

Engineer

THE PROFESSIONAL BULLETIN FOR ARMY ENGINEERS

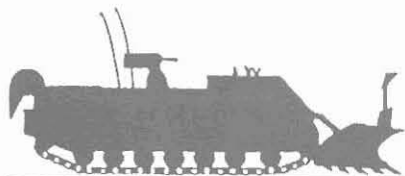
December 1995

River Crossing



Headquarters, Department of the Army

PB 5-95-4 Approved for public release; distribution is unlimited.



CLEAR THE WAY

*By Major General Clair F. Gill
Commandant, U.S. Army Engineer School*

In this era of dynamic change and development, I am proud to be the 50th Commandant of the U.S. Army Engineer School and the Commanding General of the U.S. Army Engineer Center. With your help, we are developing a single vision for our Engineer Regiment to move us successfully toward full implementation of Force XXI and the Army Maneuver Support Center, while we continue to sustain our reputation as a world-class training facility here at Fort Leonard Wood.

My boss, General Hartzog, has designated me as Engineer Personnel Proponent and Engineer Branch Chief. He has charged me to ensure that Army engineers maintain a key role in the combined arms team as we work to deter combat and promote peace in theaters around the globe.

One major task is to formulate a proponent strategic plan that will chart a pathway to our future. We all have strategies, plans, and immediate missions that demand daily attention and resources. But we also need a long-term focus (strategic plan) to integrate into broad operational requirements and planning. Strategic planning is our corporate responsibility. My chartered team at Fort Leonard Wood recently formulated draft vision statements for both the Engineer Regiment and Fort Leonard Wood:

"The Engineer Regiment...trained and ready, a rapidly deployable and versatile member of the strategic force...combining efficiencies of information with physical and technical capabilities, to master terrain in support of decisive victory."

Fort Leonard Wood's vision reads:

"America's center for maneuver support to the total force...the world's best multifaceted training center...a people-focused leader in quality of life, residing in the Ozarks...an active civic partner...a foundation for exceptional service to our nation and its values."

When finalized, these statements will complement the TRADOC effort to develop a 21st century Army.

The teams are now translating these visions into

long-term goals and their supporting near-term objectives. Together, the vision, the long-term goals, and the immediate objectives define my intent—our intent. This approach will constitute our deep battle and will be fully integrated into the close fight.

While planning for the future, the Engineer Center team must continue to provide our regiment with the highest quality service in the three core mission areas: training soldiers, combat developments, and writing doctrine. The next step is to incorporate our regiment's vision into the entire Army engineer community and take the first steps toward its attainment.

Another important hat I wear is that of Maneuver Support Center planner. As a result of a recent Base Realignment and Closure (BRAC) decision, we have the mission to plan and execute receipt of the Military Police and Chemical Schools at Fort Leonard Wood beginning after 1998. In partnership with the commandants of the Military Police and Chemical Schools, we will form a consolidated organization tentatively called the "Army Maneuver Support Center." In the operational concept, each branch will retain its commandant. He will remain the proponent for his regiment and its systems and functions.

I solicit your input throughout the entire planning and consolidation process. Teamwork is essential. I encourage you to share experiences, lessons learned, and ideas with others in the engineer community. Keep those phone calls, cards and letters coming. Use the Engineer Bulletin Board and the Engineer Hotline to get answers to your technical requests. Recent upgrades to Fort Leonard Wood's fiber-optic system allow us to "talk" via the Engineer School's Internet Home Page. *Engineer* magazine also has a role in my strategy, and I will use this forum to discuss key issues affecting our corps.

Together we will work to ensure that our great regiment remains a key member of the combined arms team, ready to support our nation and successfully meet any challenge. Essayons!

UNITED STATES ARMY ENGINEER CENTER AND FORT LEONARD WOOD

COMMANDER/COMMANDANT

Major General Clair F. Gill

MANAGING EDITOR

Catherine Eubanks

FEATURES EDITOR

Shirley Bridges

GRAPHIC DESIGNER

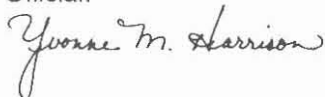
Jennifer C. Bolyard

By Order of the Secretary of the Army:

DENNIS J. REIMER

General, United States Army
Chief of Staff

Official:



YVONNE M. HARRISON

Administrative Assistant to the
Secretary of the Army

01144

Front cover photo: Active assault float bridge units (the 74th Engineer Company and the 489th Engineer Battalion) support the 353rd Engineer Group (USAR) during a river-crossing exercise in July 1995.

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ENGINEER (ISSN 0046-1989) is prepared quarterly by the U.S. Army Engineer School, ATTN: ATSE-TD-D-EB, Fort Leonard Wood, MO 65473-6650. Second Class postage is paid at Fort Leonard Wood, MO, and additional mailing offices.

POSTMASTER: Send address changes to ENGINEER, the Professional Bulletin for Army Engineers, ATTN: ATSE-TD-D-EB, Fort Leonard Wood, MO 65473-6650.

CORRESPONDENCE, letters to the editor, manuscripts, photographs, official unit requests to receive copies, and unit address changes should be sent to ENGINEER, at the preceding address. Telephone: (314) 563-4104, DSN 676-4104.

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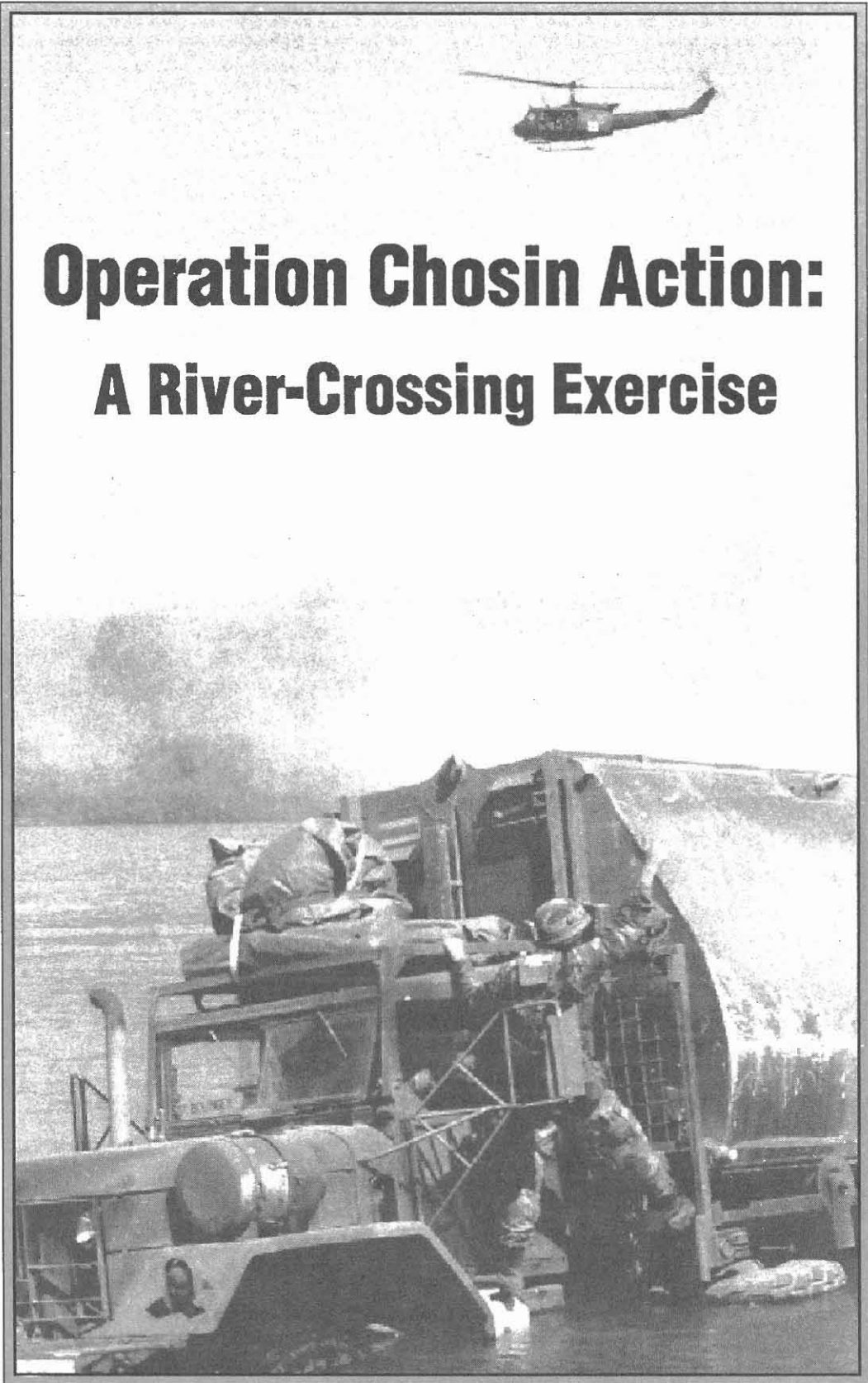
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The following three perspectives of river crossings provide insight into this complex engineer mission. First, despite the odds, the 353rd Engineer Group (USAR) planned and successfully completed a bridging exercise across the Arkansas River. The second piece describes the rationale for the new multirole bridge company and the results of a recent concept evaluation for this program. It is followed by a review of river-crossing doctrine in peacetime conditions. We invite your comments concerning this topic.



