Engineer

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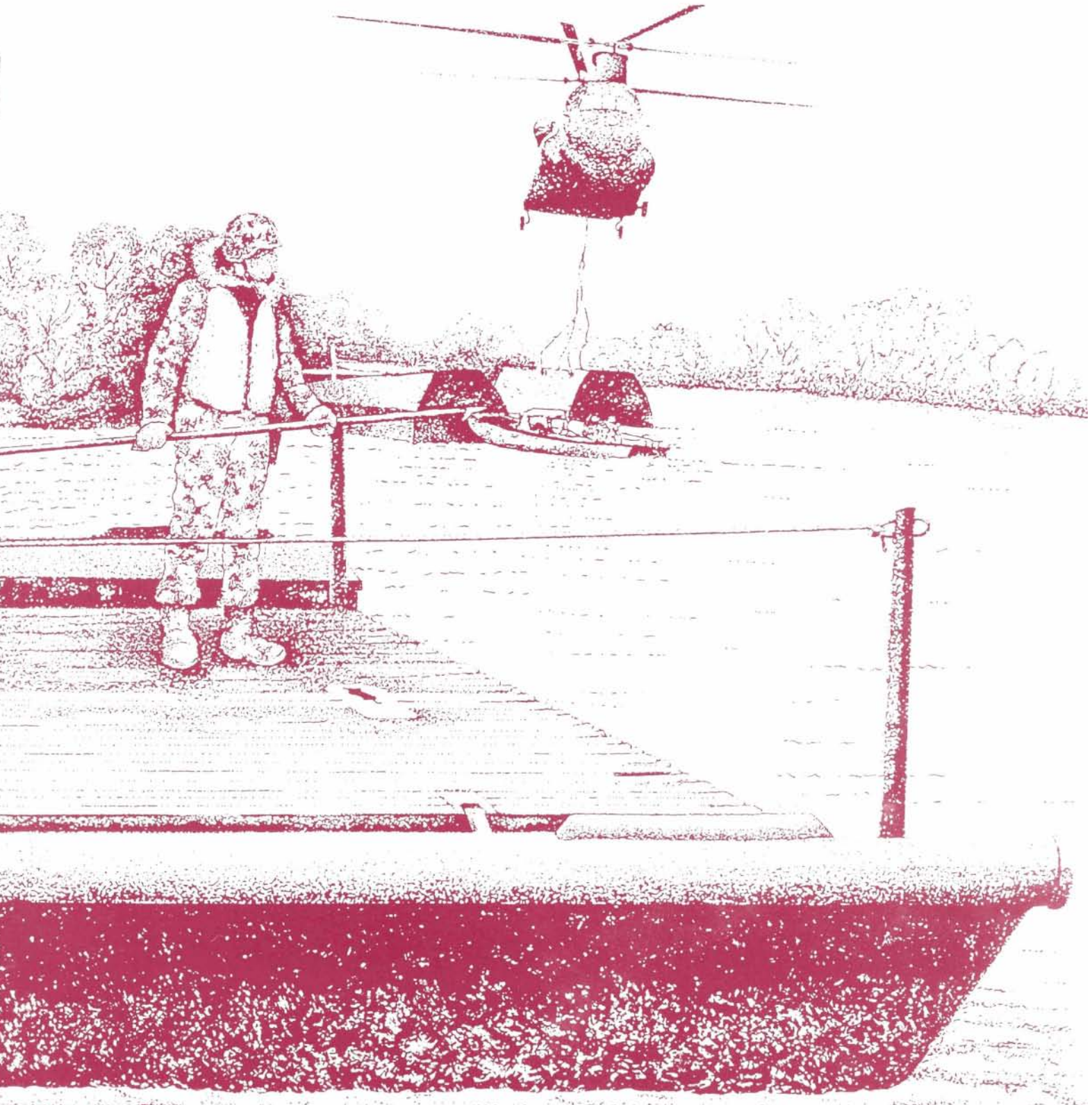

PB 5-90-3

Why Study Military Geography?

"If a general desires to be a successful actor in the great drama of war, his first duty is to study carefully the theater of operations so that he may see clearly the relative advantages and disadvantages it presents for himself and his enemies."

Jomini

Battle is conducted in physical geographic zones traditionally defined by land, sea, air, and more recently, space. As proposed by Jomini, the successful military commander will study and anticipate his theater of operations. The modern commander must understand a complex battle environment, which merges these zones through the synergism of dynamic weapon systems and joint operations.

As the Army's terrain and facility development experts, engineers must develop a battlefield environment perspective. We must also clear the way for a return to the study of military geography as the basis for preparing, altering, and restoring the battlefield for continued cultural development.

The process which provides commanders with the geographical conditions of battle has evolved with the complexity of warfare. The broad study of military geography has various interpretations in maritime and continental strategies, strategic geographic appraisal, and more recently, the Army's tactical Intelligence Preparation of the Battlefield and terrain analysis. Each evolution has adapted to specific needs.

Modern western military strategy has drawn from Mahan (maritime), Mackinder (continental), Spykman (rimland), and Seversky and Douhet (air) in order to describe the character of a particular battle environment. These global views defined geopolitical potential in terms of objectives, position, and technology. They each place a single physical geographic zone (land, sea, or air) in the dominant and decisive battle environment role.

The fixation with one strategic, physical geographic zone represses the potential for environmental synergism among them all. Jomini and Clausewitz offer environmental views at the strategic and operational levels of war. Clausewitz uses terrain, as the key to developing a sense of place, and military geography with its spatial relationships as a primary element when developing the concept of center of gravity. A commander's view of the battle environment will depend on factors like the level of interest (strategic, operational, or tactical), breadth of the area of interest, and the forces at his command.

Let me emphasize that mere data of physical geography (position, topography, resources, population, and climate) have no intrinsic political or military significance. Such data acquire military geographic or political significance only when they are related to some frame of assumption as to what is to be attempted by whom, when, where, and in conjunction with what adversaries, allies, and neutrals. Within the context of military geography, the physical geographical elements of the battle environment (land, sea, air, space) and their associated geoscience disciplines (topography, oceanography, meteorology, astronomy) are not only interdependent, but also relevant to the cultural and operational dimensions.

To be of any value, the data must be communicated in a timely manner and in a form which supports the decision. The synthesis of these elements will provide what the commander needs to know about the battlefield environment.

Without a military geography framework, the commander's decision-making process is deluged with discrete hierarchies of environmental, cultural, and operational data. For example, in combat mobility operations we might merge physical terrain and weather information and not consider the roads and man-made drainage systems that link urban and rural developments.

Or, consider the simple example of mud, which Napoleon called the fifth element of war. Mud is the synergy of soil and water (terrain and weather). The commander, however, is concerned with its effects on friendly and enemy forces, not its composition.

According to U.S. joint policy, geographic area is the most

(Continued on page 26)

By Lieutenant Colonel Robert F. Kirby

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FEATURES

DEPARTMENTS

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CLEAR THE WAY

By Major General Daniel R. Schroeder, Commandant, U.S. Army Engineer School

As we move toward the 21st century, the Corps of Engineers is actively preparing to fight and win anywhere in the world. Future threats will arise swiftly from unexpected and lethal quarters. The key to our success will be a quality force led with doctrinal proficiency by leaders who have prepared for contingency operations throughout the world.

The new Military Qualifications Standards (MQS) system promotes the doctrinal and technical proficiency demanded by the future AirLand Battlefield (see article, page 43). It provides a common ground for our officers, better enabling them to speak the language of the combined arms team. MQS I provides the essential leadership, management, and combat survivability skills needed by officers entering the military service. MQS II, tier 1, taught at the basic course, provides basic engineer warfighting skills necessary for successful platoon leadership in a combined arms environment. MQS II, tier 2, taught at the advanced course prior to company command, focuses on advanced doctrinal, leadership, and management training. Plans are underway to develop MQS III tasks for field grade officers.

To prepare for a complex variety of potential conflicts, the future engineer force structure must be leaner and more battle-focused. Future combat engineer battalions will be organic to maneuver brigades and structured to retain the mobility and momentum of the force in offensive operations. At the division level, the engineer regimental colonel will serve as the maneuver commander's engineer advisor and planner. At the corps level, engineers will provide topographic, countermobility, survivability, and sustainment engineering support.

The combat heavy battalion will evolve into a unit which provides support to installation commanders, while maintaining the capability to support deploying, reinforcing, and contingency forces.

Topographic engineers will produce automated, battlefield geographic information for command, control, intelligence, maneuver, and weapons systems employment. Topographic technology will be integrated with command and control systems to produce sophisticated, understandable tactical decision aids that will enhance the maneuver commander's ability to visualize and exploit the battlefield.

Future engineer organizations will use the latest technology to enhance battlefield performance. Engineers will employ standoff mine detection and clear scatterable mines to improve the survivability and mobility of maneuver units. Sensor technology, such as multi-spectral images, will improve our ability to detect enemy camouflage, while our own ability to hide will improve through developments such as terrain masking.

Reserve Components will continue to play a critical role in "rounding out" the Active Army. They will be fully integrated into the technological and developmental improvements of the Active Army, as they must be to ensure a full range of responses to world contingencies.

In addition to shifts in organizational structure and improvements in technology, more emphasis will be placed on battle-focused training in which the commander's intent is the governing principle of all actions. The lethality of modern weapons systems, their potential for mass destruction, and their widespread proliferation, make it imperative for leaders at all levels to have the skills necessary to recognize and act upon the commander's intent. To survive, units will remain widely dispersed while emitting minimal electronic signatures. They will mass with great speed at the appointed place and time and advance decisively behind a wall of fire, only to disperse again upon achieving their objective.

During each phase of such a future battle, engineers will be a critical asset. They must speak the language of the combined arms team with fluency and be trained to recognize and buttress the commander's intent.

Many of the potential contingencies for which we prepare will stop far short of high-intensity conflict. Rescue and recovery, noncombatant evaluation, and disaster relief, for example, are operations with a critical engineer component. Our organization, training, and doctrine must remain flexible enough to meet these needs.

We are unique among the combined arms team in that the level of support required of us will remain high, regardless of the contingency. We must make every effort to integrate battle-focused leader training with lean, flexible organizations, and improvements in technology. Our success depends on this.

BRIDGE THE GAP

By Command Sergeant Major W. E. Woodall
U.S. Army Engineer School

"They send us in front with a fuse an' a mine
To blow up the gates that are rushed by the Line,
But bent by Her Majesty's Royal Engineer,
With the rank and pay of a Sapper!"

A verse from "SAPPERS," by Rudyard Kipling

The term sapper goes back to the 16th century wars. Since then, sappers have proven their technical and tactical abilities by building and destroying fortifications, roads, obstacles, and airfields.

In the past, success on the battlefield often depended on sappers leading the way. To continue this success, we must develop competent and confident noncommissioned officers who have the ability to operate under stress as team members. Fort Leonard Wood's Sapper Leader Course provides a unique training opportunity for the engineer corps to build these skills.

Mission. The mission of the Sapper Leader Course is to train engineer leaders so they can better support maneuver units. The course trains an engineer company's leadership and focuses on the development of team leaders and squad leaders. Instruction is oriented primarily at the sergeant and staff sergeant skill levels. Many of the topics covered are especially pertinent to light, airborne, and air assault engineer battalions. Although designed mainly for light engineers, the training is available to any combat engineer unit.

Training. The 28-day program provides instruction in a mix of light and special operations engineer skill areas. Topics include air, water, and mountain operations; medical techniques; land navigation; demolitions; expedient antennas and communications; survival; and small unit tactics and patrolling.

While most of the material is taught in a classroom, it is reinforced through repeated practical exercises. Sapper students spend the last 10 days of the course in the field, putting to use the skills and techniques they have learned.

The course teaches our junior leaders how to fight and win as a member of a unit. When an entire unit attends the Sapper Leader Course, the leaders have only one thing to accomplish—to successfully complete the program. In other words, the training is conducted in an environment free from daily distractions. Because it is conducted in a tough, uncompromising environment, units leave the course a better trained and more cohesive group.

Our sapper course challenges every leader regardless of rank, position, or experience. The continuous operations, together with the mental and physical demands, place students in very stressful conditions. Noncommissioned officers are stressed to the limits of their endurance. Obviously, the challenges are many, but equally apparent are the rewards of better trained noncommissioned officers.

The key to success for a unit to graduate as a sapper company is to prepare or train-up the company and its leaders before coming to Fort Leonard Wood.

Preparation. I have watched units attending the Sapper Leader Course, and there are two individual training areas that we, as noncommissioned officers, need to fix: Physical fitness and land navigation skills. These two areas are the major reasons why students fail to graduate from the course. Our training is strenuous, and it requires that soldiers be in peak physical condition. As a minimum, students must be prepared to pass the Army physical fitness test, complete fast-paced runs, and road march as far as 12 miles with a rucksack.

The land navigation course complements the sapper's fitness program. To fully prepare for the sapper leader course, soldiers need to sharpen their basic map-reading and land-navigation skills. These skills are tested over the most rugged terrain Fort Leonard Wood has to offer. The rolling Ozark hills make the land navigation course physically demanding.

To complete the course, students must use different navigation techniques, including terrain association and the use of "attack points." They negotiate the course with rucksacks and as individuals—not as buddy teams. The course is a true test of a sapper's ability to move cross country.

Other skills you may want to sharpen in preparation for the course are math skills, drownproofing, and the combat water survival test.

The Sapper Leader Course is a unique training opportunity for combat engineers. Unlike other schools' programs, the training is primarily for unit leaders and focuses on the development of noncommissioned officers. We invite you and your unit to come and take advantage of this training opportunity. With the proper train-up and warrior spirit, any noncommissioned officer can earn the title of Sapper Leader.

"Whose Side Are Those !*@#%& Engineers On, Anyway?"

By Lieutenant Colonel Thomas D. MacIver and Major Andrew H. Hough

OK, so the "book," FM 100-5, tells us that divisions "assign" obstacle zones and brigades assign belts.

The purpose of belts is to block, turn, fix or disrupt the attacking enemy. Lanes may be specified through a zone or belt to enable the defender to move—not maneuver—through the area. Obstacles installed by defending engineers have to be located within the belts.

All very nice and neat. Right? The concept integrates the battlefield operating systems of maneuver and countermobility. Smartly done, it integrates fires, too. Trouble is, nobody does it—at least not very well.

The common result is that the defending maneuver force finds out the hard way that "their" engineers put obstacles in surprising places. And such surprises often lead to the uttering of many phrases, the most polite of which is the title of this article.

Everyone thinks they understand the commander's intent and scheme of maneuver when it's first stated. Then everyone takes a copy of the maneuver graphics and goes off in separate directions to put their piece into action. Too often, the maneuver graphics do not show obstacle belts at all, or give only an indication of obstacle-free zones.

Presumably, the engineer recommends belt locations and gets them approved later. But somehow this later approval plan never quite works, i.e., what ends up on the ground never quite jives with the maneuver plan. In the worst cases, obstacle belts are designed "from the bottom up." After well-meaning engineer platoons dot the map with proposed (and then installed) obstacles, the staff engineer "circles" groups of the dots, thereby designating belts for his brigade commander. It may be well coordinated at company/team or even task force levels, but it certainly isn't integrated in the brigade or division scheme of maneuver.

"...we think we have a better, simpler way to keep us engineers well integrated."

In other words, current practice looks good in the brigade TOC, but causes fratricide on the ground.

The lesson is one we, as engineers, have all learned—but seem slow to apply: When the brigade's maneuver and engineer plans are developed separately, the results aren't likely to be integrated. Take this thought across a brigade boundary, and the situation is a magnitude worse. The repositioning of forces, lateral reinforcement, counterattack, and passage all suffer. AirLand Battle remains in the book and doesn't happen on the ground.

Well, here in the hinterlands of the Fulda Gap, we think we have a better, simpler way to keep us engineers well integrated. This article explains the thought behind the process, and why we think it ought to be the next improvement in FM 5-100. The two overlays (Figures 1 and 2) allow you to immediately see what the scheme of maneuver is, and where obstacles will go and why.

In our operations with the 11th Armored Cavalry, the regimental commander's overlay for a defense (or covering force battle) shows a set of engagement areas in which to focus squadron and/or regimental fights. Here, of course, the

terms regiment and squadron equate to brigade and task force.

The regiment wants to get the enemy into an engagement box and then focus all available combat power on him there. If it looks like there is a particularly "target-worthy" enemy force coming into a box, the regiment will move friendly elements laterally to reinforce the fight. Obstacles help get the enemy into a box and keep him there.

The trick is to install obstacles that have the desired effect on the enemy without impairing our own agility for lateral reinforcement and other maneuvers. We ensure such agility by having the engineer in the dialogue when the engagement areas are first outlined. The design process usually involves the S-2, S-3, the engineer, and the fire support coordinator. We determine where we prefer to conduct the fights and where we prefer to maneuver, but that's not all. We also determine where the obstacle belts should be. The obstacle belts may even be designed first, and then the best engagement areas stand out.

The necessary obstacle belts and their purposes are immediately obvious when the belts and the engagement areas are designed jointly. In certain places, we need to block enemy movement so he can't get around the engagement areas. In other places, we want to turn the enemy and encourage his movement toward the engagement area. In an engagement area, we want to fix the enemy.

We treat the engagement areas as "fixing" belts because they are places where we want to make the ground "sticky" for the enemy while we apply our combat power. In some areas, usually well forward, we want to disrupt enemy movement, echelonment, command and control, and follow-on support. When the S-2, S-3 and engineer are bending over the same map together with such thoughts in mind, blocking and turning belts are identified as easily as any other feature of the plan.

When the regimental commander issues his order and overlay, he also assigns obstacle belts; better yet, he articulates their purpose and priority. The way this assignment happens is that the S-3 and engineer draw the belts on the initial operations overlay.

There is no separate overlay for the obstacle graphics. Obstacles are an essential feature of the maneuver plan, so the belts are drawn on the maneuver graphics. Further, the commander specifies the routes he wants to use for lateral reinforcement or other moves. Putting these extra features on the overlay takes no appreciable extra time and it pays big dividends.

Maneuver commanders at task force and team levels are happy because they know what to expect in terms of obstacles in their own and adjacent sectors. They know where they can move and maneuver. Their artillery coordinator is happy because he now has better ideas about where, when and why to target. The engineer battalion and company commanders are happy because they have clear guidance. And the regimental commander is happy because the process is simple—and it works.

What we do is best seen in some examples. Look at the first overlay (Figure 1 on page 6). Suppose the 11th ACR mission is to be a covering force forward of phase line (PL) Mustang. The covering force area is designated by corps as an obstacle zone. The commander's concept is to:

- Delay forward of PL Goodwill.
- Strip away enemy reconnaissance using indirect fires (artillery, air and disruption obstacles).
- Avoid decisive engagement.
- Delay back to PL Goodwill, then defend behind PL Goodwill to make it appear to be the main battle area (MBA).
- Cause enemy deployment.
- Identify his main effort.
- Pass lines rearward and hand off the battle to MBA brigades.

Defending maneuver forces often find out the hard way that "their" engineers have put obstacles in some surprising places. The lack of solid integration of engineer effort can lead, at best, to confusion, and to fratricide in the worst cases.

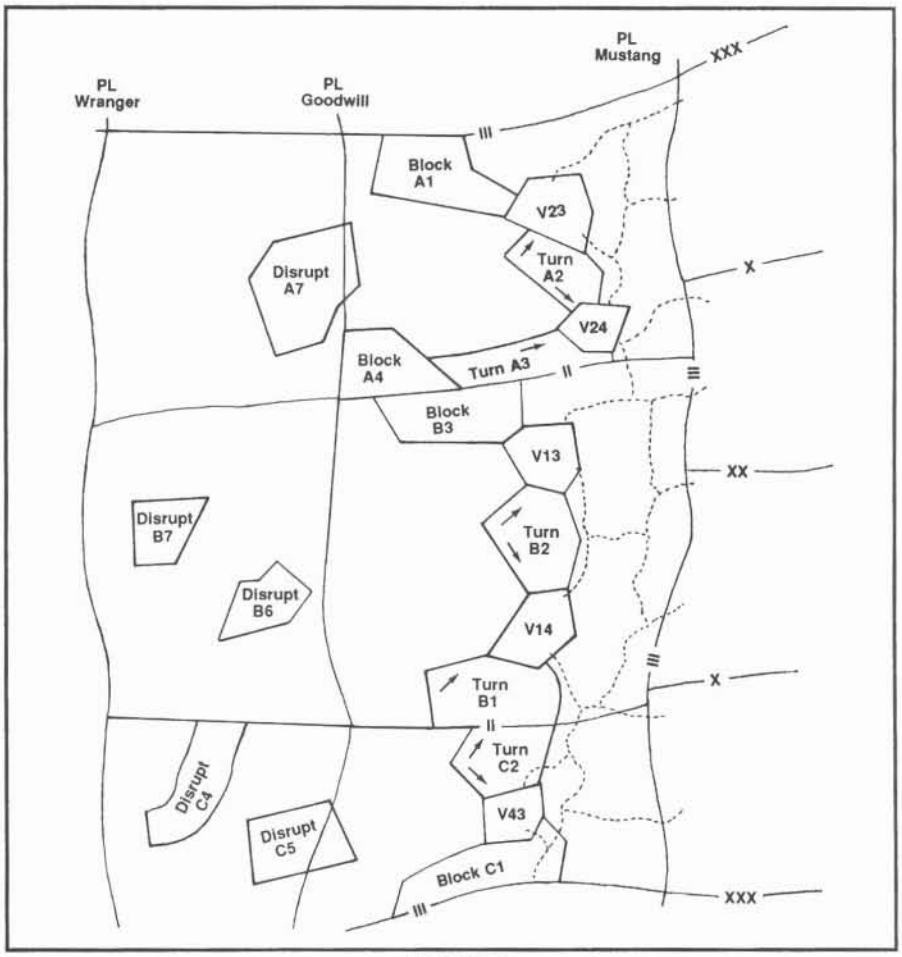


Figure 1

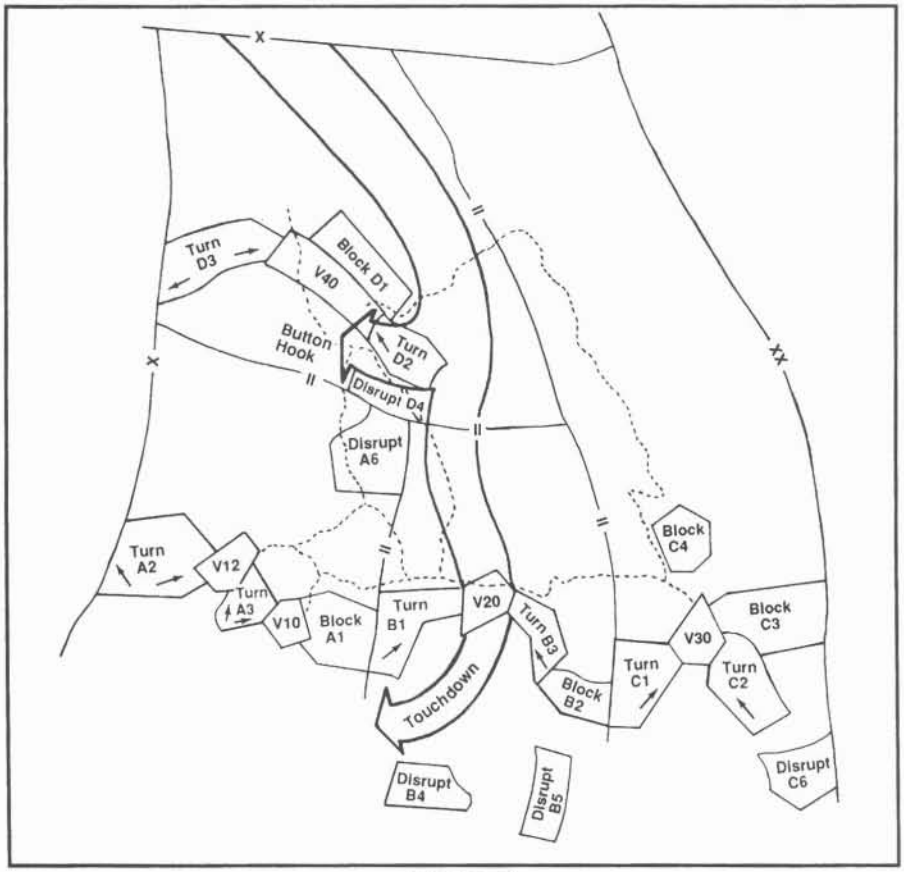
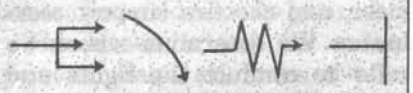


Figure 2

Editor's Note: LTC Roger Somerville, Chief, Tactics, Training and Doctrine Division for the Engineer School's Department of Combined Arms, found the authors' article "on the mark."

