer Battalions

Considerable changes have occurred in Engineer Battalion designation and location — here is an update.

CONUS

NOTE:
* Re-designated as "Combat (Heavy)"
• Units activated during FY 76

1st Engineer Battalion, 1st Inf Div	Fort Riley, Kansas
• 3rd Engineer Battalion, 24th Inf Div	Fort Stewart, Georgia
4th Engineer Battalion, 4th Inf Div (M)	Fort Carson, Colorado
5th Engineer Battalion (Combat)	Fort Leonard Wood, MO
• 7th Engineer Battalion, 5th Inf Div (M)	Fort Pol, Louisiana
8th Engineer Battalion, 1st Cav Div	Fort Hood, Texas
11th Engineer Battalion (Combat)	Fort Belvoir, Virginia
•13th Engineer Battalion, 7th Inf Div	Fort Ord, California
14th Engineer Battalion (Combat)	Fort Ord, California
15th Engineer Battalion, 9th Inf Div	Fort Lewis, Washington
17th Engineer Battalion, 2nd Armd Div	Fort Hood, Texas
• 19th Engineer Battalion (Combat)	Fort Know, Kentucky
20th Engineer Battalion (Combat)	Fort Campbell, Kentucky
27th Engineer Battalion (Combat) (Abn)	Fort Bragg, North Carolina
30th Engineer Battalion (Base) (Topo)	Fort Belvoir, Virginia
34th Engineer Battalion (Construction)*	Fort Riley, Kansas
39th Engineer Battalion (Combat)	Fort Devens, Massachusetts
43rd Engineer Battalion (Construction)*	Fort Benning, Georgia
46th Engineer Battalion (Construction)*	Fort Rucker, Alabama
52nd Engineer Battalion (Construction)*	Fort Carson, Colorado
62nd Engineer Battalion (Construction)*	Fort Hood, Texas
76th Engineer Battalion (Construction)*	Fort Meade, Maryland
92nd Engineer Battalion (Construction)*	Fort Stewart, Georgia
•299th Engineer Battalion (Combat)	Fort Sill, Oklahoma
307th Engineer Battalion, 82nd Abn Div	Fort Bragg, North Carolina
326th Engineer Battalion, 101st Ambl Div	Fort Campbell, Kentucky
548th Engineer Battalion (Construction)*	Fort Bragg, North Carolina
•588th Engineer Battalion (Combat)	Fort Gordon, Georgia
864th Engineer Battalion (Construction)*	Fort Lewis, Washington

EUROPE (GERMANY)

NOTE:
* Re-designated as "Combat (Heavy)"

9th Engineer Battalion (Combat)	237th Engineer Battalion (Combat)
10th Engineer Battalion, 3rd Inf Div	249th Engineer Battalion (Construction)*
12th Engineer Battalion, 8th Inf Div	293rd Engineer Battalion (Construction)*
16th Engineer Battalion, 1st Armd Div	317th Engineer Battalion (Combat)
23rd Engineer Battalion, 3rd Armd Div	547th Engineer Battalin (Combat)
54th Engineer Battalion (Combat)	549th Engineer Battalion (Service)
78th Engineer Battalion (Combat)	559th Engineer Battalion (Service)
79th Engineer Battalion (Construction)*	563rd Engineer Battalion (Service)
82nd Engineer Battalin (Combat)	565th Engineer Battalion (Service)
94th Engineer Battalion (Construction)*	649th Engineer Battalion (Topo)

HAWAII

NOTE:
* Re-designated as "Combat (Heavy)"

65th Engineer Battalion, 25th Inf Div	Schofield Barracks, Hawaii
84th Engineer Battalin (Construction)*	Schofield Barracks, Hawaii
652nd Engineer Battalion (Topo)	Ford Island, Hawaii

KOREA

NOTE:
* Re-designated as "Combat (Heavy)"

2nd Engineer Battalion, 2nd Inf Div	Camp Casey, Korea
44th Engineer Battalion (Construction)*	Camp Mercer, Korea
802nd Engineer Battalion (Construction)*	Camp Humphreys, Korea

BRIDGING

AVIATION TO BECOME OPMS SPECIALTY

As a result of recommendations made in a detailed ODCSPER study of the Army's aviation management system, the addition of Aviation to the list of specialties under OPMS has been approved.

Originally, Aviation had not been designated as a separately managed specialty because of the relatively low number of aviator positions at the LTC and COL level and because aviation skills were identified as integral to 35 of the 47 approved OPMS specialties. However, the Aviation Career Incentive Act of 1974 and projected aviator strength imblances severely impacted on the planning for aviator professional development under the "aviation as skill" concept; the demands of the legislation to gain optimum return on aviator training investments restricted many aviator management options under consideration at the time.

The new Aviation specialty concept — scheduled for implementation in early 1976 — will be keyed to meeting field grade aviator requirements. The main features of the concept include the following:

- Aviation will become an advanced entry specialty designated in an officer's eighth year of service.
- Aviators will be trained and assigned based upon their basic entry specialty.
- In the future, only officers from Infantry, Armor, Field Artillery, Air Defense Artillery, Engineer, Signal Corps, Transportation Corps, and Military Intelligence branches may receive flight training.
- Officers will enter flight school between their 24th and 60th months of commissioned service, except for those in the Aviation Materiel Management specialty who will attend upon completion of the Transportation Officer Basic Course.