Operation Chosin Action: A River-Crossing Exercise

By Major James K. Rupp

Imagine evacuating a town of 5,000 people over a one-lane bridge, with every vehicle arriving at the bridge 100 meters apart—and with no traffic jams, no accidents, and no impatient drivers. This situation is difficult to envision, but it is what is expected when a division conducts a deliberate river crossing. A reinforced division crossing 20,000 strong at two brigade crossing sites with two bridges each equates to that town of 5,000 at each of the four bridges.

River crossing is one of the most complex engineer operations to plan and execute. In addition to overcoming the logistics problems, a deliberate river crossing must project forces across the river in synchronization with the commander's battle plan. Success depends on meticulous planning and numerous rehearsals.

Many in the engineer community misunderstand who is responsible for planning river-crossing operations. FM 90-13, *River Crossing Operations*, a combined arms manual, states that corps engineers are additional staff planners of crossing operations and provide command and control of the crossing assets. It also states that divisional engineers should focus on the fight. Yet, when the manual outlines planning procedures and responsibilities, it lists the brigade and the division engineers. ARTEP 5-145, *Mission Training Plan (MTP) for Engineer Brigades and Groups*, provides the tasks, conditions, and standards for an engineer

group to plan a river-crossing operation. However, some group commanders maintain that it is not their mission but that of the division engineers. Division engineers say they have no bridging assets and therefore should not conduct the planning. We must clearly define this responsibility so that someone has ownership.

River-crossing exercises are not held often. During a recent 16-month period, four Warfighter exercises were conducted with Southeast and Southwest Asian and European scenarios and none of them included a river-crossing operation. Yet, if the United States was to fight in these theaters, it is unlikely that we could win without crossing a river. Additionally, III Corps at Fort Hood, Texas, conducted its Roadrunner exercise in September 1994 without a single river-crossing operation. In its after action review, III Corps stated that it had not conducted such an operation in 10 years.

Planning an Exercise

The 353rd Engineer Group (USAR), Oklahoma City, decided to conduct a river-crossing exercise because we have the MTP task to plan river-crossing operations. Although maneuver commanders are responsible for the operation, they depend heavily on the engineers' technical expertise. Operation Chosin Action, planned for mid-July 1995, would be a multiechelon exercise that integrated active and reserve units. To get the exercise



Engineer soldiers maneuver a bridge into position by hooking a boat to the bridge.

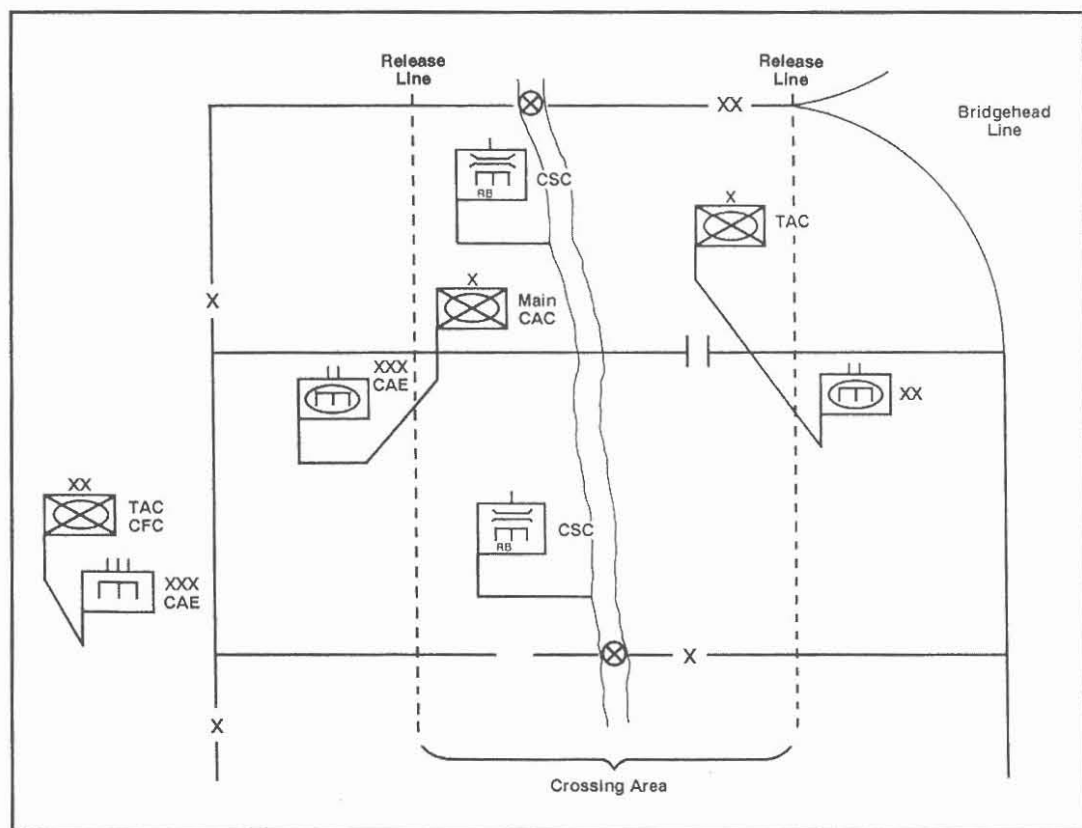


Figure 1. Control elements for a deliberate crossing

off the ground, the group identified a training area, a task organization, and a tactical scenario.

Training Area. Fort Chaffee, Arkansas, was chosen as a training area. The military reservation spans both sides of the Arkansas River, which allows control of both the entering and exit banks, and has four bridging sites. Permission to close the Arkansas River to navigation traffic during the exercise was coordinated with the Little Rock District of the Corps of Engineers and the U.S. Coast Guard.

Task Organization. Figure 1 shows the command and control relationships of a river-crossing operation. A full division crossing requires a minimum of two corps engineer battalions, four ribbon bridge companies, and numerous support units.

In the plan for this exercise, the commander of the 353rd served as the crossing force engineer (CFE) and the commander of the 489th Engineer Battalion (C)(M) (USAR), North Little Rock, Arkansas, served as the crossing area engineer (CAE). Other participants initially remained unidentified. One year before the event, the 353rd sent invitations to every Active, Reserve, and National Guard ribbon bridge company in CONUS and to military police, medical, aviation, infantry, and signal units. Although no one promised to be there, the group staff continued to plan the exercise. Ideally, a combat force would serve as crossing force commander (CFC). The next best alternative was for a maneuver training command to prepare and control the exercise. But those commands were preparing for

lanes training and could not support our request. So the task of preparing the exercise scenario and controlling the exercise fell to the 353rd.