The Engineer School is now teaching a technique that solves many typical obstacle integration problems. LTC Somerville writes: "(Our new Engineer School) technique has proven effective on the training center battlefield. It allows for brigade and task force commanders to convey their obstacle intent to subordinates. The synchronization of obstacle effects is, therefore, top driven. However, it also provides the subordinate TF or Co/Tm commander the flexibility to further refine the obstacle intent to fit his particular scheme of maneuver or direct fire plan. Obstacle integration is, therefore, bottom driven where it is most effective."

An article detailing this new technique will appear in the next issue of ENGINEER. The authors' graphic overlay symbols, used here to illustrate their technique, should not be used in lieu of the recently-approved symbols which appear below:



The regiment issues the operations overlay, which shows several engagement areas (V—or victory—boxes) in which to focus squadron and/or regimental fights. Each squadron will be positioned across one or two potential enemy regimental avenues of approach. The overlay also shows the obstacle belts, their purpose, and their priority within each squadron (task force) sector.

We depart from the standard symbols shown in FM 5-100 in that we do not show triangular "bumps" on our obstacle belt lines. The bumps make it easy to see the belts on a crowded overlay, but they are a source of confusion. For example, can we place obstacles in a bump or not? Finally, the overlay shows routes we want to be able to use, including what we see as the best exit points for rearward passage. We then recommend these to the MBA brigades for passage points.

The belts are named for their purpose and priority. For example,

Engineer effort on the ground often doesn't match the maneuver plan. In the worst cases, obstacle belts are designed from the bottom up," by well-meaning engineer platoons (U.S. Army photo).

the purpose of belt Block A1 is to block movement in part of task force area A. It is also engineer obstacle priority number "1" in this sector. The belt's name carries the regimental commander's intent that this blocking belt is the most important of the belts in this sector. Once everyone is familiar with the naming system, the belt name may be shortened to simply "BA1."

The turning belts include arrows to indicate the direction(s) in which we want to encourage enemy movement. Belt "Turn B2" is in task force area B. The belt's purpose is to encourage enemy movement into either engagement area V13 or V14, and it is the second obstacle priority in this task force sector.

The letter designators "A" and "B" for different task force sectors are a simple addition to the name of each belt that make the name unique. By the way, there is no special reason why we use the letters A, B, and C in this example to refer to different task force areas. For better distinction from the "B" that means "Block," you can use X, Y and Z. In other words, use whatever provides easy distinction of belts in different areas.

The engagement areas are understood to be fixing belts without being so labeled. The choices of a letter (such as "V" here) and some numbers to name the engagement areas are arbitrary. The numbers do not imply priority. These engagement area fixing belts have a priority lower than that of blocking and turning belts, and this will be covered in greater detail shortly.

Disruption belts, if there is time and effort enough to have any, are also labeled. They have the lowest priority among the belts. It is possible that "ground mounted" engineer effort may not be committed in a disruption belt. Instead, these may be areas where artillery or air-delivered scatterable mines are focused.

Another overlay feature is the series of dashed lines which show regimental routes to be kept open. Where these routes cross into the MBA is where we prefer to conduct the rearward passage. Normally, we give each route a name.

Several features of standard operating procedure (SOP) help keep execution integrated with the commander's intent. Our SOP is that obstacles are planned and installed in accordance with the named priorities. This is not to say that all engineers work first in belts numbered priority 1, then move to number 2, and so on. Available engineers are allocated by platoon to address the needs we estimate in each task force and company/team area. Exactly who works where, on what and when is left to the commanders on the ground.

As work progresses, some task organization changes may occur if our initial estimate needs to be adjusted. In a given sector, work may be in progress concurrently in several different belts. The net result, however, is what one would expect. High priority belts tend to get more effort earlier, have more obstacles in them, and get done sooner than low priority belts.

In general, blocking and turning belts are the highest priority because the fight won't happen where we want it to happen—unless the blocking and turning belts accomplish their purpose first. The fixing belts (i.e., obstacles in the engagement areas) are lower priority than the blocking and turning belts.

Combat power will be focused in the engagement area. It's possible to win the fight there even if there is too little time to install fixing obstacles, as long as the blocks and turns are effective. Disruption obstacles rate the lowest obstacle effort priority. These are not likely to be done by engineers on the ground unless time, materials and engineer effort are plentiful before the fight starts. Artillery-delivered scatterable mines are often very useful in such disruption belts, and they may be the only obstacles planned or installed.

Obstacles cannot be placed outside of belts or on regimental routes unless approved at regiment. Such approvals usually make the obstacle a regimental reserved target, or tie its execution to a specific event (e.g., passage). Squadron (task force) level commanders may designate additional squadron level engagement areas, but these are not new obstacle belts unless so approved at regiment level. Squadrons may also designate additional routes.

In center sector, for example, the squadron commander may fight by positioning one or two of his scout troops (company teams) forward of PL Goodwill. The scouts screen the area between PL Goodwill and PL Wrangler. With help from air scouts, they observe the advancing enemy, send in a steady stream of spot reports, get off a few well-aimed shots, call in artillery and air-delivered fires, and delay without becoming decisively engaged.

The scouts delay back through V13 and/or V14 to pre-determined positions from which to fight the battle focused in the engagement area. Other elements of the squadron are positioned in belts Block B3 and Turn B1. They help the belts serve their purpose by covering obstacles with fire. They also help to "encourage" the enemy into V13 and V14.

The squadron's tank company is in a hide position at the rear of belt Turn B2, and is prepared to move and attack quickly into either V13 or V14. On call from the regimental commander, the tanks may even move out of sector to the north, to V23 or V24, or out of sector to the south to V43, depending on where the best enemy target force is moving.

Engineers continue to install obstacles, improving the belts, until the fight forces them back. As the fight progresses, engineers focus attention on the designated lateral mobility routes and passage routes to ensure they remain open. By the time the enemy gets to engagement areas V13 and V14, his combat recon patrols and forward security elements will have taken a severe beating.

The enemy's advance guard battalion bullies his way into one of our engagement areas. Artillery, attack helicopters, close air support, tank maneuvers, electronic measures and fixing obstacles all come into play as the squadron destroys the advance guard. The action forces the enemy regiment to deploy. The cavalry continues to grind down the enemy as it hands off the battle to the MBA. All across the corps front, enemy regiments are identified and "greeted" in this fashion. We are able to identify the main enemy effort, bloody his nose, make him deploy, and set him up for MBA brigades.

The second example (Figure 2 on page 6) shows a four-task force brigade in the defense of an MBA. One task force is in depth. An important aspect not evident without the map is that there is a significant natural obstacle in the terrain. A difficult ridgeline runs from the northwest side of engagement area V30 to the rear of belts Block D1 and Turn D3.

Forward of the ridgeline, a potential enemy regiment (or larger) avenue of approach runs through V20 to V40. This brigade overlay shows division counterattack axes Touchdown and Button Hook. Such axes are usually designated as obstacle-free zones, but this blanket restriction isn't always required. With some care, it may be reasonable to put fixing obstacles in V20 without impairing Axis Touchdown, and put turning obstacles in Turn D2 without impairing Axis Button Hook.

One criteria for success of the counterattack is that the force must be able to transit the axis without undue impediment, and without fratricide. The counterattack force commander must have approval authority (or, he must have disapproval authority) over what obstacles go into V20 and Turn D2. He and all his leaders, down to M1 and M2 commanders, will need to know precisely what routes will be open, and where each target will be planned. As work progresses, the counterattack force engineer will pay close attention to obstacle reporting by the forward units. V20 and Turn D2 are places where the division engineer earns his pay—helping to ensure that both the defense and the counterattack are supported.

For those division and brigade commanders out there, this is the prescription for the next time you are ready to throw down your kevlar in disgust, and shout "Whose side are those !*@#%& engineers on anyway?"

We're on your side. Just let us help draw smart lines on your operations overlay.

To belt or not to belt. That is the question.

And we have the answer.

Lieutenant Colonel MacIver is the professor of military science at Bucknell University. He previously served as commander of the 54th Engineer Battalion. Other assignments include assistant corps engineer, V Corps; executive officer, 317th Engineer Battalion; assistant professor of physics at West Point, and command of two engineer companies. He is a graduate of Command and General Staff College, and holds a master's degree in engineering applied sciences from the University of California at Davis. He is a West Point graduate.

Major Hough is the S-3 of the 54th Engineer Battalion. He previously served as the regimental engineer for the 11th Armored Cavalry Regiment. He has commanded two engineer companies, and served as resident engineer for the Corps of Engineers in the Netherlands. He is a graduate of Command and General Staff College, and Combined Arms and Services Staff School. He holds a master's degree in mechanical engineering from Washington State University, and is a registered engineer in Virginia.

Staff Rides & The Flawed Works of Fort Constitution

There is an old saying that those who ignore history are doomed to repeat it. It's a truism which holds particular significance for Army leaders. Military successes or failures of a hundred or even a thousand years ago can hold important lessons for modern combat commanders.

But finding a way to take history off the bookshelf and put it to practical use isn't always easy.

One of the best avenues for instilling historical lessons in young military leaders is the staff ride. Staff rides allow commanders to use the accomplishments—or follies—of long-gone military figures to provide important lessons in decision making.

Hundreds of militarily important historical sites throughout the United States provide the backdrop for old problems and crises that can parallel a surprising number of modern military situations. A good example of one of these sites, and one that the Department of History of the U.S. Military Academy uses often, is the juncture of the Hudson River and West Point.

And therein lies the story of Bernard Romans and Fort Constitution—a story that all modern-day engineers should learn well.

The Hudson River and West Point played a significant role in the outcome of the American Revolution.[1] This article will critique the work of Romans, the first military engineer at Constitution Island.

American and British political and military leaders considered the Hudson River militarily significant throughout the American Revolution. George Washington had recognized the value of the Hudson River at least as early as May 1775, when he had served on a committee of the Continental Congress that had recommended fortifying both its sides in the Hudson Highlands.[2] His later view, in 1783 in his "Sentiments on a Peace Establishment," was that the fortifications at West Point had been the "key of America." This had influenced his thinking throughout the war.

Units of the Continental Army generally garrisoned in the Hudson Highlands, and Washington concerned himself personally with the construction of the works along Popolopen Creek and at Constitution Island, Pollepel's Island, and West Point.[3]

The British made the "line of the Hudson" the centerpiece of their strategies to take New York City in 1776, Albany in the Saratoga campaign of 1777, and West Point in 1780 (with the assistance of its commander, Benedict Arnold). The British Commander in Chief, General Sir Henry Clinton, who was involved in all three of these plans and

By Lieutenant Colonel James M. Johnson

West Point cadets view the site of Romans' planned fortifications during a staff ride sponsored by the school's Department of History (U.S. Army photo).

the capture of Stony Point in 1779 later wrote that "the River Hudson naturally presents itself as a very important object."[4]

Washington, Clinton, and their respective political leaders were convinced that the British could bisect the colonial rebellion economically and politically by controlling this major river.[5] The New York Provincial Convention and Committee of Safety repeatedly reminded the Continental Congress of the Hudson's importance "for the defense of the United American States, and keeping up a communication between the eastern and southern states," as it solicited funds for its defense.[6] British subjects and Americans would forfeit their lives and national treasure as they tried to maintain control of this vital artery.

The initial requirements for fortifying the Hudson at West Point had been clear from the very first reports rendered on May 19 by Washington's committee and on June 13, 1775, by James Clinton and Christopher Tappen. Both of these men, sent by the Provincial Congress to determine the best location to block the river, were New York delegates and residents of the Hudson Valley. Additionally, Clinton, a surveyor, had served as a captain of militia in the French and Indian War.

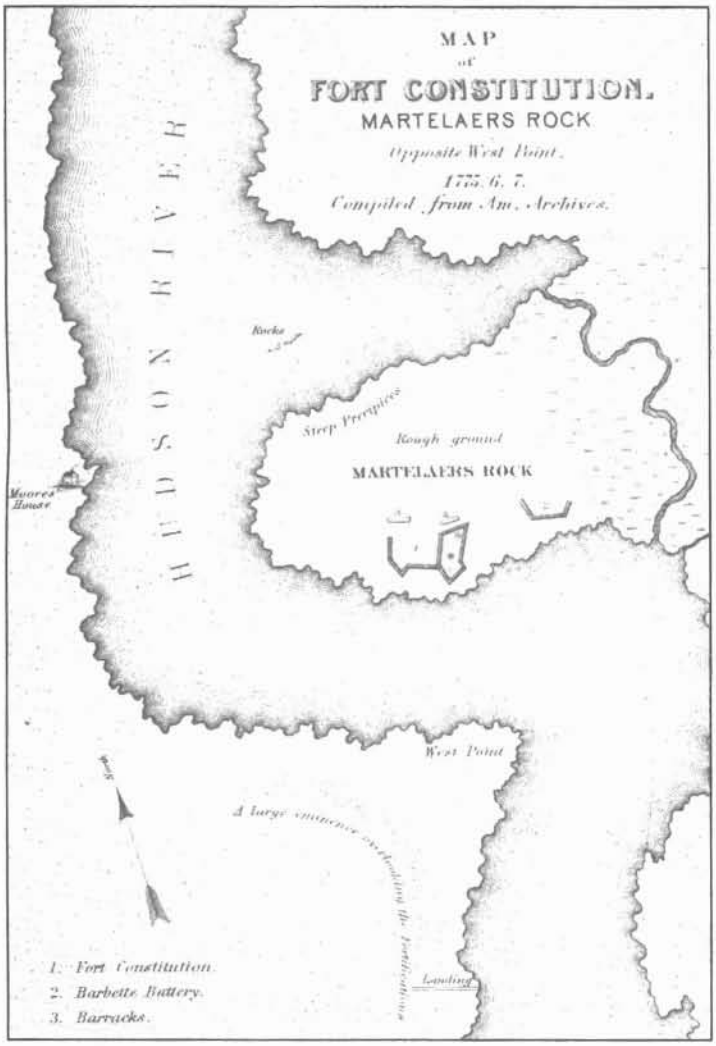
The Continental Congress and the two New Yorkers had agreed that both sides of the river required posts and garrisons. After surveying other sites, such as Popolopen Creek and Con Hook, Clinton and Tappen chose the difficult, "S"-shaped curve at West Point. They believed the narrowness of the channel here and the effects of tide (3-feet high) and current made this the most appropriate spot. Their report included a description and drawing of a post on Martelaer's Rock with a garrison of 300 men and another at West Point with 200 men. They had also recommended stretching booms across the Hudson between the two posts.[7]

Why did a venture that began with such insight and energy result in failure? Why were the works in the Hudson Highlands so flawed that they failed to stop the British in October 1777?

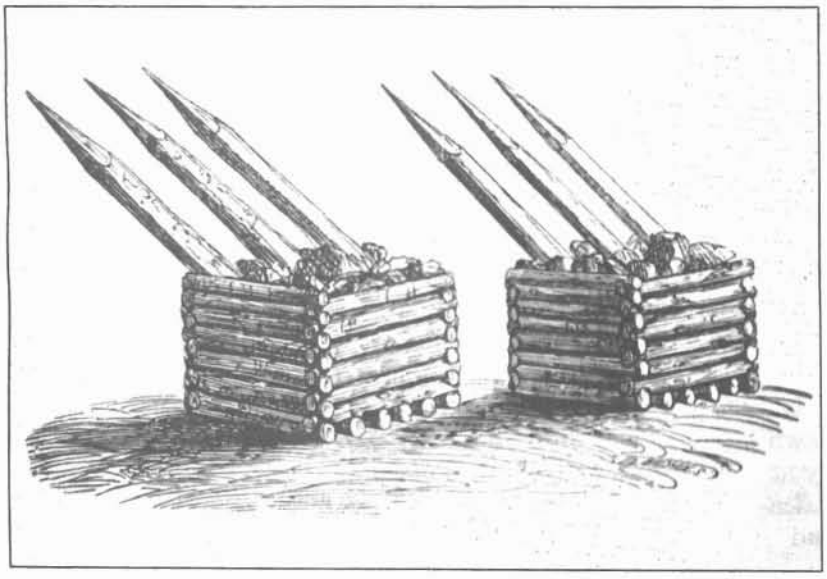
The failure was at two levels. First, the engineer hired by the New York Committee of Safety, Dutch-born surveyor, cartographer, and botanist Bernard Romans, failed as a military engineer at Martelaer's Rock. He did not locate the fortifications there properly. Secondly, he failed to develop them effectively, expeditiously, and economically. On August 29, 1775, Romans began work on a "Grand Bastion," dubbed Constitution Fort.

By February 9, 1776, when the Continental and Provincial Congress dismissed him, Romans had completed only an octagonal, wooden blockhouse with eight four-pounder cannons, barracks, a storehouse, and a curtain or wall mounting a battery of fourteen cannons.[8] Romans' failure at Martelaer's Rock led colonial leaders, who still accepted parts of his general plan for Fort Constitution, to seek alternative sites for fortifications and obstacles. Congressional leaders heard from visiting committees that Fort Constitution was inadequate, and that Popolopen Creek, more than four miles downriver, had off-setting advantages.

Beginning in January 1776, precious manpower and materials were diverted to two forts (Montgomery and Clinton), along with a chain and



Chevaux-de-frise



boom. A *chevaux-de-frise* (iron-tipped, wooden stakes protruding from sunken log cribs filled with rocks) was to be emplaced between Pollepel's Island, across the river to Plum Point on its west bank.[9]

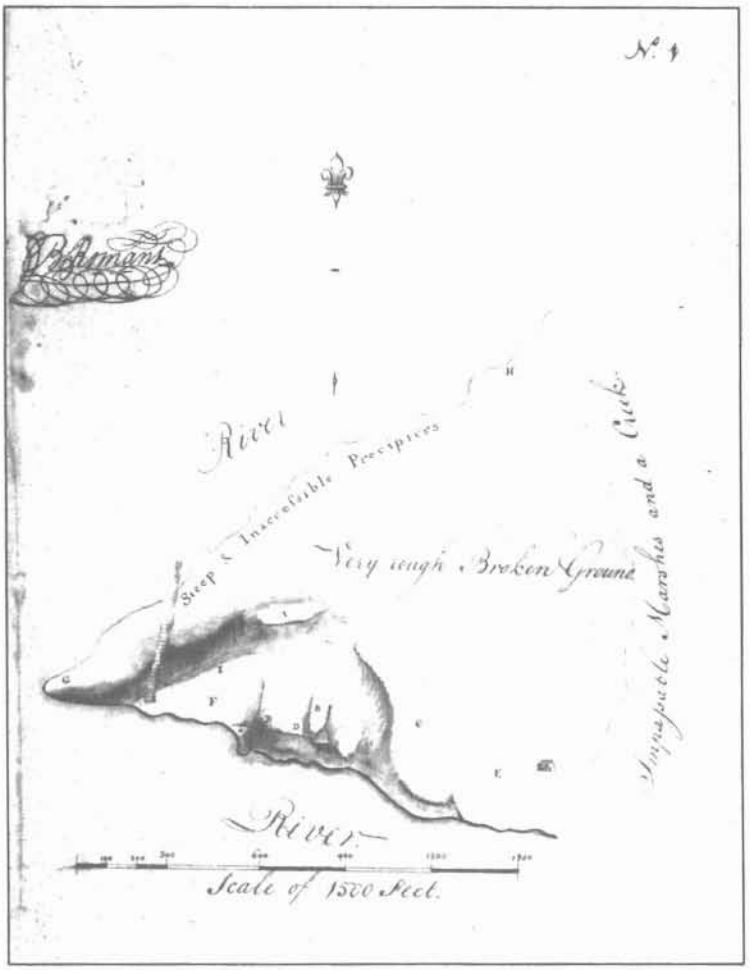
These works and the *chevaux-de-frise* at Pollepel's Island would divert effort and manpower from Fort Constitution, as it was now called. Consequently, the patriots had incomplete fortifications or barriers at three places and too few soldiers to man them. The end result was failure when success might have been possible.

Romans failed at Martelaer's Rock because he did not follow the basic rules of military engineering as they were understood at the time. This is not surprising, because he apparently had little or no practical experience as a military engineer. His biographer cites some training in England prior to 1756, but this presumably was in civil engineering.[10] Romans had a working knowledge of military terms and structures, which he revealed in his observations of Fort St. Augustine, Florida.[11] He had also assessed the cost of repairing Fort Ticonderoga for Benedict Arnold in May 1775, after that once formidable work was captured.

Since his arrival in North America, however, Romans earned his livelihood as a surveyor, cartographer, and botanist. In fact, while he was in the pay of the New York Provincial Congress, the King of England was paying him a 50 pound annual stipend as the botanist for the Floridas.

To his credit, Romans purchased a copy of Roger Stevenson's *Military Instructions for Officers Detached in the Field* in Philadelphia before travelling to New York.[12] He may have learned something about fortifications from John William Gerard de Brahm, a military engineer and his original superior as Surveyor General of the Southern District. However, there is no evidence that he consulted or owned other treatises about military engineering.

