THE ENGINEER

WINTER 1978-1979

Soviet Combat Engineers

page 6

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MAJ Sandor I. Ketzis

EDITOR
Jerome J. Hill

ILLUSTRATOR
SSG Mike Furr

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THE COVER

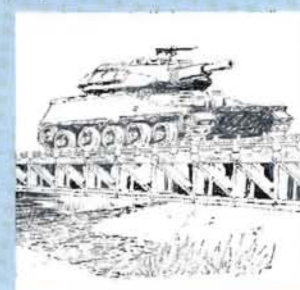
Soviet combat engineers perform many, but not all, of the same functions as their U.S. counterparts. Major Arthur J. Parr, Jr., examines the staff and organization of Soviet combat engineers beginning on page 6. Cover art by Staff Sergeant Mike Furr.

THE ENGINEER

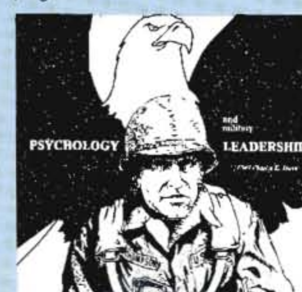
VOLUME 8 WINTER 1978-1979 NUMBER 4

FEATURE ARTICLES

page 13



page 19



page 30

DEPARTMENTS

News & Notes

FTX

Troops of the 5th Engineer Battalion (Combat), US Army Training Center Engineer and Fort Leonard Wood, prepare to attach the deck plate to the superstructure of a Class 60 float bridge during their Field Training Exercise last fall. The FTX, considered the most comprehensive ever for the 5th Battalion, covered 5,400 square miles with training sites at Fort Leonard Wood, Wappapello National Guard Training Area, Mark Twain National Forest, Weldon Spring, and Stockton Lake. The FTX culminated an eight-week training cycle during which each company of the battalion rotated to each training area to practice different combat engineer operations. (U.S. Army photo by 1LT David Faltot)

LAB OF THE YEAR

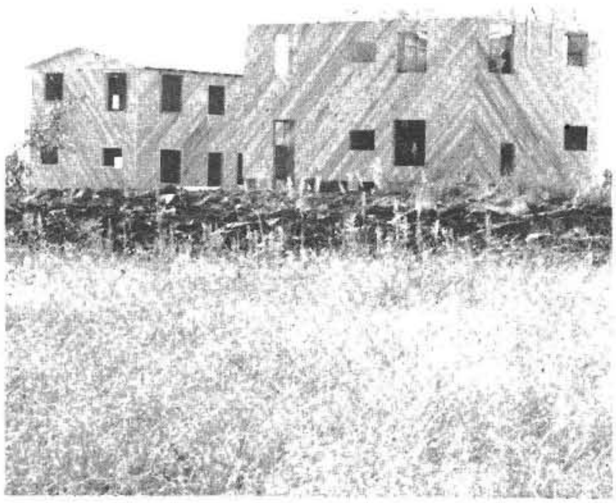
The U.S. Army Engineer Topographic Laboratories (ETL), Fort Belvoir, VA, has won the U.S. Army Laboratory of the Year award for scientific and technical achievement in mapping, military geography information, and geographic intelligence systems. A total of 32 laboratories competed for the 1978 award.

Specific achievements which helped ETL win the prestigious award included: development of the Digital Interactive System for image interpretation and special product research and development; development of a Print Head System to place map names and symbols; development of digital input-output display equipment (DIODE) which automates techniques for editing cartographic data; and development of mathematical and computer techniques for storing millions of terrain data points.

MOS 12B SURVEY

Military Occupational Specialty 12B, Combat Engineer, was one of six MOSs surveyed during the first quarter of FY 79 to provide feed back on job skills and training. Results of the survey should be ready for MOS management officials and training centers early this year, according to MILPERCEN. The purpose of MOS surveys is to get soldiers' opinions and critiques of job qualifications, specific duties performed and benefits of job training. Results are studied to arrange future training and testing to correspond more closely with duties rather than job descriptions.

CITY BUILDERS



When members of the 34th Engineer Battalion of Fort Riley, KN, set their minds to a task, they seem to be able to accomplish wonders. For example, with the assistance of the 203rd Engineer Battalion, a Missouri National Guard unit, they constructed an entire city in less than three months. A little hard to believe, but nevertheless true. Of course, the city consisted of just 13 wooden buildings, but it will do just fine for training purposes. The single and two-story structures were designed and built to provide a combat-in-cities training environment for infantry, armor and military police units at Fort Riley. The "city" is located about four miles north of the installation's new troop billets on a four-acre training site.

NEW OCE DIRECTORATE

A new directorate has been established in the Office of the Chief of Engineers (OCE), replacing the Military Construction and Facilities Engineering Directorates. The new Directorate of Military Programs, headed by Major General William R. Wray, is designed to streamline military programs and strengthen support to the Army.

PEOPLE

- **Private First Class Andrew D. Leach,** Company A, 307th Engineer Battalion (ABN), was selected as the 82nd Airborne Division "Trooper of the Month" for October 1978. Leach is a 20-year-old Combat Construction Specialist from El Paso, TX.
- **Colonel Lee Roy Nunn, Jr.,** has been selected to suceed Colonel George R. Robertson as the Alaska District Engineer, effective this June. Colonel Nunn is currently attending the Army War College.

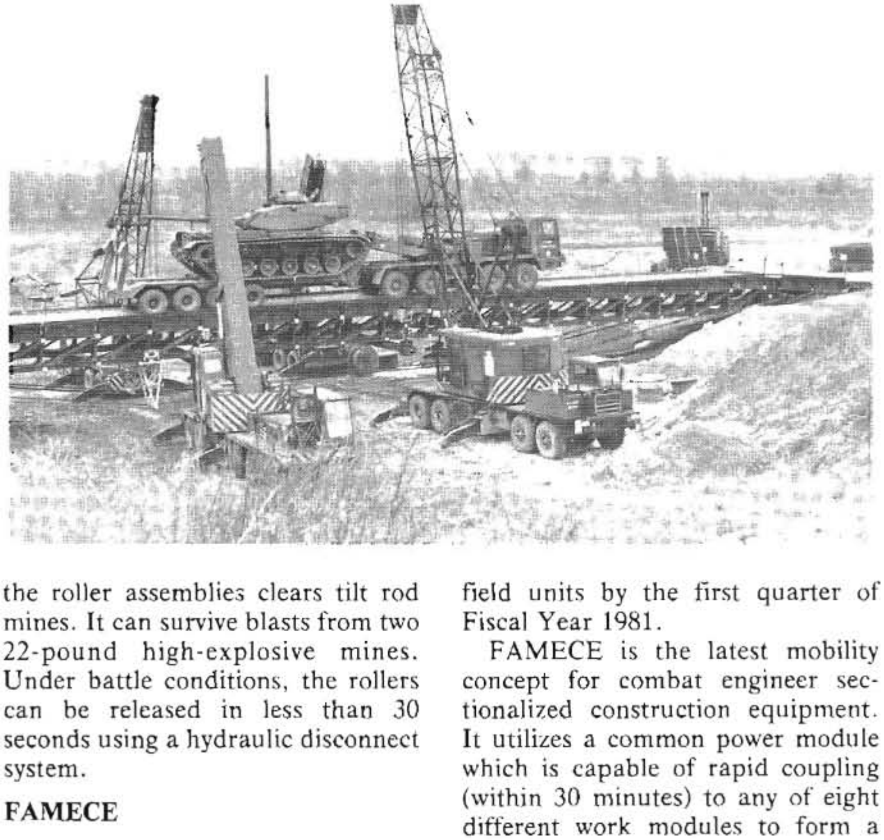
NEW INSIGNIA

A new shoulder sleeve insignia for military personnel assigned to U.S. Army Corps of Engineers divisions and districts is now being distributed. The new insignia is a 2¼-inch square with white border, placed point up. The background is divided in half vertically with white and scarlet. It bears a castle tower divided in half with scarlet and white. Opened dividers are centered above a gridlined globe, both divided in half with white and scarlet. The globe symbolizes activities of Engineer divisions and districts, the dividers symbolize design and planning, and the tower is symbolic of the construction mission.

Equipment Update

MGB TEST ANALYSIS

The U.S. Army Test and Evaluation Command's analysis of the test report on the Medium Girder Bridge has been forwarded to the Troop Support and Aviation Materiel Command in St. Louis for a final decision on the MGB. The test report, based on three years of testing and evaluation by the Materiel Testing Directorate, Aberdeen Proving Ground, had been labeled "very favorable" by test director William Deaver.



MINE CLEARING ROLLER

Pre-production tests on the first two Track Width Tank Mounted Mine Clearing Roller Systems are scheduled to begin in May at Aberdeen Proving Ground, MD.

The production contract was awarded last August to Chrysler Corporation. It called for the production of 15 mine clearing rollers at a cost of $1.5 million.

The system consists of a retrofit kit, mounting kit, roller kit and fixture kit. It weighs less than 10 tons and can be mounted in the field by a tank crew in less than 15 minutes for use day or night under all weather conditions.

The roller is about 90 percent effective against pressure fused mines buried up to four inches when traveling up to 10 miles per hour. A weighted chain suspended between the roller assemblies clears tilt rod mines. It can survive blasts from two 22-pound high-explosive mines. Under battle conditions, the rollers can be released in less than 30 seconds using a hydraulic disconnect system.

FAMECE

Type classification of the Family of Military Engineer Construction Equipment (FAMECE) is expected on or about 15 February. If the decision is to buy, the Army will purchase approximately 150 complete vehicles at a cost of $18 million. Barring unforeseen delays in the production schedule, the first vehicles should be in the hands of engineer field units by the first quarter of Fiscal Year 1981.

FAMECE is the latest mobility concept for combat engineer sectionalized construction equipment. It utilizes a common power module which is capable of rapid coupling (within 30 minutes) to any of eight different work modules to form a highly mobile, combat support construction vehicle.

The vehicles consist of a heavy road grader, a 2½-yard loader, two compactors (vibratory smooth drum/pneumatic and tamping foot/pneumatic), a dumper with 10-ton payload that is also used as a squad carrier, a dozer, a 2,500-gallon water distributor, and a 10-cubic-yard scraper. All modules will be liftable by medium lift helicopter, and complete vehicles will be air droppable.

Final testing of FAMECE prototypes is being conducted in Alaska and at Fort Knox, KY, by the U.S. Army Armor-Engineer Board. The latter tests are being conducted to determine the relative differences in capabilities between FAMECE and commercial construction equipment. Operational testing of FAMECE was completed last year at Fort Bragg, N.C., and Fort Campbell, KY.

Letters to the Editor

Sir:

In response to MAJ Kish's article "Combat Engineers and the Heavy Division" in the Fall 1978 issue, I have to reply for two reasons.

Reason one is a moral obligation to the USAES. For a 21-month period between 1975 and 1977, he and I debated command and control in print. In the history of THE ENGINEER Magazine this is the only subject to spark controversy and a continuing dialogue.

The second and more pertinent reason is to provide information. I'm in complete agreement with the article! The USAES has been teaching and the DA print copy of FM 5-100, Engineer Combat Operations (1979 publishing date), clarifies the composition of Task Forces. Either the divisional or non-divisional engineer battalion must furnish a small staff when they create a TF. Other lessons learned are now doctrine. The little red schoolhouse at Ft Belvoir must point out, however, that the task organization has minor errors. The minus (–) signs are omitted from the 17th and 62nd battalions under divisional troops three times.

The command and control annex of FM 5-100 clearly states the options for task organization. These are not precise formulae. The commander must weigh these carefully as part of the total combined arms operation. Hopefully he has actively participated in the conceptional planning. Feedback from REFORGER 78 confirms this is a fact. Therefore, the emphasis has changed and the Chief of Engineer's concern in his interview response on page 5 can also be allayed. This brings me to the answer for "what is the role of the engineer group headquarters." The group must also be prepared to dispatch part of its staff in the formation of TFs. It also may be a TF itself in an offensive operation that includes a river crossing, for example. But, as pointed out, in the active defense, the subordinate units are mostly depleted. Its role? Simply its future planning. In an FTX during peacetime this is hard to impossible to simulate. Both reconnaisance information and higher level intelligence are meshed with engineer capabilities and anticipated situations. Its a full time job in wartime. The payoff is in winning battles and saving lives. Don't sell group and brigade headquarters short.

DOUGLAS K. LEHMANN
Major, CE

Dear Sir:

The inside back cover of your FALL 1978 issue includes the statement "THE ENGINEER magazine is designed as a medium for disseminating information throughout the Army engineering community."

On page 39 is your RESERVE COMPONENTS page. While the word COMPONENTS is plural, you only present information of interest to, or pertaining to, one component, the U.S. Army Reserve, including their logos to make it official.

There are TWO reserve components, the other being the National Guard. It is both the oldest, and the largest, of the two. More personnel belong to it, in active training units, than in the USAR. And as Engineers, we perform the same tasks and find ourselves a real part of "the Army engineering community."

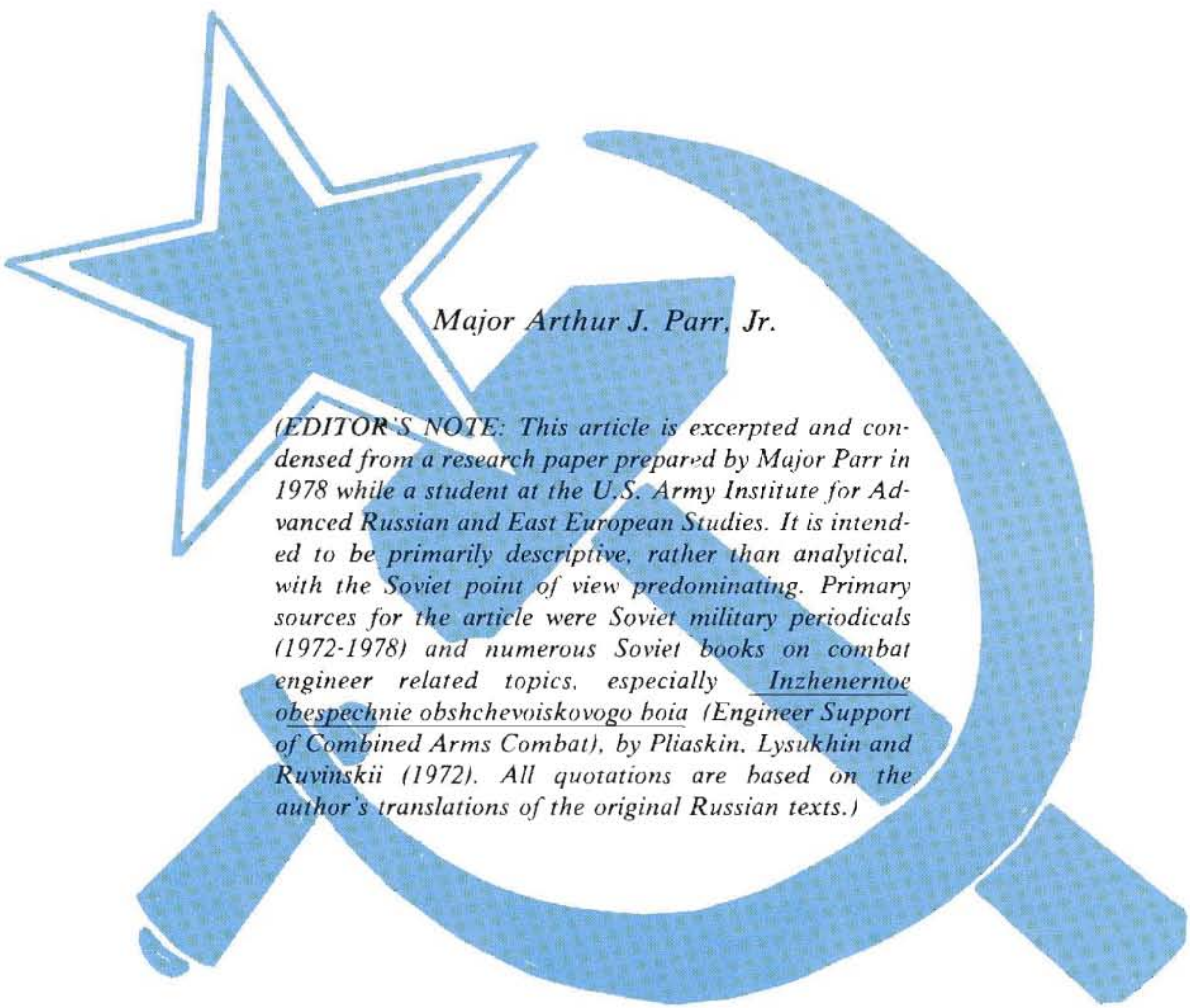
Perhaps your Reserve page could include both logos, or rotate between the two, so that all your readers know we are also a part of the One Army Team.

LEONARD L. LORGE
CW4, MI ARNG
Assistant Adjutant

We regret the omission of the National Guard from our RESERVE COMPONENTS section in the last three editions of THE ENGINEER Magazine, but we are experiencing problems in obtaining input on NG activities. It is not our intention to exclude the Guard from these pages, because, as you point out, it is the largest and oldest of our two reserve components. However, if we are unable to obtain information pertaining to Guard activities, we can't print it. That's where you, and others like you, can help. Let us know what's happening out there. Tell your unit public affairs officers to get with the program. We recognize that the Army engineering community includes the National Guard, but without your help, coverage of Guard activities in THE ENGINEER isn't likely to improve a great deal.—Editor

Soviet Combat Engineers

staff and organization



Major Arthur J. Parr, Jr.