Tactical Scenario. Using operations orders, messages, and logs from two previous Warfighter exercises conducted by the 4th Infantry Division in Korea, the group staff pieced together a tactical scenario for Operation Chosin Action. By moving their operations farther south in the next Warfighter exercise, the 4th can use the same scenario for a deliberate crossing of the Han River.

While preparing for the exercise, the staff periodically contacted the units invited to participate. When none of them committed to attend, we thought that the multiechelon training exercise we were planning might become an elaborate command post exercise for just the group and battalion staffs. Then, in January, units began to confirm their attendance. As the task organization filled in, the possibility of developing a role for a diving detachment surfaced. Then vendors of Zodiac boats and Jet Propulsion outboards wanted the Army to try their new products. By April, all the pieces were in place. The final task organization is shown in Figure 2.

The battalion and group staffs conducted crossing area reconnaissance. They looked at routes and staging areas on the Arkansas River but could not get within 1.5 kilometers of the crossing site due to flooding. In May, this was a minor concern; but in June, when a reconnaissance with commanders

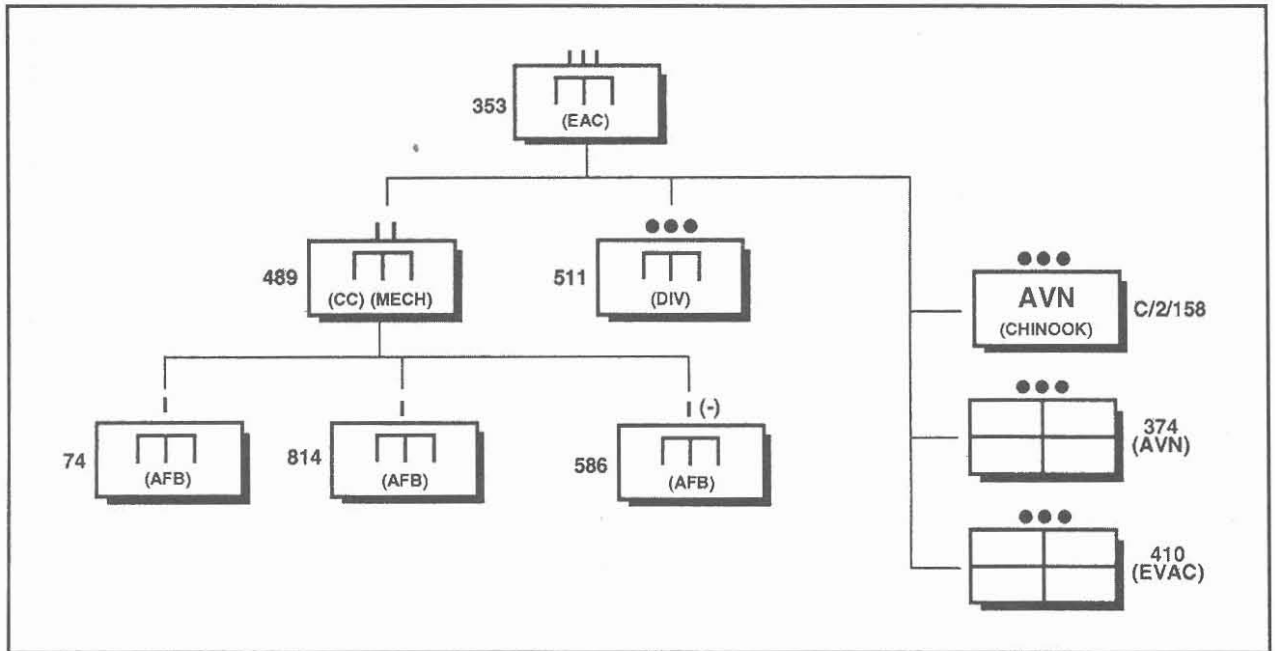


Figure 2. Task organization for Operation Chosin Action

from the bridge companies showed that the situation had not improved, it became a major problem. The hydrology division from the Little Rock District forecast that the river would recede before the crossing in mid-July. However, the weather and the snowmelt from the Rockies did not cooperate, and the river remained at flood stage. When the first units arrived on 8 July, the river was still 1 kilometer out of its banks.

Planning Process

Operation Chosin Action officially began at 1900 on 9 July when the division operations order was briefed to the engineer group and battalion commanders. The exercise included the following training objectives:

- The group staff will plan a division river crossing.
- The battalion staff will plan a brigade crossing and will command and control engineer units in the crossing area.
- The engineer companies will conduct river-crossing operations.

The flow chart in Figure 3 on page 6 guided the staff during their planning process.

Commander's Intent. Each step required close coordination between the crossing force engineer and the crossing area engineer. The plans developed for the brigade fit within the division commander's intent and were incorporated into the division plan. Before the crossing area engineer attempted the next step in the planning process,

the crossing force engineer incorporated the brigade crossing plan into the division plan.

Restated Mission and Warning Order. A restated mission was developed and warning orders were issued to subordinate units. River-crossing plans were based on the 4th Infantry Division's task organization in the Warfighter exercises. The tactical scenario in these exercises called for two brigades crossing abreast to bypass and isolate Seoul. With only one crossing area engineer participating in Operation Chosin Action, the group staff planned the second brigade's crossing and incorporated it into the division river-crossing annex.

Crossing Estimates. The staffs prepared crossing estimates based on physical features of the crossing site and enemy countermobility capabilities. At regular intervals, they issued intelligence updates on enemy activities, engineering capabilities, and obstacles. Intelligence officers used Terra-base, a computerized terrain data system, to provide detailed terrain analyses and enemy obstacle templates. Korean terrain was used for the intelligence preparation of the battlefield, but the staffs used the physical terrain of Fort Chaffee at the immediate crossing sites. Site selection was based on the assumption that the river would recede, and the normal width of the river at the selected sites was used in the crossing estimates. The estimates were prepared on a spread sheet that broke the task organization down to company-sized elements. It showed the number of vehicles present, the number of raft loads required, and the