Romans would have served himself and his adopted country better had he followed the maxims of acknowledged, published engineers, particularly those of Stevenson. He might then have first built field fortifications of earth and wood that commanded the river rather than starting a bastioned fort of masonry. A committee of the Continental Congress observed on November 23,



Romans' Plan #1 indicated the terrain seen by Romans on Martelaer's Rock.

1775, that as the southwest curtain was the "least useful, we think it should have been last finished. . . ."[13] Without doubt, Romans was very skillful with a pen, as his drawings and plan of work for Fort Constitution reveal. His approach to his craft as a cartographer and even, perhaps, as a civil engineer are evident in the introduction to his book, *A Concise Natural History of East and West Florida:*

A describer of countries, ought in a great measure, to imitate a building Engineer, in first laying before those, whom he will employ, accurate and distinct plans of his intended work, thereby enabling them more distinctly of the execution thereof. . . .[14]

Unfortunately for Romans, there was and is more to military engineering than a well-drawn plan, a point that John Muller made directly at the time to all who read his treatise on fortifications.[15] The flawed execution of Romans' plan would be his undoing and, ultimately, the Highlands' as well.

Because of his apparent inexperience as a military engineer, Romans chose poor locations for his major works. Had he consulted or remembered the contents of prominent published treatises on fortifications, such as those of Muller, Vauban, or Pleydell, he would have noted their caution to practitioners to be careful about their "choice of situation" and "to make use of every advantage of ground. . ." Muller even thought that leaders should not trust the judgment of a single engineer, even one "so well qualified," but rather should seek other opinions.[16] Unfortunately for the colonies, engineers were in short supply. New York and the Continental Congress had little recourse at the time but to rely upon the careful drawings and detailed estimates of Bernard Romans.

In "his choice of situation," Romans accepted too literally the location on Martelaer's Rock proposed by Tappen and Clinton rather than surveying and tracing out the best site himself. His initial proposal proved that he was not totally bound by the opinion of "Some gentlemen, not well enough versed in the sience [*sic*]. . ." because he had himself found a spot a short distance to the east of the one selected by the committee.[17] Furthermore, after sketching a blockhouse and battery for a site that Clinton and Tappen had chosen at West Point, he had then ignored these dominating heights across the river less than one-half mile away.

Stevenson pointedly warned against allowing such a thing to happen with terrain in the very book that Romans owned and presumably had read.[18]

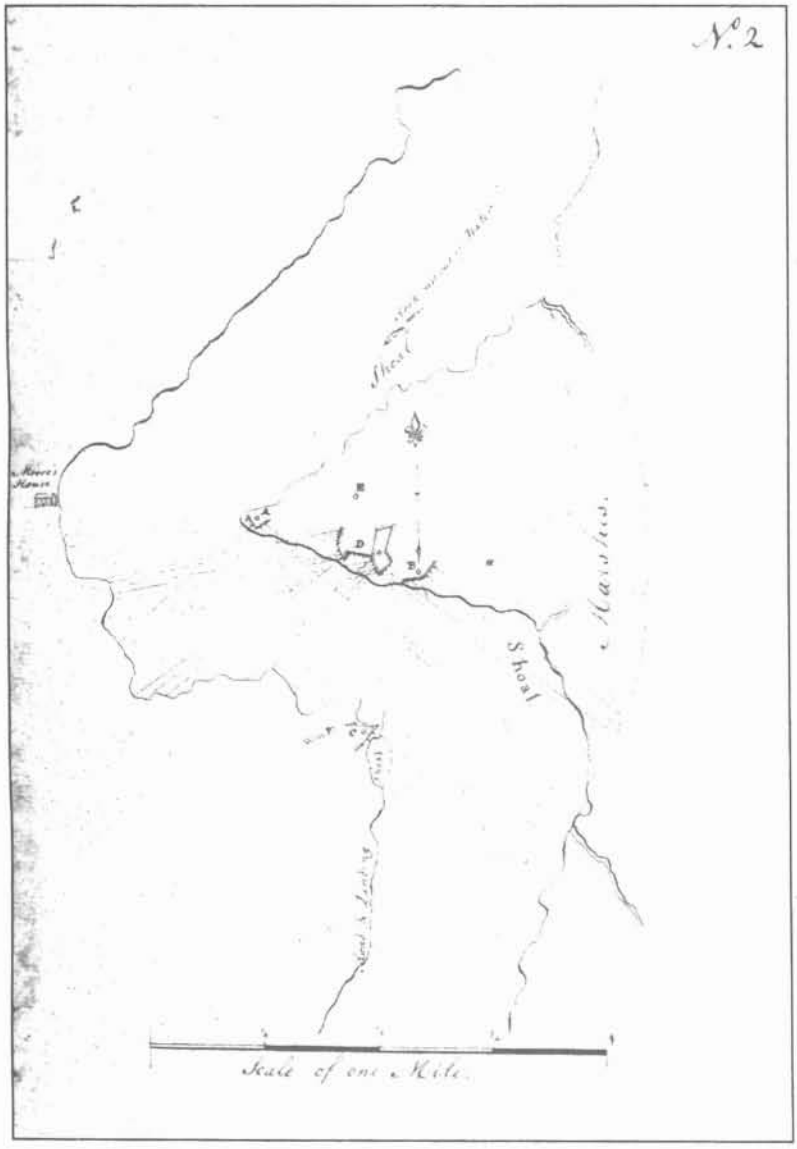
Although most observers, like Clinton and Tappen, recognized the value of the higher ground at West Point, it would continue to be ignored until 1778. In June 1776, for example, Lord Stirling, General William Alexander, noted that "every work on the island is commanded by the hill on the West Point. . . ."[19] The reason for this crucial oversight may have simply been that Fort Constitution had now become an auxiliary to Forts Montgomery and Clinton. Cannons emplaced at Romans Battery would be unable to take an enemy ship under fire until it was broadside, more than halfway through the "S"-curve.

Field works, made from fascines (bundles of sticks), timber, dirt, and sod—and located farther to the east at the future site of the Gravel Hill

Battery where Romans himself had drawn a blockhouse and a battery—would have at least confronted both problems. Romans would have done well to have remembered or read Pleydell's admonition in 1768 "That an hundred men properly posted, and entrenched according to rule, can effect more than a thousand, who have taken up a wrong position."[20]

Having chosen the wrong place to begin his work, Romans next ignored or misunderstood the command relationship established by the New York Provincial Congress when it appointed the commissioners for the fortifications in the Highlands. As a result, there was no unity of command. The famous French engineer, Vauban, had made clear in his writings that members of his profession were "often forced to follow someone else's opinions and work at strange notions."[21]

To his ultimate regret, Romans stubbornly or pridefully viewed himself as the sole director of construction. He did not show his original plan to, or coordinate it with the commissioners, who then criticized it without offering an alternative. The plan was delivered directly to the New York Committee of Safety, which forwarded the impressive drawings and estimates to the Continental Congress.[22] This initial action led to increasing animosity and a paper war between the principals of the project—Romans writing from his blockhouse and the commissioners from their office in the storehouse a short walk to the rear.[23] This was not the first time, nor would it be the last, that Romans would show his difficult personality.[24]



Romans' Plan #2 shows his original scheme for batteries and blockhouses.

Embroiled in controversy first with the commissioners and later with the respective Congresses, Romans proceeded to build a blockhouse and a battery too slowly and at too great expense. Muller had pointed out that a major consideration in planning a fortress must be "The expence necessary in the building of it" to avoid the possibility that "instead of being an advantage, it becomes a burthen to the nation."[25] Tappen and Clinton had originally estimated that the cost of their two proposed posts would be about 1,500 pounds; Romans' initial estimate was 4,645 pounds, 4 shillings, 4 pence, excluding ropes, iron stoves, and artillery. The minutes of the New York governing bodies indicate the routine disbursement of funds to support the construction to the north.[26]

Had the results of Romans' labor been more evident to the many observers sent to evaluate progress, the expense might not have been a major factor. Lord Stirling summarized the issue very succinctly in his report of June 1, 1776: "Mr. Romans has displayed his genius at a very great expence and to very little publick advantage."[27]

Cost became a consideration precisely because, even by the time of Lord Stirling's visit, Romans, the commissioners, and their laborers had accomplished so little of consequence. The commissioners completed a second curtain, to be called Marine Battery, mounting eight cannons.

Investigating committees, influenced by their reports to the Provincial

Congress, further added two batteries of fascines, planks, and earth (Gravel Hill—8 cannons, and Hill Cliff—3 cannons) on the eastern end of the island. Here, the cannon could fire on British ships long before they reached Martelaer's Rock.

The British, upon their arrival in October 1777, faced a Fort Constitution that comprised Romans' Battery and Blockhouse, Marine Battery, and Hill Cliff and Gravel Hill Batteries.[28] Even these works, such as they were, would not be tested. The small detachment of militia and Continentals was demoralized by the British victories downriver at Forts Montgomery and Clinton. They would flee these works, third in priority at the time for resources behind the projects at Popolopen Creek and Pollopel Island, after firing only one shot at a British flag of truce.[29]

Forts Montgomery and Clinton fell quickly and tragically for reasons that parallel those that led to the ignominious demise of Fort Constitution. Started in the fall of 1775 as an alternative to Fort Constitution, these works nonetheless competed for men and materials, and later with the *chevaux-de-frise* at the northern gate of the Highlands. Patriot laborers had not completed either of the forts by the time of the British attack.

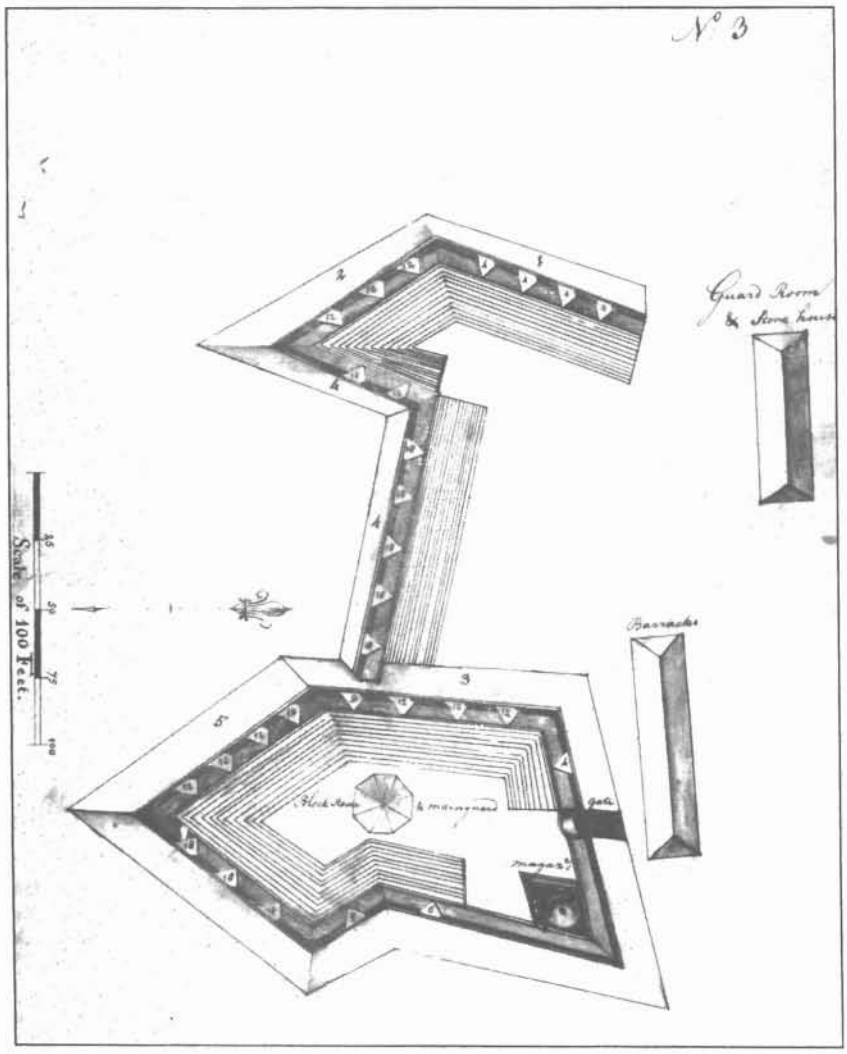
Generals George and James Clinton found that the forts were too large for the few Continentals and militia they were able to muster. Disregarding Washington's warnings, these inexperienced leaders and General Israel Putnam, the overall commander, failed to guard critical passes to the south and west. That allowed the British to attack the landward side of forts, which were tragically and ineffectually oriented on the river.

A chain, boom, row galleys, and Continental frigate served little useful purpose as Loyalist Colonel (and local resident) Beverley Robinson led British Regulars and provincials through Timp Pass and Doodletown. They attacked the rear of the two American works in a final assault that lasted only about 30 minutes. After occupying Constitution Island, the British naval squadron made equally short work of the inadequately defended *chevaux-de-frise* at Pollopel's Island and roamed as far north as Kingston, New York.

The Provincial Convention fled as the British first took and then burned the capital. Unable to save "Gentleman Johnny" Burgoyne at Saratoga, Clinton's soldiers and Hotham's sailors destroyed 2-years' futile efforts by Americans to prevent just such an outrage as they fell back downriver to New York City.[30]

The story loops full circle back to the post proposed for Martelaer's Rock, and the one at West Point—and to Bernard Romans' flawed interpretation of his assignment.

The New York Provincial Congress had hired Romans as a military engineer to block the Hudson River at a point that would begin to prove decisive in early 1778. As his "imagination took wing," Romans squandered time and money trying to build a "Grand Bastion" rather than field fortifications better suited to the needs of the moment.[31] Of even greater significance, he chose to build the fort where it



Romans' Plan #3 of the "Grand Bastion." Romans completed only the center curtain and the octagonal blockhouse.

commanded little and could be dominated from almost every direction.

Romans' initial failure led his political and military masters to fortify Popolopen Creek and Pollopel Island even as they continued some efforts at Fort Constitution. The patriots had too few men, too little time and money, and too little experience to do all of these tasks effectively at the same time.

It is most unfortunate that the reasoning of Silas Deane, of Connecticut, did not prevail in October 1775, as he and fellow delegates to the Continental Congress debated the future of Fort Constitution: "they have employed an engineer. The people and he agree in the spot and the plan. Unless we rescind the whole we should go on; it ought to be done."[32]

The second generation of fortifications at West Point were true to Tappen's and Clinton's original conception. More competent engineers blocked the Hudson with a mighty chain and covered it with the fires of forts, batteries, and redoubts on both sides. Perhaps the words of engineer Pleydell best indicate why success could be achieved at West Point in four short months in 1778, when failure had plagued the work of the previous two years:

> *It is very certain, that many, after throwing away great part of their lives in handling the scale and compass, have yet been unable, on service, to fortify posts as they ought to be; that is to say, they have not known how to take every advantage of the ground, and judge of its strengths and defects.*[33]

Bernard Romans' failure as a military engineer set in motion a chain of events that proved disastrous but not fatal in 1777. Victory would come, and Fortress West Point would play a major role.

Paradoxically, the United States Military Academy later arose at the same site. Its mission was, and still is, to train military leaders to do their job better than Romans did his.

Lieutenant Colonel Johnson is associate professor of history at the U.S. Military Academy. He has served as speechwriter for the Chief of Staff, U.S. Army. Other assignments include S-3 of 2nd Battalion, 78th Field Artillery, and REFORGER action officer for Headquarters, USAREUR. He has commanded two field artillery batteries. He is a graduate of the College of Naval Command and Staff, and holds a doctorate in history from Duke University.

All art, except where indicated, courtesy of Special Collections, U.S. Military Academy Library, West Point, New York.

Notes:

[1]Lincoln Diamant, *Chaining the Hudson: The Fight for the River in the American Revolution* (New York: Carol Publishing Group, 1989).

[2]Worthington Chauncy Ford, ed. *Journals of the Continental Congress, 1774-1789* (Washington: Government Printing Office, 1905) 2:52-53, 57, 59-60; Peter Force, ed., *American Archives*, 4th ser., 6 (Washington: M. St. Clair Clark and Peter Force, 1837-1853) 2: 844-45; George Washington, *The Diaries of George Washington*, ed. Donald Jackson (Charlottesville: University Press of Virginia, 1978) 3:330-31.

[3]George Washington, *The Writings of George Washington from the Original Manuscript Sources 1745-1799*, ed. John C. Fitzpatrick (Washington: United States Government Printing Office, 1938), 26:382.

[4]Sir Henry Clinton, *The American Rebellion*, ed. William B. Willcox (New Haven: Yale University Press, 1954), 11.

[5]Richard Palmer, *The River and the Rock* (New York: Greenwood Publishing Corporation, 1969), chap. 21; Charles E. Miller, Jr. et al., eds., *Highland Fortress: The Fortification of West Point During the American Revolution, 1775-1783*, 2d ed. (West Point: USMA Department of History, 1988), 5-8.

[6]New York. *The Journal of the Committee of Safety*, 25 November 1776, Library of Congress, *Records of the States of the United States*, Reel 1, p. 718, microfilm. (Hereinafter cited by page number from the respective New York governing body).

[7]Report of James Clinton and Christopher Tappen to the New York Provincial Congress, June 13, 1775, Force, 4th ser., 2:1296, map, 736. New York *Journal of the Provincial Congress*, 20, 40-41; Papers of the Continental Congress, 1774-1789 (New York State Papers, 1775-1788), National Archives, Record Group 360, Roll 81, pp. 286, 288-290, microfilm (M247), hereinafter cited as Papers, Continental Congress. Lincoln Diamant's poor copy of the map unfortunately obscures the letter "B" used to mark the "post" at West Point, leading him to conclude in both books that the committee had only meant to fortify Martelaer's Rock. *Chaining the Hudson*, 4, and *Bernard Romans*, 60.

[8]Lincoln Diamant, *Bernard Romans: Forgotten Patriot of the American Revolution* (Harrison, N.Y.: Harbor Hill Books, 1985); New York Provincial Congress, August 18, 1775, Force, 4th ser., 3:535; Romans to New York Committee of Safety, September 14, 1775; Commissioners to New York Provincial Congress, November 11, 1775, Force, 4th ser., 3:733-36, maps between 736-37, 1891-92; also in Papers, Continental Congress, 55-58, 272, 274, 276, 278-79; Romans, "Plan of a Part of Hudson's River Near & About the Fortifications Now Erecting in the Highlands," undated (probably late fall, 1775), USMA Special Collections.

[9]Report of Nicoll, Drake, and Palmer, December 14, 1775, Ibid., 312-19; the Continental Congress had asked the New York Provincial Congress to determine if there were other places "where small batteries might be erected," and Romans had highly recommended "Pooploop's Kill," minutes, October 7, 12 and 17, 1775, Romans, Samuel Bayard and William Bedlow to Nathaniel Woodhull, President of the New York Provincial Congress, October 16, 1775, New York, Journal of the Provincial Congress, 172, 174, 177, 179-80.

[10]Diamant, *Bernard Romans*, 15, 71, 132.

[11]Bernard Romans, *A Concise Natural History of East and West Florida* (New York: Bernard Romans, 1775; repr., New Orleans: Pelican Publishing Company, 1961), 174-75.

[12]P. Lee Phillips, *Notes On the Life and Works of Bernard Romans* (Deland, Fla.: The Florida State Historical Society, 1924), 47, 54; Diamant, *Bernard Romans,* 70.

[13]Roger Stevenson, *Instructions for Officers Detached to the Field: Containing a Scheme for Forming a Corps of a Partisan* (Philadelphia: R. Aitken, 1775); Robert R. Livingston, Robert Treat Paine, and John Langdon to John Hancock, November 23, 1775, Force, 4th ser., 3:1657-58.

[14]Romans, *Natural History,* 1.

[15]John Muller, *A Treatise Containing the Practical Art of Fortification in Four Parts,* 3d ed. (London: W. Strahan et al., 1774), 123-24.

[16]J.C. Pleydell, *An Essay on Field Fortifications* (London: J. Nourse, 1768), vi-vii; John Muller, *A Treatise Containing the Elementary Part of Fortification, Regular and Irregular* (London: J. Nourse, 1746; repr., Ottawa: Museum Restoration Service, 1968); Sebastien LePrestre de Vauban, *A Manual of Seigecraft and Fortification,* trans., George A. Rothrock (Ann Arbor: The University of Michigan Press, 1968), 157; Stevenson, 9; Muller, *Practical Art,* 124, 128-29.

[17]Romans to the New York Committee of Safety, September 14, 1775, Force, 4th ser., 735-36.

[18]Marked "C" on Plan No. 2, September 14, 1775, Papers, Continental Congress, 274. No blockhouse or battery appeared at West Point in his "plan" done in late fall; he seems to have substituted instead a battery at present-day garrison on the eastern side of the river. The sketch accompanying the report of Nicoll, Drake, and Palmer does not indicate any fortification at West Point, December 14, 1775, Papers, Continental Congress, 280-83. "He must take care not to be commanded by any neighboring heights,..." Stevenson, 10.

[19]Lord Stirling to General George Washington, June 1, 1776, Force, 4th ser., 6:672-78.

[20]Pleydell, ix.

[21]Vauban, 168.

[22]Minutes, August 18, 22, 30, September 6, October 16, 18, 23, 1775, New York Provincial Congress and Committee of Safety, Force, 4th ser., 3:535, 541, 567, 571, 880, 1290, 1295-96, 1301, 1363-64; only Samuel Bayard had accompanied Clinton and Tappen on the original survey, ibid., 2:1296; commissioners would continue to supervise construction at Fort Constitution and Popolopen Creek until June 13, 1776 when the Commander in Chief assumed control, New York, *Journal of the Provincial Congress,* 493; minutes, September 25, 1775, ibid., 158-59; New York Committee of Safety to the Continental Congress, September 19, 1775, Papers, Continental Congress, 41; John Berrien to the New York Committee of Safety, September 21, 1775, Phillips, 112.

[23]The correspondence exchange between the commissioners and Romans may be found in Force, 4th ser., 1355-67 and in Merle G. Sheffield, *The Fort That Never Was: A Discussion of the Revolutionary War Fortifications Built on Constitution Island, 1775-1783* (West Point: Constitution Island Association, 1969), 13, C-1-C-12.

[24]Captain Mott of the Connecticut militia had commented on this in his journal while enroute to Fort Ticonderoga in May 1775: "Mr. Romans left us and joined us no more; we were all glad, as he had been a trouble to us, all the time he was with us." General Philip Schuyler would later prefer court-martial charges against Romans, now the commander of a Pennsylvanian company of matrosses, in April 1776, during his march to the Canadian Department, Diamant, *Bernard Romans,* 52, 123-26.

[25]Muller, *Practical Art,* 130.

[26]Report of Clinton and Tappen, June 13, 1775, Force, 4th ser., 2:1296; Romans' estimate, September 18, 1775, Papers, Continental Congress, 55-58.