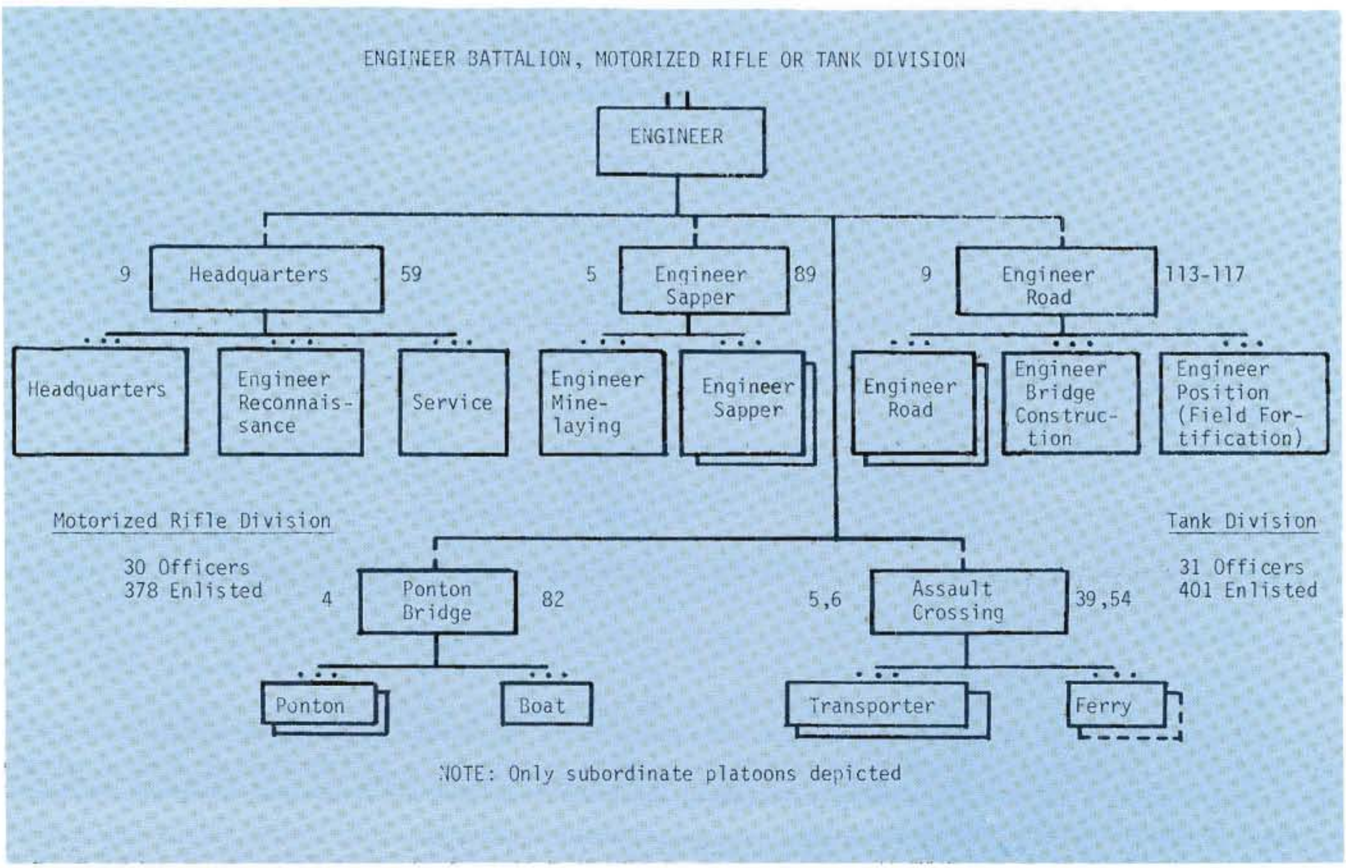
(EDITOR'S NOTE: This article is excerpted and condensed from a research paper prepared by Major Parr in 1978 while a student at the U.S. Army Institute for Advanced Russian and East European Studies. It is intended to be primarily descriptive, rather than analytical, with the Soviet point of view predominating. Primary sources for the article were Soviet military periodicals (1972-1978) and numerous Soviet books on combat engineer related topics, especially Inzhenernoe obespechnie obshchevoiskovogo boia (Engineer Support of Combined Arms Combat), by Pliaskin, Lysukhin and Ruvinskii (1972). All quotations are based on the author's translations of the original Russian texts.)

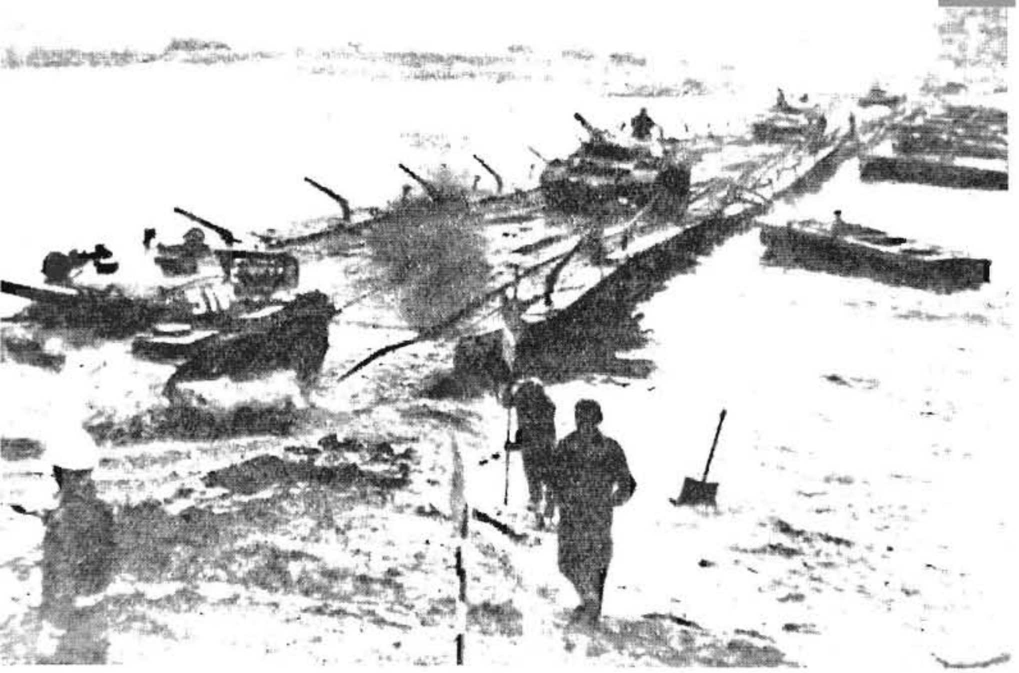
"Soviet military-engineering art has proved its complete superiority over bourgeois military art in the years of the Civil War and the Intervention, and especially on the fields of combat of the Great Patriotic War . . . . Soviet military-engineering art, guided in its development by Soviet military science, will be the most advanced in the future as well."

IT IS DOUBTFUL that any Western military engineer would have acknowledged the superiority claimed above by the Soviet author in 1954. Yet, in 1961 the Soviet Union fielded its ribbon bridge, a revolutionary new design of tactical floating bridge. Nearly a decade and a half later, the U. S. Army paid the Soviets the supreme compliment of fielding a new standard ribbon-type floating bridge: a reverse-engineered copy of the Soviet bridge. Soviet engineers provide their tactical units and formations with professional, minutely-planned and dynamic support in all phases of combat, whether in postulated nuclear or non-nuclear situations. The manner in which this support is organized, the units outfitted and employed, is an appropriate topic for detailed study.

In the Soviet Army's vocabulary the term, "military engineer," is a broadly-applied designation for a whole range of military-technical specialties embracing all arms and services. A military engineer may be an artillery engineer, radio-electronics engineer, or a command systems engineer as well as a construction engineer or an engineer in a combat unit. Engineer support, however, generally refers only to combat engineer training, preparation, and measures in support of the various aspects of combat operations, mobility and disposition of troops. It does not include railroad construction and repair, pipeline construction and maintenance, or cartographical preparation and supply.

IN OTHER WORDS, the Soviets understand "military engineer' in a broader sense than it is usually applied in the West, while their concept of "engineer





Soviet T-62 tanks crossing PMP ribbon bridge

support" does not encompass some Western combat engineer functions. In this article the generic term "engineer" and the terms "combat engineer" and "sapper" will be used to describe those units (subunits) normally ascribed to engineer support of ground and river-crossing mobility (less repair functions) in division-sized units.

Soviet combat engineers proudly trace their historical antecedents to Russian fortification specialists in the eighth and ninth centuries. Road construction and maintenance is claimed to date to Ivan the Terrible's assault on Kazan in 1552. Regular engineer units were first formed in the 18th century, when Peter the Great affirmed the creation of a company of mine preparers (1702) and ponton teams (1704), and founded a regiment of military engineers in 1712.

Nearer to the present, engineer regiments were formed in 1941 in all military districts and regions, consisting of about one thousand personnel comprising a staff, two engineer battalions, one technical battalion, and support and service subunits. During the Great Patriotic War (World War II) more than 200 brigades, battalions and separate companies were awarded the honorary designation, "Guards." The experience of the war provides a history rich with examples of individual and unit bravery and self-sacrifice, constantly referred to in Soviet military journals as the source of object lessons for psychological preparation and inspiration of engineer troops in today's Soviet Army.

SOVIET engineer authors contend that ". . . . practice has shown that the greater the degree of mobilization, the greater the dependency on the trafficability of terrain and the condition of roads, and the more complex the defense against modern means of destruction." Rivers, mountains and other natural obstacles now present a more serious hindrance to troop movement than they previously did. Overcoming these obstacles requires a high degree of engineer support measures by *all* troops, to include specialized support by engineer units.

The basic goal of engineer support is "to create conditions for more effective application of the means of attack, unhindered movement of friendly troops in the vicinity of the enemy and the effecting by them of maneuver on the battlefield; and also for their defense from the destructive means of the enemy . . . . The basic goals of engineer support to combined arms combat include: the creation of favorable conditions for the deployment of subunits and their swift transfer to the offensive; the effecting of maneuver and successful forcing of water obstacles at high speed; and, with regard to modern weapons, increasing the stability and viability of subunits in the defense."

Engineer tasks common to all forms of combat operations include: reconnaissance of the enemy and the terrain, in close coordination with combat reconnaissance; preparation and maintenance of routes of movement and maneuver; surmounting of natural and man-made obstacles and barriers; demolitions work and the construction of obstacles; fortification and camouflage of positions, areas, command posts and rear facilities; exploration for sources of water and its supply and purification; measures to camouflage troop movements and operations; and engineer actions to eliminate the after-effects of nuclear attack.

AS STATED ABOVE, engineer measures are not the function solely of engineer units. "With the sharp increase in the scale and scope of engineer measures, the role of the basic troop arms in the accomplishment of many tasks of engineer support has increased." In order to avoid excessive reliance on specialized engineer machines, which may not be available in the required numbers in certain circumstances, tanks and other tracked vehicles can be fitted with a number of special "strap-on" items (dozer blades, mine-clearing plows, etc.).

Further, each subunit should also contain several personnel competent to perform certain other engineer tasks, such as mine and countermine warfare, the use of demolitions materials, and so forth. This not only lessens reliance on engineer troop units, but also insures that subunits will have a certain level of organic "engineer" support on hand to fulfill the necessary tasks and reduce the time required to accomplish engineer support in general.

Engineer units are organic in the Soviet ground forces units down to and including maneuver regiments. This provides these units the opportunity independently to resolve the basic tasks of engineer support. When necessity requires, at the option of the senior commander, additional engineer units may be attached for general support or to accomplish specific tasks. General principles of employment, or guidelines for use of organic and attached engineers, may be enumerated as follows:

1. Concentrate engineer efforts on the main or critical area.

2. Use assets properly. Proper use refers not so much to the application of the capabilities of a given machine, but to the centralized application of units in accordance with tactical requirements.

3. Consider the inherent engineer capabilities of all organizations. When combat troops are detailed to perform engineer tasks, organic or attached units may also be integrated.

4. Attached engineers are most often used with organic engineers, except when the senior commander specifies the mission (intent or use) and the period of attachment. In such a case, he must also stipulate the details of the task, provide covering forces and support, and the timely return of the unit to his control. When the attachment is not thus limited, the supported commander must clarify the details of the mission, provide security, etc.

5. As a rule, organic engineer units are used only for tasks in support of the unit of which they are a part. Attached engineer units may not be diverted to other tasks; they must work only on assigned missions of engineer support of combat operations.

6. Removal of even one man from the normal crew of an engineer machine substantially degrades the effectiveness of the machine and subunit performance. The optimum working day for a man (10 hours) and a machine (15 hours) may be extended in extreme circumstances to demand more from the men and to stress machines to their technical limits, at the option of the combined arms commander.

7. Centralized control is preferred during the preparation of an offensive, during construction of fortifications and minefields, during river crossing operations, and in other rapidly arising situations. Decentralized control, however, is preferred at the start of the offensive, or when switching to the defense.

8. Bridge or crossing sites and passages through minefields, etc., are usually maintained and serviced by the unit which emplaced the bridge (established the crossing) or cleared the passage.

9. Always maintain an engineer reserve to meet new requirements or replace losses.

Heavy self-propelled tracked amphibious ferry (GSP)

Truck-mounted multiple span bridge (TMM)

IN ANY GIVEN tactical situation, with the possible exception of a lesser degree of emphasis during the preparation of the defense, the bulk of engineer planning and control authority rests with the chief of engineer services (*nachal'nik inzhenernoi sluzhby*, or NIS) located as a member of the commander's special staff at all levels down to maneuver regiment. "The regimental chief of engineer services both in peace and in time of war is responsible for organization of engineer support of the regiment; preparation (training) of regimental personnel in engineer matters; support of the regiment with engineer equipment, to include maintenance in working order of that equipment; and combat and mobilization readiness of the engineer-sapper subunits of the regiment." It must be assumed that chiefs of engineer services at higher levels perform essentially the same broad duties.

As noted above, the NIS is a "chief of service," a position which finds its closest U. S. equivalent in the commander's special staff. The NIS is the direct chief (staff supervisor) of all organic and attached engineer subunits, and as such, his directives and the decisions of the commander comprise the basis for organization of engineer support. In the organization and planning of engineer tasks, the NIS assures that:

a) The plan complies with the commander's concept of the operation and his decision, in accordance with the concrete realities of the tactical situation.

b) Engineer tasks are executed in a timely fashion.

c) Actions by engineer units are conducted with due concern for security, so as not to inadvertently divulge the nature of the plan to the enemy.

d) Engineer tasks are clearly defined so as to concentrate efforts in the direction of the main effort or on critical defense sectors.

e) In accordance with the developing tactical situation, and in close coordination with combat forces, engineer units maneuver correctly in response to requirements.

f) Camouflage and deception measures are applied by all units.

This NIS, usually a major at maneuver regiment level, participates directly in the work of the staff, coordinating his actions with those of the other chiefs of services, but primarily cooperating with the chief of staff and the assistant chief of staff for operations (*pomoshchnik nachal'nika shtaba-1*, or PNSh-1). He contributes to the reconnaissence plan, the combat order, the river-crossing graphic and the plan of CBR defense; he works out the details of the plan of engineer support, the combat disposition of the engineer subunits, and the disposition of combat units assigned to engineer tasks. Although the NIS's organization of engineer support of the unit is quite logically based on his commander's decision, he is also responsive to the directives of the NIS at the next higher level, so that there is a direct technical connecting line between engineer staff officers at all levels.

THE GENERAL sequence of staff-planning procedures followed by the NIS may be briefly summarized. On receipt of the commander's warning order, or his concept of the operation, the NIS quickly clarifies the mission and conducts an estimate of the situation from an engineer's point of view. He considers initial reconnaissance-intelligence data available (map studies, military-geographic studies, long-range reconnaissance information) and issues an alert to the engineer subunit commanders in order to allow them maximum preparation time. He next works out his proposals and recommendations for the plan of engineer support of the operation, to include: the sequence and timing of engineer tasks; forces detailed to engineer tasks and reinforcement of engineer subunits; location, disposition and maneuver of engineer subunits; and mutually supporting operations with units and subunits of other arms and services.

The NIS then presents to the commander his analysis of the terrain and the situation, pointing out area of difficulty or threat, and indicating how his plan recommends dealing with the anticipated problems. The commander may require the NIS or his engineer subunit commander to report on other matters of interest, such as the capabilities of assigned or attached engineer subunits, along with additional recommendations for their employment.

When the plan is accepted and affirmed by the commander, it is signed by the NIS and counter-signed by the chief of staff to become a part of the combat order for the operation. Specifics of tasks assigned to engineer subunits are refined as preparations move forward. Both the NIS and the engineer subunit commander(s) closely monitor the fulfillment of the assigned mission and prepare to shift or reassign assets to address problem areas or meet newly-arisen tasks during the course of the operation.

TYPES OF ENGINEER units in the Soviet ground forces include reconnaissance, sapper, road, position (field-fortification), bridge construction, camouflage, crossing-assault, ponton, and special subunits for obstacles, countermine warfare, water supply and other functions. All these types of units and subunits have been discussed in recent issues of Soviet military journals, with two exceptions: the subject areas of camouflage and water supply continue to be of concern, but specific engineer units charged with carrying out these functions are not noted.