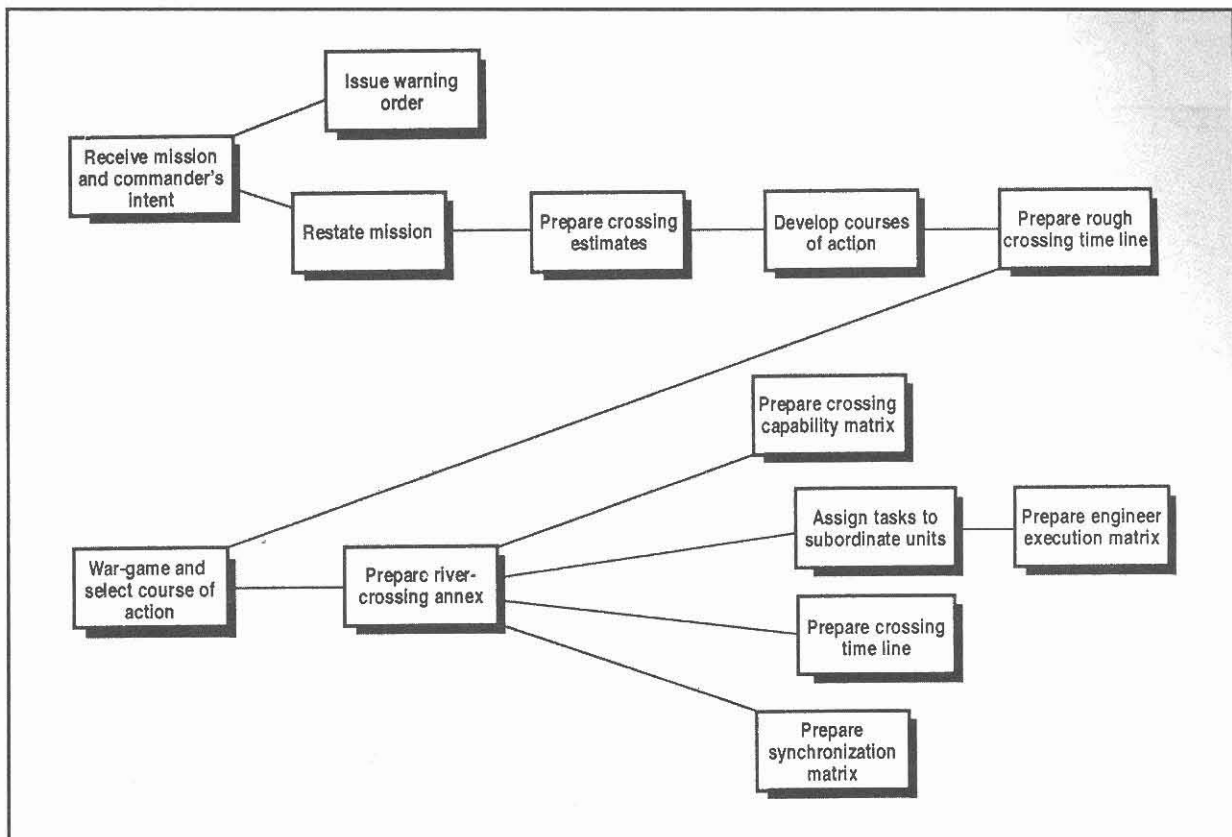


Figure 3. Planning process for a river crossing

time required to cross a bridge. The staffs calculated the time needed to construct rafts and bridges and the time required to make a round trip across the river. Using the spread sheet information, the staffs calculated rafting times and bridge-crossing times for each unit.

Courses of Action. Crossing estimates were the building blocks used to develop possible courses of action.

Rough Crossing Time Line. The staffs prepared a rough crossing time line for each course of action considered.

War Gaming/Course-of-Action Selection. After war gaming possible courses of action, the staffs made recommendations to the commanders, who selected the appropriate action.

River-Crossing Annex. The group staff prepared the crossing annex using input from the battalion staffs on crossing capability matrices and crossing time lines for the supported brigades. They incorporated the information into the division crossing capability matrix, crossing time line, and synchronization matrix.

While they planned the situational crossing, the staffs also planned an actual crossing with the units at Fort Chaffee. But with the river at flood stage, it looked doubtful that the crossing sites would be above water in time for the exercise. They asked the hydrology departments at both the Little Rock and the Tulsa Corps of Engineer Districts to

determine how to reduce the water level and the best estimates of river flows and elevations. Both districts provided forecasts for the next six days. If the river elevations followed the forecast, the exercise could be conducted at the proposed site. If not, an alternate site owned by the Corps of Engineers would be used. Officers and members of the Fort Chaffee training staff helped coordinate for use of the alternate site and approved the route upgrades required to access it. The staffs prepared crossing annexes for a division crossing the Han River and for Fort Chaffee units crossing the Arkansas River at two locations.

Bridge companies from the 489th Engineer Battalion convoyed from Fort Hood, Texas; Fort Polk, Louisiana; and Fort Benning, Georgia. After conducting maintenance operations, they began rafting training at Engineer Lake and on the Arkansas River at the Corps of Engineer site. In addition to the river-crossing operation, the battalion conducted lanes training with support from its resident reserve training detachment.

Execution Matrix. On the morning of 15 July, subordinate units received the operations order to execute the crossing on Fort Chaffee and be prepared to use the alternate Corps of Engineer site. The width of the river at the alternate site (almost 500 meters) exceeded the bridging capability of two plus companies. Even with half of the active Army's bridging assets present, there was not enough to

span the Arkansas River. The alternate plan was to conduct a rafting operation.

As the crossing area engineer prepared the engineer execution matrix, the engineer companies conducted reconnaissance and prepared for the exercise. The 74th Engineer Company practiced sling loads and conducted rehearsals with C\158th Aviation Company.

During this time, the 511th Engineer Diving Detachment from Fort Eustis, Virginia, was the focus of everyone's attention. Although there is no doctrine for using diving detachments in river-crossing operations, their ability to produce hydrographic surveys of the crossing centerlines, identify underwater near- and far-bank conditions, and breach underwater obstacles was critical in determining the crossing site. The data they collected, when correlated with data from the Little Rock District, showed that the Fort Chaffee site would be above water by 18 July and that bank conditions could support wheeled traffic.

Rehearsals

On the afternoon of 16 July, the units conducted a sand-table rehearsal of a crossing plan that had two center lines, one for rafts and one for the bridge. They exercised the traffic patterns on the sand table and resolved the identified problems—where to locate the engineer equipment park, the engineer routes, and the sling load area for the bridge bays airlifted to the site.

The crossing site was still partially underwater, the river width exceeded the available bridging capacity, and aviation support was unavailable for the full dress rehearsal on 17 July. Because the bridge company commanders were concerned about the river velocity and the bridge anchorage, they conducted a limited rehearsal with the following goals:

- Verify the traffic flow through the staging, holding, and call forward areas.
- Launch bays and construct rafts at the crossing site.
- Develop a bridge anchorage.
- Conduct rafting operations.

While the rehearsal was successful, several issues remained unresolved. Of the two centerlines identified, only one was usable and it was partially inaccessible. Divers conducted a hydrographic survey to define the site's underwater trafficable limits. The Little Rock District projected water elevation drops for the evening of 17 July and the morning of 18 July. Even so, the crossing sites would still be partially underwater, but with some work one site would be usable. Dozers reworked the shallow crossing area to prevent rafts from

becoming beached. When the units convened for the rehearsal after action review, they decided to constrain the crossing to one centerline. The alternate site at the Corps of Engineers area would be used to launch bays and boats rafted downstream, relieving congestion on the centerline.

The Crossing

On the morning of 18 July, the river elevation was as projected and the crossing began. All the preparation and rehearsals fit together for the first time. As the assault force prepared, smoke drifted across the far shore, indicating that the pneumatic boats had received the order to move across the river. When the far shore was secure, the 814th Engineer Company began building rafts near the centerline. The 74th Engineer Company and the 2d Platoon, 586th Engineer Company, built rafts 3 kilometers upstream at the alternate site. Additional bays from the 74th were airlifted from Arrowhead Drop Zone to the centerline by C\158th Aviation Company.