[27]Lord Stirling to General Washington, June 1, 1776, Force, 4th ser., 6:672-78.

[28]Ibid., 6:678.

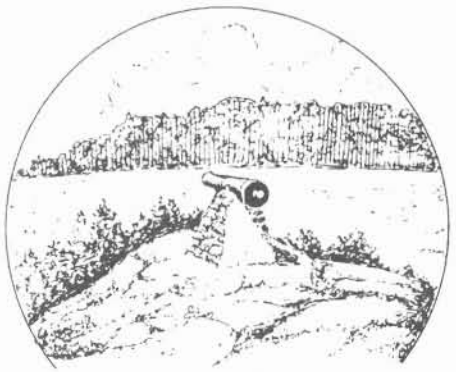
[29]Sir Henry Clinton to Sir William Howe, October 9, 1777, and Commodore William Hotham to Lord Viscount Howe, October 9, 1777, Donald F. Clark, ed., *Fort Montgomery and Fort Clinton* (Fort Montgomery, NY: Town of Highlands, 1952), 12, 14.

[30]For the most complete story of the state of the forts and their fall, see ibid., 3-16; William H. Carr and Richard J. Koke, *Twin Forts of the Popolopen: Forts Clinton and Montgomery,* New York 1775-1777, Historical Bulletin Number 1 (Bear Mountain, NY: Commissioners of the Palisades Interstate Park and the American Scenic and Historic Preservation Society, July 1937); report of Court of Inquiry to His Excellency George Washington, April 5, 1778, and Alexander McDougall to Washington, May 21, 1778, Alexander McDougall Papers, New York Historical Society, microfilm.

[31]Diamant, *Bernard Romans,* 72. Report of Francis Nicoll, Joseph Drake, and Thomas Palmer to the New York Provincial Congress, December 14, 1775, Papers, Continental Congress, 312-19; report, 4:420-22, Lord Stirling to General Washington, June 1, 1776, 6:672-78, Force, 4th ser.; New York, *Journal of the Provincial Congress,* 322, 330; minutes, February 1776, Ford, 4:133-34. (In a 2-day visit to the Highlands, Captain William Smith, the engineer of General Charles Lee, traced out the former on Gravel Hill on a site identified but not fortified by Romans because the Continental and Provincial Congresses had dismissed him as of February 9, 1776. Smith would also propose a trace for Fort Montgomery).

[32]Notes of debate, October 6, 1775, Ford, 3:485.

[33]Pleydell, xii-xiii.



HERE STOOD
"THE FORT THAT NEVER WAS"

Art courtesy Constitution Island Association

Engineers and the Army of the 1990s

By General Carl E. Vuono
Army Chief of Staff

Throughout our long and proud national history, the U.S. Army Corps of Engineers has played a unique and vital role—in both peace and war—in building and protecting this nation. From the construction of the nation's capital to the opening of the west, the Corps of Engineers has helped forge the very foundation upon which this nation rests. Throughout the land, countless bridges, waterways, monuments, and railroads serve as silent reminders of the timeless contributions of the Corps to the American people.

U.S. Army combat engineers take a back seat to no one in valor and courage in battle. Engineers like Private Junior N. Van Noy, a 19-year old from Idaho and a posthumous winner of the Medal of Honor in New Guinea, have helped defend this nation with their sweat and with their blood for more than two centuries.

As proud heirs to this legacy, the engineers of today—along with the Army they serve—are poised on the brink of new challenges and new opportunities. In this article, I will discuss the Army's view of the future and my perspectives on how the Corps of Engineers must evolve to meet our national objectives in this decade and beyond. Finally, I will discuss the single most important quality that each engineer leader must have as we approach an era of great change. That quality is professionalism.

The International Environment

No discussion of the Army's future can begin without an examination of the evolving international environment—for that environment dictates the characteristics and qualities that the Army must have to fulfill its strategic obligations to the nation. It is no secret that the current international environment is in the throes of dramatic change, particularly in Europe and the Soviet Union. Over the course of the past year, we have witnessed events of profound significance, and we have seen the once monolithic Soviet empire begin to unravel.

These are events that, first of all, demonstrate that our unrelenting defense of freedom has not been in vain. Put simply, democracy in Europe is winning, and the emerging triumph is due, in no small measure, to the selfless service of millions of American soldiers. These are the soldiers who have manned the ramparts of freedom along the Iron Curtain for four decades and who, supported by the other services and standing shoulder to shoulder with our NATO allies, have broken the back of Soviet aspirations in Europe.

But the struggle is not yet over, and the victory is not yet won. In Europe we have yet to build a new and enduring security structure from the ashes of the old order, and there remain many challenges that the free world must confront before we can pronounce that continent safe for democracy. Indeed, as we listen to the clamoring of many to cash in on the so-called "peace dividend," we must also remember the haunting words of Neville Chamberlain who, in 1938, pronounced that the world had achieved "peace in our time." As history records, less than a year later that same world was embroiled in the mightiest war in human experience—a global conflict that would consume whole nations and leave 50 million dead.

I am not suggesting that the Europe of 1990 is teetering on the brink of a world war. But the continent is clearly entering a period of great uncertainty and potential instability as newly emerging

democracies and, indeed, the Soviet Union itself, struggle with the impact of cataclysmic change. This argues strongly that the United States, in conjunction with our NATO allies, must remain a bulwark of stability and an anchor of continuity as the winds of uncertainty howl through the continent.

At the same time, we cannot ignore the emerging military power of nations in the developing world where regimes hostile to the United States are acquiring vast arsenals of tanks, artillery, ballistic missiles, and chemical weapons. These capabilities join forces with regional animosities, ethnic conflicts, religious hatreds, and the lust for economic power to create a world simmering with the potential for violence and war.

For those who would argue that warfare and conflict are relics of the past and that economic power now commands the international community, I would only point to the ongoing levels of violence that we see around the world—violence at a level that was demonstrated by the Iran-Iraq war and demands an effective ability by the United States to respond.

In the international environment of today and tomorrow, it is a cold, hard reality that military force remains a primary instrument of national power. If we are to create a better, more peaceful world in the next century, we must recognize that such a world can emerge only if armed conflict becomes such a fruitless alternative that the community of nations has little choice but to resolve international disputes in a nonviolent fashion. This, in turn, demands a powerful United States Army to deter aggression and to defend America's interests wherever they are threatened. This is an inescapable requirement for this nation and the price of admission for a superpower in the decade of the 90s and beyond.

The Corps of Engineers has a central part to play in the Army of the 1990s, for the Corps uniquely serves the nation across the entire spectrum of operations—from peacetime competition and nation assistance to international conflict and global war.

Shaping the Force

As we shape the Army and the Corps in a complex and demanding environment, we must keep our eyes firmly fixed on a simple vision of the future—a vision of a trained and ready Army today and tomorrow capable of meeting its strategic obligations anytime, anywhere.

In fulfilling this vision, we begin from an enviable baseline. Put simply, the Army of today is the finest peacetime force this nation has ever fielded. It is an Army that is built on the solid foundation of six enduring imperatives—principles that serve as an anchor of continuity in an era of change and as a beacon to steer us into the next century. I have written and spoken extensively about these imperatives, but they bear highlighting because of their central importance to the Army and to the Corps of Engineers.

First, the Army must maintain an effective and evolving warfighting doctrine—effective for today and evolving for tomorrow. In the midst of extensive discussions of maneuver and fire support, it is no exaggeration to say that the success of our doctrine of AirLand Battle—and its tenets of agility, initiative, synchronization, and depth—depend upon our engineers. This is because engineers provide our maneuver elements with the capability to move quickly, to mass effectively, and to achieve overwhelming combat power at the critical point. Moreover, engineers are crucial in shaping the battlefield to deny the enemy freedom of movement, in enhancing the survivability of our forces, and in expanding the lethality of our battlefield systems.

As our doctrine evolves into AirLand Battle-Future, the role of the engineers will become even more important to the combined arms team. Engineers at all levels must understand the Army's doctrine and, equally important, be proficient in the tactics, techniques, and procedures that bring doctrine to life on the battlefield.

Second, we must maintain a mix of forces—armored, light, and special operations—in our Active and Reserve Components. This force mix gives us the indispensable capability to tailor force packages that are appropriate to the threats we face. As an integral element of each of these forces, engineers must understand their unique capabilities and must be able to function effectively in force packages of diverse designs. Engineers from heavy units must be prepared to work alongside units from light elements, and all engineers must be capable of supporting the unique requirements of our special operations forces.

Next, we must continue to modernize the force, even in the face of severe budgetary constraints. We modernize for a single purpose—to enhance our combat capabilities. Our modernization strategy is straightforward and effective. First, we will continue to modernize those systems in which we have a significant battlefield deficiency. The forthcoming fielding of the M9 Combat Earthmover, the VOLCANO multiple mine delivery system, and the Digital Topographic Support System will address pressing needs we have in each of these areas. Second, we will accept some near-term risk by deferring, delaying, or deleting other systems. Certainly, no leader likes to accept additional risk. But, if we must accept risk to meet the constraints of the budget, now is the time to do it.

The more distant future, however, is far less certain. Accordingly, the last element in our modernization strategy is to continue to invest heavily in research and development, pushing back the frontiers of technology

Army engineers drill a well as part of our nation assistance program. Engineer efforts in this program will become increasingly important in the 1990s as we defend America's interests abroad (U.S. Army Photo).

and seeking genuine "leap ahead" improvements in weapons systems beyond the year 2000.

Engineers have a uniquely important role in the modernization process. Not only must engineers absorb and adopt new equipment themselves, they must also provide the facilities, the training simulators, and the support that make every other modernization plan work.

The fourth imperative is our uncompromising commitment to tough, realistic training. Each of us must understand one of the iron lessons of history—the more we sweat in peace, the less we will bleed in war. So every time you spend that extra hour planning training, every time you invest that extra effort in executing training, and every time you devote that extra energy to assessing training, you are investing in the security of this nation and protecting the lives of America's soldiers. As an Army, we must never back away from setting and enforcing the highest standards in training that we can possibly achieve.

The Corps of Engineers faces unique training challenges, for you must work diligently to ensure that the engineers are fully integrated in training the combined arms team. Maneuver and fire support commanders must understand what the engineers can do and how to exploit your almost limitless potential to influence the outcome of battle. Every engineer must become a tireless proponent of mobility, countermobility, and survivability, always with your eye firmly fixed on the scheme of maneuver you are supporting.

Engineers within our districts have equally daunting challenges in the training arena. You must maintain and build your technical skills while you are working on the tasks and projects that support our national infrastructure.

Regardless of your training responsibilities, however, the principles of sound training remain the same. FM 25-100 outlines the Army's fundamental concepts for training. This year we have completed FM 25-101, which provides "how to" instructions for the execution of the principles contained in FM 25-100. Together, these two manuals form a solid foundation upon which an effective training program can rest.

As the Army's fifth imperative, we continue to develop competent, confident leaders with unmatched ability—officers and NCOs who are fully capable of leading the Army to victory anywhere in the world. In the Corps of Engineers you have special responsibilities, for each of your leaders must be an integrator of combat power and must fully understand how to lead in the combined arms team. And equally challenging, our engineers must be particularly adept at dealing with civilians and community leaders around the world. You must understand their concerns and their desires as you fulfill your responsibilities in engineer districts throughout the United States and in nation-assistance operations in the far reaches of the globe.

For engineers of all ranks, your model must be engineers like General Bill Hoge, after whom the headquarters building at Fort Leonard Wood is named. General Hoge cut his teeth as a professional engineer on the spines of the Canadian Rockies, building the AlCan Highway, which remains a marvel of engineering today. He led engineers in combat in two world wars and ultimately rose to command the IX Corps in Korea. He was a leader who understood not only the technical aspects of his trade but also the integration of combat power that is fundamental to victory. His is a proud legacy to which every engineer should aspire.

Tomorrow's Army will depend on highly trained engineers who are capable soldiers and experts in the art of war. Competence and the willingness to accept responsibility are hallmarks of the professionalism demanded of soldiers now and in the future (U.S, Army photo).

The final imperative—last listed but first in importance—is to maintain a quality force. Throughout the ages it has been the quality of the soldier that has made the difference in battle and has determined the fate of nations. Quality is the very foundation of the entire Army and, indeed, of our national defense.

And quality is particularly vital to the Corps of Engineers for, whether in the crucible of combat or in the building of nations, your work is of singular importance. By the very nature of your tasks, engineers are often required to work individually or in small groups with little supervision. This, of course, requires the highest quality soldier our nation can produce. We achieve that quality in the Army and in the Corps by establishing an environment that attracts young Americans into our ranks and encourages our veterans to remain. This must be an environment that fulfills each soldier's highest expectations for personal growth and professional achievement.

These are the Army's six imperatives and the principles by which we must shape the Corps of Engineers for the future. Building on these imperatives, we have created an Army of unchallenged capability today. By sustaining these imperatives, we will maintain the Army that our nation needs in the challenging times ahead.

Vision of the Army

As good as the Army is today, and as competent as the Corps of Engineers has shown itself today, we cannot stand still. In an era of historic change and unprecedented challenge, we must move forward aggressively to shape the Army to meet our national responsibilities and to respond to increasingly austere budgets. We must apply the lessons of the past and take command of our own destiny. For if we do not, someone else will.

In forging the Army of tomorrow, we are guided by a single, clear commitment. We will not compromise, equivocate, or yield on the six imperatives. Even under the most Draconian budgetary constraints, we must never accept an Army that is undermanned, ill-equipped, or poorly trained—an Army that we allow to be fractured by the budget or one that will be neither credible for deterrence nor capable of defense.

Our choices are clear. We can either maintain an artificial force structure at the expense of training and readiness, or we can build a smaller force in which our standards of training and readiness are not sacrificed. Although it is painful to take down the flags of proud divisions, that is the road we must take if we are to maintain the trained and ready Army that our nation will require in the tumultuous decade ahead.

Accordingly, over the course of the next five years, we will carefully, deliberately, and gradually shape a smaller force, including a smaller Corps of Engineers. We will shape the force based on the Army's overall plan that we have developed and refined over the course of the past two years—a plan that has our strategic responsibilities as its foundation and takes into full account both the evolving international environment and the budget realities we confront.

If we adhere to this plan, we will continue to have an Army that has the vital characteristics needed to

support our nation's security. It will be an Army that is versatile in its ability to respond to crises, conflicts, and contingencies worldwide—from Central America to Europe; from the Persian Gulf to Northeast Asia. We will be an Army that is deployable—able to project significant land forces quickly to trouble spots around the world. And we will be an Army that is lethal—lethal to fight and win on any battlefield, against any enemy, anywhere our interests are threatened.

The Corps of Engineers is central to each of these characteristics, for you provide the Army the indispensable ability to move throughout the length and breadth of the battlefield, to survive in an era of unprecedented destructiveness, and to dictate the shape of combat to an enemy.

Professionalism

The Corps of Engineers has a bright future as an integral component of the trained and ready Army and as a national asset of enormous value. For those of you who are facing uncertainty as we shape the Army for the future, I say to you: Do not fear the night. The Corps of the 90s will be a challenging, exciting, rewarding place to be, and the engineers will always have room for quality men and women, in both the Active and Reserve Components.

As you prepare yourselves to meet the challenges of this Army in a brave, new world, there is an overriding characteristic that each engineer must adopt as a personal creed. That characteristic is professionalism—only a single word but a powerful concept that embraces all that you can be, all that you must be, and all that you shall be. I have written about professionalism in other fora, but I want to reiterate the components of this vital characteristic because they are of singular importance to the future of the Army and to the lives of each engineer.

First, Army engineers must be competent in the profession of arms, expert in the art of war, and the most capable engineers this nation can produce. Competence is not an inherited trait; it grows from study, discipline, and plain hard work. Throughout your careers, you must continuously acquire expertise from our educational institutions, both military and civilian, from your operational assignments, and from your own independent efforts.

This must be an ongoing process, for the world does not stand still. Onrushing technology, changes in doctrine, and the evolution of the challenges we confront demand that competence be built and sustained throughout an entire lifetime. And your competence must extend far beyond the confines of engineer tasks. In order to properly apply your expertise, you must be knowledgeable in every element of the combined arms team—you must understand the principles of maneuver, fire support, command and control, and every other battlefield operating system that is influenced by the work of the engineers.

But competence alone is not enough. To be a professional, you must willingly embrace responsibility—responsibility for the performance of your unit and responsibility for every soldier with whom you serve. Engineers share a special responsibility to the rest of the combined arms team; you deal in tactics, techniques, and procedures that may not be fully understood by the units you support. You must persevere in the sure knowledge that your efforts may well determine the difference between victory and defeat and will certainly decide the fate of great numbers of soldiers.

Finally, a professional must be committed to the profession of arms and to the nation. You must be willing to serve in the difficult assignments and in the isolated posts, and you must be prepared to give your life for the defense of the nation. It is this commitment that lends meaning to sacrifice, and it is this commitment that lends honor and humility to personal achievement.

These qualities of competence, responsibility, and commitment make up the professional of today—a leader of rare distinction and an asset to be carefully nurtured throughout an entire lifetime.

Conclusion

Perhaps at no time in our national memory does the Army offer such challenge and such opportunity. Our profession asks much of us, but that is not surprising, for ours is a special calling. We are entrusted with an awesome responsibility—the protection of a great nation and the defense of freedom worldwide.

Engineers throughout the world should take enormous pride in the important contributions you are making to the preservation of the ideals upon which this nation was founded. To people all over the world—to those who have freedom and those who aspire to it—the American soldier is the embodiment in the ideals and principles of individual liberty for which the United States stands. And often the American soldier is represented by the young Army engineer helping to build a road, a school, or a bridge, and symbolizing for many the hope of a better life.

You and I have a sacred obligation to our fellow soldiers, to the U.S., and to freedom everywhere. We can never relax our efforts to maintain a trained and ready Army and a Corps of Engineers second to none. I ask that every engineer in the Army now rededicate yourself to the spirit embodied in your motto as we confront the challenges of tomorrow: *Essayons—Let Us Try*. No nation could ask for more.

STRAC:

By Captain Jim Glass

Training with mines and demolitions is dangerous. It is also a necessary part of preparing engineers for combat. And the job of teaching soldiers these skills is tough enough without having to wrestle with the system to get the munitions you need for training.

For the foreseeable future, the expected reduction in training funds will require leaders to make ingenious use of increasingly limited resources to produce combat ready engineers. The Standards in Training Commission (STRAC) provides some answers to these challenges.

As a company commander in the 9th Infantry Division, I knew that the S-3 and S-4 used STRAC to determine how much ammunition and munitions (Class V) I would receive in a given year. I even reviewed STRAC in the vain hope that I could increase the amount of ammunition my company would get.

No such luck.

The assistant S-3 who managed the 15th Engineer Battalion's ammunition account could only get the ammunition that was available at division. If there was a

A Training Strategy that Works

shortage of mines, for instance, then those precious munitions were divided equally among the companies.

The only bright spot in this picture was the hope of a training bonus at the end of the year. If a fellow engineer or other combat arms unit had been too busy to use up its allocation—or had done a lousy job of planning its training schedule—I could often get my hands on the leftover Class V. What also helped sometimes was being able to get munitions through the maneuver units we were attached to during training. Often, they were able to provide most of the Class V we needed.

One thing that STRAC does well for the average commander is to outline training strategies vital to the process of becoming an engineer. After becoming familiar with STRAC, I knew how many times a year to train mines, demolitions, and other weapons to be considered a qualified, competent engineer unit. I also knew the recommended ammunition requirement. Not only did I know this for engineers and engineer systems, but I also knew what my fellow combat arms units needed.

Common Standards

The STRAC program is managed at the Army Training Support Center (ATSC) at Fort Eustis. The program provides commanders and other unit trainers with a common set of standards for weapons and weapon systems qualifications. Suggested weapons training strategies outline the minimum attainment and sustainment standards needed to be a proficient engineer. These standards are measurable and will assist the commander in evaluating a portion of his unit's overall training readiness.

The Engineer School (USAES) analyzes proponent training strategies and munitions allocations for mines, demolitions, and the combat engineer vehicle (CEV). The Infantry School recommends the strategies to qualify with all small arms, anti-tank weapons, and claymore mines. The other proponent branch systems and weapons (e.g. howitzer, tank, etc.) do not directly apply to engineer units.

The revised DA Pamphlet 350-38, *Standards in Weapons Training (STRAC)*, is scheduled for publication in October 1990. It

One thing that STRAC does well for the average commander is to outline training strategies vital to the process of becoming an engineer.

has some new training strategies and ammunition allocation recommendations that will change how engineers train.

It does not, however, completely resolve some issues that are still being debated in the engineer community and the Army.

The Engineer School conducts a biannual Council of Colonels to review changes submitted in the engineer arena. These recommended changes come from the engineer community and other branches of the Army that train with mines and demolitions.

The Engineer School's Directorate of Training and Doctrine (DOTD) coordinates requests for changes, and facilitates the analysis to support justified requests. All requests, by the way, are considered justified unless sound reasons are found that cause them to be rejected. The approved recommendations are then submitted to ATSC for approval and funding.