The organizational data presented in the tables represent the findings and, in some cases, the opinions of the author. They are not official Department of Defense (DOD) or Department of the Army (DA) holdings. They are composites based to some degree on open-source Soviet, East German and Polish military publications. Probably no Soviet engineer company or battalion conforms precisely to these organizational figures. Regional and other variations may create fairly wide deviations from these rough guides. They may, nevertheless, serve for a general analysis of the type of combat engineer support at division and maneuver regiment level.

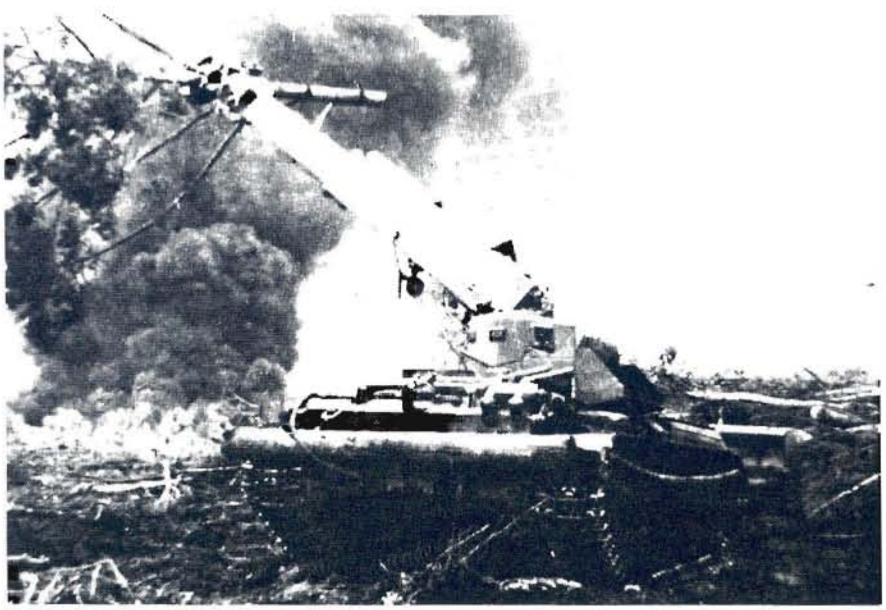
Within the maneuver elements of a regiment, tank dozers are available on the basis of one per tank battalion, and mine clearing plows on the basis of one per tank platoon (nine per battalion). both are normally transported on 7-ton or 5-ton trucks.

THE ENGINEER company of the maneuver regiment has nine or more additional plow sets, and roller plow sets are available, probably on the basis of one per tank battalion in the regiment. The company also has road construction, position preparation, mine and countermine warfare, reconnaissance, and short gap bridging capabilities—in short, some capability for every type of engineer support available in the division except float bridging and amphibious transport.

The division-level engineer battalion has five specialized companies. Tactical employment of engineer units, however, does not always follow strict organizational lines. The specialized equipment of ponton bridge and assault crossing units limits their application in general engineer support roles. Tactical employment of sapper, engineer-reconnaissance, road and road-bridge subunits generally involves the formation of one or more of the following functional groupings: engineer reconnaissance patrol, reconnaissance/obstacle-clearing detachment, mobile obstacle detachment, and movement support detachment.

For example, the mobile obstacle detachment (*podvishnoi otriad zagrazhdenii*—POZ), deployed to blunt enemy armored thrusts or seal off flanks or penetrations, may be based on a sapper platoon, but usually is formed around (or consists wholly of) a sapper minelayer platoon equipped with self-propelled minelayer vehicles or towed minelayer trailers, augmented by anti-tank guns or missiles. The movement support detachment (*otriad obespecheniia dvizheniia*—OOD) may also be formed around any sapper unit, but this function is normally assigned to elements of the road-bridge platoon (at maneuver regiment level) or the road company of the divisional engineer battalion.

Major Arthur J. Parr, Jr., is currently assigned to the Office of the Joint Chiefs of Staff as a Presidential Translator on the Washington-Moscow hotline. He is a Russia-East Europe Foreign Area Officer who has served with the 1st Infantry Division and the 5th Special Forces Group (airborne) in Vietnam, and with the Defense Intelligence Agency as a Soviet Ground Forces Analyst.



Engineer obstacle-clearing vehicle (IMR)

FASCAM

in defense of cities

Major George F. Smith

Large scale city fighting in World War II, Korea, and Vietnam was a relatively rare occurrence primarily because doctrine stressed the notion that built-up areas were to be isolated and bypassed rather than risking costly, time consuming operations in a difficult environment. But urban sprawl in the highly industrialized countries of Western Europe has forced a departure from that doctrine.

An examination of the traditional avenues of approach into and through West Germany quickly establishes the importance of urban sprawl to modern tactics. These historical avenues are no longer unobstructed routes suitable for fast moving armor operations but are frequently blocked or narrowed by a series of urban areas.

Soviet doctrine stresses that offensive formations attacking across highly developed regions will encounter at least one large built-up area every 70 kilometers and numerous villages and clusters of structures that restrict and even block traditional avenues of approach. Since Soviet attack doctrine also stresses that Soviet forces will advance 60 kilometers per day, it is obvious that confrontations could occur in built-up areas.

Retired British Major General J.F.C. Fuller has written that the defense "should command the roads leading toward and through the area being held. The knots in the road are villages, hamlets and small towns. These knots are also tank-proof. Therefore, small towns and villages are the first areas that must be considered." These "knots in the web," as Fuller characterizes them, are ideal locations for antitank strongpoints.

Built-up areas supplement or extend obstacle systems. Building complexes are in themselves obstacles to a mechanized force. Therefore, with minimal effort and materials, a built-up area can become a significant obstacle to advance. Passage can be blocked, canalizing enemy armor into open natural terrain interlaced with anti-armor fires and reinforced with mines and other obstacles. The built-up area can itself become one huge tank and soldier killing zone with an insatiable appetite.

The skillful integration of built-up areas into the total defense scheme enhances and strengthens defensive combat power to attrit, delay and eventually defeat a numerically superior force.

THE USE OF MINES IN THE CITY

To maximize the defender's advantage within the city, defenses are organized in depth. Depth is achieved by selecting and preparing a series of mutually supporting battle positions, strongpoints and obstacles throughout the built-up area.

The proper selection and location of obstacles immediately increases or multiplies our available combat power. Properly employed, obstacles (in particular, mines) greatly increase the killing capability of our antitank weapons by increasing the amount of time that a target is in the "target window." While obstacles are discussed in most of the literature concerning combat in

built-up areas, details concerning the proper use of mines is sorely lacking. In fact, the new family of scatterable mines (FASCAM) is rarely mentioned.

The Combat in Cities Report, published by the Infantry School, concluded paradoxically that standard pattern minefield construction time precludes its use in many cases, but that mines can be used effectively along streets and at intersections within the city and at critical choke points along likely avenues of approach into the built-up area. One must hastily add that the built-up area, itself, is a choke point.

Supporting the Report's conclusion concerning conventional mines is an extract from a KETRON, Inc., Technical Report, which states, "The current inventory of mines is not suitable for use in the city. Both off-route and scatterable mines would assist in controlling specific areas by canalizing movement of enemy forces and slowing the rate of enemy advance." Before isolating on the employment of FASCAM in cities, it is first necessary to discuss current U.S. doctrine regarding the defense of a built-up area so that FASCAM can be logically introduced.

DEFENSE OF A BUILT-UP AREA

The defense begins well forward of the city on terrain suitable for a balanced combined arms covering force designed to wear down the attacker and cause him to reveal his intentions before reaching the built-up area. As the attacker approaches the periphery of the city, he comes within range of anti-tank guided missiles and tank and artillery fire from strong, mutually supporting battle positions and strongpoints of the main battle area arranged in depth throughout the built-up area.

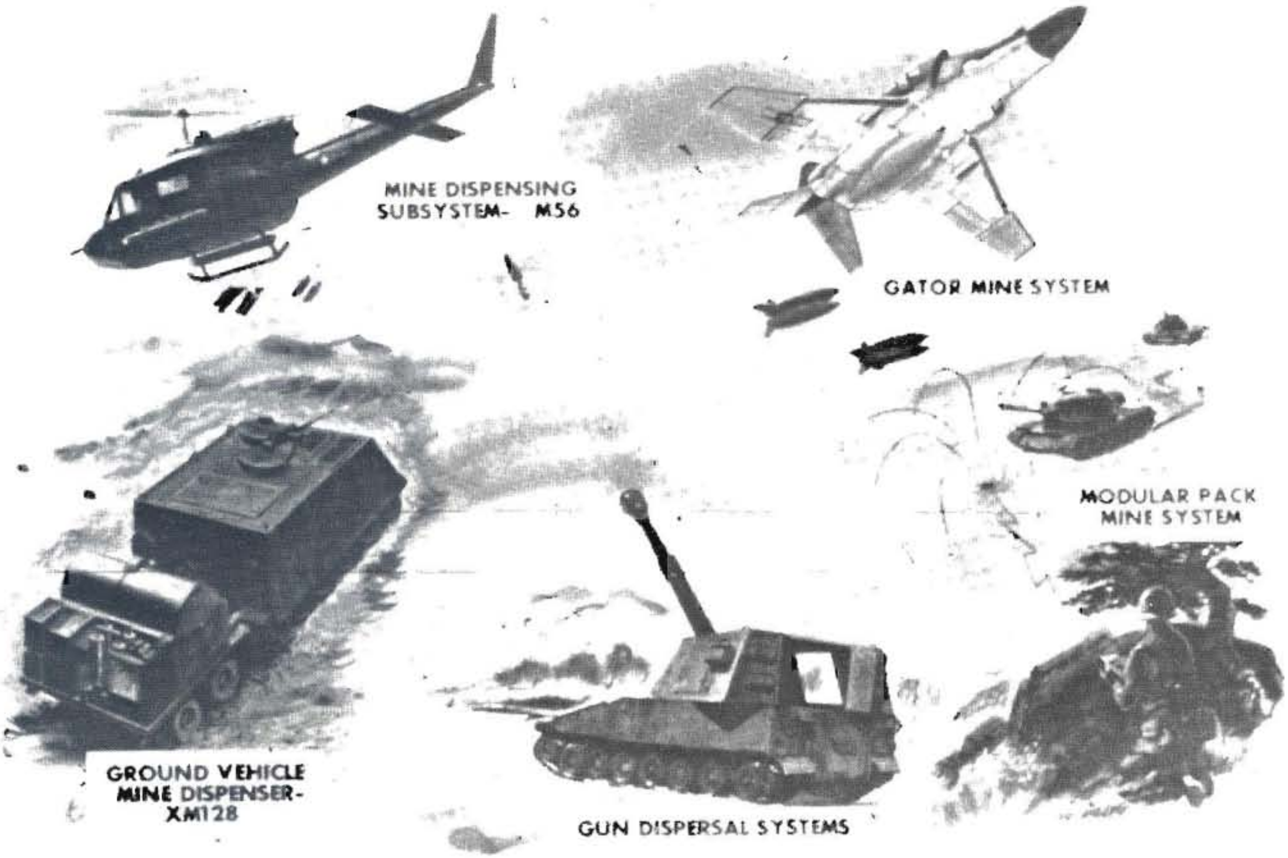
Success is achieved by an integrated defensive scheme between forces in the city and forces defending adjacent terrain. The key to defense within the city is the strongpoint, where squad and platoon leaders will often be required to fight independent battles without detailed orders. The skillful use of mines and obstacles will greatly enhance the defensive capability of these mutually supporting strongpoints.

THE USE OF FASCAM

The use of scatterable mines in the covering force area forward of the built-up area is essentially no different than in the normal defense. Prior to the battle, maximum use must be made of the Ground Emplaced Mine Scattering System (GEMSS) and M56 to rapidly emplace minefields along likely avenues of approach to enhance the effectiveness of covering anti-tank weapons.

Particular attention must be given to obstacles on the flanks of the city since it would be the defender's intention to force the attacker into the city. As the covering force withdraws, Artillery Delivered Anti-vehicle, Anti-tank and Anti-personnel Mines (ADATM and ADAPM) can be effectively employed in front of enemy formations to assist in breaking contact and further attriting the enemy. As the enemy comes within range of the Main

RESPONSIVE DELIVERY MODES FOR SCATTERABLE MINES



Battle Area (MBA), the Surface Launched Unit-Mine System (SLUMINE) can rapidly seed the obvious avenues of enemy approach and close breaches in existing minefields. The range of the SLUMINE prohibits its use forward of the MBA.

Within the city itself, the various types of scatterable mines must be emplaced to support each battle position and strongpoint. The uses for FASCAM inside the built-up area are limited only by the imagination of the defender. Because employment of these mines within the city is the heart of the issue, each mine system will be considered separately in an examination of several possible applications.

ARTILLERY DELIVERED MINES (ADAPM AND ADATM)

Since the effectiveness of artillery may be degraded due to restricted observation, proximity of friendly forces to enemy troops, the corresponding requirement for pinpoint accuracy, and frequent attachment of artillery sections to infantry platoons and squads, the ADAPM and ADATM should rarely be used within the city. Furthermore, the weight of the ADATM mine, coupled with its rate of descent, would virtually insure its penetration of roof tops and cause the interior of many buildings to be mined. The effectiveness of an anti-tank mine in a basement is limited.

The ADAPM, however, could be used since it is not heavy enough to penetrate roof tops. In fact, antipersonnel mines emplaced on roofs would be effective in blocking that traditional avenue of approach by infantrymen in the city.

GEMSS

The GEMSS is ideally suited for the rapid emplacement of mines throughout the city. Streets and boulevards can be mined as easily as parks and cemetaries. However, mined areas must be marked to preclude friendly casualties. In most cases the defender's routes of withdrawal and lateral movement will be above or below ground, thus reducing the concern for mines in the street. The defender will use the street far less than the attacker. However, counterattack routes must be kept open. The limiting characteristic of the GEMSS is its long self-destruct time. Areas mined with it are essentially denied to defender use.

SEQUENCE OF OPERATIONS FOR MODULAR PACK MINING SYSTEM (MOPMS)

M-56 HELICOPTER DISPENSED SYSTEM

This system could not be used once the battle in the streets begins due to its high vulnerability. However, before the battle begins, it could be used to mine large, open areas such as parks, autobahns, and the like.

SLUMINE

SLUMINE is capable of covering large areas rapidly. Therefore, like the M56, it has limited effectiveness within the city, although it is not vulnerable to air defense fire like the M56. Its principal use within the built-up area might be to contain a penetration in an open area or to re-seed a breach in a GEMSS field, also in an open area. The low angle of fire of the SLUMINE rocket severely limits its application in areas containing tall buildings. The SLUMINE launcher would be more effectively employed firing SLUFAE at soft targets.

MODULAR PACK MINE SYSTEM (MOPMS)

This system has the greatest utility of any FASCAM system for combat in cities. It is easily transported and does not require a launch system. It can be placed easily in support of squad and platoon strongpoints, activated when required, and recovered if not employed. Not only would it be effective in the streets against tanks and soldiers, but it could be devastating if employed inside a building following withdrawal by defenders and just prior to enemy seizure. The expenditure of the MOPMS could be extremely effective if the building is a critical strongpoint.

MANUALLY EMPLACED MINE SYSTEM (MEMS)

This system is not currently in development, but could prove very useful in urban combat. The MEMS is essentially an ADAPM which is activated by pulling a pin and throwing the mine into place. Consider the effect of leaving one of these in each room of a building as the defender withdraws. Similar employment could be effective on flat rooftops, in alleys and doorways, and particularly in trafficable sewers. Extreme control of such a system would be necessary to prevent friendly casualties resulting from over-enthusiastic employment.

CONCLUSION

The family of scatterable mines has truly added a new dimension to mine warfare and the mechanized battlefield. No longer is mine warfare limited to open terrain on the traditional battlefield. FASCAM will enable the defenders of cities to more effectively and efficiently employ their anti-tank weapons to kill the enemy and win the first battle.

Major George F. Smith is currently assigned as the Executive Officer of the 565th Engineer Battalion, USAREUR. In his previous assignment as Project Officer at the Armor and Engineer Board, Fort Knox, KY, he designed tests for the Artillery Delivered Antitank Mine.

The Topographic Element of Combat Power

Major Craig R. Hutchinson

SEVERAL new "How to Fight" manuals have been published and a detailed knowledge of FM 100-5 (Operations), FM 101-5 (Command and Control of Combat Operations), and TC 101-5 (Control and Coordination of Division Operations) is necessary to keep abreast of the situation. However, if you search these manuals for the topographic element of combat power, you will not find it in bold print. In fact you have to read between the lines to find it at all.

You may find clues to the topographic element of combat power in FM 5-100 (Engineer Combat Operations), FM 100-10 (Combat Service Support), and FM 101-10-1 (Staff Officers Field Manual; Organization, Technical, and Logistical data). However, two new field manuals (FM 21-32 Topographic Support and FM 5-146 Engineer Topographic Units) discuss the topographic element of combat power in detail. Since the new manuals won't be published until later this year, let's examine the topographic elements of combat power today.

First, what is the topographic element? To find out, let's go to the new FM 101-5 which presents a systems approach to operations and defines functional systems for corps down thru battalions. Specifically, it includes the following corps functional systems: Command, Control, and Communications (C3); Maneuver; Engineer; Intelligence; Fire Support; Air/Ground Operations; Electronic Warfare; Air Defense Artillery; and Combat Service Support.