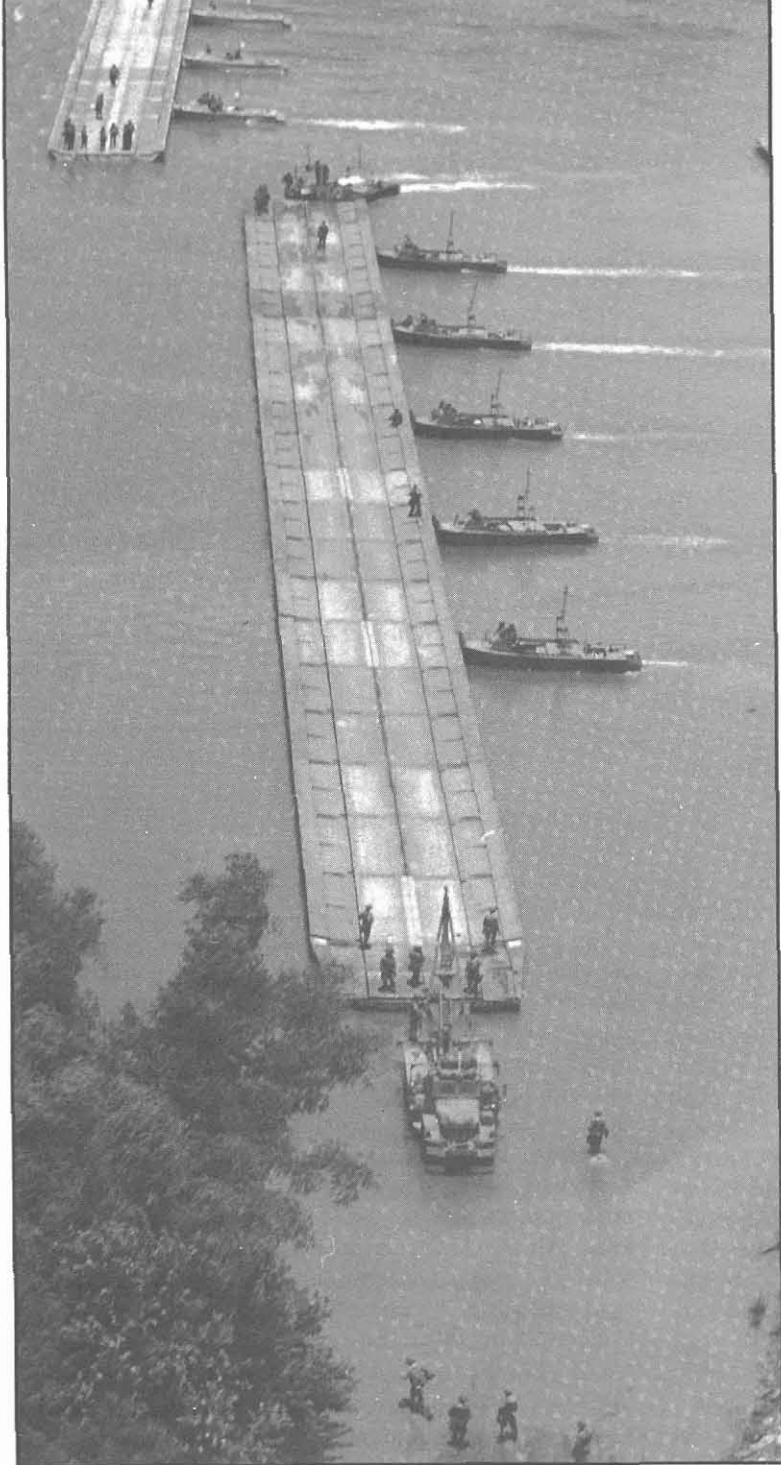
Rafts soon moved armored vehicles across the river and reinforced the far shore. At the same time, progress was slow on the bridge being constructed 300 meters downstream because of congestion at the centerline. Bays were rafted and launched in a jetty about 100 meters wide and 300 meters long. When rafts were being loaded, bridge launching ceased; when the rafting phase ended, the pace of bridge construction increased.

Three hours after construction began, the Arkansas River was bridged and the crossing site engineers requested traffic from the call forward area. Although the river was spanned with every available bay, vehicles had to travel through approximately 30 meters of shallow water before they could drive up the ramp bay. Within an hour, all traffic had crossed. The only actions that remained were to retrieve the bridge and identify the lessons learned.

Lessons Learned

Several lessons were learned and relearned during this exercise.

- Intelligence preparation of the battlefield is key to conducting successful river crossings. The crossing force engineer relied heavily on support from two nontraditional sources—civilians in the Corps of Engineers and the diving detachment. Without the forecast and hydrographic surveys indicating that the site would be crossable on 18 July, a limited exercise probably would have been conducted on Engineer Lake instead of on the Arkansas River.



Although the river was spanned with every available bay, vehicles had to travel through approximately 30 meters of shallow water before they could drive up the ramp bay.


- Automation speeds the planning process through use of spread sheets and Terrabase. Software needs to be standardized and shared.
- Close coordination is required at all levels of the operation. The 353rd Engineer Group and the 489th Engineer Battalion have a peacetime command relationship but still had difficulties meshing the brigade plan into the division plan. Most corps engineer groups and

battalions are in the reserves, and bridging companies are split between Active and Reserve Components. Units must develop training relationships because there are few opportunities to train in the organization in which they will fight.

- A broad secure front is required. When too much activity was conducted around one centerline, operations were severely impacted and construction times doubled. There is a trade-off when working in training areas with limited resources.
- Rehearse, rehearse, rehearse. Even with the constrained working area, the bridging process would have been smoother if a full rehearsal had been conducted. Some problems identified during the bridging exercise could have been identified and resolved in a full rehearsal.

Engineers will rise to any challenge that confronts them. Even though the units had not trained together before the exercise, as soon as they hit the ground they became a team. As usual, active and reserve units at all levels integrated readily to complete the mission.

Concerns

Operation Chosin Action was successful, but several concerns still exist. Engineers must know who is responsible for planning river-crossing operations. Corps engineers demonstrated in this exercise that they possess the capability. But are divisions adequately concerned about river crossing? Since they have lost their bridging assets, do they even consider it a mission? Are there enough bridging assets in the inventory? Half of the bridging assets in CONUS were at Fort Chaffee, but there was barely enough bridge to cross a task force. These questions must be answered to ensure that we can fight and win on today's battlefields. 

Major James K. Rupp is the S3 of the 353rd Engineer Group. He holds a bachelor of science degree in mechanical engineering from the University of Wisconsin and is a registered professional engineer.



The Multirole Bridge Company: *An Update*

By Alan Schlie

Military history is replete with defeats (and victories) of armies backed against uncrossable chasms. And many heroes were made in assaults across those same chasms, into the face of a defending army. The crossing of chasms is a mission of U.S. Army engineers.

General George Washington escaped defeat and certain annihilation on Long Island in August 1776 by using soldiers from Colonel John Glover's 14th Continental Regiment (MA) as pontoniers to ferry 10,000 soldiers across the East River to Manhattan and safety. On Christmas Eve and again on New Year's Eve, Washington's soldiers and cannons were ferried across the Delaware River to surprise the Hessian garrison at Trenton. The pontoniers participated in both ground attacks before taking the prisoners and the victors back to Pennsylvania. Ever since, the Army's specialized river-crossing units and equipment have belonged to the pontoniers—the engineers.

Except for brief experiments with "India rubber" during the Civil War, bridging equipment for the horse-powered Army remained unchanged until the beginning of World War II. The introduction of tanks to the battlefield and the advent of armored tactics were the impetus for changing the pontoniers' equipment. The

full-fledged mechanization of the Army created a need for bridging equipment to support increasingly heavy combat systems.

Factors for Change

Revisions to tactics, techniques and procedures (TTP), changes in training, and refinements to organizational structure always follow the introduction of new equipment. But recently other factors have affected TTPs, training, and organization:

- Restructuring the heavy division's engineering support moved all the bridging assets to corps level.
- The collapse of the Iron Curtain changed the Army's focus from a single threat to multiple threats.
- The use of military units in contingency operations.
- Force structure planning based on the premise of a power-projection Army capable of fighting two nearly simultaneous regional conflicts.
- Reductions in forward-deployed forces.
- Budgetary constraints that forced installation closures and the costly movement of stockpiled supplies.
- Consolidations that result when fewer

soldiers are left in military occupation specialties and the impact that teaching more skills has on available training time.

Efficiencies are gained by consolidating units with similar missions. When that assumption is coupled with the factors listed above, the decision to merge existing, single-role bridge units into a multirole bridge company (MRBC) is understandable. An MRBC will be significantly more versatile and flexible from both the operational and logistical perspectives than separate units. It will be trained and equipped to install or assemble all current and developmental U.S. Army system bridges. It will carry mixed sets of bridging as a "basic load" and expend that bridge as it supports the maneuver or assaulting forces, being resupplied when and where necessary.

The Plan

The MRBC process action team examined the impacts of doctrine, training, leadership, organization, materiel, and soldiers (DTLOMS) and concluded that a field evaluation was needed to "proof" the concept. The Test and Experimentation Command agreed to conduct the evaluation, and the 74th Engineer Company (AFB) from Fort Hood, Texas, volunteered to be the evaluated unit. The 586th Engineer Company from Fort Benning, Georgia, provided additional soldiers and equipment. The evaluation began on 20 July 1995, following the river-crossing operation of the 353rd Engineer Group at Fort Chaffee, Arkansas (see page 2).

Two 72-hour field training exercises provided opportunities to collect data to evaluate two issues:

- Can the MRBC headquarters effectively command, control, and communicate while providing bridging support?
- Can the MRBC be sustained in a combat environment while conducting continuous and simultaneous operations?