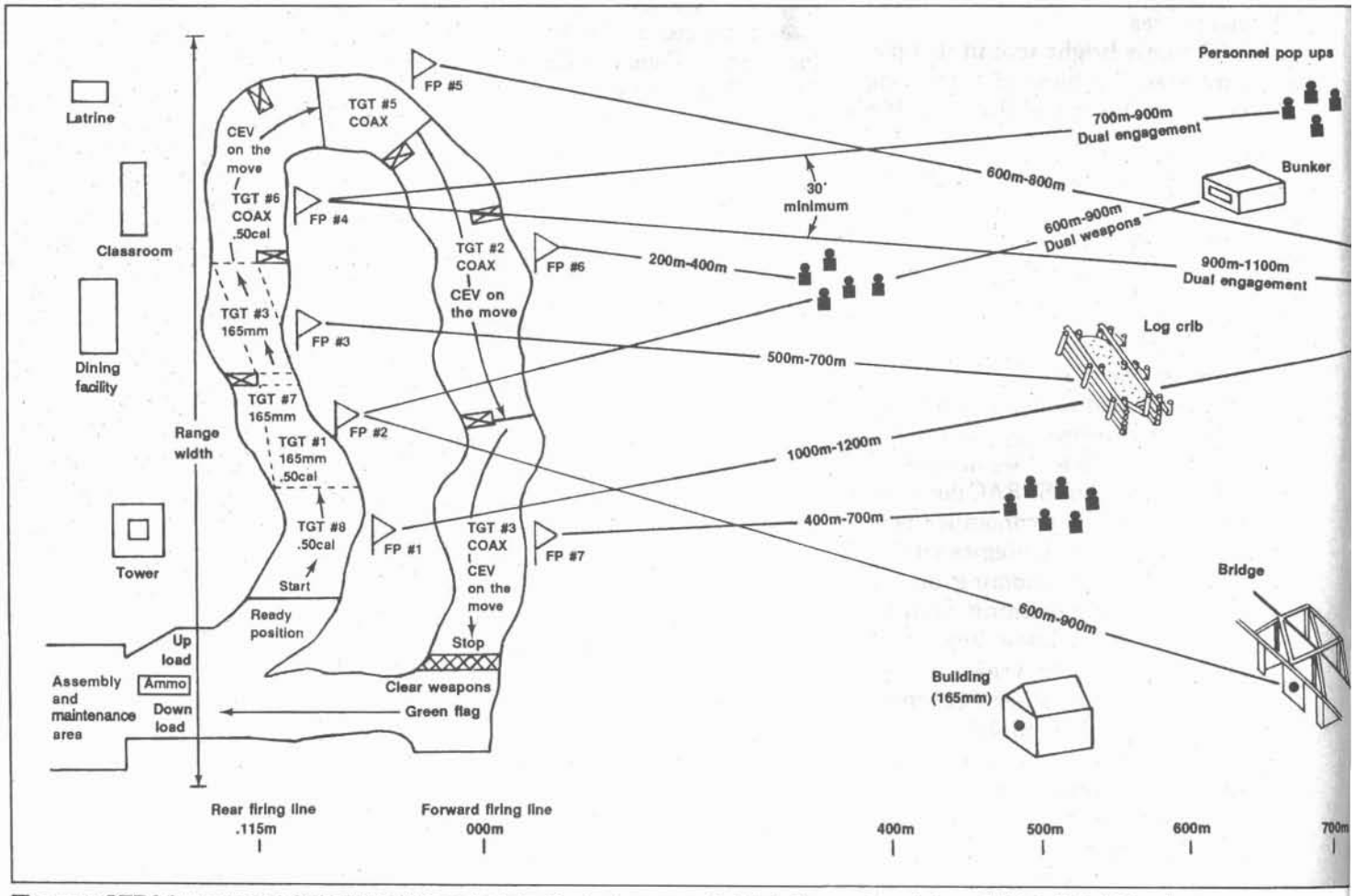
The 1990 STRAC revision changes the training readiness conditions (TRC). These TRCs contain recommendations on how much Class V you get, and how many times you must train to be considered qualified.

The Department of the Army assigns TRCs on an annual basis. Factors considered in assigning TRCs are deployment times, contingency missions, prepositioning of materiel configured to unit sets (POMCUS) fill, and home station locations. In general, TRC "A" units are those in the Active Army. TRC "L," which replaces the old TRC "B" category, will represent those units in the light infantry divisions. TRC "C" covers the reserve units.

An Issue At Point

During the on-going STRAC process, one of the issues coming under close scrutiny by the Engineer School and by the Army is live mine training. While DA has temporarily banned the use of live mines for training, the Engineer School advocates that engineer units must be allowed to use antitank mines in training. Such training should be conducted, according to the engineer community, based on a unit's mission essential task list (METL), a risk analysis by the chain of command, and the amount of Class V available.

The use of live mines to train the individual skills that support such tasks as installing a point minefield or conducting a hasty minefield breach will insure that engineer soldiers and leaders are

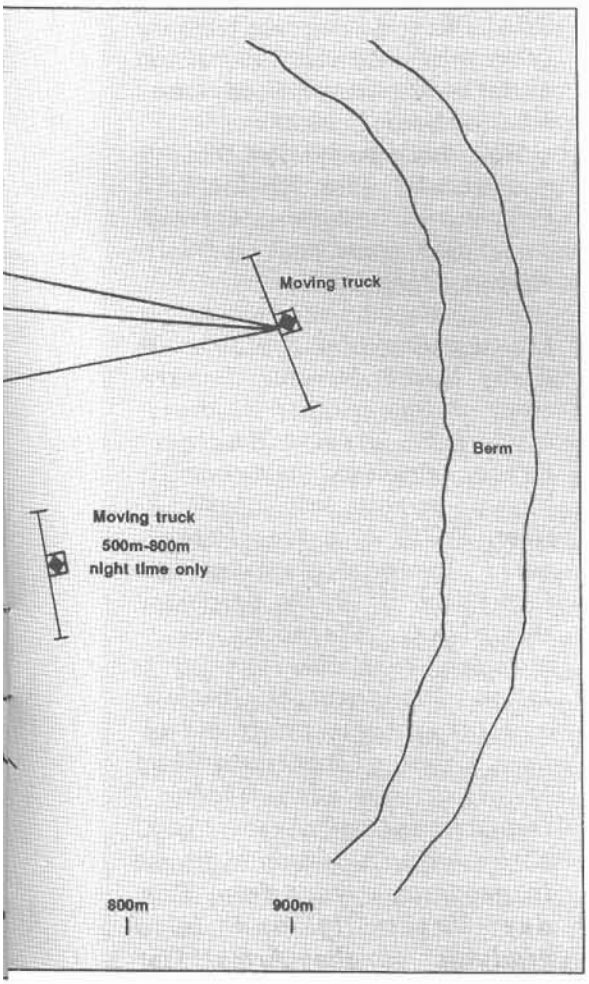


The new STRAC-approved CEV Table V is scheduled to be incorporated into the next revision of TC 5-117, *"Combat Engineer Vehicle Operations."* The expanded table will permit multiple engagements and firing on the move.

able to gain a firm appreciation for mine capabilities. Allowing a soldier to uncrate, arm and detonate the actual munitions will give that soldier more confidence in his ability to accomplish his wartime mission.

The Engineer School maintains that there is no valid reason why engineer units, using proper safety procedures, should be denied the use of live anti-tank mines in training. The risks associated with live mine training are no greater than those associated with infantry "live battle runs" or combined arms live fire exercises (CALFEX). These exercises, like live mine training, require complex coordination and stringent safety procedures.

History supports the Engineer School's position that live mine training is safe. Mine injuries in the recent past have been due to human error. Accidents happen when mine placement or mine arming/disarming procedures are not followed.



Because of this, the Engineeer School is conducting a risk analysis of live mine training. The Engineer School is using a new method that has been developed by the United States Army Safety Center (USASC). USASC has provided assistance in this effort by sending safety experts to the Engineer School to take part in joint work sessions. The resulting proponent risk assessment is the prototype for other schools and posts.

TRADOC and DA are currently reviewing the risk assessment, and initial feedback indicates they will support the Engineer School's initiative.

Some have raised the concern that engineers will train with live mines in ways that create risk. One issue involves the risk of excessive arming and disarming of mines. This may have some foundation, especially with anti-personnel mines, such as the M14. Individual tasks like these will be trained using inert mines, as outlined in the STRAC regulation.

However, mine systems that are unsafe in training should not be used in wartime either. The Army is working to eliminate faulty or dangerous mines.

The Engineer School will recommend, in the final risk assessment, which mines can be trained "live," and how many times a live mine can be armed or disarmed before it is destroyed. These are artificial constraints placed on training, based on the availability of live mines.

Another example of the Engineer School working with the STRAC system involves the use of live anti-handling devices on inert training mines. The Engineer School is proposing that live devices, such as the M1, M1-A1, M3, M5 and M142, be trained with inert activators/-boosters. Units would also be allowed to use trip wires.

In the event of error during assembly or disassembly, the flash/bang would come only from the replaceable percussion cap inside the standard. The danger of minor injury is negligible and is offset by the valuable training experience for soldiers.

The Army is developing one universal anti-handling device, the M142, which will ease training and stockage issues. Until all other stocks are depleted, however, the Army must continue to train on all types of anti-handling devices.

Live mine training, including the use of live anti-handling devices, is intended to replicate wartime conditions. It is not intended, however, to replace inert training aids such as the place training mine (PTM) kits. Rather, inert training will prepare soldiers to train with live munitions. Inert training also provides reliable sustainment training.

But there is no good substitution for hands-on live mine training.

STRAC and the CEV

Changes and additions are also being made to the combat engineer vehicle (CEV) gunnery program under the revised STRAC. Until a future generation vehicle, such as the combat mobility vehicle (CMV), is fielded sometime near the turn of the century, the CEV will figure prominently in the future of all engineer operations.

A new STRAC-approved CEV Table V, which significantly improves realism and training value, is scheduled to be incorporated into the next revision of TC 5-117, *Combat Engineer Vehicle Operations.* The old table uses static firing with single engagements, while the new table allows for multiple firing and firing on the move.

Another product of the STRAC program is the XM970, a 40

millimeter (mm) subcaliber device that allows more CEV main gun firing. The device is scheduled to be fielded at Fort Leonard Wood this year and to other units in 1991. While it doesn't duplicate the exact trajectory of regular practice rounds, the XM970, which is shaped like a regular 165mm round, allows excellent realism for a subcaliber device.

Other systems and training devices to be integrated into STRAC in the near future include the Volcano, a multiple-delivery mine system, the Modular Pack Mine System (MOPMS), and the Tactical Explosive System (TEXS). A complete list is in the USAES' Systems Handbook. The handbook, while not distributed Army-wide, is issued to all engineer officers attending their basic and advanced courses.

Smart use of existing ammunition and judicious application of STRAC will result in training strategies that will produce qualified engineers. Become familiar with the STRAC system. If you think there is a need for changes in the allocation of munitions or in the standards for training with them, let us know how you feel. The Engineer School has a good track record for getting the changes needed by line units.

Remember, if you don't ask for changes, then someone will decide that what you already have is sufficient.

Captain Glass serves as chief, Collective Training Branch, Directorate of Training and Doctrine, U.S. Army Engineer School. Previous assignments include platoon leader for the 2d ACR, company commander of B Co, 15th Engineer Bn (CBT), and as the assistant division engineer of the 9th Infantry Division (MTZ). He is a graduate of Combined Arms and Services Staff School and has a bachelor's degree from Mankato State University, Minnesota.

(Personal Viewpoint continued)

commonly used basis in the organization of a command. The geographic area determines the size and nature of assigned forces, and the extent of authority exercised by the commander so that he may implement strategic plans and guidance. The impact of military geography influences the doctrine, organization, materiel, training, and logistics requirements of the forces and the feasibility of different military courses of action.

The Army makes engineers responsible for environmentally related disciplines (topography, hydrology, and environmental sciences) and military construction and related nation assistance. Engineers impose their support on the battlefield and dictate its environment before, during, and after combat. Engineer preparation of the battlefield alters and overcomes the terrain and cultural developments.

We engineers must use the broad scope of military geography in battlefield planning and execution because we will be called upon to restore the environmental infrastructure after the battle. For military engineers, the study of military geography must become as much a part of our professional development as tactical support, engineering design, and project management. We must anticipate the where of the battlefield, and why its environmental character has relevance to the support we give. Engineer terrain expertise must evolve to military geography expertise in order to execute our geographically diverse engineering missions. These missions range from nation assistance in the Americas to combat support and sustainment of the strategic Army force in Southwest Asia.

As the nation's engineer, the Corps of Engineers has an organizational structure to support the battle environment requirements of the Army, joint commands, other military services and agencies, and U.S. foreign military commitments. The Corps can provide operational support through its tactical units, laboratories, and civil works elements.

I propose that the Corps of Engineers pursue a fully integrated environmental mission to formulate and coordinate policy, and to provide direction and oversight of battle environmental support and training to the Army, joint commands, and other DoD services and agencies. Engineers should be trained to apply their military engineering to nation assistance and battlefield environments on a firm foundation of military geography. To do this, I propose that the Engineer School set the example for TRADOC and integrate military geography into our instruction at the basic officer and advanced NCO and officer levels.

Well, that's my opinion. What do you think? The ENGINEER Professional Bulletin and I welcome your comments and curriculum suggestions.

Lieutenant Colonel Robert F. Kirby is the director, Department of Topographic Engineering, U.S. Army Engineer School. Previous assignments include terrain intelligence officer, 517th Engineer Detachment, Vietnam; commander, Company B, 69th Engineer Battalion, Vietnam; commander, 29th Engineer Battalion (Topographic), Hawaii; and topographic programs officer, Office of Assistant Chief of Staff for Intelligence, Department of Army. LTC Kirby holds a master's degree in geodetic science from Purdue University and is a graduate of the Army War College.

Fast-Water Bridging at Night:

High-Risk Training

By Major Randolph L. Hessman

The operation started smoothly and according to plan. An engineer platoon was conducting night rafting operations in fast-moving water. A bridge truck, loaded with a bridge erection boat, backed onto a riverside ramp and parked. The operator put chock blocks in back of the front wheels and set the electric (hydraulic) brake switch. Then he climbed into the boat to prepare it for launching.

Because the truck operator was not on the water and was not yet involved in water-crossing operations, he did not wear a personal flotation device (PFD). He could not swim and was, in fact, afraid of water.

When the soldier moved to the stern of the boat to check a bilge drain plug, the vehicle began to roll. Neither the brake nor the chock blocks held the truck, and it rolled into the water with the boat still secured. Within moments, the force of the water turned the vehicle downstream and broke the port bow tiedown. The boat capsized, and the sinking truck dragged it to the river bottom.

The soldier panicked when he fell into the swiftly moving current. Within seconds a strong undertow pulled him beneath the water, and despite rescue attempts, he never resurfaced.

Analysis

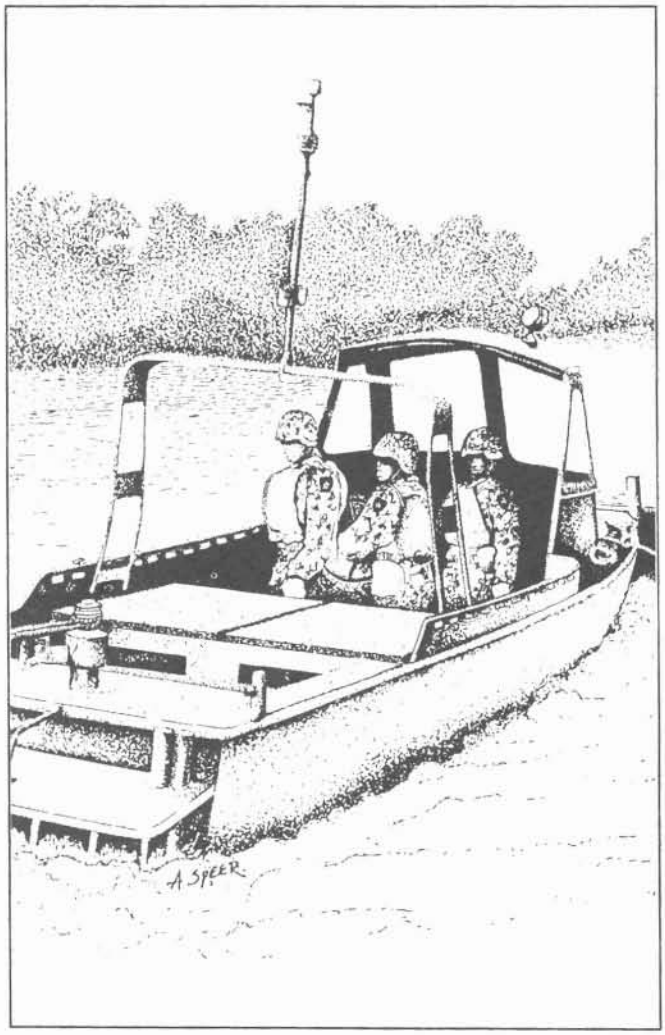
An analysis of this accident determined that several factors contributed to it.

▶ A critical factor was the lack of a PFD on a nonswimmer—a nonswimmer who was afraid of water despite completion of two drownproofing courses.

▶ The electric (hydraulic) brake was disconnected at the time of the accident. The operator did not know this—he pressed the switch and thought the brakes were engaged and holding. Because it positively holds the bridge truck in position during launching and retrieval operations, the brake lock is an important part of the safety system.

▶ The parking brake was not set. Current Department of Army publications are contradictory about the necessity of this requirement. Only the operator's manual for the bridge transporter (TM 5-5420-209-12) requires the use of both brakes.

▶ The chock block placed behind the front wheels could not hold the vehicle on the inclined ramp, particularly when the soldier moved around in the stern of the boat. His movements lightened the load on the front wheels. In addition, the chock block was positioned before the electric brake was applied, giving the false impression that the brake was working.



Although fast-water training is dangerous, personal floatation devices (PFD) can reduce the severity of accidents. PFDs are required any time soldiers (swimmers and nonswimmers) work over water.

The safety boat should be the first craft launched during a bridging operation. A trained lifeguard should remain onboard this boat until all training is completed (U.S. Army photo).

Lessons Learned

Several lessons learned from this accident may help prevent similar ones in the future.

▶ Ensure all soldiers put on their PFDs before climbing into a bridge boat that is either on, over, or near the water. It is especially critical that nonswimmers wear PFDs whenever they are around water hazards.

▶ Designate a PFD control area around all water operation sites, and require that PFDs be worn while personnel are in this zone.

▶ Engage both the electric (hydraulic) and the parking brakes during boat preparation, launching, and retrieval ramp operations. Upcoming changes in technical manuals (TM) will reflect this requirement. In the future, TMs and soldier training products (STP) will describe the electric (hydraulic) brake as the "brake lock."

▶ Do not use chock blocks during launch or retrieval operations.

▶ Ensure that a qualified operator is in the vehicle cab at all times when the truck is parked on an inclined ramp and during launch/retrieval operations.

▶ Check the brake lock (electric [hydraulic] brake) during pre-operation PMCS. Upcoming changes in TMs will add this check.

▶ Designate lifeguards, train them to Red Cross standards, and provide them with rescue equipment. Post a lifeguard with rescue equipment downstream immediately upon arrival on site. Ensure a lifeguard is on the first boat (safety boat) launched.

▶ Develop and rehearse emergency water rescue drills. Contact the Engineer Branch Safety Office for assistance (AV 676-5200/5002 or (314) 563-5200/5002).

▶ Do not expect nonswimmers to help themselves when they enter the water. They panic—even those wearing PFDs. Visually identify nonswimmers with white arm bands, reflective armbands, or chemlites (as visibility conditions dictate). They allow the lifeguard and chain of command to keep track of these soldiers at all times and enable rescuers to find and retrieve them quickly.

▶ Remember, nonswimmers panic. They may not yell for help. They may not hold onto a flotation device, and they may attack rescuers. Nonswimmers may have trouble keeping their heads out of the water even when wearing PFDs. The chain of command should consider these individuals' special needs when conducting water operations.

▶ Reduce the risks associated with fast-water training at night by:

- Verifying equipment operability
- Demonstrating soldier training competency in lighted, calm water conditions
- Ensuring soldiers are in optimum condition (rest, morale, and training)
- Rehearsing rescue operations

A leaf floating calmly on the surface of a river does not reflect the tons of water force that strike a boat or bridge bay when it enters fast-moving water. Swift currents, cold water temperatures, and strong undertows can quickly overcome even the strongest swimmers. Out-of-control boats, bridge bays, or soldiers will be swept downstream and will smash into, through, or under obstacles in their path.

Fast-water river crossings are hazardous, high-risk operations that are critical to the Army's success in battle. Leaders contribute to the success of the entire mission or battle when they take measures to stop water-crossing accidents.

Major Hessman is the Combat Engineer Military Systems Safety Manager at the U.S. Army Safety Center, Fort Rucker.

Obstacle Breaching and Marking For Squads

By Sergeant First Class Bruce Rider

In combat, when units lose the ability to conduct a breach using mine clearing line charges (MICLICs) or mechanical means, forward momentum doesn't have to stop. Both engineer and infantry squads should be trained and resourced to hand-breach and mark minefields and wire obstacles.

The first unit to reach an obstacle must be able to create a breach wide enough to allow assaulting forces to pass through. The lanes must be clearly marked so units do not become disoriented and lose valuable time.

Too often though, maneuver units wait for engineers to clear an obstacle, or engineer squads are short of breaching and marking materials.

What I recommend here is a breaching and marking materials list for infantry and engineer squads. I've based this article on my own experience at the National Training Center (NTC), and on published engineer battle drills.

Before we discuss breaching, we must identify the type of obstacles we are preparing to breach. The NTC Opposing Force (OPFOR) emplaces surface-laid anti-tank minefields with three to four rows. The distance between mines is 4 to 6 meters and rows are 20 to 40 meters apart. Thus the minefield could have a depth of up to 120 meters. The normal density is 550 to 750 mines per kilometer of front. Minefields supporting a fire sack (kill zone) normally have a wire fence on the enemy side, while flank protection obstacles generally do not.

What is the goal of a maneuver unit when it approaches a minefield? Obviously, the unit would prefer to bypass the obstacle, but that is a decision to be made by the unit commander. When a unit bypasses a minefield, both the obstacle and the bypass route must be marked so that follow-on units are not delayed.

If bypassing is not feasible and the obstacle must be breached, FM 5-101, *Mobility*, states that the initial lane must be at least 4 meters wide to accommodate advancing vehicles. Even better is an 8-meter lane, which, given sufficient time, can be developed from an initial 4-meter lane.

At the NTC, an 8-meter initial lane is preferred. The larger lane provides a greater margin of safety, and there simply isn't enough time to come back and expand smaller lanes. After the lane is cleared, it must be marked to ensure the safe and swift movement of vehicles through the obstacle. Again, FM 5-101 calls for units to mark lanes with whatever resources are available. Markers must show the beginning and end of the lane, along with the side limits. Markings should be at least 1 foot inside the mine-free area to provide a safety margin.

There are three methods of breaching conventional mined areas: mechanical, explosive and manual. I will discuss only the manual breach method, using explosives. It requires minimal equipment, and is not as risky or time consuming

as using grappling hooks, A-frames, or removing mines by hand.

The primary techniques employed at the NTC are the use of detonating cord ring mains, line mains, or the "pop and drop" method. All of these techniques involve placing a 1-pound block of TNT next to each enemy mine.

The probability of enemy mine detonation is best with ring main, diminishes somewhat with line mains, and is lowest with the pop and drop method. However, the chances of success come at the price of increased material requirements and breaching times.

A breaching kit for the line main method requires at least 150 meters of detonating cord. The line main consists of identical lengths of detonating cord, taped together every 18 inches to keep the cords from separating.

To prepare the cord, place an overhand knot at the end of the line main on which you intend to place the initiating system. Cut 5-meter-long branch lines and tape the ends to prevent moisture from entering the det cord. Use these branch lines to prime the individual blocks of TNT. The line main should be electrically primed for command detonation, with a backup non-electric system.

To carry the line main, roll it back on the reel in which the det cord was delivered, or use the DR-8 and reeling machine you use for blasting wire. Before packing them away, prime each of the TNT charges with det cord. Wrap the cord around each block to prevent it from becoming entangled.

The ring main is prepared much like the line main. Prepare the TNT charges the same way. Keep the det cord on the shipping roll. After arriving on site, lay out the cord and cut it to the length you need. This will prevent kinks from getting in the line. As with the line main, use an electric initiating system so it can be command-detonated, and a non-electric system as a back-up.