THE TOPOGRAPHIC element is not explicitly stated here, but one can pick up its tracks in the engineer system, which equates to mobility/countermobility and survivability and is composed of divisional and corps engineer units. According to FM 5-100, in corps engineer units you will find a cartographic company of the engineer topographic battalion, theater army. It is in this cartographic company that the topographic element can be found. Topographic elements and their functions are defined by FM 5-100 as follows:

MAP DISTRIBUTION—Operating the corps map supply and distribution system down to division level.

MAP UP-DATING—Planning and supervising local map revision to meet the needs of the corps.

PRINTING—Producing revised maps, map supplements, overprints, sketches, drawings, and terrain intelligence material to meet the needs of the corps.

ANALYSIS—Provide terrain intelligence, prediction, and analysis of the effects of terrain factors on military operations to corps and divisions.

SURVEYS—Provide survey information required by the combat elements in support of their modern weapons systems.

But, what is combat power? It is not explicitly defined in the new FM 100-5. The Command and General Staff College defines combat power as leadership and the functions of land combat under the influence of environment and tactics. Specifically, "A unit's ability to develop and apply combat power is directly dependent on the unit's capabilities for performing the functions of land combat, i.e., firepower; intelligence; mobility; command, control, and communications (C3); and combat service support." If firepower and mobility are equated with fire support and maneuver in the corps functional systems previously presented, one can see that the functions of land combat are a subset of the corps functional systems. Thus, performing land combat can equate to managing the corps functional systems and we have a working definition for combat power: it is the command, leadership, and management of a unit's functional systems within the influence of environment and tactics.

THE QUESTION remains as to how the functional systems are managed in order to obtain combat power from the topographic element? According to FM 101-5, each functional system within a unit interfaces with every other system in the unit. Thus, the engineer system interfacing with all other systems provides the topographic element in some form to the other systems. FM 21-32 (Topographic Support) and FM 5-146 (Engineer Topographic Units) provide the details of this interface and thus the answer to our question. However, let's examine the topographic element interface between the engineer system and C3 system.

The C3 system consists of: The Commander and Staff; Communications; Staff Organization; Staff Procedures; and Decision Making. The topographic element interface between the engineer system and the C3 system includes assisting the commander and staff in communications, staff procedures, and decision making. Examples 1 and 2 illustrate how the topographic element interfaces in staff procedures and decision making in the C3 system.

EXAMPLE 1

SEQUENCE OF COMMAND AND STAFF ACTIONS*	TOPOGRAPHIC ELEMENT	STAFF INTERFACE
1. Mission received. 2. Information to CO and staff sections.	1. Update maps and graphic portion of the Intelligence Preparation of the Battlefield (IPB) data base. 2. Provide updated maps. 3. Gather terrain analysis materials.	G2/G3/G4
3. Mission analysis and CO's planning guidance.		
4. Staff estimates.	Provide terrain analysis input for the IPB.	G2/G3
5. CO's estimate including decision and CO's concept.		
6. Preparation of plans or orders.	Printing of IPB reports and OPLANs or OPORDs on overlays.	G3/G4
7. Approval of plans or orders.		
8. Issue of plans or orders.	Distribution of topographic products.	G2/G3/G4
9. Staff/Command supervision.	Printing of Frag Orders on topographic products.	G3/G4
10. Mission Accomplished.		

*From Superseded FM 101-5

EXAMPLE 2

MILITARY ESTIMATE	TOPOGRAPHIC ELEMENT	STAFF INTERFACE
1. *Mission Analysis* a. What must be done and when? b. Restate for clarity.	1. Update maps and graphic portion of IPB data base. 2. Provide updated maps. 3. Gather terrain analysis materials.	G2/G3/G4
2. *Situation and Courses of Action* a. What is the situation? (1) What enemy forces are opposing us and where? (2) How can the terrain be used to gain an advantage? (3) What is the effect of the weather? (4) What friendly forces are available? b. What are feasible courses of action to accomplish the mission?	Provide terrain analysis input for the IPB.	G2/G3/G4
3. *Analysis (Wargame) and Comparison of Courses of Action* a. Wargame courses of action. b. What is the best course of action and why?	Provide terrain analysis and printed graphics as required.	G2/G3/G4
4. *Decision or Recommendation (Concept)* a. Refine the best course of action into a clear decision/recommendation. b. Announce the decision/recommendation. c. Commander issues concept. d. Issue plans/orders.	1. Printing of IPB Reports and OPLAN/OPORDs overlays. 2. Issue of maps and related topographic products.	G2/G3/G4

*From new FM 101-5

PART OF the command and staff's combat power in the C3 system lies in the accuracy and timeliness of their actions interfacing with the military estimate and decision process. As illustrated above, the topographic element contributes to that accuracy and timeliness. In making staff estimates, the topographic element supports the Intelligence Preparation of the Battlefield (IPB) by providing:

a. Up-to-date maps (changes in roads, vegetation, and obstacles);

b. Terrain Analysis (cross-country movement maps, underground complexes, possible enemy drop zones, utility complexes);

c. Rapid printing.

The functional systems of a unit interface within the unit and with the functional systems in the units above and below. Through such interface, the use of the topographic element for communicating OPLANs and OPORDs with graphic overlays and overprints further achieves its combat power.

Thus, the topographic element provides combat power in the C3 system by assisting in providing more accurate and timely staff procedures, decision making and communications.

IT IS EASY to see combat power in the barrel of a loaded gun pointing at you. It is not so easy to see combat power in a combination of a sequence of command and staff actions and a military estimate and decision process which resulted in pointing the loaded gun at you. However, the sequence of command and staff actions and the military estimate and decision process are key tools in the C3 system for commanders and their staffs, and the topographic element is an integral part of its employment.

Who has the staff action for coordinating the topographic element of combat power in the corps? FM 101-5 indicates the responsibility remains with the Assistant Chief of Staff, Intelligence (G2). Actually, the G2 recommends engineer topographic troop assignments in coordination with the corps engineer. Therefore, if you are looking for topographic support to meet your C3 needs, check with your G2 section.

The 649th Engineer Battalion in Europe is currently providing a tactical topographic task force (T3F) in direct support to the US corps in Europe in order to keep the corps in tune with the topographic element of combat power. In addition, the battalion is providing a T3F to support the divisions as required. This is a change to previous and current doctrine, where direct topographic support was no lower than the corps headquarters. The 649th is exercising its tactical topographic task force on corps and division FTXs and CPXs as requested. This provides terrain analysis for the exercise areas and results in the production and distribution of necessary products to meet corps and division needs.

THE TASK FORCE consists of a terrain analysis element and a Tactical Information Printing (TIP) element. The two elements work together in order to satisfy required response times for a timely sequence of command staff actions at corps and division level. For example, the task force maintains up-to-date map changes in a format ready for tactical information printing on standard products, including changes in roads, autobahns, quarries, and vegetation, as well as other up-to-date IPB information the corps or division G2 requires.

To meet the needs of the modern battlefield, TIP can overprint and provide 500 copies of any single-color map in the area of operations within one hour. One objective is for the corps and divisions to provide hard copies of topographic products used and developed in the sequence of command and staff actions and military estimate and decision process as far down as company level if time permits. This eliminates some of the time wasted in "gathering" around the situation map and provides for more rapid dissemination of IPB reports, OPLANs and OPORDs.

The T3F is augmented with a map distribution element to assist in bulk map distribution at corps level and also with a survey element to assist the corps in bringing control forward.

Is the topographic element of combat power a requirement of the peacetime force structure? In order to maneuver forces, you must be able to direct them as rapidly and accurately as possible. This requires terrain analysis and survey as well as distribution of the graphics and data necessary for weapons systems, estimates, OPLANs, and OPORDs to combat commanders prior to the first battle. Only combat commanders can decide if it is required for our peacetime force structure, for they must be prepared for the first battle on very short notice.

Major Craig R. Hutchinson is currently assigned as the Commander, 517th Engineer Detachment (Terrain), attached to the 649th Engineer Battalion, USAREUR. He served as the S-3 for the 649th for 19 months prior to his current assignment.

THE MEDIUM GIRDER BRIDGE

panacea or problem?

Major Harvey G. Ramsey

The Medium Girder Bridge is here; we must now prepare to cope with it. The introduction of the MGB into our units in Europe will provide an additional dimension to the engineer capability on the battlefield. Its impact will be felt most significantly in two critical resources areas—time and manpower.

The positive qualities of the MGB have been demonstrated in both field tests and actual operations. It can be constructed faster and with less manpower than the Bailey bridge which it compliments!

I have used the word "*compliment*" because it is included in the brief doctrinal statement concerning the employment of MGB which follows:

a. The Medium Girder Bridge and Bailey bridge will be used as complimentary systems pending fielding of a mechanically launched system.

b. MGB should be used forward in the Main Battle Area (MBA).

c. Bailey bridge should be used in Lines of Communication (LOC).

d. TOE units should be pure MGB or Bailey bridge rather than composite.

e. Maximize availability of the MGB on the battlefield by replacing emplaced MGB with Bailey bridge when possible.

f. Recommended basis of allocation for the MGB is two sets per division.

The purpose of this article is not to tout the obvious advantages of the MGB or to diminish the value of Bailey by unfair comparison. Rather it is my intention to point out that the MGB has critical limitations which must be considered by the commander in the field. Since some of the MGB's weaknesses are strengths of the Bailey system, I suggest that perhaps our current thoughts on allocation and deployment of these two bridges do not take maximum advantage of the capabilities and limitations of each system.

Given the doctrinal framework, let's examine the advantages and disadvantages of MGB more closely.

ADVANTAGES

a. *Speed of construction*—The MGB allows significantly faster construction rates. For example, a class 60 MGB 103 feet long can be built in 90 minutes. An equivalent Bailey bridge would take about five hours.

b. *Reduced resources*—The 103 foot MGB could be constructed by only 25 soldiers. The equivalent Bailey would require 71 soldiers.

c. *Interoperability*—Our NATO allies are largely equipped with MGB. Equipping our units with MGB would promote compatibility on the battlefield.

d. *Palletization*—The MGB is stored on pallets in the unit. This enhances construction site organization and significantly improves upload problems from depots or bridge parks.

DISADVANTAGES

a. *Limited capacity*—The MGB cannot be constructed in any manner to allow passage of vehicles greater than class 60. Allied nations apparently plan to use the bridge as their primary tactical bridging equipment. They have developed ancillary equipment to offset this deficiency. The US Army has not initiated action to procure ancillary equipment.

b. *Limited length*—MGB is currently limited to lengths of 103 foot military load class (MLC) 60. There is no capability within existing equipment to install the bridge with intermediate supports. Addition of the cable reinforcing system will extend the class 60 length to 162 feet but this reinforcing system is not expected to be available until calendar year 1980 at the earliest.

c. *Limited life*—The MGB is made of an aluminum-zinc-magnesium alloy. It has a well identified fatigue problem which reduces its value on lines of communication. Its estimated life is 10,000 class 60 crossings. The more we train with the bridge, the shorter will be its useful combat life. Stated doctrine implies that the bridge will be a dynamic battlefield asset. This is to say it will enhance the main battle area; being emplaced and removed as battlefield mobility requirements arise. Loss of useful life due to erection, extraction, and hostile fire have yet to be determined. It is safe to assume that continued use will contribute to existing problems of metal fatigue. Our current system for determining fatigue conditions is simply to check for cracks in the outer lugs of panel jaws. When cracks appear, the bridge can still sustain at least 1,000 MLC 60 crossings. Hopefully, we will be able to observe cracks immediately and thus accurately estimate the remaining life.

d. *Limited replacement parts*—Limited procurement, only 34 sets, results in limited replacement parts. Europe is programmed for only 12 sets.

e. *Reduced repair capability*—Since MGB is made of an exotic metal, repair at unit level will be virtually impossible.

f. *Flexibility*—Use of the MGB is rather rigid. Time may produce additional knowledge about uses of the equipment. Flexibility of the Bailey bridge is legend.

g. *Cost*—One set of MGB is expected to cost $420,000. Bailey bridge, currently on hand, had a procurement cost of $35,391 per set. When the cost of erection sets and pallets is considered, MGB will cost about $3,800 per foot, compared to about $270 per foot for the Bailey.

Since we are preparing for a battlefield characterized by aggressive movement, where does the MGB fit in? Obviously, the Armored Vehicle Launched Bridge (AVLB) will best satisfy the need for gaps less than 60 feet. The MGB can be used to span gaps between 60 and 100 feet. Remember, under *no* circumstances can we utilize MGB for gaps greater than 103 feet.

Under current doctrine, the MGB will be issued to Corps Panel Bridge companies. These units will download, or reduce, their present supply of Bailey. In return, they will be charged with the responsibility to maintain, transport and install the MGB. Installation of the bridge is a new mission for the Panel Bridge Companies. It's a mission which causes some concern in view of the described modern battlefield. The vision of a dump truck-mounted Corps bridge company bouncing around "forward in the main battle area," installing and removing MGB, is ludicrous.

Considering bridging requirements on the future battlefield and comparing the equipment alternatives, the case favoring current doctrine becomes quite tenuous. Figure 1 describes the battlefield in terms of bridging equipment.

Gaps up to 60 feet encountered in the brigade areas are best bridged by AVLB. As the brigade moves, these bridges may be left in place. If not, they may be replaced

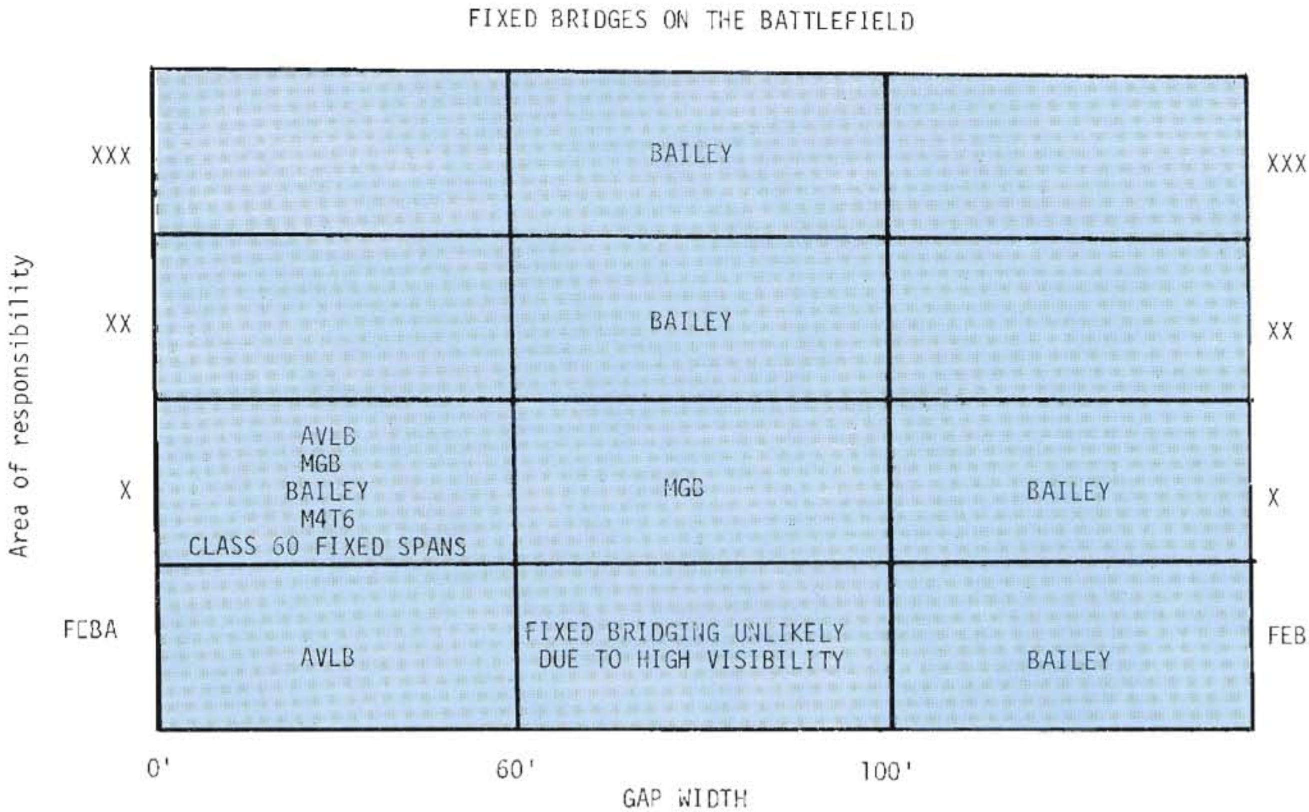


FIGURE 1

by MGB, Bailey, M4T6, or class 60 fixed spans. If the bridge is expected to remain in place for an extended period or if it is on an LOC, the bridge should be replaced by Bailey since MGB has a life span and capacity limitation. Bridges in Division and Corps areas should be Bailey for the same reasons.

Assault gap crossings using Bailey bridge have been conducted, although rarely and at great expense, in the past. Neither the Bailey bridge nor the MGB is an assault bridge. Signature of both bridges on the modern battlefield will mitigate against their use. If, however, such crossings are to be accomplished on the battlefield, they favor the use of MGB. Gaps 60 to 100 feet in the rear of the brigade area are the most likely candidates for use of MGB. In the Corps area, the MGB should be replaced by the higher-capacity, longer-life Bailey bridge.

Since existing equipment limits MGB to 103 feet, wider gaps *must* be bridged by Bailey. Longer term introduction of the cable reinforcing system will expand the MGB to gaps of 162 feet.