The evaluation mechanisms for issue one were the decisions made during operational planning and the information flow. The evaluation mechanism for issue two was the MRBC's operational readiness rate.

The Evaluation

The 74th reorganized under a test table of organization and equipment before the evaluation and was allowed time to become

familiar with its newly acquired medium girder bridge. The new MRBC then deployed to a field location where it received bridging missions through both field training exercises. The company, the platoons, and sometimes the sections received missions to construct bridges and rafts at sites scattered across Fort Chaffee. Missions were executed during the day and at night to simulate battlefield conditions and provide the unit with data to evaluate their competence. Some sites were inaccessible because of flooding on the Arkansas River. That added realism complicated travel, bridging, eating, and sleeping schedules.

The evaluation was strictly for purposes of the Concept Evaluation Program (CEP) rather than a unit Army Training and Evaluation Program, but that did not distract the bridge builders' focus or reduce their intensity. When soldiers were asked to perform, the results were always "mission accomplished!" The unit was overloaded with missions, but there was no other way to determine the MRBC's capability to control and support its elements.

This concept evaluation substantiated the MRBC's ability to effectively command, control, and communicate while providing bridging support and to be sustained in a combat environment while conducting continuous and simultaneous operations.

The Future

The next step for the MRBC is to present this concept to a force development review panel at TRADOC to seek approval to create the new organization and implement it Armywide. The MRBC's multiple capability provides a synergistic impact on the mobility of the combined arms team. Each DTLOMS area will be positively enhanced through minor changes and will be firmly established when the next generation of bridging—the heavy dry support bridge and the improved ribbon bridge—is fielded.

With the completion of this CEP, the evolution of Army bridging has taken a significant step forward by demonstrating how the pontoonier of the future will support Force XXI.

CSM (Ret) Schlie is a Force Development Analyst with the Directorate of Combat Developments, U.S. Army Engineer School. He has served in various capacities in Europe, Korea, and CONUS throughout his 22-year career.

Demystifying River-Crossing Operations

"Nature alone is often sufficient to foil a river crossing; if a crossing point is expertly defended, the slightest aggravation of terrain becomes a weapon in the enemy's hands. ...By their very nature, river crossings demand the coordinated action of several arms and branches whose roles are critical to tactical success. Yet even when fortune appears to favor one's own side, the potential for disaster in this, as in all military operations, is never far away".

Dr. Roger J. Spillar

"Combined Arms in Battle Since 1939"

Why do maneuver forces infrequently train for river-crossing operations? Part of the answer lies in the fact that many maneuver commanders and their staffs believe it is unlikely that the U.S. military will be forced to conduct a deliberate river crossing on the modern battlefield. In some respects they're correct, and we hope that the tempo of operations will not allow an enemy time to prepare a defense on a river.

This type of thinking is not new. After the Berlin Wall came down, maneuver commanders questioned whether we would ever have to conduct a deliberate breach again. But when Desert Storm and the possibility of a deliberate breach became a reality, the Army had to relearn combined arms breaching techniques. For that operation, we had time to train the force.

River-crossing operations are more difficult to conduct than deliberate breaches, and the skills at all levels are harder to maintain. As key players, engineers must reinforce the impor-

tance of training the combined arms team for river crossings and remove some of the mystery in planning and executing this important mission.

To demystify the terrain around a river, we must portray it in a way that is usable by the combined arms team. We do this by providing a digital terrain picture for the Army Battle Command System, requesting terrain products and providing detailed analyses of these for mission planning and rehearsals. As terrain experts, engineers play a critical role in the selection of assault crossing sites, supporting overwatch positions, support-by-fire positions, defilade routes, and assembly areas. We identify terrain that will support the employment of situational obstacles on flanks or on likely enemy counter-attack routes. As river and terrain conditions change due to weather or enemy action, we must continually update our maneuver forces' map data.

These requirements are not just Force XXI initiatives. We have always provided this advice, but Force XXI initiatives will help us do it more quickly and easily. The Engineer Officers Advanced Course trains captains to analyze terrain and give timely advice for mission planning. We must demonstrate our ability to portray terrain to the force so that commanders will feel comfortable about conducting this type of operation.

FM 90-13, *River-Crossing Operations*, provides the doctrinal basis for planning and conducting river crossings. However, some confusion exists in the engineer community about the planning responsibility of the division engineer and the corps

engineer group commander. This legitimate concern is often expressed by the maneuver commander and his staff.

The answer is that the division engineer has overall responsibility for planning the river crossing and coordinates for corps engineer units to cross the force. The division engineer begins planning immediately after he receives a warning order or when mission analysis determines the need to cross a river. Through parallel planning and providing input to the maneuver plan, the division engineer helps eliminate delays in the planning process at division headquarters or in the engineer brigade. When the engineer group commander and his staff link up with the division engineer, initial and critical engineer input already is incorporated in the maneuver plan.

The two engineer staffs then develop a detailed crossing plan that supports the maneuver plan. Therefore, the relationship between the division engineer and the engineer group commander in the planning process is mutually supporting and mission-oriented. The engineer community must clarify these relationships by educating commanders and staffs through officer professional development and command post exercises.

How does the engineer corps demonstrate flexible command and support relationships that take into account a fast-moving modern battlefield? River-crossing operations are an ideal opportunity to show maneuver commanders the advantages of massing engineers. Traditionally, the command and control of engineer support for the

(Continued on page 19)

By Major Glenn Fenton

Engineer Battlefield Assessment:

The Good, the Bad, and the Ugly

By Michael W. Sayer

This is the first in a series of three articles about the roles of NCOs in an engineer battalion of a heavy division.

"Tell me what you know about EBA," said my battalion commander.

I was dumbfounded. "EBA? What does this refer to, sir?" I asked.

"Engineer battlefield assessment," he replied.

Thus began my introduction to a topic that was to drive my field duties for the next two years.

When the 4th Engineer Battalion transitioned under the Engineer Restructure Initiative (ERI) in 1992, I inherited a job that no other 12B30 I knew of had filled—the position of intelligence NCO. The ERI made critical personnel changes. Its modified table of organization and equipment (MTOE) eliminated the intelligence officer/S2 position and replaced it with an engineer master sergeant (12Z50) position. Since master sergeants are usually in short supply in a battalion, I got the job. As part of my professional develop-

ment, I read FM 34-130, *Intelligence Preparation of the Battlefield*, but my knowledge was still cursory. The assignment opened my eyes and broadened my perspective considerably.

At first glance, the EBA seems like nothing more than an engineer using the intelligence preparation of the battlefield (IPB) process. But this reasoning misses the purpose of EBA, which is to complement and broaden the IPB process. Literally, EBA is an analysis by engineers that concentrates on the effects of terrain, weather, and the enemy on the battlefield.