The favorite method of emplacement at the NTC is the pop and drop. The pop and drop is not recommended by the Engineer School because of safety concerns and its somewhat diminished effectiveness. While this method is very dangerous, it is faster than forming a ring or line main, and can be extremely useful in critical tactical situations.

To make pop and drop (or individual assault) charges, the TNT should be primed with a non-electric cap, 2.5-3 minutes of time fuse, and an M60 fuse ignitor. The time fuse should be wrapped or taped around the TNT to prevent the time fuses from getting tangled together. (*Author's Note:* Although beyond the scope of this article, an excellent reference for the organization and execution of the pop and drop drill is *Sapper Techniques II,* dated August 1988, and published by the Engineer School).

With an OPFOR minefield density of 0.75 mines per meter of front, the average number of mines in an 8-meter-wide path is six, with a maximum of eight.

A carrier for eight charges can be made from an M25A1 protective mask carrier, or an M18A1 claymore mine bag.

A basic squad-sized demolition kit for manual breaching of surface-laid minefields should consist

An engineer squad member, foreground, participates in a breaching operation during field exercises at the National Training Center (NTC), while umpires look on (U.S. Army Photo).

of the following:

- 50 1-pound blocks of TNT
- 1 1000-foot roll of det cord
- 100 feet of time fuse
- 20 fuse ignitors
- 5 electric caps
- 20 non-electric caps
- 20 fuse adaptors
- 2 M18A1 claymore mine bags or M25A1 mask carriers
- 2 DR-8 reels with reeling machine and detonating wire
- 1 M35 blasting machine
- 2 crimpers
- 2 pliers with side cutters
- 1 roll of electrical tape
- 1 roll of cloth tape

This package will allow at least two breaches using any of the three methods.

To provide the signature of a deliberately laid minefield, the OPFOR places either single or double concertina on their side of the minefield. If you need to cut this wire, use grappling hooks to shake the wire first to check for booby traps. The NTC OPFOR has become particularly adept at using grappling hooks. They will attach 25 feet of 1/8-inch wire cable, 1-inch-diameter rope, or 1/16-inch-diameter chain to their grappling hooks, and attach the other end to their vehicles. The hooks are thrown over the wire, and the vehicles pull it away from the breach site.

Figure 1

This method of breaching will normally take from 30 seconds to 1 minute. Since there is always the chance that wire obstacles may be booby trapped, additional tools are needed to facilitate breaching. Each squad should carry:

- 1 pair of bolt cutters
- 2 wire cutters
- 2 grappling hooks
- 100 meters of Marline or parachute cord

Terrain is a major factor in deciding which kind of lane marking system to use. It's essential to have a system that can be easily identified by the assaulting and follow-on forces. I will explain the types of marking systems that have been effectively employed by units during their training rotations at the NTC.

Tripod with VS17 Panel. The tripod (Figure 1) is formed by bolting three long, U-shaped pickets together. The pickets are spread apart to form a tripod base, with the bolted end at the top and one leg facing the friendly forces. Attach the VS17 panel to the top and bottom of the leg on the friendly side of the tripod. To mark the lane, place the tripod on either side of the entrance and exit of the breached lane. This system is good on flat or raised terrain.

Engineer tape or Hand Emplaced Mine Marking System (HEMMS) marking tape. Tape is good for marking the limits of the breached lane. The most effective technique is to use multiple strips to delineate the right side from the left. Use two strips of tape on the right side, and one on the left. The tape should be attached to the entrance and exit markers at waist height.

Nine-foot pole with 2x2 yellow marking flag. The pole is constructed using three camouflage net poles, with a 2 foot by 2 foot yellow marking flag attached at the top. To support the pole, a 4-foot metal rod (a generator grounding rod is recommended) is driven into the ground about 2 feet. The poles are placed over the top of the rod. Any flag larger than 2 feet by 2 feet will cause excessive strain on the anchoring rod, causing it to bend in windy conditions. One unit put this setup to good use by grouping three poles, 100 to 200 meters from their breach. This provided a larger visual signature for approaching units. This system is good for rolling terrain and brushy areas.

Pyrotechnics. Colored smoke at the entrance and/or a colored star cluster can be used to tell the unit the breach has been completed. Because pyrotechnics dissipate

quickly, it's necessary to keep firing these until all units are through the breach.

I recommend that a combination of these marking systems be used (Figure 2). To initially mark the breach, place the tripods with the VS17 panels at the entrance and exit. Pop a colored smoke grenade to mark the entrance. This will allow the assault force to move through the breach. The squad should continue to improve the lane by marking its limits with engineer tape. The flag poles should be placed 100 to 200 meters from the entrance to the lane. Star clusters should then be fired to direct units to the area of the breach. Colored smoke should then be continuously employed to mark the lane entrance.

Night and limited-visibility conditions present unique problems in identifying the lane. The tripod system can still be used, but a visible light source is needed to attract vehicles at night.

Chemlights or flashlights. The entrance and exit should be marked using a color code. The entrance should be marked on both sides with green lights, and the exit with blue. This will reduce any confusion as units approach the breach. Remember, chemlights fade over time and are designed for varying durations. With night

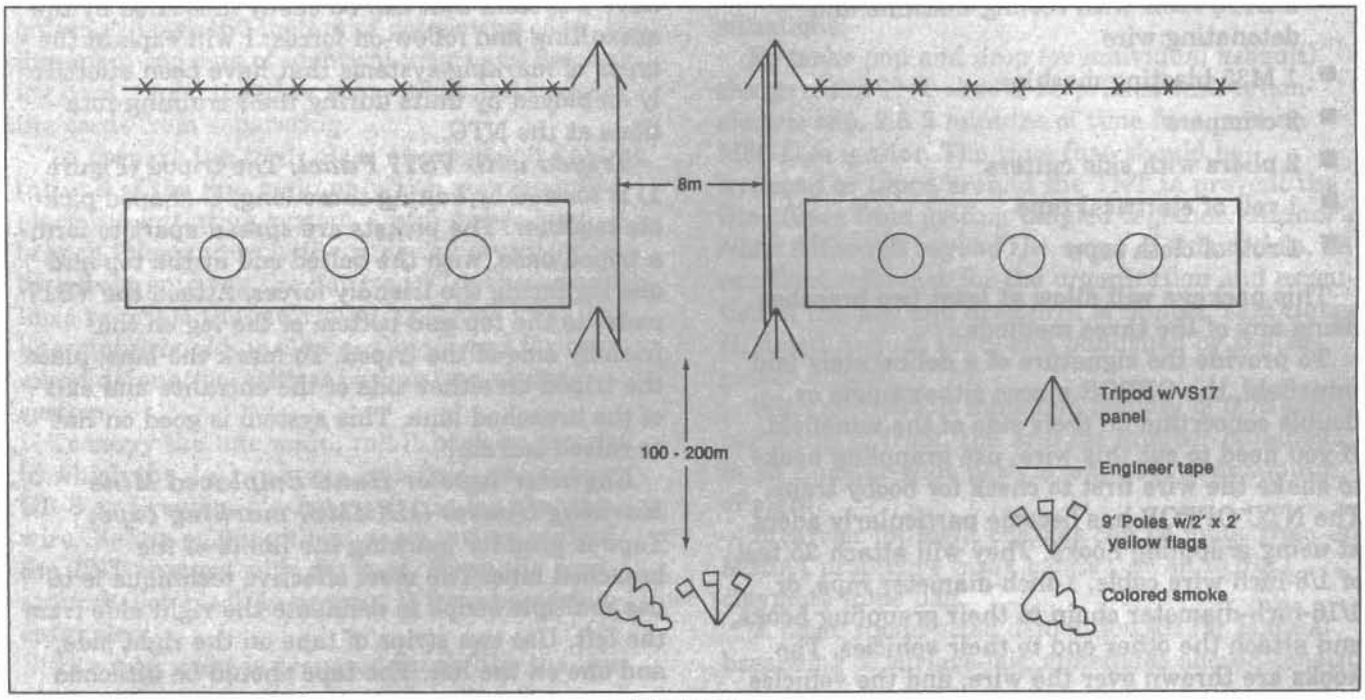


Figure 2

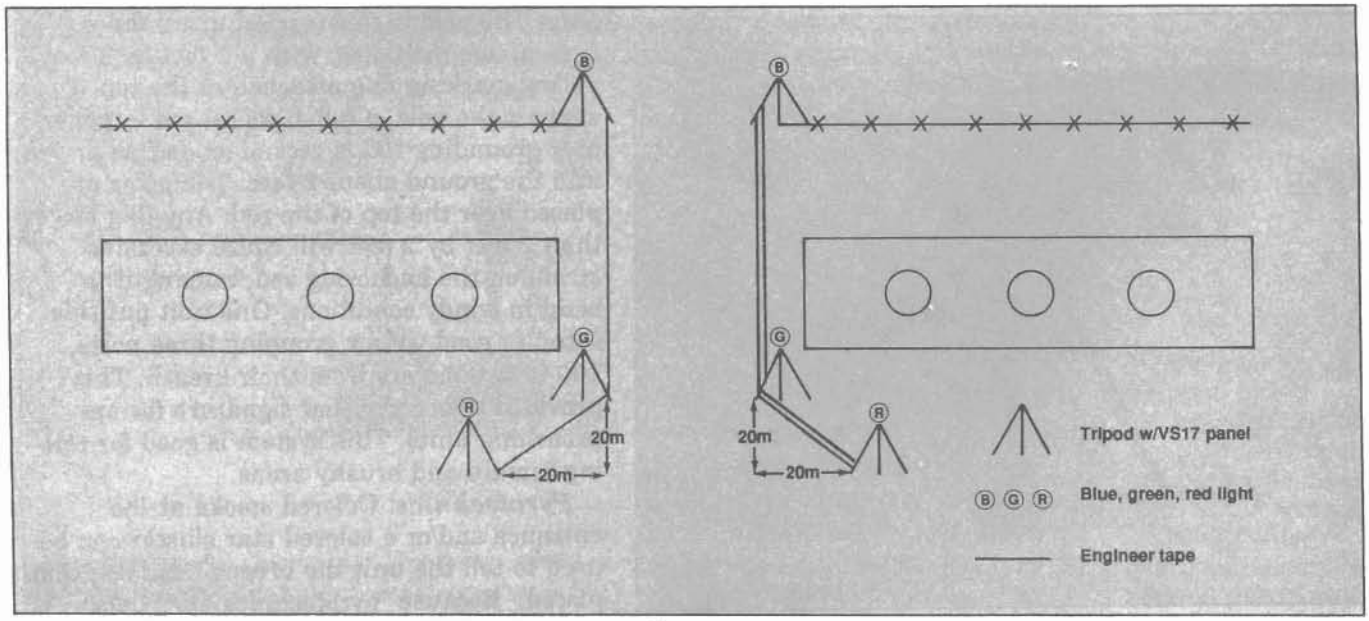


Figure 3

visibility at 50 percent or less, the lights can be seen up to 1 kilometer (km) away. A flashlight retains its brightness for up to 8 hours, and can be seen for 1 to 3 km depending on the terrain. Both chemlights and flashlights can be used as directional signals that cannot be seen from the enemy side. Remember, colors cannot be distinguished when wearing night vision goggles. A possible solution for this is to use multiple lights on the right side, and only one on the left.

Road flares. These flares last 20 minutes or longer, depending on the length of the flare. Because of its very bright, omnidirectional light, these flares work best during smoke operations or fog. Otherwise, they tend to expose vehicles to enemy fire at night.

For low-visibility situations, the best arrangement is to combine the flashlights with the tripod marking system (Figure 3 on page 32). Once a lane has been marked with the tripods, place blue or green tinted flashlights to mark it. At the entrance, place additional tripods 20 meters to the side of the lane on the minefield side, and mark these with a red flashlight. Mark the lane with two strips of engineer tape on the right, and 1 strip on the left. Smoke can obscure the lane, so also consider using a colored star cluster to mark the breach site.

The materials and techniques covered here should allow any engineer or infantry squad to breach and mark minefields and obstacles. The use of rehearsals for units from squad level through task force will ensure that a unit will be able to make a successful breach.

Even without MICLICs or mechanical clearing assistance, a well-trained squad should be able to clear the way and allow assaulting forces to maintain the momentum of the attack.

Sergeant First Class Rider is the engineer individual skills trainer for the 177th Armored Brigade (OPFOR) at the National Training Center. He has served as the brigade's operations NCO, and as a platoon sergeant in 42 maneuver training rotations at Fort Irwin.

The ENGINEER Writer's Guide

We think engineers take a special pride in their profession, and *ENGINEER* is always looking for articles from readers who want to share their expertise, experience and ideas.

If you're a potential contributing writer, here are a few "writer's guide" tips that should help steer you in the right direction:

Articles can cover engineer training, operations or doctrine, engineer equipment, history, or other areas of general interest to an engineer readership.

We're especially interested in articles that have a "how-to-do-it-better" theme. For instance, we're not looking for articles telling readers how you conducted a routine field exercise. But if you think you have a "new-and-improved" way of conducting a tactical operation, training exercise, or other operational procedure that may prove helpful to other engineers—that's what we need.

Articles should generally come from contributors with first-hand experience with the subject being presented.

Avoid theatrical writing styles like: "It was a dark and stormy night...," or "...the soldier blazed through the jungle on his lumbering D7, providing a trail of freedom for the other vehicles...."

Articles should be concise, straightforward, and in the active voice.

Length should range between 2,000 and 4,000 words, and the text should be typewritten and double-spaced. Generally, each such page will contain from 200 to 250 words.

Articles containing attributable information or quotations not referenced within the story should carry appropriate footnotes.

Manuscripts must be original, unpublished, and not under consideration by another publication. Normally, you can expect a reply to your submission within two weeks after we receive it.

All submissions are subject to editing.

Contributors are encouraged to include black-and-white photos, artwork, and/or line diagrams to help illustrate your article.

Include your full name, rank, current unit and job title. Also include a list of your past assignments, experience and education, your mailing address, and daytime phone number—preferably Autovon. Send your articles to: Editor, *ENGINEER Professional Bulletin*, ATTN: ATSE-TDM-PB, Fort Leonard Wood, MO 65473-6650.

If you have any questions about an article you're working on—or considering writing—give our features editor, Phil Howell, a call at Autovon 676-7532, or commercial (314) 563-7532.

We look forward to hearing from you.

P.S.* ENGINEER *is planning to start a Letters to the Editor column soon, and correspondence from our readers is welcome.

ARTEP Mission Training Plans:

Making Life Easier

Mission training plans (MTPs) can make your life a lot easier, particularly if you're an engineer unit leader.

How many times have you had the experience of trying to fill out your unit's training schedule, and you just can't think of anything new or interesting to put on it? The operations sergeant wanted it yesterday, he's already called twice today, and the only thing you've got on the form so far is PT at 0600 every morning.

You're lost for ideas. Your unit seems to be in a rut, training on the same events every three months or so. It seems the only place to find ideas is a stack of old lesson plans.

Maybe it's time for the aspirin. Or maybe you can use an MTP for assistance in conducting your training program.

Out With The Old

MTPs are manuals which assist soldiers and leaders in line units to successfully train on collective tasks. Both the "ARTEP MTP" name and format are new. In 1989, the Engineer School published the first MTPs for the combat engineer battalion, company and platoon, and for the airborne/light/air assault combat engineer battalion, company and platoon. The chart on page 35 shows the manuals already published, and those scheduled to be published in FY91 and FY92.

The MTP manuals were previously referred to as Army Training and Evaluation Program (ARTEP) manuals. They were bulky and cumbersome to use. Unit trainers seldom used them, except when it came time for the battalion's annual ARTEP exercise. Then they were dug out from the bookshelf, dusted off, and grudgingly used for a couple of weeks.

In the past, companies spent valuable time conducting "ARTEP train-up" exercises on those things that the Mission Essential Task List (METL) said you needed to know to succeed in your wartime mission. Then you deployed to the field, with ARTEP evaluators hot on your heels for the duration. Your company and battalion "did their thing," and got an "attaboy" from the battalion commander.

Another year and another ARTEP exercise successfully completed, according to your evaluators (whose battalion you are scheduled to evaluate next month). But did your unit really get any good training from the exercise?

By Captain Robert C. Kurtz

Engineer ARTEP Mission Training Plans

MTP	Title	Publication date
5-145-MTP	Headquarters and Headquarters Company, Engineer Battalion, Heavy Division/Corps	Feb 89
5-145-31-MTP	Engineer Company, Heavy Division/Corps/Armored Cavalry Regiment	Feb 89
5-145-11-MTP	Combat Engineer Platoon, Heavy Division/Corps/Armored Cavalry Regiment	Feb 89
5-025-MTP	Headquarters and Headquarters Company, Combat Engineer Battalion (Airborne/Light/Air Assault/Motorized Division and Airborne Corps)	Oct 89
5-025-31-MTP	Combat Engineer Company, (Airborne/Light/Air Assault/Motorized Division and Airborne Corps)	Oct 89
5-025-11 MTP	Combat Engineer Platoon, (Airborne/Light/Air Assault/Motorized Division and Airborne Corps)	Oct 89
		Planned date (FY)
5-145-DRILL	Engineer Drills	91
5-145-32-MTP	Engineer Bridge Company	91
5-145-12-MTP	Engineer Bridge Platoon	91
5-415-MTP	Headquarters and Headquarters Company, Engineer Battalion (CBT) (HVY)	91
5-415-31-MTP	Engineer Company, Engineer Battalion (CBT) (HVY)	91
5-415-13-MTP	Construction Equipment Platoons, Engineer Battalion (CBT) (HVY)	91
5-415-14-MTP	Maintenance Platoon, Engineer Battalion (CBT) (HVY)	91
5-415-15-MTP	Equipment Support Platoon, Engineer Battalion (CBT) (HVY)	91
5-415-17-MTP	Construction Platoon, Engineer Battalion (CBT) (HVY)	91
5-605-MTP	Headquarters and Headquarters Company, Engineer Battalion (CBT) (HVY)	92
5-605-31-MTP	Engineer Company, Engineer Battalion (TOPO)	92
5-605-11-MTP	Engineer Platoon (TOPO)	92

HEADQUARTERS,
DEPARTMENT
OF
THE ARMY

ARTEP 5-025-MTP

MISSION TRAINING PLAN FOR THE HEADQUARTERS AND HEADQUARTERS COMPANY, COMBAT ENGINEER BATTALION

(AIRBORNE/LIGHT/AIR ASSAULT/MOTORIZED DIVISION and AIRBORNE CORPS)

OCTOBER 1989

DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

The old ARTEP manuals had other problems as well. The training standards for the tasks were long and tedious to read. The manuals were hard to use and understand, which made the training process unnecessarily difficult.

Better Guidance

The new ARTEP MTPs don't have these problems. The MTP is a lot more user friendly than the old ARTEP manuals. Their purpose, as the preface in each MTP states, is "to provide a descriptive, mission-oriented training program to be used as a guide to train the unit to perform its critical wartime missions." The MTP provides better guidance for leaders on how to successfully complete a meaningful ARTEP exercise at platoon, company or battalion level.

Training and evaluation outlines (T&EO) make up the vast majority of each MTP. They are the outlines of the collective tasks which have been deemed critical for your particular type of unit. These collective tasks were compiled from comments from the field, and by executive committees convened at the Engineer School.

Each T&EO has a number to distinguish it from other branches and from other T&EOs within each branch. The first number identifies the branch that is the proponent for that collective task. Engineer collective tasks begin with number 5. The second number stands for the unit level at which this task is performed and evaluated. Number 1 is for battalion, 2 for company, 3 for platoon, 4 for squad, and 5 for team/section. The last four numbers represent the unique collective tasks.

The T&EO explains exactly, step by step, what you need to successfully train your unit on a given task. Many junior leaders have had to write an outline for each training event, and then determine the training, resources and time required to support it. Well, the MTP takes care of all that for you.

In each T&EO, the element, task, condition and task standards are identified for each collective task. After the task standards, the T&EO lists all the steps required to successfully complete that collective task. It is nothing more than a lesson plan on how to teach and train that task—all laid out for you in an easy-to-follow format.

At the end of each T&EO, there are two items that will greatly assist trainers: individual task references, and opposing force (OPFOR) tasks/conditions/standards. Listed here are the individual soldier and officer tasks that support the T&EO. This feature allows trainers to go directly to the Soldier Training Publication (STP), and the Military Qualification Skill (MQS) Manual, to find the individual task steps which support the collective task. The OPFOR tasks/conditions/standards allow trainers to put their unit against an OPFOR element to

form that collective task under pressure.

The new MTPs also have sample situation training exercises (STX), which are a collection of T&EOs wrapped into a field training exercise. An STX is a platoon- or company-level exercise that lasts up to 72 hours. The sample STX provided in the MTP is set and ready to go and includes such things as a proposed time line and suggested resource requirements. The STX can be used as is, or modified by unit trainers as they see fit.

Getting Better All The Time

Future MTPs will contain several innovations which will make them even more useful training aids to the leader in the field. The addition of OPFOR tasks/conditions/standards will allow units to more fully test their ability to perform combat missions. Additional emphasis on integrating nuclear, biological and chemical (NBC) skills into training, and a more extensive individual soldier task list at the bottom of T&EOs should further increase the usefulness of MTPs.

In early FY91, the Engineer School will publish a drill book which lists all drills a combat engineer, an engineer vehicle crewman, or a bridge crewman might use. A drill is a critical action a small unit conducts as part of a collective task. The drill manual will be pocket-sized, which should make it easier for the average soldier to use. The Infantry School also publishes a drill book that provides engineer soldiers with valuable information on basic combat skills.

The MTP should prove to be a valuable tool for engineers. It is one way to train—but it's not the only way. It is a foundation that must be modified for each engineer unit, based on the commander's mission essential task list (METL) and that age-old acronym, METT-T (mission, enemy, troops, terrain and time). The Engineer School plans to revise and re-issue MTPs every five years, or earlier if warranted. Questions or comments concerning MTPs can be mailed to Commandant, U.S. Army Engineer School, ATTN: ATSE-TDU-C, Fort Leonard Wood, MO 65473, or by calling the Collective Training Branch at Autovon 676-7784/7786 or commercial (314) 563-7784/7786.

Captain Kurtz is a training analyst with the Collective Training Branch, Directorate of Training and Doctrine, U.S. Army Engineer School. He previously served as a platoon leader, mobility/countermobility platoon leader, company executive officer, and assistant S-3 for the 16th Engineer Battalion. He is a graduate of the Engineer Officer Advanced Course. He holds a bachelor's degree in civil engineering from Purdue University, and a master's degree in civil engineering from New Mexico State University.

Engineer Problem

Your platoon has been tasked to emplace a 500 meter (m) row minefield with a density of 0.75-0-0. You have decided to space the mines 6 m apart. Determine the number of M15 mines to order and the number of 5-ton dump trucks required to deliver the crated mines.

Reference: FM 20-32

Engineer Solution on page 44.

Hedgehogs:

Iron Animals For Engineers

By Captain John H. Breidenstine, Jr.