I have arrived at an untenable position in direct opposition to current doctrine. I have argued that the inherent limitations of MGB, coupled with limited procurement, mitigate against extensive employment of this bridge on the battlefield. Yet the two bridge companies in Europe are being converted to MGB. Current doctrine requires MGB to be installed by its owning unit forward in the main battle area. I suggest that this concept is folly.

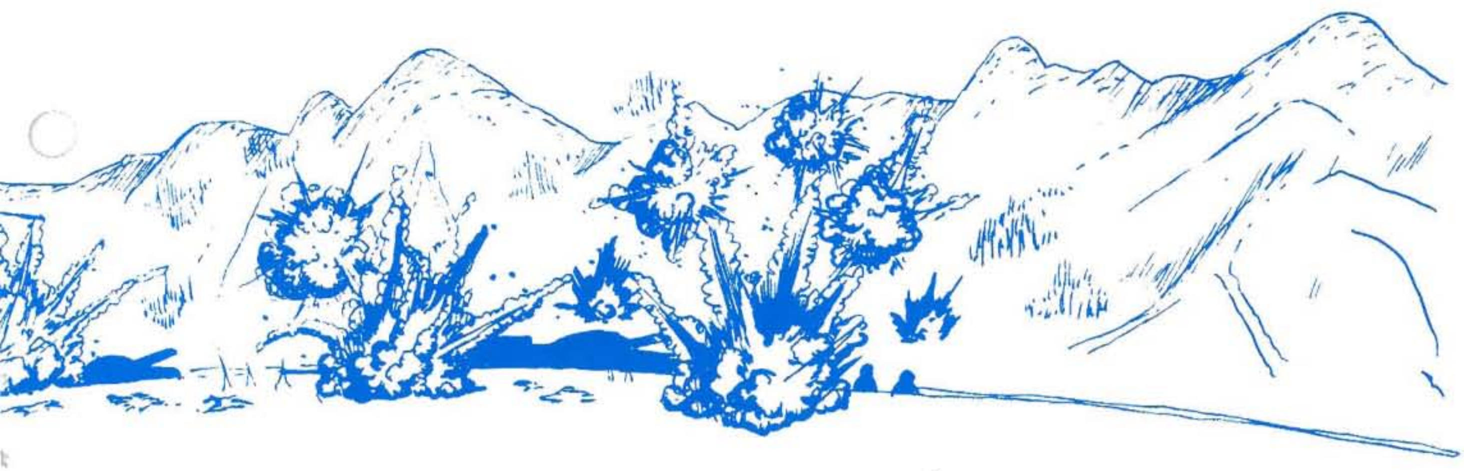
I believe we should combine the best of our available assets by creating composite Bailey bridge/MGB companies. At present, the TOEs of the two companies are almost identical. The retention of Bailey bridge as primary equipment would allow each company to respond to its most likely requirements. We do not currently take advantage of a significant advantage of the MGB—its palletization. Because of this characteristic, it can be more easily uploaded in trucks, helilifted or moved by aircraft to construction sites and installed by the bridge company, a Corps company or a division's combat or bridge company. I suggest we keep the Bailey bridge in the panel bridge companies, uploaded in trucks for rapid deployment, and maintain, at the same place, palletized MGB, ready for deployment to the critical gap.

MGB is a significant addition to our family of tactical bridging. It has practical limitations, but also many advantages. The prudent engineer will understand all its characteristics and deploy it to best support the tactical commander in the field.

Major Harvey G. Ramsey is currently assigned as Chief of the Combat Operations Division, Directorate of Training, USAES. He is a previous contributor to THE ENGINEER Magazine.

The Rodriguez Tactical Training Range

Lieutenant Colonel John B. Wheeler



The silence of the valley is shattered as high-explosive mortar and artillery rounds whoosh overhead and rip jagged craters into the enemy hill mass just 200 meters away. VT fuse warheads burst much closer, peppering friendly TOW and fighting bunkers with white-hot shrapnel. Air Force fighter bombers scream out of the sky and release their deadly payloads. The earth trembles as bombs explode on target.

Suddenly the artillery and airstrikes shift and M-60 tanks roar toward the objective, stopping only to fire. Cobra gunships rake the hill with rockets and cannon fire. Finally, infantry soldiers charge the pulverized objective, firing on the move.

THE NARRATIVE above describes not an actual battle, but a training exercise conducted regularly by soldiers of the Second Infantry "Indianhead" Division at a unique training site 14 kilometers northeast of division headquarters at Camp Casey, Korea. The Rodriquez Tactical Training Range, a project of the Indianhead's 2d Engineer Battalion (Combat), affords soldiers of the 2d Division and their Air Force counterparts the rare opportunity to participate in live-fire exercises that come as close as possible to replicating the actual pace and pressure of joint air/land combat.

In the fall of 1977, the 2d Engineers were assigned the task of completing the first phase of the range project—constructing 20 reinforced concrete fighting and TOW bunkers—before the onset of the harsh Korean winter. The bunker project, called "Little Line Papa," was to include 18 fighting bunkers and two specially-designed reinforced concrete bunkers to house the ground-mounted TOW anti-tank weapons system. Working closely with the Division G-3, the engineers patterned the defensive positions after similar fighting positions found throughout the Republic of Korea.

While plans, blueprints and materials were being produced, Charlie Company of the 2d Engineers conducted site planning and surveying in conjunction with Division G-3 to determine exactly where each bunker should go to best utilize the existing terrain. Excavation into a ridgeline began immediately. As soon as each bunker site was excavated and leveled, forming and placing of concrete floors was initiated. This first phase of construction presented no real problems and progressed smoothly.

However, when the time came to form and pour reinforced concrete walls and roofs, it became evident that the average 12B Combat Engineer is not familiar with steel work, concrete finishing, and many other construction skills normally associated with heavy construction projects. On-the-job-training and experience gained on the bunker project significantly improved the combat engineers' basic skills and improved unit morale.

NUMEROUS other problems made the bunker project a real challenge. Logistical support and vehicle maintenance was difficult because line platoons were separated from the Company CP by several miles of very poorly maintained road. Truck loads of construction materials had to be delivered daily and personnel shuttled back to garrison frequently for showers and administrative matters. Communications was also disconcerting. All communications with the battalion and company had to be made through Radio Wire Integration (RWI), an unresponsive mode due to heavy use by other units in the division. Security was a 24-hour-a-day consideration. Around-the-clock guards, high-intensity perimeter lighting and triple concertina fencing were necessary to hold down material and equipment losses.

But the most bothersome and frustrating problem, from an engineer standpoint, was the intermittent use of the range for live fire training exercises. Eventually interruptions became so frequent that engineers were permitted to continue work during such exercises.

As Charlie Company engineers developed expertise, production accelerated. Despite the frequent interruptions, construction on 14 two-man bunkers, one large command bunker, two hugh TOW bunkers and three small Dragon firing positions was completed in only 2½ months—well ahead of the cold weather.

To test the strength and durability of the bunkers for live fire exercises, a series of tests was conducted. Hand grenades placed at bunker entrances were command detonated to see if schrapnel would penetrate the entrances. It did not. A 105-MM Howitzer round was then command detonated on top of the command bunker and one of the two-man bunkers, each of which had eight inches of reinfored concrete roof and two feet of earth and rock overburden. Again the bunkers withstood the test. "Little Line Papa" was ready.

AIR FORCE targets were the second phase of the construction at Rodriquez Range. The targets, constructed approximately 900 meters down range from "Little Line Papa," were designed to provide realistic close air support targets during combined arms exercises.

The targets consisted of two simulated bunker positions dug into a mountainside and a simulated North Korean missile site complete with telephone poles for missiles. These were positioned inside earth revetments and were connected by trench lines to simulate a command bunker. This project was finished in five days. With its completion, C Company engineers returned to Camp Castle and were replaced by A Company personnel who focused their attention on the final phase of the project—the 200-meter Moving Target System.

The purpose of the system was to improve TOW/Dragon and tank gunnery accuracy. Construction guidance given to the 2d Engineer Battalion was simply that the target be realistic. Translated, this meant that the target had to be life-sized, move uphill and downhill (as well as on level ground) and vary in speed up to 20 mph.

Complicating requirements was the fact that the system would be some 10 miles from U. S. compound and would not be continually guarded after its completion. This required that the system be capable of disassembly after operation so that all moveable components could be secured. After much discussion, a system was conceived which would meet all requirements.

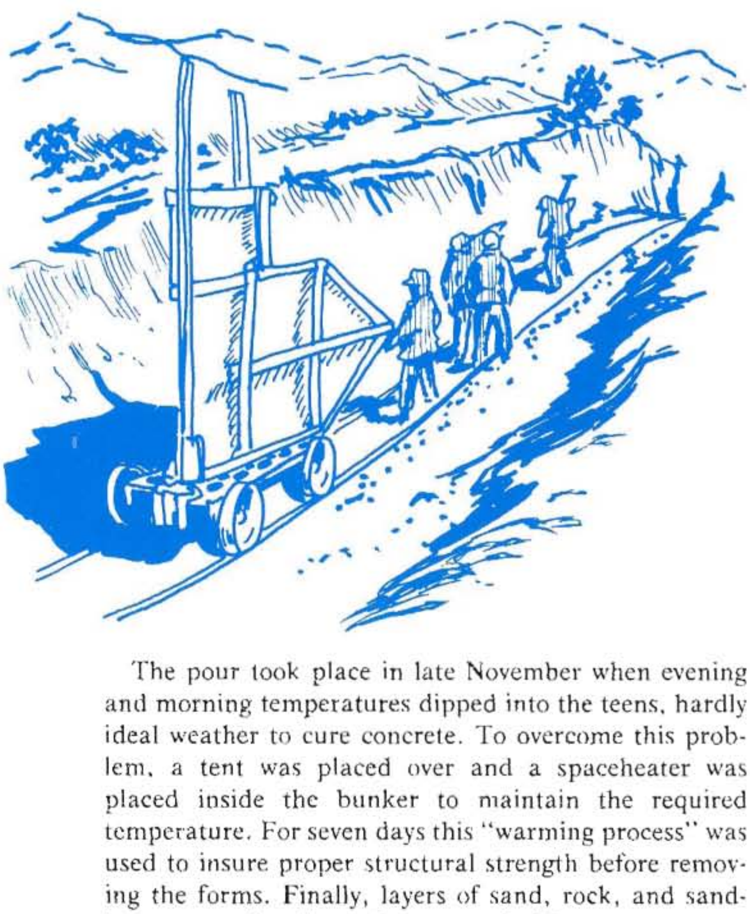
The moving target range consisted of four main components: the runway (upon which the target cart rides), a reinforced concrete bunker (to protect the personnel required to operate the system), the power system, and a target cart.

CONSTRUCTION of the runway became the mission of the 1st Platoon, A Company, 2d Engineer Battalion. After the site was surveyed, dozers were put to work cutting a slot in a gently sloping hill. A concrete slab (the runway) would lie in this slot protected from the weapon fire aimed at the target moving along its surface. By putting the runway on a hillside, the up/down hill requirements would be met and the natural vegetation above and below the runway would be preserved as well. Faced with cost problems and the threat of theft from nearby indigenous personnel, it was decided that slots cut in the surface of the concrete runway would be used instead of 400 meters of angle iron to guide the cart as it moved. To make the slots, two parallel pieces of 4"x4" lumber were set in the runway, and concrete poured around them. These provided two parallel 3" deep slots when the two pieces of lumber were removed after the concrete cured.

The slabs were poured in 20-foot sections and reinforced with wire mesh to provide strength against extreme temperatures. A "leap frog" pouring method was used to allow one full day of curing before expansion joints were placed and adjacent slabs completed. The platoon was split into three crews. One crew surveyed and constructed the forms, another crew operated the mixers and moved the concrete, and the third crew "worked" the concrete, finished the surface, and placed metal rollers along the center line of the runway. The rollers guide the "drive" rope which makes a single continuous loop from one end of the runway to the other and is tied off to the target cart on both ends.

The runway was 722 feet long and was bordered by gravel, sandbags and ditches as protection against erosion. Continual surveying was essential to keep the runway absolutely straight. The lumber, when properly greased, could be pulled from the hardened concrete with little difficulty. The runway was completed in five weeks.

THE CONCRETE bunker project was undertaken by the 2d Platoon. The bunker was built at right angles to the runway and large enough to hold the one-quarter-ton truck which would be the power source to move the cart. An open slot three feet high was formed in the wall of the bunker which faced the runway. The bunker walls and roof were eight inches thick and made of reinforced concrete. Careful forming and crossbracing were necessary to allow a continuous pour of the entire bunker at one time. Initially, concrete was transferred from the mixer by scooploader, but when the "scoop" broke down, engineers finished the job with wheelbarrows.



The pour took place in late November when evening and morning temperatures dipped into the teens, hardly ideal weather to cure concrete. To overcome this problem, a tent was placed over and a spaceheater was placed inside the bunker to maintain the required temperature. For seven days this "warming process" was used to insure proper structural strength before removing the forms. Finally, layers of sand, rock, and sandbags were placed on the top and sides to serve as a burster layer. When completed, the bunker resembled a hugh dirt and rock mound with one open end.

When the runway and bunker had been poured, the mechanical system had to be designed to move the target back and forth along the 200-meter track. This job was assigned to the battalion's engineer warrant officer who combined his mechanical experience with the talents of his welder and machinist. Using standard issue automotive parts, they put together a simple power system consisting of two jeep wheel rims mounted at either end of the runway. At the far end of the runway the hub was mounted on a moveable sled which sat on the runway and which could be moved further away from the bunker by a block and tackle affixed to a deadman at the extreme end of the runway.

AT THE BUNKER end of the runway, the wheel was mounted inside the bunker on a sheet of half-inch steel plate. A jeep shaft was connected to the rim. This prop shaft was then modified so that it could be attached to the rear differential plate of a jeep which is backed into the bunker. Rope is wound around the drum device, threaded through the rollers along the runway, wound around the hub at the far end of the runway and back over the top of the rollers; both ends are tied off to the cart. The rope is tightened by pulling up slack at the cart as much as possible and then using the block and tackle to eliminate all slack. Power is supplied by the jeep when its rear wheels are jacked off the ground. In forward gear, the cart moves in one direction, in reverse it moves in the other direction and at any speed desired!

The fourth component of the system is the target cart. Nine feet long, two feet wide, and two feet high, it was welded together with four-inch angle iron. It can travel along the runway fully protected from gunners either by the slot cut in the side of the hill (the slot's walls being four to six feet high), or by a 12-foot high berm on level areas. The cart's wheels consist of M113 Armored Personnel Carrier road wheels mounted with jeep bearings and wheel spindles. The road wheels (2½ inches wide) ride smoothly in the slots of the concrete runway. The cart can actually travel at 20 MPH without jumping the track. The target itself is a simulated T-62 tank made out of plywood, 2" x 4" lumber, and target cloth. The Moving Target System was completed in seven weeks. It has been extensively used in TOW/Dragon and tank gunnery practice. The whole system can be set up in about 30 minutes by six men. Additionally, all components subject to theft can be removed at the end of operations and safely secured.

The completion of the Moving Target System marked the end of construction at Rodriquez Range. The entire project—20 fighting bunkers, the Air Force targets and the Moving Target System—cost approximately $20,000. The Range continues to provide both Korean and U. S. soldiers with realistic combined arms training. Equally important, it enabled many combat engineers of the 2d Engineer Battalion to polish their construction skills and ready themselves for a similar task in actual combat.

Lieutenant Colonel John B. Wheeler is currently assigned as the Director of the Department of Military Engineering, Directorate of Training, USAES. He commanded the 2nd Engineer Battalion, 2nd Infantry Division prior to his current assignment.

the interactive MAPPING system

CW2 Herbert H. Kressler

A measure of success in topography, and especially cartography, is rapid and accurate response. The major problem shared by many cartographers is their inability to produce or revise maps or related products in the quantity and various types desired within an adequate response time. An Interactive Mapping System can provide a means of accurate and rapid revision or compilation and a variety of new products or "services." But before plunging into interactive mapping, let's examine two phases of the map-making process most widely utilized— compilation and color separation.

CONVENTIONAL PRODUCTION METHODS

Map compilation is the incorporation of data assembled from numerous sources such as other maps or charts, aerial photographs and field surveys. These sources are "compiled," i.e., graphically presented on a manuscript containing a properly oriented projection and grid of the appropriate spheroid at a specified scale.

Planimetric compilation (depicting the horizontal position of features only, no portrayal of elevation) can be accomplished by visual interpretation or with the use of various devices that allow the superimposition of photography to an existing map; revisions are then drafted from the superimposition. Planimetric compilation can also be achieved, when the terrain is relatively flat, by segmenting the photography into pieces of relatively equal elevation and then directly tracing from the aerial photo or photomosaic.

Topographic compilation (portrayal of relief features in addition to planimetric detail) is accomplished on analog or analytical stereoplotters which, by using overlapping stero-photos, create three-dimensional models.

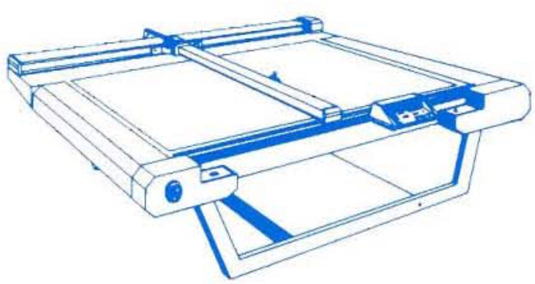
Various features are portrayed on a map compilation manuscript. To produce a five-color map, the features are categorized according to the colors in which they will appear on the final product and drafted accurately and neatly on separate sheets or flats (photographic negatives or positives of final drafted map features). This process is called color separation.