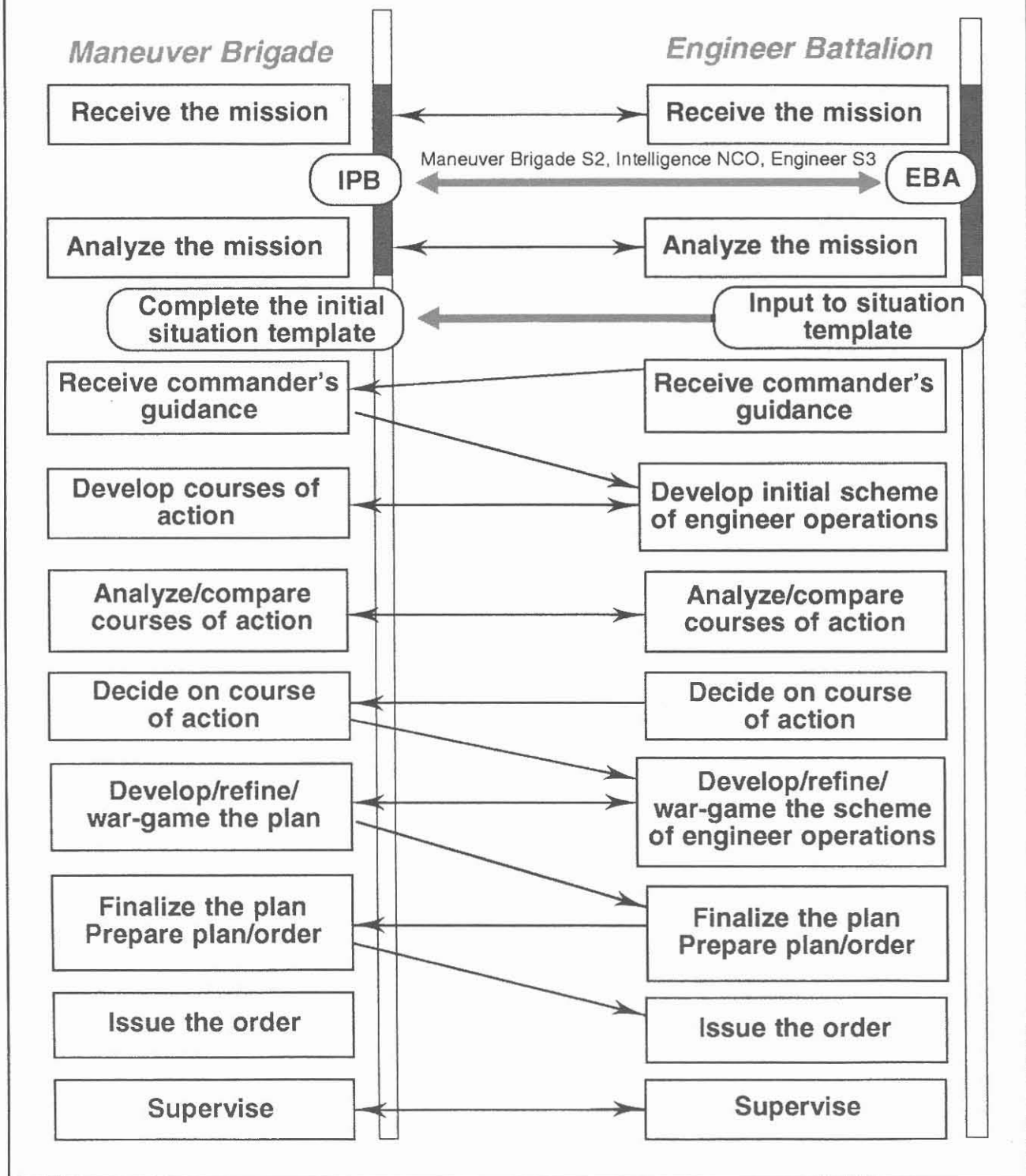
Terrain Analysis

Terrain is the bedrock on which all operations rest. Mobility, trafficability, vegetation, and terrain determine how difficult an operation will be. In addition to analyzing soil types and cross-country mobility, we must consider the effects of these factors on operations. When a brigade commander plans a defense in sector, he must use all of the terrain visualization tools available. Some of the tools

currently used by the division terrain team are the Multi-Spectral Imagery Processor (MSIP) and Terrabase. These software programs provide terrain visualization information that give users a feel for what the area of operation looks like. The division terrain team uses cross-country mobility and trafficability overlays, aerial photos, and satellite imagery. They also keep bridge reconnaissance information, assorted overlays, and 1:25,000 scale maps. While terrain teams have access to various scale maps, selection of the proper scale depends on the mission, equipment, time, troops and terrain (METT-T). For example, in a mechanized brigade movement to contact, a 1:25,000 map is of limited use, but in a light infantry raid, it is extremely valuable.

Engineers look at all of these products to provide the maneuver S2 with a terrain analysis that is in greater depth than the restricted and severely restricted evaluation commonly performed. By using the parallel planning process shown in the figure on page 13, we bring the battlefield operating system (BOS)

THE PARALLEL PLANNING PROCESS



input to the war-gaming process and integrate it in the time-space-purpose analysis of all previously identified factors.

If a unit is to defend in sector, soil composition is critical information. When the commander plans a defense using natural obstacles such as drainage or slopes, he needs to know about the surrounding terrain. Whether the soil is a silty clay or hard rock influences his choice of battle positions and whether he will fight dug in or above ground. Because the soil type directly affects engineer effort, it must be identified early in the planning process. Without such information, precious blade and platoon hours may be lost during the defensive preparation. An EBA terrain analysis depends on an immediate and accurate depiction of the terrain in the area of operations; additional analyses are required to complete the EBA.

OCOKA

The process of observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA) provides additional depth and breadth of information on the military aspects of terrain. A brief discussion of OCOKA follows; for more detail, refer to FM 34-130.

Observation and Fields of Fire. Observation is the ability to see either visually or through surveillance devices. Because cover and concealment limit direct observation, engineers (the brigade terrain experts) have assets that provide detailed horizontal line of sight (LOS). Soldiers use LOS

when they emplace surveillance and communications assets, such as Q-36 and Q-37 radars and retransmission sites. When a commander is forced into a hasty defense, Terrabase provides LOS and visible area plots from selected locations that help him visualize terrain and engagement areas. LOS products also help emplace intercept units' baselines and locate laser designators. A field of fire is the area a weapon or a group of weapons may effectively cover from a given position.

After engineers analyze the surrounding vegetation, elevation, and man-made objects, they make an overlay that delineates locations used to evaluate observation and fields of fire. They use the overlay to determine the effects of observation and fields of fire on the plan.

Cover and Concealment. Cover is protection from fire; concealment is protection from observation. Engineers provide recommendations to the commander about defensible terrain, approach routes, and assembly areas. Adding cover and concealment information to that already plotted on the overlay increases its effectiveness in the planning process.

Obstacles. Obstacles are natural or man-made terrain features that stop, impede, or divert military movement. They are the engineer's prime responsibility, and we must determine the effects of each obstacle on the force. Obstacle systems emplaced perpendicular to the line of march favor the defense and those emplaced parallel favor the attacker. Vegetation, surface drainage, surface materials, slopes and gradients, natural

and man-made obstacles, transportation systems (such as bridges and roads that are classified as restricted due to curves, slopes, or width), and the effects of weather are factors affecting obstacle effectiveness. Annotate the effects of these factors on the overlay to produce a combined obstacle overlay.

Key Terrain. Key terrain provides a marked advantage to its holder, but decisive terrain is necessary to accomplish a mission. A hilltop overlooking the valley containing the objective is key terrain. The pass leading past the hill that is the only route to the objective is decisive terrain. Annotate these factors on the overlay.

Avenues of Approach. Avenues of approach are determined from information plotted on the overlay. First, identify areas that canalize movement due to terrain constriction; these are mobility corridors. Then see if the corridors are wide enough to move tactical formations two echelons below your level. After identifying the corridors, categorize them by the size or type of force they will accommodate. When the mobility corridors are grouped, they form avenues of approach. These avenues must provide ease of movement and enough width to allow the force to pass. When this information is plotted, the result is the Modified Combined Obstacle Overlay (MCOO).

MCOO

The benefits of an MCOO become apparent when a planning process begins. Because it is produced before deployment or just after arrival in theater, the MCOO is immediately available for planning.

With the MCOO, it is unnecessary to repeat the entire analysis process each time a mission is received. It also allows a greater depth of analysis.

Engineers analyze the areas of OCOKA, factor in the weather, and then determine their effects on friendly and enemy maneuver. By comparing the advantages and disadvantages of various plans, we can focus early in the process and provide a timely and accurate product for the fight. To be effective, engineers must thoroughly understand the enemy's capabilities.

Enemy M/CM/S Capabilities

For the engineer staff, this is the point where the intelligence NCO is critical. It is impossible to overstate the need to know everything about the enemy in general and enemy engineers in particular. The intelligence NCO has support from the S3, the XO, and the commander, but he must be the subject matter expert. He must work closely with the S2s from the engineer and the maneuver brigades and make accurate deductions from the available data.