Well, you've seen your engineer company put up a vast array of training obstacles during this particular ARTEP, and you're proud of what your soldiers have done. The "enemy" advance is expected any time now, and you're in a vantage point to watch them try to make it through a particularly critical mountain pass. You and your men have put a day and a half of work into carefully covering the pass with training minefields.

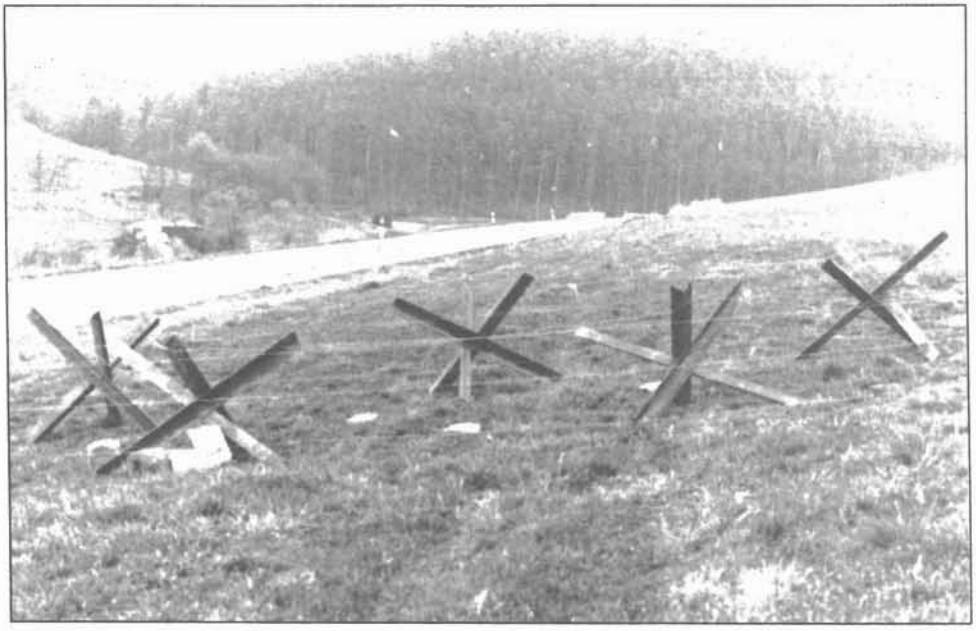
Now you can hear the roar of the lead vehicles of the infantry task force as it edges through the pass—and right through one of your "minefields." There are no umpires to be found anywhere, and the enemy charges on to outflank your own task force.

Ever wish you had something a little more substantial to put in the way of the opposing force during field exercises?

The answer may lie in the hedgehog, a training device that resembles a giant toy jack. Used by the 130th Engineer Brigade strictly as a training aid during maneuver exercises, the hedgehog has proven its worth in adding a significant amount of realism to engineer field training.

The hedgehog is a relatively simple design that consists of three pieces of 2-meter-long angle iron, and is assembled with bolts. Assembly consists of spreading apart two angle irons that are already bolted together into the shape of a cross, and then sliding the third leg into position to form the "toy jack" shape. The three are then bolted together. Each hedgehog weighs about 250 pounds, depending on the size of the angle iron.

The hedgehog is a highly visible device that requires



Hedgehogs being used to block an open field in Germany during a Reforger exercise. Such an obstacle, reinforced with barbed wire, takes a combat engineer squad of seven men about two hours to assemble and install (U.S. Army photo).

manpower not only for installation, but for removal as well. It's also "nestable," so large numbers of them can be easily stored in a relatively small space. Too, the "hog" provides the bulk weight required to simulate the amount of Class IV and V barrier material that would be needed by a combat engineer unit.

A combat engineer squad of seven men requires about two hours to assemble and install five such devices (including supporting barbed wire) on a standard-sized road. This five-hedgehog obstacle, nicknamed HEX, weighs about 1,250 pounds. A squad can transport two complete HEX obstacles on a trailer.

Additional equipment required includes several sledge hammers and crescent wrenches. Ideally, a cable should be run through the ends of each hedgehog and securely anchored at each end of the obstacle. This adds to the "enemy's" difficulty in removing it. Barbed wire should be liberally employed in and around the HEX to help deter manual breaching.

While not designed for wartime use, hedgehogs can serve as a valuable training obstacle. The best use of the device is probably as a good countermobility obstacle that would effectively channelize the enemy. They have sufficient weight and volume to discourage manual breaching, and combined with minefields and wire obstacles, they make for an effective and challenging training scenario.

Some of the hedgehog lessons learned by the 130th include:

- The devices are very manpower intensive and are an excellent engineer obstacle emplacement training drill.
- They can't serve as obstacles by themselves, but need to be supplemented by minefields, wire, or booby trap devices to reinforce their effectiveness.

Combat engineers bolt together pieces of angle iron to form a hedgehog. While not designed for wartime use, hedgehogs serve as valuable training devices (U.S. Army photo).

- Like all obstacles, they must be tied into natural terrain features to be effective.
- A disadvantage is that the hedgehog, once disassembled, is fairly easy to transport and install. Once an enemy has cleared the obstacle, it would be a simple matter for him to use it against you.

In conclusion, it needs to be restated that the hedgehog is not suitable as a wartime obstacle. It is, however, an extremely effective obstacle device that can serve your unit well in countermobility training. Give it a try. And you won't need an umpire to tell your ARTEP opponent to stop for an obstacle.

Captain Breidenstine is commander of C Company, 54th Engineer Battalion. He previously served as the assistant adjutant of the 130th Engineer Brigade. He has also served as a platoon leader. He is a graduate of the Combined Arms and Services Staff School and Engineer Officer Advanced Course.



The Command Sergeant Major

As Seen By The Battalion Commander

By Lieutenant Colonel Herbert F. Harback

Much has been said about two critical "command teams," the commander and his spouse, and the commander and his subordinate commanders. This article focuses on a third team, seldom written about but more important than the other two. It is the commander and the command sergeant major.

The halls of both officer and NCO clubs are filled with "war stories" of past tenuous commander/command sergeant major relationships. "Would have been better off without him!" "I had to do both jobs!" "He had no idea how to handle it!" These comments sum up some of the things said by both parties at one time or another.

Forming the Team

In spite of an awareness that such disconnects may exist, there still remains a void of academic guidance, field-tested procedure, and sage advice.

Both commander and command sergeant major, more often than not, find themselves "assuming" more than actually talking. Particularly when it comes to their responsibilities to one another and to the unit they serve. Seldom written about, yet key to any success their soldiers are to enjoy, the commander/command sergeant major team is not an easy one to form or sustain.

The letter which follows is one commander's view of how that relationship should be. Each time I have formed up a new command team, I have prepared such a letter for my command sergeant major. Given on the first day and informally updated on a monthly basis, it is the start of an open partnership. Although the words may change with time, and as each new team forms, the basic philosophy of command and the senior enlisted leader's role in that relationship remain the same.

The Starting Point

Five key points provide the interlacing for the team's flexibility and strength. First, responsibilities must be clearly spelled out in order to establish focus and efficiency. They also serve to provide accountability.

Secondly, the commander must understand that his command sergeant major has been successful not being an officer, and that there exists two separate and distinct career patterns. The commander may not want to be an NCO, but neither does the command sergeant major want to be an officer.

The third point is an open dialogue. Easy to say, but hard to do. Every workday there must be a huddle of the two leaders. No matter how great one may think the team is going, daily azimuth checks are needed.

Next, be honest and talk through the bad—as well as the good—days. In most cases, both commander and command sergeant major are about the same age and time-in-service, and are going through many of the same feelings. Share them in order to form a bond of trust and honesty.

Finally, there is only one commander. He must not abdicate his authority or responsibilities. He must cooperate and delegate. The commander needs to respect the command sergeant major, for he is—like the commander—only one soldier deep. Neither must be placed in a position of failure or isolation. Together, the commander and the command sergeant major form the unit's true command team.

Here is my letter:

MEMORANDUM FOR:
Command Sergeant Major

SUBJECT:
Responsibilities of the Command Sergeant Major

1. Our relationship is the single most important factor in the success of the battalion. As a team, things will click and the spirit of the battalion will be high. If we are not in harmony, there will be needless confusion and damaging frustration. The purpose of this letter is to provide to you my thoughts, expectations and initial guidance.

2. Much time was spent in developing of the 14 command policy memos. I need for you to understand each one and to enforce them wherever you go. I see your range of operations covering all parts of the battalion. Your presence should be known and sought, not avoided or feared. I consider you my main counsel and a major mentor for both NCOs and officers. I do not expect you to be with me at all times. I see us as a team, split to cover more area, but speaking with one voice. I anticipate getting together at least twice a day to discuss our sensing as to where the battalion is, and what our actions will be to keep the battalion at its cutting edge of readiness.

3. As a key leader, you need to understand the NCOs and officers—their needs, goals and responsibilities. You are not an officer candidate, you are the senior NCO of the battalion. You possess a great deal of experience which must be shared with both NCOs and officers. You are the chief advisor in CTT and engineer skills. You are the person I turn to for ITEP, NCOES, squad proficiency, schools, marksmanship, physical training and soldier certification programs. I expect for you to be an expert in all of these areas. Become personally involved in our support to Fitch School, the battalion's Developmental Physical Readiness Program, the implementation of the monthly soldier, and the new EER counseling systems. In addition, I need you to inspect the companies—their formations, training, billets, retention activities, and motor pool operations. Do not spend the bulk of your time on specifics. Rather, dedicate yourself to checking on soldier development and leadership. Meet with and work with the first sergeants and the senior staff NCOs. The battalion will rise or fall based on the caliber of leadership we find at the NCO leader levels. You are the key player in this endeavor.

4. First impressions are lasting ones and are very important. A good first impression allows us to call our own shots, keeps the established momentum going, and permits us to train as we had planned. A bad impression brings a lot of outside onlookers, uninvited inspections, and general confusion. First impressions start with the appearance of the battalion headquarters (inside and outside) and company areas. They continue with the way the soldiers act, salute, dress, train and project a solid warrior spirit. I need your help in these areas. When a person comes by, he should know he is in combat engineer country! "*Rugged*" was the motto of our regiment, and it is our motto. It is that feeling of being among professional soldiers—*rugged.* Top-notch troopers should jump out in what people see and how we feel about ourselves. Our battalion history is very important. It gives to the soldiers a common heritage and direction. It provides roots. I need for you to inculcate this positive spirit into ALL of our soldiers. Soldiers and their equipment must be in top shape, on the ready line, and leaning forward—combat ready, anytime, anywhere.

5. I look to you, as the senior NCO, to be the role model for all junior NCOs. That means you must constantly possess the values and standards of a professional leader. Your focus must be on the mission, and on the soldiers and equipment which will do the mission. Standards of conduct and readiness which you must display require exacting states of physical, mental and moral strength. You need to be totally involved in all missions which impact upon the soldier and his family—be it PAC activities, post support, field exercises, battle drills or reenlistments. I am very concerned with sole parent issues, family unrest and the proper care of the soldier and his equipment. Who is he? How is he? Where is he?

These are the three questions I want you to constantly push on all leaders in this battalion. Help me train the good leaders, and weed out the substandard ones. Our soldiers deserve only the best in leadership.

6. I have mentioned a number of items in the paragraphs above. Let me highlight the top five issues I need for you to begin work on now as you develop programs on the other points.

a. Command policy memos. Know them, implement them at all levels and at all times—starting now.

b. Upgrade of company and billet areas. We need a first class, rugged, combat soldier area of operations. No matter what the MOS, every soldier is a combat warrior. Get a winning, battle-focused spirit going in all we do and in how we look and feel. Take special time and effort in keeping the soldiers of the 761st as l00 percent members of the battalion team.

c. ITEP, NCOPD and NCOES. Get them off center and moving. Don't accept excuses when it comes to soldier skills, physical fitness, and SQT scores, as well as training, counseling and marksmanship programs. Low-density MOS training needs your immediate attention. METL focus and FM 25-100 must be the central theme of our NCOPD.

d. Power down. Place the focus at the lowest level of leadership and allow that leader to lead soldiers as he develops himself. Get accountability lined up with authority and responsibility. Make the training programs real. Hold the trainers' feet to the fire. Concentrate on CTT and battle drills. Be the advisor to officers as well as NCOs. You have the experience to help both groups. Counsel every new officer on the role of the NCO, and how to be a leader. Set up a program of transition from soldier to NCO for all promotable specialists and recently promoted sergeants.

e. Standards. Enforce them. Leaders live them all of the time. Accepting substandard performance, conduct or appearance means that we have a substandard leader who, if allowed to continue, will bring our battalion to a nonmission-capable status. Push bars on the substandards—the profile riders, the overweight and out-of-shape soldiers, the shammers, the drug users and all the others who can't cut it. Instill a battle focus in all of our actions, and total combat readiness in our soldiers and their equipment. This task force is to continue to be the hallmark of professional standards—from head to toe in all we are about and do. That includes garrison, motor pools, training areas, and on the battlefield.

7. In order to do all that I have mentioned, you and I must be a team. We need to be where the action is, anytime—day or night—throughout the whole week. We need to anticipate and assist. Above all, we must lead by example here and down range.

Where are we now? I know we have a superb battalion with strong leaders and solid soldiers. I also feel that standards need to be continually stressed. Basic field skills need help. We must also maintain a full court press on sustaining a combat focus of readiness (physical, mental and moral) in our daily operations.

8. I look to you as my partner in these efforts. If you feel any doubts about this relationship, now is the time to discuss them. We are on a fast train, and tomorrow is too late. The soldiers and junior leaders need us now. This letter is my initial counseling to you and will be the focus of our next meeting.

9. *Rugged!*

Herbert F. Harback,
LTC, EN
Commanding

Beyond The Letter

It's a start. Without this charter there can be no sense of responsibility or focus. Both the commander and the command sergeant major need to understand each other and how they will function together as a team. This letter begins that process.

But more important is what lies beyond the letter. A command will have unlimited potential if the commander and command sergeant major team takes the point and leads the unit to new levels of readiness.

Lieutenant Colonel Harback is the commander of the 14th Combat Engineer Battalion (Corps), Fort Ord. He has served in various command and staff positions, including executive officer, Bayonet Combat Support Brigade, 7th Infantry Division (Light); deputy commander, 7th Engineer Brigade, VII Corps; S-3, 7th Engineer Brigade, and aide-de-camp to the commanding general, U.S. Army Western Command.

Revised MQS System Will Enhance Officer Training

By Captain Jonathan M. Williams and Captain Thomas G. Young

The Military Qualifications Standards (MQS) System is undergoing a complete revision designed to improve its value as an officer training tool.

Previous MQS manuals have met with criticism from the field because they were too long and troublesome to use. To improve their usefulness, Training and Doctrine Command (TRADOC) directed that the system be revised.

Since that guidance was issued, all MQS products have been scrutinized and are under various stages of revision. The Engineer School is currently revising its branch MQS manual and expects to distribute the new product by January of next year.

The MQS system provides commanders with an important tool for structuring a comprehensive professional development program. It outlines critical tasks for officers, while allowing commanders to tailor the program to their unit's mission essential task list (METL).

The MQS lists the critical common tasks and professional knowledge subject areas within each task. The tasks are also identified as to their training location (resident versus nonresident). The system serves as a convenient assessment tool, allowing the commander to provide feedback to junior officers on their progress.

In April, the Engineer School conducted a selection board to determine which engineer-specific tasks would be included in the branch guide. The board had instructions to keep the manual short and concise, and avoid duplication between the branch guide and the common guide.

Both the branch and common guides contain task summary sheets (TSS). These are not meant to provide comprehensive "how to" guidance, like enlisted soldiers' manuals, but are intended to provide training outlines. As a separate, parallel effort, training support packages (TSP) are being developed which support each task with detailed information. Each TSP will be a "stand-alone" product which should give the trainer all the resources necessary to conduct training on a specific task.

Upon completion of the MQS development effort, the Engineer School will integrate the revisions into the resident officer basic and advanced courses. The new MQS materials are scheduled for their first appearance in officer classes in FY91.

The MQS I program provides tasks for precommisioning programs like West Point, ROTC, and OCS, and is entirely task oriented. This manual is undergoing final review at the Combined Arms Center.

The new MQS II program has two tiers: Tier I for lieutenants and Tier II for captains. The Combined Arms Center is currently reviewing the task summary sheets that will be included in the common guide, which is expected to be "on the street" by early next year.

The goals of the MQS II are to prepare company grade officers for their wartime missions, and to provide a sound basis for their continued professional development.

The revised MQS system is an officer professional development milestone. It will do much to guide officer training in critical engineer skills.

Questions or comments involving the development of the MQS system can be addressed to: Commandant, U.S. Army Engineer School, ATTN: ATSE-TDU-I, Fort Leonard Wood, MO, 65473, or call Autovon 676-7553/Commercial (314) 563-7553.

Captain Williams, currently in graduate school, was an analyst in the Directorate of Training and Doctrine (DOTD), at the Engineer School. He previously served as a company commander with the 35th Engineer Battalion. He is a graduate of the Combined Arms and Services Staff School. He holds a master's degree from Webster University.

Captain Young, commander of the International Student Detachment at Fort Leonard Wood, formerly worked in the Course Development Division, DOTD, at the Engineer School. He previously served as a company executive officer and platoon leader with the 10th Engineer Battalion. He is a graduate of the U.S. Military Academy.

Engineer Solution

Step 1. Determine the number of antitank (AT) mines required. Multiply the desired density by the minefield frontage:

0.75 mine per meter x 500 m = 375 mines.

Step 2. Determine the number of AT mines per row. Divide the minefield frontage by the desired spacing interval between mines.

Note: Round down the answer to the nearest whole number.

500 m ÷ 6 m = 83.3 (round down) = 83 mines per row.

Step 3. Determine the number of rows. Divide the number of AT mines by the number of mines per row.

Note: Round up the answer to the nearest whole number.

375 ÷ 83 = 4.51 (round up) = 5 rows.

Step 4. Determine the actual number of mines. Multiply the number of AT mines per row by the number of rows.

83 x 5 = 415 mines.

Step 5. Determine the number of AT mines to request. Allow for 10 percent waste. Multiply the actual number of AT mines by the 10 percent factor for waste.

Note: Round up the answer to the nearest whole number.

415 x 1.10 = 456.5 (round up) = 457 mines.

Step 6. Determine the number of trucks required. Refer to table B-1, page 249 in FM 20-32 or page 3-26 in FM 5-34.

457 ÷ 204 = 2.24 (round up) = 3 trucks.

This problem was submitted by SSG John Chester, an instructor in the Mine Warfare Branch, Department of Military Engineering, U.S. Army Engineer School.

LESSONS LEARNED

By Captain Martin B. Dorey

The following Lessons Learned apply to equipment, mobility, and survivability issues. Derived from after action reports submitted by the National Training Center, they are in the engineer lessons learned data base. For more information, write to Commandant, U.S. Army Engineer School, Attn: ATSE-ES-AL, Fort Leonard Wood, MO 65473-6630. Or, call (314) 563-5321/5339, AV 676-5321/5339.

ISSUE: Structural and curb damage to the Armored Vehicle Launched Bridge (AVLB).

DISCUSSION: The class 60 AVLB has sustained structural and curb damage because the M60/M48/M88 and M1 family of vehicles are driven at excessive speeds.

RECOMMENDATION: The Tactical Army Command (TACOM) imposed the following restrictions in a "Safety of Use" message issued in June 1987, subject: Operational Crossing Restrictions for Class 60 Bridge, Armored Vehicle Launched (NSN 5420-00-522-9599). These restrictions apply to combat vehicles that exceed a 50-ton vehicle weight.

- Vehicle must be centered on bridge.
- Maximum crossing speed is 8 miles per hour (13 km/hr).
- No stopping, accelerating or gear shifting while on the bridge.

All subordinate units and operators of vehicles exceeding 50 tons must follow these restrictions.

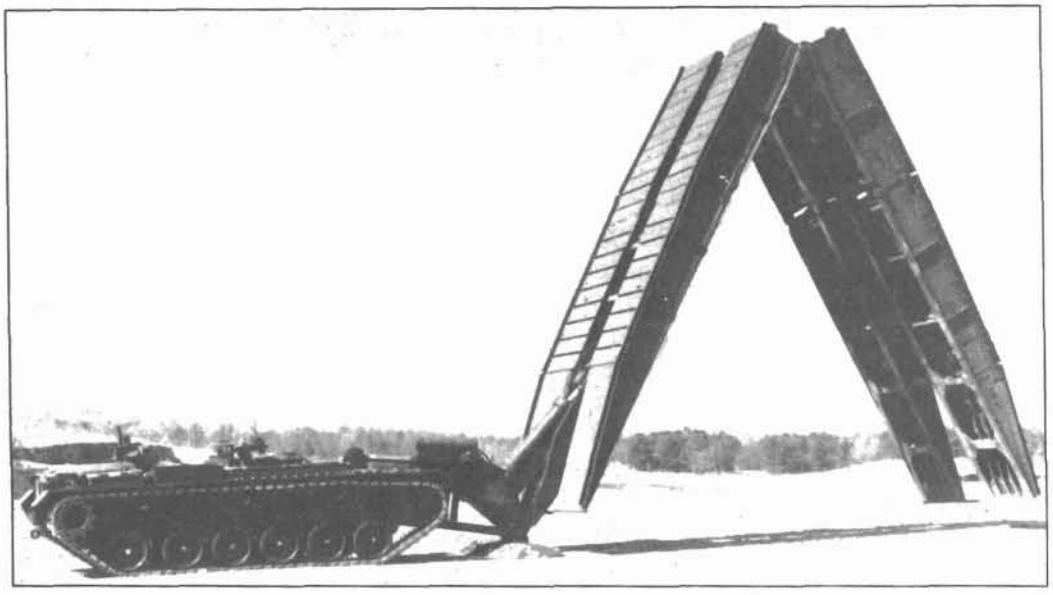
Units in charge of AVLB sites should fabricate conspicuous signs listing these restrictions and post them at crossing sites.

Commanders are responsible for ensuring that vehicle operators are properly briefed on crossing restrictions and for ensuring that operators strictly adhere to the restrictions.

ISSUE: M9 Armored Combat Earthmover (ACE) Operations.

DISCUSSION: Testing of the ACE at Fort Hood, Texas, has produced the following lessons learned:

- *River Crossing.* The ACE should be used in tandem during river-crossing operations. One will prepare the access ramp; the other will prepare



Armored Vehicle Launched Bridge (AVLB)

M9 Armored Combat Earthmover (ACE)

for swimming and be available to recover the first, if required.