There are different methods of achieving color separation but the most widely used is engraving, or scribing selected features on a coated, stable-base plastic sheet. Color separation must be applied to the compilation manuscript as the lithographic offset printing process requires separate flats to produce press plates of each color that will appear on the final map.

COMPONENTS OF AN INTERACTIVE MAPPING SYSTEM

Prior to explaining how an Interactive Mapping System will enhance the map making process, it is necessary to identify the system's major components— a digitizer, processor, edit station and final output plotter.

Digitizers are used to measure x, y coordinates with the operator assigning a code for the features. Digitizers are usually operated manually, but some use scanners. A digitizer station includes a cursor, a detector system (usually built into the working surface) for measuring the cursor position, an alphanumeric keyboard interfaced



with a computer, and an edit station (usually a cathode-ray tube device). In the newest developmental systems an automatic scanner is employed.

The *processor* is a computer and storage device, combined with appropriate software. It is the heart of the interactive system. Speed, flexibility, and capability are highly dependent on the computer size and storage capacity, and the efficiency of its software. The advent of minicomputers has drastically reduced space and cost requirements for this component and the availability of large capacity Random Access Devices (RAD) for storage has made the use of minicomputers for mapping systems feasible.

The *edit station* can be a simple proofing plotter or a cathode-ray tube (CRT) device in which the digitized data is displayed, thus permitting on-line, virtually real-time visual inspection and quality control. Corrections, additions, and deletions can be made and data redisplayed for verificiation prior to final drafting. The final output plotter may be used for this function, but the CRT is generally preferred.

The *final output plotter* produces a pencil, ink, scribe or film copy of the various "flats" of a map. Specifications for this plotter vary widely according to the precision or quality required by the customer. The "flats" are used for making press plates for offset printing of the final product in large quantities.

INTERACTIVE MAPPING SYSTEMS

The incorporation of an Interactive Mapping System into the map making process starts with the digitizer, edit station and processor in the compilation phase. Aerial photographs are registered to a geographically-related control base (grid, existing map, etc.), using at least three known points. Digital compilation can then be performed to specifications via the digitizer. The digital data is then encoded and stored by the processor. The data compiled is displayed and verified on the CRT and, if necessary, refined at the edit station. Next, color separation of this digitized compilation can be accomplished by successive selection of data (which was labeled and stored upon input) to be produced on the final output plotter.

Automated cartography became possible in the 1950s with the advent of automatic plotters. It has progressed from simple tasks to complex drafting, from compilation digitizing by a manual (hand-held cursor) system to digitizing by an automatic raster scanner. In the early 1960s the Defense Mapping Agency (DMA) introduced an automated symbols and names placement system and the digitizing of terrain detail. Automated photogrammetric compilation equipment facilitated the recording of profiles and contour detail and greatly contributed to the development of a fast means of producing orthophotographs, which are prepared from perspective photos with compensation for tilt and relief.

In the early 1970s, computer-assisted drafting equipment, with software to symbolize map detail, was introduced. Linear digitization and interactive drafting was followed by a totally digital editing procedure, and today a semi-automatic digital compilation procedure is available. The final steps in the development of this system may be machine recognition of map features followed by fully automated cartography.

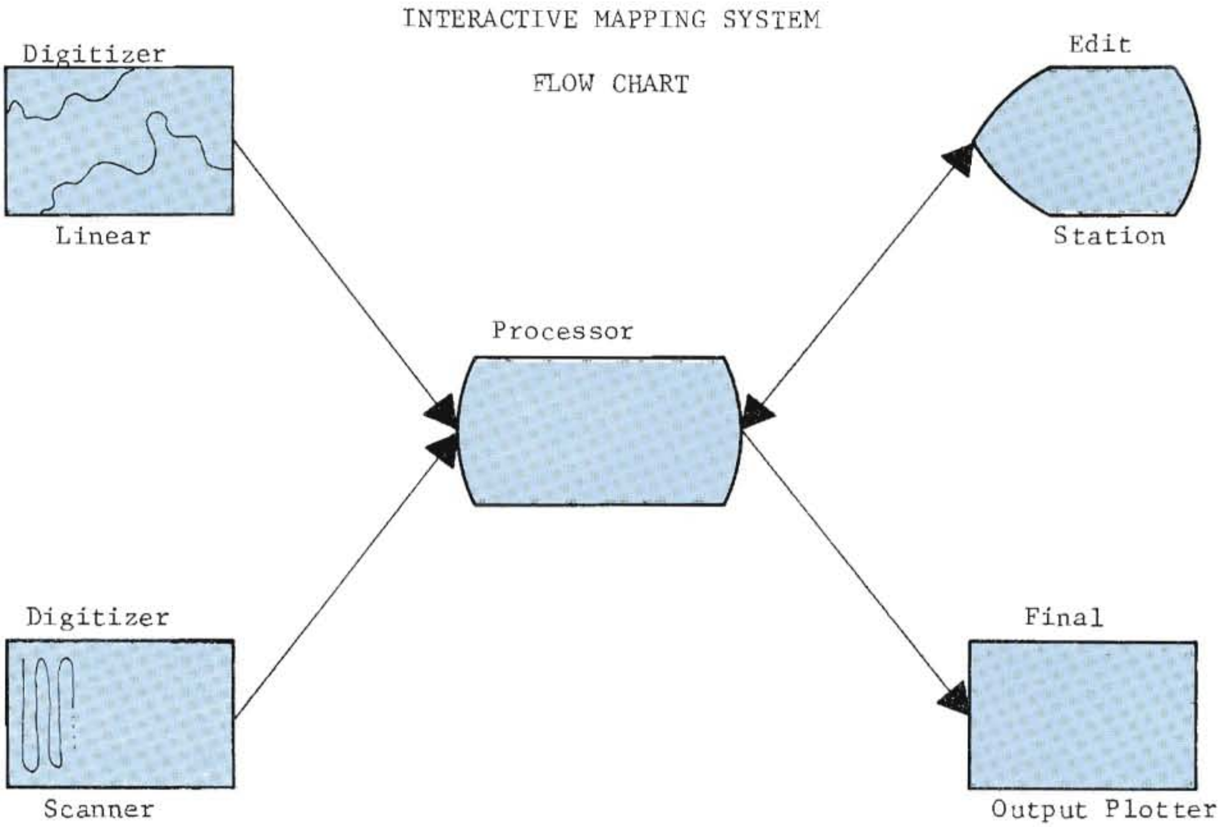
Let's examine the disadvantages and advantages of an Interactive Mapping System when injected into a production environment. Disadvantages focus on the high initial cost of the equipment needed to implement the system. Other causes for concern include operating and maintenance cost as well as training for operator and maintenance personnel. Advantages include improved response time, man-hour savings, flexibility, quality control, consistency, improved accuracy of the final product, and higher volume capability. Experimental and operational work has proven that Interactive Mapping Systems can produce maps, charts, and related products to required specifications and accuracies.

Interactive mapping is developing at a time when digital data and related products are in great demand and economy and efficiency are becoming increasingly important.

SYSTEMS EXAMPLES

The Lineal Input System (LIS) is a portion of the Interactive Mapping System at DMA where it is used for creating and maintaining digital representation of lineal features in an automated on-line computerized system. LIS equipment includes off-the-shelf general-purpose minicomputer, graphic display devices, peripheral disk pack and tape drives, printers, plotters, and lineal digitizers complemented by both vendor-supplied and customer-developed software.

The major LIS components and their functions include: a cartographic table containing a cursor/carriage/gantry arrangement which can perform digitizing, plotting or interactive editing; a batch processing system that provides software for an extensive set of cartographic processing functions; and a Cartographic Data Base System feature classification.



The latter produces a "data cell," which is a collection of geographically related lineal features. Feature descriptions and locational precision are detailed enough to permit exploitation for various conventional mapping and advanced aerospace products. The output file also identifies source material sufficiently to establish its own accuracy and completeness in support of data base maintenance and data exploitation.

The LIS is a rapid means of updating data bases. Communication between the cartographer/operator and the system takes place using functional words rather than codes. The major benefit of the LIS is error-free digital representations of mapping source material.

The DMA digital mapping system employs the UNIVAC 1108, a large-scale computer. Automated cartographic and photogrammetic equipment is coupled with specially designed computer programs and integrated with hardware into a production system known as the Semi-Automated Cartographic System

(SACARTS). Phase 1 has been implemented and presently produces color-separated material.

SACARTS includes graphic digitizer compilation units, high-speed verification plotters, fast ultra-precise linework, symbol, alphanumeric photoplotting, Control Graticule and Grid (CONGRD) software, and a Symbols, Names, and Placement System (SNAPS). The operator at the digitization station records point, line, and text information for processing through the Graphic Improvement Software Transformation System (GISTS). Once the digitized data is drafted by flatbed plotters for editing and refinement, the refined data is then stored on tape or produced by final plotters in the form of scribecoat, photographic film or paper.

Interactive Mapping Systems and digitization are being implemented in many city planning offices, utility companies, construction companies and other types of production facilities, resulting in significant cost and manpower savings as well as more efficient revision, storage and reproduction of products.

Rapid growth in the field has resulted in numerous private enterprises that provide assistance in interactive mapping, operating much like computer services companies. Services are available for digitizing, data reduction, data base generation, software development, analysis, computer processing and computer graphics. Such service organizations have engaged in meteorology, geology, hydrology, and biology, as well as mapping. Some of these companies advertise mapping services at approximately half the cost of producing the same maps conventionally and in half the time required for manual preparation.

SUMMARY

The development and refinement of Interactive Mapping Systems will continue to have a great impact on manpower, cost, and organizational structure in cartographic agencies, and will provide a level of response and a variety of products never before possible. Interactive mapping is materializing at a time when military and civilian demands for digital data and related products are rapidly increasing, as may be seen in on-board navigation systems for modern aircraft, missile systems, target locating, census records, utilities, etc.

Since Interactive Mapping Systems are automated, but not automatic, they call for a high degree of man/machine interaction. Cartographers provide the human intelligence and cartographic input, while the system provides the speed, precision and computational muscle to accomplish the mapping mission within an acceptable response time.

CW2 Herbert Kressler, Jr., is currently assigned as Course Manager of the Basic Cartography Course in the Department of Cartography and Applied Graphics at the Defense Mapping School, Fort Belvoir, VA. He is a native of Quakertown, Pennsylvania.

Commander's Update

COL Philip R. Hoge
2nd Engineer Group, 8th Army

COL Jerome B. Hilmes
7th Engineer Brigade, USAREUR

COL James W. Vanlobensels
18th Engineer Brigade, USAREUR

COL John C. Levanger
20th Engineer Brigade, Fort Bragg

COL Robert E. Ayers
36th Engineer Group, Fort Benning

COL Thomas M. McClelland
130th Engineer Brigade, USAREUR

COL Joseph L. Spruill
937th Engineer Group, Fort Riley

COL George H. Hilt
USA Engineer Center Brigade
Fort Belvoir

COL Kerwood W. Barrand
USA Engineer Training Brigade
Fort Belvoir

COL James K. Highfill
2nd Training Brigade (OSUT)
Fort Leonard Wood

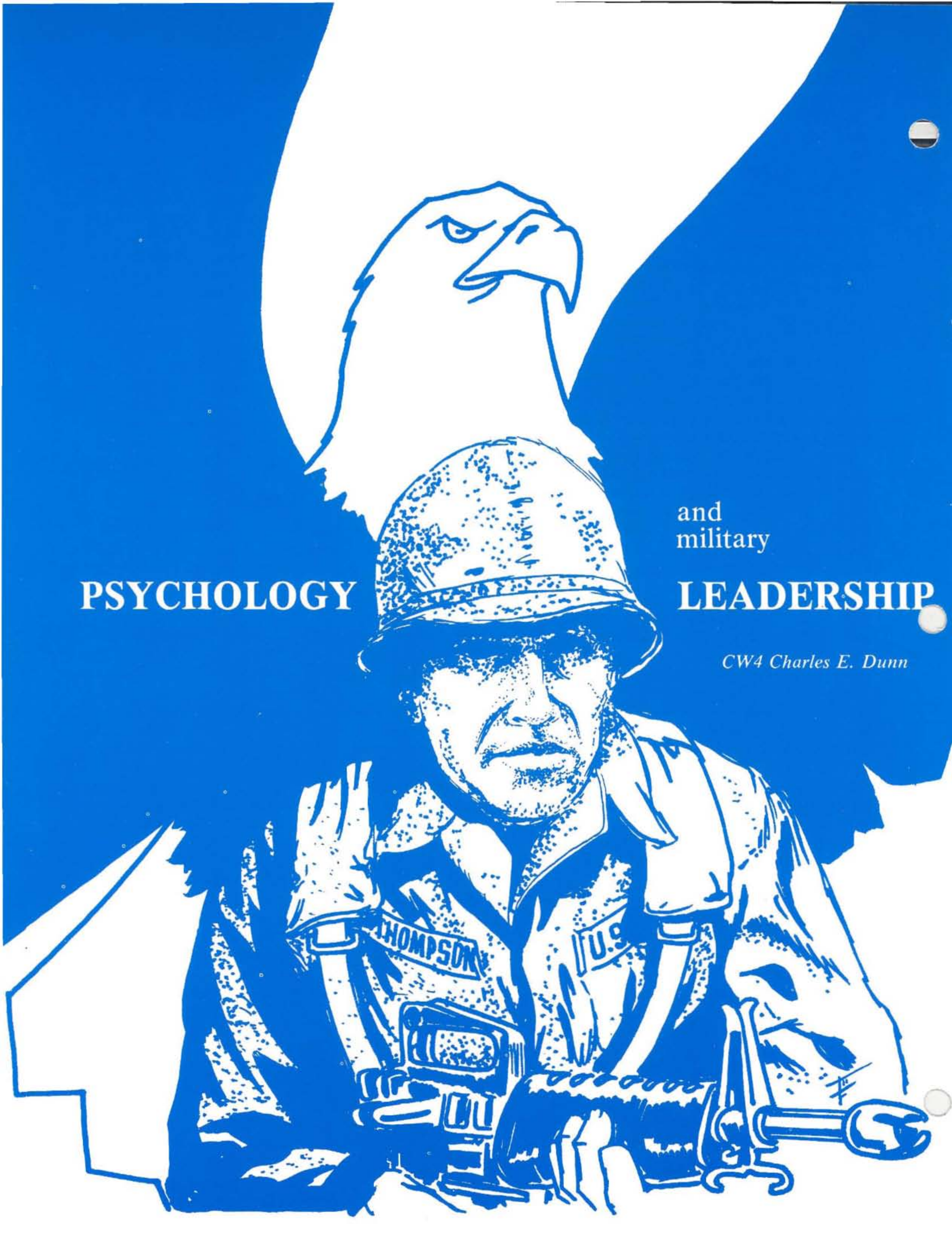
COL Tenho R. Hukkala
4th AIT Brigade (Engineer)
Fort Leonard Wood

CE Directory

The 1979 Corps of Engineers Officer and Warrant Officer Directory is available for purchase from the Post Exchange Book Store, Building 269, Fort Belvoir VA 22060. The cost of the 1979 Directory is $1.50 per copy. Due to personnel constraints, the directory is no longer available by mail order through the USAES Periodical Publications Fund.

PSYCHOLOGY and military LEADERSHIP

CW4 Charles E. Dunn



ON ANY given day from one to many very proud men and women are handed a document that appoints them as officers and non-commissioned officers in the United States Army.

What problems must newly appointed commissioned, warrant and non-commissioned officers surmount to become good leaders? How can they gain the willing obedience of their subordinates? How, if at all, does psychology affect their ability to lead? The answer to these and other questions about military leadership will be found in this article.

Before leadership can be discussed it must be defined. According to Merriam-Webster, the verb *lead* means "to guide on a way" and "to direct the operations, activity or performance of." A much more meaningful and useful definition which agrees with Webster is offered by Norman Copeland: "Leadership is the art of dealing with human nature, influencing a body of people, by persuasion or example, to follow a line of action."

Keeping in mind the definition of leadership, a definition of military leadership must be determined. The best definition I have found comes from the Department of Defense Command and Small Unit Leadership pamphlet: "Military Leadership is the art of influencing and directing men in such a way as to obtain their willing obedience, confidence, respect and loyal cooperation in order to accomplish the mission."

THE SAME pamphlet offers further amplification of the definition: "The ability to handle men, the heart of leadership involves understanding, predicting, and controlling men's behavior." Now consider objectives of psychology as set down by Ruch: "to understand, predict, and control the conditions and situations that man meets in his environment and within himself." Thus it is easy to understand that the practice of psychology and leadership parallel each other and have the same goal. In fact, leaders are continually drawing from the work of psychologists and psychologists use leadership situations and experience to aid their work.

Perhaps social psychology offers the greatest promise for future applications of psychology to leadership. Among military officers there are few problems as important as the selection and training of leaders, the organization and managing of teams, the predicting and influencing of attitudes, and the group process of evaluating evidence to decide a course of action. Although military leaders are selected today through various tests, we are looking for better and more scientific ways of predicting the leadership potential of those selected. It is very difficult to break down a leader's functions into unitary and measurable factors.