NEW INVOLUNTARY RETRAINING/RECLASSIFICATION PROGRAM

Armywide overages of noncommissioned officers in a number of Combat Support and Combat Service Support MOSs and critical shortages in the Combat Arms field have led to a new program for retraining and reclassifying career soldiers into Combat Arms MOSs. The program is intended to satisfy two major needs of the Army: to balance the enlisted MOS/grade structure, and to increase Combat Arms strengths to fill the requirements of a 16-Division Force.

To meet these goals, MILPERCEN's Enlisted Personnel Directorate (EPD) is screening the records of enlisted soldiers in MOSs that are overstrength Armywide. Physical profiles, Enlisted Evaluation Scores, status of enlistment or reenlistment bonuses (i.e., not receiving EBs, VRBs, SRBs), and the soldier's potential to qualify and compete in another MOS are some of the factors EPD will consider before selecting a soldier for involuntary reclassification from an overstrength skill into the Combat Arms field.

Upon selection, the soldier will be retrained formally and reclassified into an appropriate Infantry, Armor, Combat Engineer, Field Artillery, or Air Defense Artillery PMOS. His former skill will then be designated as his SMOS, and he will be required to maintain proficiency in the new PMOS.

Initial classes of approximately 30 soldiers each will begin retraining for MOSs 82C (Artillery Surveyor) and 13E (Field Artillery Cannon Operations) at Ft. Sill, OK, and MOS 13B (Field Artillery Crewman) at Ft. Hood, TX, in January 1976. After completing the courses, soldiers will remain on station for at least one year to gain additional skills, knowledge and experience in their new MOSs.

All soldiers involuntary reclassified into the Combat Arms field will be notified by personal letters which explain the program and stress that selection is neither based on substandard

performance nor punitive action. A special letter will be included in each soldier's Official Military Personnel File (and 201 "Field" File for E-5s) to indicate to future Promotion Selection Boards that the involuntary reclassification action should not be viewed as adverse, and that without exception, only those soldiers who have records of satisfactory performance are being selected for the program.

All involuntary reclassifications into Combat Arms MOSs are dictated by the needs of the Army. MILPERCEN will reconsider only those soldiers who for cogent military reasons (i.e., physical disqualification) forward within 14 days of receipt of notification the required documents supporting requests for deletion from the program.

EMERGENCY LEAVE POLICY REVISED

New guidance expanding current policies under which emergency leave and administrative absence may be authorized was recently incorporated into AR 630-5 and implemented by a MILPERCEN message.

Effective 17 November 1975, conditions under which service members may take emergency leave have been broadened to include emergency situations involving an immediate family member of the service member's spouse. Prior to this change, soldiers were only authorized emergency leave in connection with an emergency involving the service member's immediate family. Immediate family members include parents, brothers, sisters, children, persons in loco parentis, or the sole surviving blood relative.

A new paragraph (6-10d) has also been added to the "Leave, Passes, Administrative Absence, and Public Holidays" regulation allowing dependents of service members to travel "space-available" on DOD owned or operated aircraft in conjunction with a bona fide family emergency in accordance with DOD Regulation 4515.13-R provided they possess written authorization.

A final change to the emergency leave section (Chapter 6) of the regulation involves military personnel assigned to the Military Assistance Program (MAP) who are stationed in areas not serviced by scheduled Military Airlift Command (MAC) flights. In the future, soldiers travelling on emergency leave will only be authorized transportation on DOD owned or operated aircraft to an from a location where MAC transportation can be acquired. In the past, commercial transportation to a MAC-serviced area was also authorized at government expense.

Conditions under which an administrative absence may be taken have also been broadened in the regulation. In addition to meetings sponsored by recognized professional legal/ecclesiastical societies and organizations, an administrative absence may be taken for attendance at meetings sponsored by recognized non-federal technical, scientific, and professional medical organizations. In order to qualify, the meetings must be of a nature which does not require the approval of the Secretary of the Army and must bear a direct relationship to the service member's professional background or primary duties while clearly enhancing the individual's value to the Army.

Further details of the policy changes to AR 630-5 are contained in the implementing MILPERCEN message 171720Z November 1975.

SPECIAL FORCES VACANCIES

Positions are currently open in Special Forces units for volunteers in MOSs 05B (Radio Operator), 12B (Combat Engineer), and 91B (Medical Specialist).

Selected soldiers in these MOSs will be Airborne and Special Forces trained before they report to their Special Forces units in Panama, Germany, Korea, Thailand, or Forts Bragg, NC, or Devens, MA.

Soldiers interested in a Special Forces assignment should submit a volunteer request in accordance with Chapter 12 of AR 614-200 through channels to the Commander; US Army Military Personnel Center; ATTN: DAPC-EPK-S; 2461 Eisenhower Avenue; Alexandria, VA 22331.



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