- *Slope Operations.* The ACE can negotiate slopes up to 60 percent and side slopes up to 40 percent. Excessive slope, heavy vegetation, and rocks can cause the ACE to throw a track. On very steep slopes, the vehicle climbs better in reverse.
- *Smoke Launcher.* The smoke grenade launcher system can provide a smoke screen approximately 125 meters away from the vehicle for a period of 30 seconds, depending on the weather. When the system is not being used, the rubber caps should be placed over the tubes to prevent rain, snow, or other foreign matter from entering them. The operator's hatch must be closed before firing to prevent accidental burning of the operator.
- *Vehicle Recovery.* Winch capacity of the ACE is 12.5 tons. Proper winding and lubrication procedures will ensure that this effective capacity is maintained. Deploy the ACE in tandem for recovery operations, especially in light divisions.
- *Night Operations.* Night-vision goggles are required when the ACE operates in the dark. Operators must receive acclimatization training for these goggles to avoid nausea while wearing them. Also, the instrument panel lights may cause the goggles to malfunction temporarily. Until a product improvement plan is completed to correct this situation, operators should turn off the panel lights when operating with night-vision goggles.

ISSUE: Lack of coordination and effective planning for breaching obstacles.

DISCUSSION: The task force engineer was not involved in the tactical planning phase for various missions. Therefore, the maneuver force was unable to coordinate breaching operations or use the engineer units effectively. As a result, breaching operations were ineffective and not according to doctrine. In one case, an obstacle that could have been bypassed easily was not. Due to lack of coordination, the engineers and maneuver units did not rehearse together. Instead, the individual company/teams and the engineers conducted separate rehearsals.

For one mission, the task force engineer was involved in planning and briefing the company/teams. This time the obstacles were breached effectively, which greatly improved the task force's ability to continue the attack.

RECOMMENDATION: Stress the effective use of task force engineers to maneuver commanders and the engineers themselves. Ensure the staff coordinates so that breaching is integrated into the tactical plan. Integrate the engineer and maneuver units and perform rehearsals to ensure successful obstacle breaching and continuation of the attack.

ISSUE: Cosmetic berms constructed in front of vehicle fighting positions provide no protection.

DISCUSSION: Engineers often expend much effort constructing berms in front of vehicle fighting positions. A berm creates a false sense of security for the user. A modern armor-piercing, fin-stabilized, discarding sabot (APFSD) round will easily penetrate loosely compacted soil berms.

RECOMMENDATION: Use the available engineer effort to construct additional survivability positions. Engineers must stress this lesson to the maneuver commander to ensure that these berms are no longer used.

ISSUE: Use of scoop loaders to dig survivability positions.

DISCUSSION: During a training exercise, a unit used a scoop loader to construct survivability positions. Because the soil was too compact, the equipment broke down.

RECOMMENDATION: Only responsible individuals knowledgeable of soil conditions should select the type of equipment to be used for digging survivability positions. Scoop loaders should be operated only in loose soil conditions.

Directorate of Training and Doctrine (DOTD)

Common Collective Task Training. Units without an ARTEP Mission Training Plan (MTP) are advised to use ARTEP 5-145-Series, as applicable, for common collective task training. The manual of common collective tasks and standards that was distributed in June 1989 for units without proponent MTPs is no longer available. It was developed primarily for use as a TRADOC training development aid, and had limited distribution on a one-time basis. Point of contact (POC) is Russ Hinkle, AV 676-7513, or (314) 563-7513.

Engineer Drills-ARTEP 5-14-DRILL. An ARTEP designed to support all combat engineer units is scheduled for publication in November 1990. ARTEP 5-145-Drill includes breaching, bridging, and CEV/AVLB drills. POC is CPT Frank Barry, AV 676-7512 or (314) 563-7512.

Units subscribing to ARTEP 5-025 and 5-145 series MTPs will receive ARTEP 5-145-DRILL on the initial distribution. Other units may order it from the U.S. Army Publications Distribution Center (USAPDC), 2800 Eastern Boulevard, Baltimore, MD 21220. Their hotline number is AV 584-2533 or (301) 682-8529.

Soldier Qualification Test (SQT) Notice. Soldiers are advised to study only those references given in the SQT notice by task. These references are used to develop questions in the individual SQTs.

Department of Combined Arms (DCA)

Attention Light Engineers. The 6th Annual Light Engineer Conference at Fort Leonard Wood, scheduled for 23-26 October 1990, has been cancelled. The conference will be rescheduled later, possibly for spring 1991. POC is CPT Thomas Kula, AV 676-5821 or (314) 563-5821.

Obstacle Control Problems. Combat Training Centers (CTC) report that obstacle control continues to be a major problem. Inadequate control procedures have led to fratricide and have hindered the mobility of friendly forces on the battlefield. Problems include improper reporting and recording, failure to disseminate obstacle location information to appropriate leaders and staff, inadequate obstacle turnover, failure to execute lane closure plans, and unmarked friendly minefields.

Obstacle control is a critical task that requires discipline and continual sustainment training. References are FM 5-100 for obstacle control, FM 5-102 for reserve obstacle procedures, and STANAG 2017 for target folder procedures.

Engineer and maneuver units rotating to a CTC must include obstacle control tasks when they conduct predeployment training. The following tips may help you improve these skills.

- Engineer platoon leaders and platoon sergeants must understand obstacle reporting and recording procedures and forward reports as required.
- Maneuver staffs must develop field/tactical standing operating procedures (SOP) that emphasize minefield marking requirements and standards.

- Critical engineer-related items, such as reserve target responsibility or lane closure plans, must be stated in paragraph 3 of subunit instructions.
- Staff engineers must ensure that obstacle information is reported to the maneuver unit for dissemination.
- Staff engineers must emphasize to their maneuver commanders the need to rehearse lane closure plans.

POC is CPT Bob Wray, AV 676-5519, (314) 563-5519.

Directorate of Combat Developments (DCD)

Rock crusher

New Rock Crusher On Board. Fort Leonard Wood and Fort Knox received new and improved rock crushing plants in August. The equipment can produce as much as 150 tons per hour (TPH), is mobile, diesel and electric motor driven, and has crushing and screening capabilities.

The rock crushing plants consist of several state-of-the-art components. The primary crusher consists of a Thunderbird trailer, John Deere diesel engine, Pioneer variable speed vibrating feeder, and a 3042 jaw crusher. The secondary crusher consists of a Thunderbird trailer and triple deck shaker box, John Deere diesel engine, and an El-Jay 45-inch cone crusher. The 1st Engineer Brigade, Fort Leonard Wood, is responsible for training on this equipment (see item on page 49). For more information, contact MSG Michael Hammond, AV 676-7344 or (314) 563-7344.

"Bunker Busting" Systems Update. Three new weapons systems are being considered by the Engineer School as possible standoff bunker busters for the light engineer force. These systems are capable, in various degrees, of standoff bunker and field fortification reduction. Currently engineers are forced to use the 90mm recoilless rifle for this purpose. The introduction of one of these systems will allow the 90mm to be used solely for its intended purpose—killing tanks.

The three systems are:

- Ranger antiarmor/antipersonnel weapons system (M3 RAAWS). This system is now employed in NATO forces and will be issued to Army Rangers starting in September 1990.
- Multipurpose individual munitions (MPIM). This developmental item is being evaluated by the Infantry School.
- Shoulder-launched multipurpose assault weapons (SMAW). This weapon was developed by the Marine Corps, and they are currently upgrading and modifying it.

A decision as to which, if any, of these systems will be issued to engineer forces is pending. POC is Benny Pardue, AV 676-7239 or (314) 563-7239.

Engineer Organization Changes. The engineer force structure concept for AirLand Battle-Future goes before the October 1990 Common TOE Update board for final document validation and verification. The following engineer force structure changes are expected to occur out of this process:

- The heavy division engineer organization will consist of an engineer regimental headquarters, and three engineer battalions. These are organized for 80 percent offensive support and

20 percent countermobility support. All bridging assets will be located in the corps engineer brigade.

- The corps engineer brigade will include corps mechanized engineer battalions, and corps wheel engineer battalions. The reorganized combat support equipment company will include three similar earthmoving platoons. Other units within the corps engineer brigade structure include ribbon bridge companies, medium girder bridge companies, and a topographic company (all L-series TOE).
- At echelons above corps, the combat heavy engineer battalion will be reorganized similar to the Air Force's "Prime Beef" battalion. These battalions will support BASOPS and conduct nation assistance missions. POC is MAJ Joseph Seerley, AV 676-7149 or (314) 563-7149.

Department of Military Engineering (DME)

EOAC Division Update. Some Reserve Component officers continue to enroll in the incorrect resident phases. The Company Commander Course, Phase I - EOAC-RC, is Course 4-5-C23, not Course 4-5-C26, Phase I. Detailed course requirements are in the Army Formal School Catalog, DA Pam 351-4. A secret clearance is required for portions of the Company Commanders Course. Ensure that unit security managers have provided the necessary documentation before you arrive. POC is Captain Chuck Boaz, AV 676-5646 or (314) 563-5646.

Attention Vehicle Operators! Operators should *not* raise the hoods of vehicles when they park them in tactical bivouac areas. Hot engines will leave a significant thermal signature that may be detected by enemy infrared equipment. For more information, refer to Chapter 2 of FM 20-3. POC is CPT Vince Harackiewicz, AV 676-5585, (314) 563-5585.

Directorate of Engineer Branch Safety (DEBS)

M180 Firing Distances. The minimum safe distance when firing the M180 cratering kit is 1200 meters for unprotected personnel and 150 meters for personnel in missile-proof shelters. This information is in TM 9-1375-213-12-1, *Practice Mines Update.* Authorized practice mine and fuze combinations are in TM 43-0001-36, *Army Ammunition Data Sheets for Land Mines.* Use of any mine and fuse combinations other than those listed can result in serious injuries. POC is Paul Rusinko, AV 676-5002 or (314) 563-5002.

1st Brigade

Rock Crusher Training Implemented. Our latest acquisition, a rock crushing plant capable of producing as much as 150 TPH, was delivered in August. (See item under DCD, page 48.) The equipment is a significant addition to the quarry specialist training course (62G). Beginning in September 1990, all 62G students will receive training on the new crusher as well as the 75 TPH plant currently being taught. In addition, Reserve and National Guard soldiers who currently hold the 62G MOS will be sent to Fort Leonard Wood to train on this equipment. To accommodate the new training requirements, an additional 36 hours of technical training will be incorporated into the 62G Program of Instruction:

Current 75-Ton Per Hour (TPH) Crusher Course	
Phase	*Hours*
Combat Engineer Training	43
MOS Specific Training	
Introduction	12
Assembly	16
Crushing (75 TPH)	36
Drilling	36
Demolition	24
Operation and Maintenance	20
Field Training Exercise	60
	247

Training for 150 TPH Crusher	
Class	*Hours*
Operator Maintenance	8
Cone Adjustment	1
Jaw Adjustment	1
Replace/Adjust Bolts	2
Screen Adjustments	8
Crushing	16
	36

Students receive training on rock drills, scoop loaders, water pumps, conveyors, wash and screen units, demolitions, and maintenance. POC is MAJ Andrew Semple, AV 581-2519 or (314) 596-2519.

132 Brigade

Brigade Inactivated. When the 132 Brigade was inactivated in August, the 31st, 35th, and 589th Engineer Battalions became part of the 1st Engineer Brigade. The reorganized 1st Engineer Brigade is now responsible for MOS 12B/C Initial Entry Training, 15 Advanced Individual Training (AIT), one additional skill identifier (ASI) course, and Sapper Leader Training. POC is CPT Mark Lane, AV 581-4104 or (314) 596-4104.

136th Engineer Brigade

Quarry Detachment Welcomed. Fort Leonard Wood welcomed the 285th Engineer Quarry Detachment as the newest Forces Command (FORSCOM) unit on 17 October 1990. The 285th Engineer Detachment is relocating from Panama and will be assigned to the 515th Engineer Company (Pipeline) (Construction Support). The primary mission of the 31-soldier detachment is rock crushing operations. Capable of producing as much as 75 tons of crushed rock per hour, the unit greatly improves the brigade's ability to accomplish major horizontal construction projects such as roads, storage facilities, and airfields. POC is SFC Harkins, AV 581-7447.

News and Notes

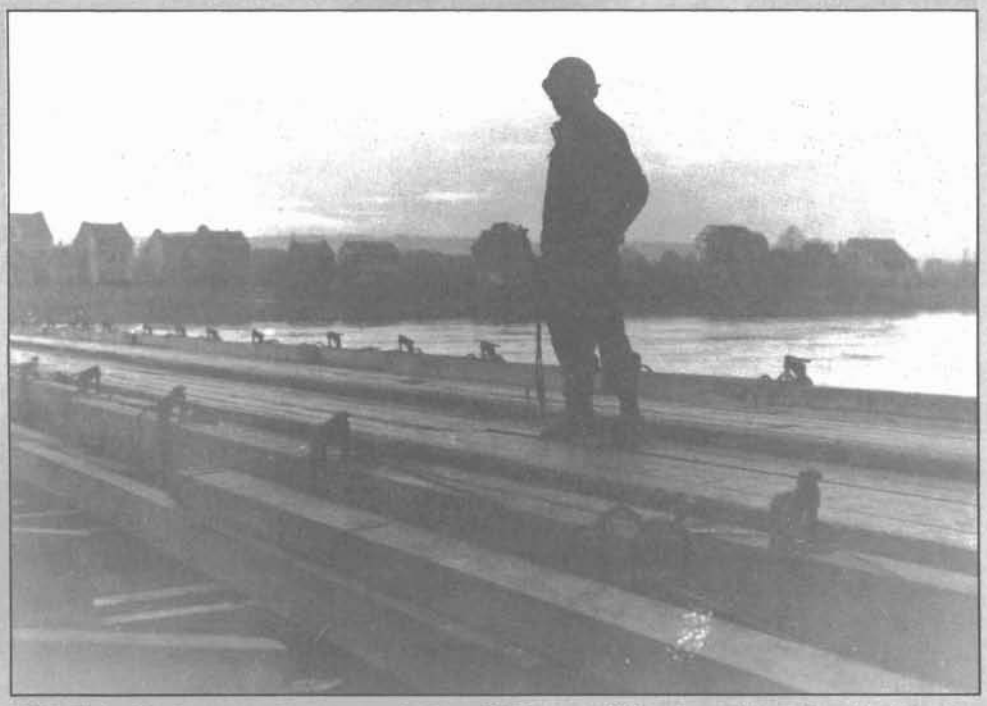
Engineer Desert Operations. Engineer lessons learned applicable to desert operations are available in a report just published by the Engineer Studies Center, Fort Belvoir, Virginia. The book has nine sections covering everything from host nation support to well drilling and vehicle maintenance. POC is Danny Brannon, AV 345-2115 or (703) 355-2115.

Training in World War II:

The 51st Engineer Combat Battalion

"In no other profession are the penalties for employing untrained personnel so appalling as in the military."
General Douglas MacArthur

During World War II, the American Army called together millions of civilians and molded them into units that could work together to go about the business of winning the war. One such unit was the 51st Engineer Combat Battalion (ECB). How well it trained and the successful results of that training is the thrust of this article.



PFC Elder D. Cannon, Company A, 51st ECB, on a "Watch on the Rhine" in March 1945. The success of the training the 51st received in New York and England was reflected in their many achievements during World War II (U.S. Army photo).

At the beginning of World War II, the United States Army sent its newly inducted recruits to units for training. Engineer Military Training Program (MTP) 5-1 called for 13 weeks of basic, individual, and team training. The next phase, unit and combined training, consisted of seven to eight months of training as a unit. It was followed by training with other units, and culminated in maneuvers with divisions, corps, and armies.

One of the 131 engineer units formed in 1942 was the 51st Engineer Combat Regiment (ECR), activated at Camp Bowie, Texas. In June of that year, the 51st Engineer Regiment's cadre of 76 enlisted men and 50 officers, most of them graduates of the Engineer Officer Candidate School at Fort Belvoir, Virginia, began cadre training. The Army training system depended on unit cadres who first received training and then trained new recruits.

A new commander, Colonel H. Wallis Anderson, took over the unit on August 17. Through example Colonel Anderson, a World War I veteran, laid the foundation for the development of teamwork and esprit de corps that bound the 51st together.

The unit moved to Plattsburg Barracks, New York, located about 20 miles south of the Canadian border on Lake Champlain, in October. The 51st chose Macomb Reservation, some 12 miles north of Plattsburg Barracks, as its field training area. There it constructed training sites in preparation for the arrival of basic trainees.

Enlisted men began arriving at the Plattsburg railroad depot on Christmas Day, 1942. The Army had inducted these men into the service from all corners of the United States, issued them

By Barry W. Fowle

Traffic rolls over a heavy pontoon bridge built over the Rhine River at Kripp, Germany, in 1945. This was one of many bridges built by the 51st Engineer Combat Battalion during their march across Europe (U.S. Army photo).

uniforms, and sent them to Plattsburg for training. By January 11 the strength of the regiment had increased from about 150 officers and men to more than 1,600. These recruits received a shock when they stepped off the train into 8 inches of snow and below-zero temperatures.

Training Begins

Basic, individual, and team training began in January and lasted until April. The recruits learned close order drill and then trained on crew-served weapons. During engineer training the men learned how to use explosives and demolitions, how to build field fortifications, how to emplace fixed and floating bridges, and how to build and repair roads and airfields.

Temperatures reached 35 degrees below zero on several occasions during basic training, and in most places the ground was covered with 2 feet of snow. Because Lake Champlain was frozen over, floating bridge training was conducted on ice that was 3-feet thick.

In spite of these conditions, the regiment conducted training outside. The 51st established an obstacle course to strengthen the stamina and self-confidence of each soldier. Many of the men came down with colds soon after arriving in Plattsburg, but the health of the unit returned rapidly after extensive physical conditioning. At the end of basic training each company built two tactical bridges at night under blackout conditions. This realistic training would pay dividends in the future.

In March 1943, the 51st Engineer Combat Regiment was redesignated. Its Headquarters and Service (H&S) Company became the 1111th Engineer Combat Group (ECG), its 1st Battalion became the 51st ECB, and the 2nd Battalion became the 238th ECB.

On April 7, the 51st ECB began unit and combined training at Macomb Reservation. The men marched 12 miles to Macomb on Monday mornings, where they practiced building various types of fixed and floating bridges. Then they marched back to camp on Friday afternoons. Everyone slept on the ground in pup tents during the week.

Near the end of April, XIII Corps conducted MTP tests for the 1111th ECG and its assigned units. The 51st ECB scored 83 percent, the highest rating of any similar organization in the XIII Corps.

Advanced training, which followed, included both infantry tactics and engineer training. It continued until September, when the battalion moved to the XIII Corps maneuver area in Davis, West Virginia. There the soldiers built roads and culverts, an airplane landing strip, and constructed a Bailey bridge and a fixed-target and known-distance range. The 51st moved to Fort Belvoir for 12 days as demonstration troops for the school, and then went to Fort Dix, New Jersey, to prepare for departure overseas.

After arriving in England on January 20, 1944, the 51st received more training. This included construction of Bailey bridges, mine and booby trap training (using the latest German mines and methods), camouflage training, and infantry tactics.

Combat Support

The men in the 51st began using the training gained over the past 18 months when they landed in France on June

27, 1944. Their highly successful battalion operations in Europe demonstrated the quality of that training.

From June until November, while under First Army, the battalion moved across France constructing roads, bridges, and culverts, and sweeping areas for mines. In France and Belgium they replaced portable Bailey bridges with semi-permanent wooden bridges on major roads. The Bailey bridges were then moved forward for use in combat operations.

At the end of October, the 51st moved into Marche, Belgium, and began sawmill operations using local sawmills and their personnel. First Army tasked the 51st to produce three million board feet of lumber for its winterization program. The men of the 51st, who were trained in using chain saws, cut the trees for, and supervised the operation of, 32 sawmills. At peak production the three companies produced a total of 80,000 board feet of lumber each day.

Sawmill operations stopped on 17 December, when the 1111th ECG was assigned the battalion barrier operations along a 40-mile front against the German Army's Ardennes Offensive—the Battle of the Bulge. That evening Company C, 51st ECB, went to Trois Ponts to organize a defense of the town and prepare bridges for destruction. For three days the company held off German tank and infantry attacks until it was relieved by the 505th Parachute Infantry Regiment, 82d Airborne Division. The infantry training the unit received in Plattsburg served them well.

River Crossings

The rest of the battalion was assigned the mission of preparing all crossings of the Ourthe River from Durbuy to La Roche, France, for demolition. They were also tasked to establish obstacles such as minefields and abatis on roads near the river. The battalion's key point in that defensive line was the Ourthe River bridge at Hotton. On December 20, Company B and the First Platoon, Company A, held off a German tank and infantry attack at that bridge for 7 hours.

Tiny elements of all three line companies and the H&S Company manned roadblocks scattered throughout the area and stopped the Germans cold. For its actions in the Battle of the Bulge, the 51st ECB received the Distinguished Unit Citation and the French Croix de Guerre.

During the first two months of 1945, the 51st supported both the 82d Airborne Division and the 75th Infantry Division, building bridges, maintaining roads, and removing numerous minefields and barriers. In January, the battalion constructed five Bailey bridges in four days. One was constructed at night, while under enemy fire and in terrible weather. Three days of rain, snow, and freezing temperatures had coated the bridge parts with a layer of ice. Blow torches used to melt the ice brought in enemy artillery fire, forcing the men to use hacksaw blades to cut the ice away. The winter training received at Plattsburg again proved to be useful.

On March 7, the Americans captured the famous Ludendorff Bridge over the Rhine River at Remagen. III Corps chose the 51st and 291st ECBs to build two bridges over the Rhine so that American troops could cross while the heavily damaged Ludendorff bridge was closed for repairs. The 51st built a 969-foot heavy pontoon bridge at Kripp, about 1.5 miles south of Remagen, while under small arms and artillery fire and German fighter attacks. It was completed on March 11, 27 hours after construction started.

When the bridges were finished, Major General John Millikin, commander of III Corps, praised the two engineer battalions. "I feel that one of the most outstanding accomplishments of the entire operation was the building of the two additional bridges under artillery and small arms fire."

The 51st was assigned to General George S. Patton's Third Army on April 17. Two days later the battalion began and completed a 255-mile trip in 20 hours with just one major breakdown, which was quickly repaired. The success of the road march reflected the high state of maintenance of the equipment in the 51st and was a credit to its training.

Mission Completed

Company A, 51st ECB, began a 325-foot class 40 treadway bridge over the Danube River at Ingolstadt on April 26. They were under direct German fire from the far side of the river during construction. The 51st crossed the Danube and finished the war maintaining roads, filling craters, and building Bailey bridges.

On May 12, Lieutenant Colonel Harvey R. Fraser, the battalion commander, called the men together and addressed them as a group for the first time since he joined the unit in mid-December. He paid tribute to the 51st for the work the men had accomplished during their drive across Europe.

Well might he have given them praise. The unit had performed in an outstanding manner while accomplishing all of its missions, both as engineers and as infantry. That it did so can be traced to the high caliber of training the unit received in the rugged, cold weather at Plattsburg, New York, and in England.

(This article is based on a history of the 51st, *The 51st Again,* scheduled for publication in 1991.)

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