Apparently, general leadership traits do not exist, or else are not classified in any familiar psychological or common-sense terms. Furthermore, it is apparent that traits which distinguish leaders from followers vary from situation to situation. It is not, however, a completely block situation. Leaders do not have to be chosen in the dark. Leadership traits such as age, dominance and emotional control are not necessarily required for a particular leadership role. Each particular type of leadership does require certain traits. There are also a few universal leadership traits, including verbal fluency and intelligence.

DESPITE the fact that psychologists are unable to scientifically pinpoint the traits of a good leader, an entire book could be written on quotations by famous military leaders about the qualities a good leader should possess. In his book, "On War," Clousewite indicates that ambition makes a great leader. He says all great leaders possess ambition, the desire to outperform others, to raise oneself above the rest.

In choosing people as future leaders, the most satisfactory, though not foolproof, method would seem to be the following: (a) determine, as closely as possible, what traits are desirable for the type leadership desired; (b) determine each applicant's military leadership traits and universal leadership traits; (c) determine the moral and intelligence level of each applicant through tests and evaluations by superiors, peers and subordinates.

There are three basic types of leadership. The first type and the one most often found in the military service is autocratic leadership, whereby the leader seeks obedience from his group. He determines policy and considers decision-making a one-man operation. However, even in the military, this isn't the only type leadership that is or should be used.

DEMOCRATIC leadership is where the leader irons out ideas and suggestions from the group by discussion and consultation. Group members are encouraged to take part in setting policy, while the leader's role is largely one of moderator.

Laissez-Faire leadership is demonstrated by the leader who is more or less an information booth. He plays down his role in the group's activity. He is on hand to provide materials and information. He exercises a minimum of control.

It might appear to the casual observer that autocratic leadership is the only type of leadership used in the military. To the psychologist it may appear that democratic leadership is the best. But the fact is, autocratic leadership in certain situations will be more effective and successful than the democratic or laissez-faire approach. Democratic leadership, under the right conditions, renders better results than any other method.

Let's look at how each method might be used by a military leader. A new platoon leader takes over a platoon and learns that his platoon has to take a technical proficiency test in two weeks. Since a minimum amount of time is available, he calls his troops together and asks them in what areas they feel a need for intensive training (democratic leadership). He then designates individuals to drive specific vehicles and states that they must be ready to start at 8 a.m. the next day (autocratic leadership). In the midst of training he is called away but before leaving he suggests that the trainees devise a faster way of performing a particular operation (laissez-faire leadership). Thus, in this example, all three types of leadership were used by the same leader on the same group of followers.

IT IS THE skill with which you apply the three basic methods of leadership that determines the level of success as a leader. Each leader will usually tend to favor one type of leadership over the other two.

Psychologists generally agree that every aspect of our behavior is a manifestation of our personality. Depending on our personalities, we prefer certain leadership methods more than others. In the long run we do better with whichever method feels more natural. Every leader must, nevertheless, use each of the three basic approaches to some extent.

But the problem of when to use which type of leadership remains. The solution depends on three factors—the characteristics of the group, the leader, and the situation. Most often the proper approach requires a compromise of all three factors. The effect of the leader's personality on his choice of leadership method has already been discussed, so I will now address the effect of the situation. In time of crisis people expect, even demand, strong leadership. When the pressure is relieved the tendency flows in the opposite direction. Age, sex, and background experience must also be considered. A subordinate's familiarity with his job or assignment favors democratic or laissez-faire leadership over autocratic leadership. It is also worth noting that people tend to prefer the same kind of leadership they would themselves provide.

Leadership, unfortunately, is not simply a matter of evaluating the three types of leadership and deciding which to use. Discipline alone converts a crowd into an army. Therefore, in order to convert a group into a team, discipline must be one of the leader's primary considerations. But what is discipline?

DISCIPLINE is the foundation of morale. It is the systematic training, exercise, development and control of the physical faculties. It is the system of instruction and submission to established authority, self-control and orderly behavior.

The best type of discipline evolves from the following conditions: (1) the leader knows the individuals who make up his group. he knows their mental make-up, their complaints and worries, their family circumstances, their history and future ambitions. He is genuinely interested. An outstanding leader will go to more trouble to understand and handle a single individual than an ordinary person will take to understand and handle an Army. (2) The individuals who make up the group know their leader. (3) The leader identifies himself with the group in every possible way. The successful leader must have empathy with the group, be in tune with it, and yet in advance of it. He must be a person of character and personality. (4) The whole group is a team inspired by the enthusiasm of the leader. (5) The team has a high esprit-de-corps. (6) The team is well instructed, keen and efficient. If a leader can establish these conditions, he will have a group that will be able to discipline itself.

Three important psychological needs that the leader must constantly be aware of are recognition, security and social approval. Recognition includes medals, letters of appreciation, etc. Another effective method of demonstrating recognition is to call a person by his/her name. A person's name is the most important thing in the English language. Calling a person by name gives him/her an identity. It singles that person out as an individual. It gives the person a sense of importance, a feeling of confidence and respect. Recognition is also shown through encouragement. It is well to remember that a good way to develop the best in anyone is by encouragement. There never has been an outstanding leader who did not keep this fact constantly in mind. Human nature craves recognition and appreciation.

A LEADER can instill a sense of security in his followers by developing their confidence in him. There is a good deal of evidence that military leaders who take care of their troops are the ones most enthusiastically followed.

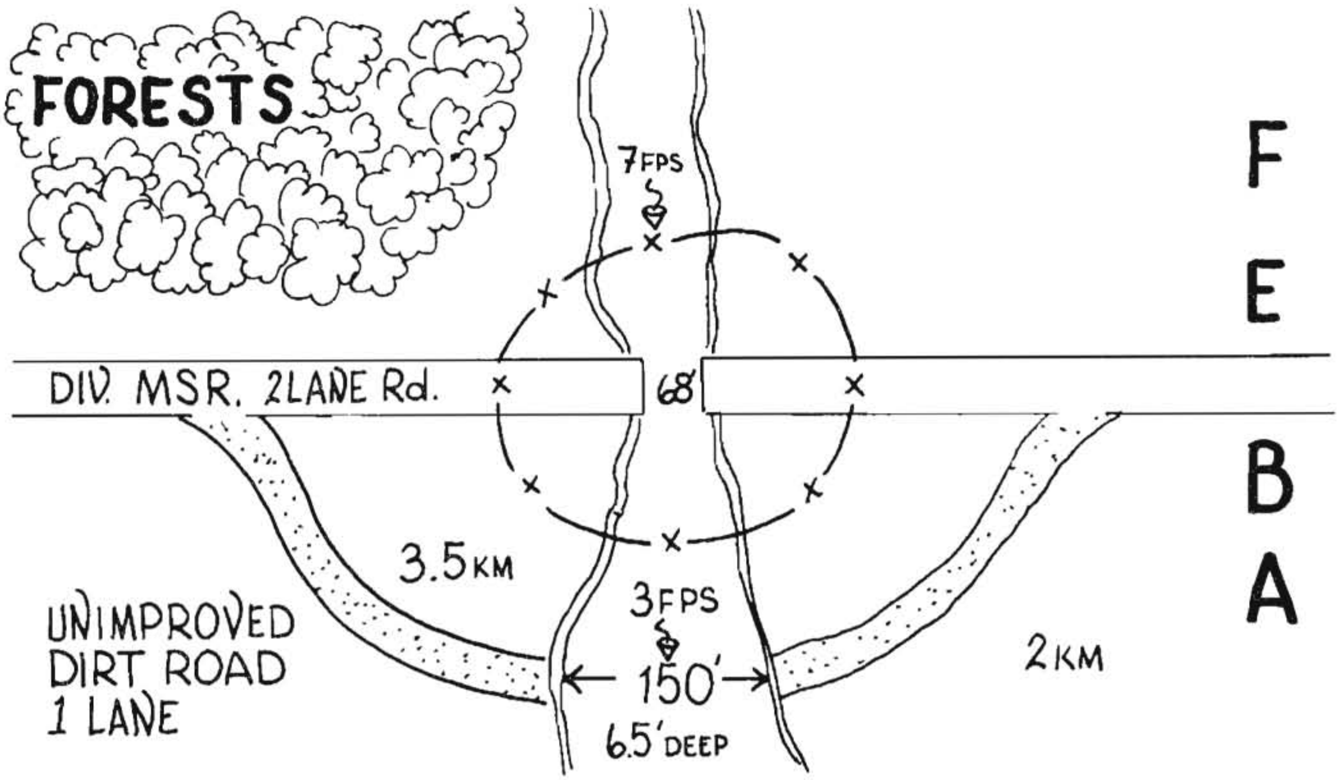
The power of the need for social approval is demonstrated by the following incident from the book, "Men Against Fire," by Marshall. A young company runner, hit by a shell at Corenton, collapsed in the arms of his commander and, with his life swiftly ebbing, said, "Captain, the company has always called me a --- up. Tell me that I wasn't one this time." The Captain replied, "No son, you weren't," and the boy died with a smile on his face. It is extremely strong force which enables a person to do what has to be done when the common good requires the repression of personal ambition.

Through the understanding and application of recognition, security and social approval, the leader is able to succeed. One of his chief duties is to develop and harness the collective mind of the group to work with maximum effort and efficiency.

Just the high points of leadership as it is connected with psychology have been discussed, but it should be clear that good leadership requires diligent study and much hard work. For leadership is a way of life in the military.

CW4 Charles E. Dunn is currently assigned as Operations Officer, Department of Mechanical and Technical Equipment, Directorate of Training, USAES. He holds a Bachelors Degree in Management from the University of Nebraska at Omaha and will soon complete his Masters program in Human Resource Management at Pepperdine University.

Tactical Problem



SITUATION

Enemy sappers have destroyed a bridge along the divisional Main Supply Route (MSR) using the water plume technique of demolition. The enemy has also emplaced an artillery delivered interdiction mine field 200 meters in diameter around the destroyed bridge. The bridge abutments sustained only negligible damage.

Your S-2 section has provided you with the following intelligence report: fair weather is expected to prevail for the next 10 days; there have been no recent heavy rains; the area of operations is in a glacial outwash plain, which contains many kames and eskers; the only vegetation in the area of operations is light to medium coniferous forests; enemy artillery has a range of 30 kilometers and has nuclear and chemical capabilities.

Your own available forces and equipment includes: two combat engineer platoons less than 45 minutes away; one earth moving engineer platoon less than 75 minutes away; nine interior sections and three ramp sections of ribbon bridge for the next 48 hours; four bridge erecton boats and an overhead bridle anchorage system less than 90 minutes away; class 60 equipment three hours away; 100 feet of DD Bailey bridge two hours and 45 minutes away.

PROBLEM

You are the S-3 for the engineer battalion responsible for maintaining the MSR. Your mission is to re-establish the divisional MSR within three hours. How do you accomplish your mission and what factors must you take into account?

See THE SCHOOL SOLUTION, page 40.

Correction

We apologize to Sergeant First Class Larry A. Sirmans, Senior Drill Sergeant for Charlie Company, 1st Battalion, 2nd Brigade, Fort Leonard Wood, MO. SFC Sirmans was incorrectly identified as SFC Simmons in the article entitled "A Bridge Too Long" in the Fall 1978 edition of THE ENGINEER.

—Editor

Officer Career Info

COLONELS

The 0-6 level command boards are scheduled as follows:

Combat Arms	6-23 FEB 79
Combat Support Arms	12-23 FEB 79
Combat Service Support Arms	6-23 FEB 79

Assignment selections normally start shortly after the command board closing date. Preferences for both troop assignments and District assignments should be provided for MILPERCEN use by early February.

LIEUTENANT COLONELS

Congratulations to those officers selected for promotion by the recent Lieutenant Colonel (AUS) board. The competition was tough and each of you can take pride in your selection. You will face new challenges and demands as O-5s and MILPERCEN welcomes the opportunity to work with you in meeting your career plans and needs.

Most assignments that LTCs desire require CGSC level schooling. If you have not already attended, invest some time in your future by taking the non-resident course. It will open up opportunities for you and will be time well spent.

MAJORS

- A reminder . . . in today's competitive promotion environment it's important to keep your official photo and physical current. The height-weight ratio (AR 600-9) is considered by the boards.
- Yes, we still use preference statements! You're urged to update yours as changes occur.
- Priority fill assignments for Majors still include Army Readiness Regions. These are considered Specialty 21 (ENGINEER) developmental positions and, based on all indications, are very competitive from the standpoint of manner of performance ratings.
- For Majors entering the promotion zone to LTC, all indicators say that CGSC attendance (be it resident or non-resident) is critical. If you've completed the school, insure that your file reflects it. If you haven't, it's time to get going on the non-resident course.

CAPTAINS AND LIEUTENANTS

Many queries are received at Engineer Branch regarding eligibility criteria and procedures for applying for civil school at either the graduate or undergraduate level. A summary of the programs and eligibility criteria follows.

Undergraduate schooling for eligible officers is provided by the Degree Completion Program in a discipline of functional value to the Army. Eligibility criteria, in general, includes high manner of performance evaluation, good promotional potential, not less than three or greater than 14 years time in service (TIS), completion of EOAC, and successful company command. As a rule, officers should not apply for this program unless they are within one year of completing degree requirements. Application for this program is made to Engineer Branch in accordance with Chapter 8, AR 621-1. No specific utilization tour is required for undergraduate schooling, but a service obligation of three years for each year or fraction of a year of schooling (up to a maximum of four years) is incurred. Cost of tuition, fees, and books for this program are paid by the officer, though VA benefits may help offset these expenses.

Graduate schooling is provided under several programs although all have some common elements. These include the requirement for study in a validated Army Education Requirement Board (AERB) discipline, a service obligation identical to that described for the undergraduate program above, and the requirement for immediate utilization in a validated AERB position following the period of schooling. All programs are highly competitive. Eligibility criteria includes high overall manner of performance evaluation, completion of EOAC and a successful command tour, high promotion potential, and not less than five years time in service. Overseas equity is also a consideration. The principal programs follow:

. . . The fully funded program authorizes up to 18 months study. Department of the Army pays tuition and an allowance for books and fees. This program is dependent upon quotas authorized for study in specific shortage disciplines. Application to Engineer Branch is made on DA Form 1618-R in accordance with Chapter 4, AR 621-1.

. . . The Degree Completion Program (Graduate level) authorizes up to 18 months of graduate study in a shortage discipline. Application, by letter, is made to Engineer Branch in accordance with para 8-5, AR 621-1. All expenses are paid by the participant.

. . . The Advanced Degree Program for ROTC Instructors (AD PRID) program also authorizes up to 18 months of full time study in a shortage discipline followed by utilization as an ROTC instructor. As for the Degree Completion Program, costs of study are paid by the participant with, as appropriate, VA assistance. Application is made by letter in accordance with AR 621-101. Since this program requires nomination to and acceptance by a school for ROTC duty as well as acceptance for study, applications take longer to process than for the other programs.

. . . Permissive TDY may be authorized for degree completion that may be accomplished within 20 weeks of full time study. Application is made in accordance with Para 8-4c, AR 621-1. With the exception of possible VA benefits, no expenses are paid by the government for this program.

. . . The United States Military Academy (USMA) program is essentially the fully-funded program described above, with certain exceptions: (1) the program is nominative; (2) study may be authorized for up to two years; and (3) study must be accomplished in a discipline and at a school acceptable to USMA. This program is extremely competitive and, in addition to the general criteria specified for graduate study above, Engineer Branch requires completion of a minimum of two tours in an officer's primary specialty before nomination for this program.

ENGINEER PERSONNEL MANAGEMENT CONTACTS IN OPMD

—Colonels Division (DAPC-OPC-AE): Lt. Col. L.E. Lufkin x7871.

—Lieutenant Colonels Division (DAPC-OPL-AS): Lt. Col. Tom Fisher x0423.

—Majors Division (DAPC-OPM-A): Major Wayne Roth x8199.

—Combat Support Arms Division, Engineer Branch (Company Grade) (DAPC-OPF-E): Branch Chief, Lt. Col. H.A. Froehle x0650; Professional Development, Major W.T. Gregory x0650; Captains Assignments, Major Mike Foster x0651; Lieutenants Assignments, Captain Bob Melchior x7434.

—Warrant Officers Division (DAPC-OPW-AU): CW3 Aleck Fletcher x7837.

Autovon prefix is 221, commerical prefix is (202) 325. Mailing address is: Commander, U.S. Army Military Personnel Center, ATTN: (Appropriate office symbol), 200 Stovall Street, Alexandria, VA 22332.

PROJECTED ASSIGNMENTS FOR OAC STUDENTS

Effective 1 June 1979, officers selected to attend the Engineer Officer Advanced Course (EOAC) will be advised on projected follow-on assignments. The new program is designed to eliminate uncertainty regarding the future and to allow student officers to tailor their EOAC elective program to the requirements of their follow-on assignment.

Requests for orders (RFOs) assigning officers to EOAC will contain special instructions requesting an up-to-date preference statement be submitted to OPMD within 30 days of receipt of the RFO. The statement should include recent and current duty assignments, professional desires, medical/special schooling needs for dependents, planned leave address, and telephone numbers.

Upon receipt of preference statements, OPMD will consider the officer's needs and desires as projected assignments are matched. Most officers selected for EOAC will be advised of their projected assignments prior to departing current duty stations enroute to EOAC. However, some assignments may not be completely confirmed until after reporting for EOAC. Examples include officers being considered for advanced civil schooling or certain nominative assignments such as ROTC assignments, which require concurrence of the gaining organization.

Projected assignments will normally be honored, but changes could occur when events alter the major considerations of professional development and personal needs. When a change is considered necessary, it will be coordinated with the individual officer concerned.

Orders for the follow-on assignment will be issued following OPMD branch visits to the EOAC. The purpose of the visits will be to formally interview each officer, answer questions regarding career development/progression, and to resolve all follow-on assignments.

EDUCATION BENEFITS

Some officers who entered on active duty prior to January 2, 1978 may still be eligible for G.I. Bill educational benefits, according to education officials at The Adjutant General Center (TAGCEN).

The Department of Defense together with the Veterans Administration have decided that persons who entered the Reserve Officers Training Corps program before January 1, 1977 and who were commissioned and served on active duty before January 2, 1978 are eligible for educational benefits under the G.I. Bill.

All service members who came on active duty after December 31, 1976 remain eligible to participate in the Veterans Educational Assistance Program (VEAP), which superceded the old G.I. Bill. More information may be obtained form Veterans Service Centers and local installation education services centers.

Enlisted Career Info

SQT GUIDANCE

The following guidance from Change 59, AR 600-200 clarifies requirements for eligibility and exemption from Skill Qualification Testing (SQT):

Soldiers must submit to SQT if they have completed a minimum of 12 months active Federal Service and are properly classified in a primary MOS identified in the SQT announcement circular. Soldiers in pay grade E-1 through E-4 must have held their PMOS, regardless of time in grade, for a minimum of 90 days immediately prior to testing. Soldiers in pay grade E-5 and above must have held their PMOS and pay grade for a minimum of 90 days immediately prior to the test date.

Exemption from SQT is granted for the following reasons only: (a) participation in a course of instruction which, upon successful completion, results in advancement to commissioned or warrant officer status; (b) attendance at a civilian college or university on a full-time basis under the provisions of AR 621-1 or AR 621-7; (c) attendance at an MOS producing course or functional school; (d) voluntary retirement within six months of the scheduled test date; (e) attendance at the resident NCOES course; (f) confinement to a civil or military detention facility; (g) separation from active duty within 90 days of the scheduled test date (applicable only to first-term soldiers who have previously verified their current PMOS and grade through SQT); and (h) special exemptions granted by the Commander of MILPERCEN.

Soldiers may request SQT while in an exempt status or within the 90-day period after termination of the exempt status. Soldiers preparing to ETS during the test period are not exempt except under the conditions listed above, and are still required to undergo SQT if it is scheduled prior to their ETS date.

SOLDIERS MANUALS

A new issue and control policy on Soldiers Manuals has been instituted recently. In the past, Soldiers Manuals were distributed directly to each individual soldier to retain permanently. The system, however, proved to be ineffective because many soldiers were reporting to new duty stations without their manuals, thus necessitating a new issue.

Henceforth, SMs will be issued to units. The quantity issued to each unit will correspond to unit strength for each MOS. Control of the manuals will be the responsibility of unit commanders.

The new control procedure should eliminate the requirement to replace manuals lost during PCS moves.

ROTC SCHOLARSHIPS

The application period for the Two-Year Army ROTC Scholarship Program for active duty enlisted personnel opened January 15. Winners for the 1979-80 school year will be announced in June.

These scholarships are designed to provide Army enlisted men and women an opportunity to obtain both a college degree and commission as an Army officer through participation in the ROTC program.

The award will pay full tuition, books and miscellaneous educational fees, plus provide a living allowance of up to $1,000 a year for each year the scholarship is in effect. In addition, winners will be paid for attending the Advanced Camp, normally held during the summer between the junior and senior years of college. Besides the scholarship benefits, winners may also take advantage of Veterans Administration benefits to which they would normally be entitled.

Competition for scholarships is limited to enlisted personnel who: have served at least one year on active duty; will be under 25 years of age on June 30 of the year they are eligible for commissioning; and have already received credit for at least two years but not more than two and one-half years of college. Also, to be considered by the final selection committee, applicants must have been accepted by a college for next fall's enrollment, must have earned a GT score of 115 or higher, and must be United States citizens.

Winners may attend any of the four-year colleges and universities hosting Army ROTC or one of the more than 500 non-host colleges which has a cross-enrollment agreement with a nearby host school.

Scholarship winners will receive an early discharge so they can arrive on campus in time to enroll in the 1979-80 fall term. Winners will also be required to enlist in the US Army Reserve prior to enrollment in the Army ROTC Advanced Course.

Additional details of this program are contained in AR 145-1.

Applications must be requested by April 15, although applicants have until May 1 to complete their applications. For further information and applications, write Army ROTC Scholarships, Ft. Monroe, VA 23651.

OCS

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

Interested personnel who haven't already submitted their applications to MILPERCEN for OCS Class 3-79 beginning 22 April have until 2 March to get their applications in for Class 4-79 beginning 3 June.

OCS is a 14-week course designed to produce professional comissioned officers for various Army branches. Basic eligibility requirements include the following:

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

REBIRTH OF AN ENGINEER MOS

Effective 1 September, MOS 12F will be reinstated to the Combat Engineering Career Management Field (CMF 12). The MOS is being re-established for duties associated with the operation of Combat Engineer Vehicles (CEV), Armored Vehicle Launched Bridges (AVLB), and Armored Personnel Carriers (APC) organic to engineer units. The MOS encompasses approximately 1,320 positions with a skill level distribution of 864 at skill level one, 245 at two, 156 at three and 55 at four.

The Engineer Tracked Vehicle Crewman will serve in various duty positions and units during his Army career. Table 1 summarizes these positions for each skill level. The implementation process will include reclassification of certain incumbents and the start of entry-level training. All positions and personnel currently classified in MOSC 12B1U (APC Driver in engineer units), MOSC 19E10 (CEV and AVLB crewmen only), MOSC 19F10 (CEV and AVLB crewmen only), MOSC 19F20 (CEV and AVLB crewmen only), and MOSC 19E30 (CEV and AVLB crewmen only) will be reclassified in current grade and skill level as MOSC 12F20 and 12F30. Skill level two, three, and four personnel now or formerly associated with CEV and AVLB operations may request reclassification into a 12F MOSC equal to their current skill level. The reclassification actions should be completed by 1 October.

Entry-level training under the One Station Unit Training concept will be conducted at the US Army Training Center Engineer, Fort Leonard Wood, Missouri. The 15-week course is scheduled to begin in September. The first school-trained Engineer Tracked Vehicle Crewman should reach the field in April, 1980.

The Engineer School is currently preparing Soldiers Manuals for the four skill levels of MOS 12F. Coordinating drafts of these manuals will be delivered to the Training Support Center, Training and Doctrine Command (TRADOC), in June. At the same time, The Engineer School will send several draft copies for special coordination to each engineer battalion that has the CEV and AVLB. The final manuals will be delivered to TRADOC by 1 January, 1980 for printing and world-wide distribution. They should reach unit level by early summer, 1980.

EERWA DATA

The Enlisted Efficiency Report Weighted Averages (EERWA), as of 1 October 1978, were as follows:

PAY GRADE	EERWA
E-9	124.34
E-8	123.58
E-7	121.99
E-6	120.10
E-5	116.87
E-4	111.98

SKILL LEVEL	DUTY POSITION	UNIT
1	CEV driver	Engineer
	CEV loader	Engineer
	AVLB operator	Engineer & Armor
	APC driver	Engineer
2	CEV gunner	Engineer
	AVLB commander	Engineer & Armor
3	CEV commander	Engineer
	AVLB section sergeant	Armor
4	Mobility/countermobility section sergeant	Engineer
	Platoon sergeant	Engineer

TABLE 1

NCO Channels

BRIDGE CREWMAN 12C

If you're having problems maintaining training proficiency in MOS 12C or looking for a balanced, well-rounded course of instruction in military bridging, the 12C Bridge Crewman's Primary Technical Course (PTC) at Fort Belvoir might be your answer. Complete course description, prerequisites and class schedules are contained in USAES Pam 350-1, FY-79. The course is five weeks in length and upon successful completion, graduates are qualified in all aspects of tactical bridging.

The PTC uses the latest instructional methods, including practical exercises on actual bridges and classroom models. Instructor-to-student ratio is usually about 1:5, and class size averages about 20. Thus, intensive, individualized instruction is the rule. A complete set of tactical bridging reference material is available to each student and may be retained upon completion of the course. This well-rounded program of instruction includes bridge classification, design and construction procedures on the M2 Bailey, MAB, M4T6 (Class 50 raft and fixed span), LTR, Ribbon and medium girder bridge. Instructor personnel are among the most highly qualified in the Army and are willing to provide individual assistance to each student.

If you are scheduled to attend 12C PTC and need additional information on the course or are interested in learning more about this excellent course, write to: CSM, U.S. Army Engineer School, Fort Belvoir, VA 22060.

APPEARANCE STANDARDS

An increasing number of NCOs are arriving at The Engineer School to attend the Advanced NCO Course in poor physical condition. Upon arrival at Fort Belvoir, each NCO is evaluated to determine if he/she meets the weight and appearance standards. Students who fail to meet the standards are counseled and placed in the weight reduction program (Operation Streamline). And if significant progress isn't made during the 10-week course of instruction, it is reflected in the student's academic efficiency report.

All NCOs should be aware of the possible consequence of substandard appearance prior to their arrival at The Engineer School. It could affect their career development.

TOPO DOCUMENT

There is a new document out entitled "DA Consolidated Topographic Support Program (DACONTP) FY 80-84," which should be interesting reading for TOPO types throughout the Army. It answers a lot of questions about TOPO's future and should be available through unit S-2 sections.

NEW TRAINING BRIGADE

Recent changes have brought about the creation of a new training brigade at the Engineer Center and Fort Belvoir. Effective 1 October 1978 the U.S. Army Engineer Training Brigade was organized. Its two-fold mission is to provide training in three MOSs for which The Engineer School is the proponent but which belong to other Career Management Fields and to provide command and control for all brigade officer and enlisted students at The Engineer School. The new brigade was formed from the Engineer School's Department of Mechanical and Technical Equipment and the 1st and 3d Battalions of The Engineer Center Brigade.

The three MOSs that are taught by the Training Brigade are: 35E—Special Electronic Devices Repairer (CMF 29); 52C—Utilities Equipment Repairer (CMF 53); 52D—Power Generation Equipment Repairer (CMF 63).

Under the current structure the 1st Battalion is responsible for MOS 52D training and the 4th Battalion (newly created under the Brigade organization) is responsible for MOS 35E and 52C training. Each unit provides command and control for students and cadre. The 3d Battalion continues its mission of providing command and control for basic and advanced officer students, NCOs attending the Engineer NCO Advanced Course and AIT students attending the Defense Mapping School.

Current training in the three MOSs is being conducted at Skill Level 1 (35E10, 52C10 and 52D10 Advanced Individual Training). Early next year training will begin in Skill Level 2 (35E20, 52C20 and 52D20, Primary Technical Course).

AIT training in MOS 52D10 has been converted to the self-paced method of instruction. The possible conversion of the remaining two MOSs (35E10 and 52C10) to the self-paced method of instruction is still under study.

The establishment of SL-2 courses in the three MOSs marks a milestone in EPMS development. The prerequisites, course descriptions and class schedules of the SL-2 courses in MOS 35E, 52C and 52D are contained in the USAES Pam 350-1, *FY-79* edition. If your training section doesn't have a copy of the FY-79 edition it can obtain one by sending a completed DA Form 17 or a written request to the U.S. Army Engineer School, ATTN: ATZA-DTR (Individual Training Section), Fort Belvoir, VA 22060.

Reserve Components

NEW LEADERS

Major General LaVern E. Weber was reappointed last August to serve another four years as Chief of the National Guard Bureau, while at the same time, Brigadier General Emmett H. "Mickey" Walker, Jr., assumed his new duties as Director of the Army National Guard.

OVERSEAS TRAINING

Twenty-seven Reserve units had been approved for OCONUS training in 1979 as of 30 October 1978. Four units are slated for training in Korea, with the remaining 23 units scheduled for training in Europe. Two of the latter will participate in REFORGER 79. Two additional USAR units are expected to be selected for overseas training later.

ANNUAL CONFERENCE

Attention was focused on the Gaining Command Program at the 6th Annual Army Readiness Region/Group/Reserve Component Commanders Conference in St. Louis 1-3 December.

The purpose of the Gaining Command Program is to identify specific reserve units and the active Army units they will support in the event of a contingency. The 412th Engineer Command outlined details of the program to the 306 conferees.

The conference, hosted by the U.S. Army Engineer School for the second consecutive year, also surfaced a pressing need to provide Reserve and National Guard units with effective methods for engineer specialty training.

PAY STATUS EXPANDED

High school seniors and graduates who enlist in the Army Reserve within 180 days of their initial active duty for training (IADT), and all others who enlist within 90 days of IADT may now be placed in a paid drill status (pay category P). Those not initially eligible for pay at the time of enlistment may be transferred to pay status when within 180 or 90 days, depending on their educational status. All recruits placed in pay status prior to IADT are expected to attend drills and receive orientation training.

UNAUTHORIZED UNIFORM ITEMS

Some local commanders have apparently misinterpretted their authority to prescribe the uniforms worn in their units, and have approved non-standard items which do not have DA approval. Effective 1 January 1979, only non-standard items approved in ARs 670-5, 672-5-1, or in Common Table of Allowances 50-906 may be worn.

MANAGEMENT OF RETIREES

The Reserve Components Personnel and Administration Center (RCPAC) has begun to identify, classify, establish periodic contact with, and make tentative mobilization assignments for some Army retirees to fill CONUS post, camp and station positions upon national mobilization. The retiree call-up will free other soldiers for demanding troop unit assignments. Individuals being considered for management within the program include retired general officers to age 64, warrant officers to age 62, and others through age 60. RCPAC hopes to contact each selected retiree twice annually to verify addresses, physical status, and civilian occupation. Based upon their military and civilian skills, RCPAC will match the retirees against MTDA positions, and upon mobilization, call them to active duty.

EXPEDITIOUS DISCHARGE PROGRAM

A recent change to AR 135-378 provides a simplified method of eliminating substandard first term enlisted members which will protect the unit and individual from later administrative problems. It applies to non-prior service USAR and ARNG troop program enlisted members who have completed at least six months, but not more than 36 months, of continuous service. Check out the new change for details of the program.

NEW SURVIVOR BENEFIT LAW

A new Survivor Benefit Law extends to Reservists the option of providing survivor benefits even though death may occur before the Reservist attains retirement pay eligibility at age 60. The following options are now available:

—Retirement eligible Reservists may continue to decline making election for or against survivor benefits until reaching age 60. This option remains the same as the arrangement under the previous benefit law.

—The retirement eligible Reservist may elect a survivor annuity payable on the date at which the member would have become 60 years of age, should he or she die prior to age 60.

—The retirement eligible Reservist may elect a survivor annuity payable on the date of death, regardless of whether death occurs before or after age 60.

The intent of the new options is to afford the retirement eligible Reservist the opportunity to provide benefits for survivors, even if the Reservist dies before age 60.

The School Solution

Put in the ribbon bridge initially in order to reopen the MSR within three hours. Upon arrival of the work forces, set up security and breach the mine field. Replace the destroyed bridge with either a Bailey bridge or Class 60 dry span. A log boom with net must be deployed upstream from both bridge sites to prevent further sapper activity.

CONSIDERATIONS AT FLOAT BRIDGE SITE

1. **Approach roads** —In a glacial outwash plain, natural drainage will be good. Use the earth moving platoon to make any urgent repairs to the detour road and to construct turnouts. Once the detour road is usable, the platoon should continue to upgrade, improve, and widen it to eventually allow two-way traffic. Fill material is readily available in any esker or kame.
2. **Bridge** —Considering the speed and ease of emplacing ribbon bridge, along with the width of the stream, the ribbon should be your choice rather than a raft bridge.
3. **Anchorage system** —Use a JD410 backhoe from the earth moving platoon to dig in dead men.

CONSIDERATIONS AT FIXED BRIDGE SITE

1. **Approach roads** —Use a dozer with the driver well protected against shrapnel to clear roads and shoulders. Artillery delivered mines will not be buried and may have anti-handling devices. Any road damage due to mines exploding can be quickly repaired. As time permits, the surrounding forests should be cleared.
2. **Destroyed bridge** —The debris will have to be cleared before the new bridge can be built.
3. **Bailey** —This bridge will require minimal maintenance, but if damaged by artillery or demolition, repair is very difficult, tedious and time consuming.
4. **Class 60 fixed span** —This bridge can be put in faster than the Bailey and is more easily repaired. Intermediate supports can be damaged by debris in the stream and the foundations are subject to be scoured away by the water.

GENERAL CONSIDERATIONS

1. **Camouflage** —Should be used for both sites and all equipment.
2. **Smoke** —Should be used to camouflage movements and for deception purposes at dummy sites.
3. **Security** —Necessary to prevent destruction of the new bridges and to safeguard the equipment and work crews.

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ANNUAL ENGINEER DINNER

The 112th Annual Engineer Dinner is scheduled for May 11 at the Fort Belvoir Engineer Mess. As usual, the Itschner and Sturgis Awards will be presented to the outstanding engineer company and enlisted soldier, respectively, but other details of the annual affair were not available at press time. For more information, write to the Protocol Office, U.S. Army Engineer Center, Fort Belvoir, VA 22060, or call Autovon 354-3332 or commercial 703-664-3332.


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PAGE 12