Specifically, the intelligence NCO must be able to state the mobility/countermobility/survivability (M/CM/S) capabilities of the enemy and incorporate them in the planning process. For example, if the intelligence NCO knows the enemy can breach six obstacles, he must emphasize that the friendly unit needs seven or more obstacles. If enemy doctrine calls for antitank

"It is impossible to overstate the need to know everything about the enemy in general and enemy engineers in particular."

ditches, the bridging assets must be in a forward position.

The intelligence NCO is the threat engineer subject matter expert. To help in war gaming, he advises the assistant brigade engineer about the enemy impact on the operation and describes the most likely method of enemy engineer employment. As with all brigade intelligence products, he coordinates his input through the brigade S2. The intelligence NCO works with the targeting cell to identify high-value targets as well as high-payoff targets. In the war game, he also identifies the high-payoff targets, explains their location and significance, and identifies M/CM/S-specific priority intelligence requirements. In the offense, he ensures that the templated obstacles are on the reconnaissance and surveillance plan and in the operations order. He also addresses the enemy's weaknesses and vulnerabilities to help determine how to overcome them.

Given a solid understanding of the enemy and connections to the division's intelligence pipeline, the intelligence NCO will provide the following information about the enemy engineer order of battle.

Identification. The intelligence NCO must know who the enemy is. He must determine if the enemy engineer unit is organic or attached from a different echelon. Is it regimental, divisional, or pushed down from corps? By going through intelligence reports, he can learn who we are facing, from echelons above corps through separate brigades and battal-

ions. If operating in a semiarid, desert climate, sighting bridging units forward may be insignificant. However, if reports state that corps-level breaching assets are moving forward, this information may be important.

Composition and Strength. This information is extremely valuable. For example, if the enemy MTOE calls for one dozer per battalion, units are unlikely to dig in. However, if the enemy has mine-laying equipment and ditching machines, the defense will be stronger and harder to overcome. The friendly order of battle is significantly different when the enemy strength is at 90 percent than when it is at 50 percent.

Disposition and Location. The enemy will try to use the terrain to his advantage to support his scheme of maneuver. By knowing the habitual type of support provided by an enemy engineer unit to its maneuver force, we can predict enemy engineer activity

fairly accurately. With this knowledge, engineers can determine a probable scheme of maneuver and support.

Recent and Known Activities. Being tied into the intelligence pipeline becomes critical at this point. When spot reports indicate enemy activity, such as breach rehearsals or routine maintenance, we can use that information to forecast upcoming actions.

Capabilities. This is the meat of the intelligence NCO's responsibilities. The enemy's capabilities are fairly apparent when we know the unit's identification, composition, strength, disposition, location, and recent activities. By combining this information with his doctrine, we can answer the following questions:

- What support will enemy engineers provide to their reconnaissance?
- What are the enemy's mobility capabilities?
- What are the enemy's countermobility capabilities? Does he employ conventional obstacles, scatterable mines, and/or tactical and protective obstacles?
- What are the enemy's survivability capabilities? Does he rely on vehicle fighting positions or fortifications, trenches, and bunkers?

Probable Courses of Action. After war gaming the enemy's possible courses of action, determine the most likely course of action of his engineer assets based on his M/CM/S capabilities. Identify when and where enemy M/CM/S assets are expected, specifying the time/space/purpose matrix on the battlefield. Then determine the effects of enemy actions on friendly forces and our maneuver or defensive

plan. Given what we know of the enemy and our counteractions to his reactions, we can exploit weaknesses or vulnerabilities identified during the EBA process.

Friendly M/CM/S Capabilities

The final part of the EBA process is to evaluate the friendly engineer mission and M/CM/S capabilities and their impacts on mission accomplishment. The S3 and assistant brigade engineer provide most of the information, based on statistics taken from reports companies send to the battalion headquarters.

EBA and the Maneuver Brigade

The ERI battalion's working relationship with the maneuver brigade is sometimes hampered because of problems in three areas:

- Personnel assignments.
- Execution, integration, and acceptance of the EBA process.
- Understanding of the EBA process.

Personnel Assignments.

Engineers often assign soldiers to the intelligence NCO position who have neither the training nor the experience needed for the job. Frequently, a soldier who is probably a superb leader and motivator is thrust into a position for which he is unprepared, causing a tremendous disservice to three elements.

- The soldier, who cannot perform his assigned mission because the noncommissioned officer education system does not train 12B NCOs for this difficult and demanding position.

- The battalion, which must spend considerable time bringing this soldier up to speed. Typically, NCOs go back to line units at the end of 12 to 18 months, before they have developed into effective team players.
- The brigade, which has a weak link in a critical battlefield operating system of the brigade combat team.

There are solutions to these problems. The Battle Staff Course is helpful, but there are few allocations for engineer battalions. NCOs may rotate to the line before receiving this training. I recommend that this position be a two-year assignment to give soldiers time to learn the job. Additionally, the position requires an expensive high-security clearance, which takes from six months to a year to complete; the cost cannot be justified for short-term assignments. I recommend that the 12B Advanced NCO Course be modified to provide time (40 hours minimum) to introduce NCOs to the requirements of this position. The additional training time will allow prospective intelligence NCOs to become knowledgeable about this non-traditional 12B job.

Execution, Integration, and Acceptance. Brigade S2 sections often do not understand how the EBA process supports the total IPB process. Some S2 personnel think that engineers are only trying to add another product to the orders process. Since intelligence NCOs are not from the military intelligence field, they must prove themselves and the value of their product to the S2 section. Time will solve this problem.

(Continued on page 49)

CMF 12 Advanced Noncommissioned Officer Course Program of Instruction

By Sergeant First Class John Hurley
and Sergeant First Class Steven Eberharter

During the past two years, the National Training Center analyzed the present and future training needs of NCOs to determine their battlefield requirements, responsibilities, and duties. From this analysis, the Combat Training Centers and the Center for Army Lessons Learned concluded that—

- NCOs have the technical skills required to perform missions tasked.
- NCOs lack the tactical skills required to perform missions tasked.
- The NCO's role on the battlefield is not clearly defined in doctrine or in the units.
- Future doctrine must include NCOs as tactical assets on the battlefield.
- The NCO's knowledge must complement the officer's knowledge to build a more cohesive team.

Shortcomings in the NCO's ability to accomplish battle tasks relate directly to the lack of institutional and unit training required for those tasks. TRADOC Regulation 351-10, *Guidelines for the Development of Enlisted Training*, states that the Advanced Noncommissioned Officers Course (ANCOC) and the Officers Basic Course should integrate training of common level tasks. The tasks should be those that both NCOs and officers must perform.

The U.S. Army Engineer School established a new, interim program of instruction (POI) based on conclusions from the two-year analysis and the requirements of TRADOC Regulation 351-10. In addition to the integrated tasks mentioned above, this POI includes common leader training required by the U.S. Army Sergeants Major Academy and technical training required by the Engineer School. The interim POI will be tested and validated during the FY96 course period.

So that future ANCOC students and their supervisors can become familiar with requirements of the new course of instruction, the NCO Academy developed Student Advance Sheets and

sent them to all commands. They addressed the following lessons:

- Provide Engineer Support to Army Operations
- Plans and Orders
- Breach an Obstacle
- Conduct Engineer Tactical Planning
- Task Force Engineer Responsibilities and Duties
- Determine Engineer Capabilities
- Provide Engineer Support to Offensive Operations
- Conduct Offensive Operations Practical Exercise
- Conduct Offensive Operations TEWT
- Provide Engineer Support to Defensive Operations
- Determine Tactical Obstacle Requirements
- Conduct Defensive Operations Practical Exercise
- Conduct a Defensive Operations TEWT
- Conduct Offensive Operations
- Conduct Defensive Operations
- Obtain Combat Service Support
- Determine Division Organization
- Conduct River-Crossing Operations

Battalion command sergeants major and senior NCOs must ensure that scheduled ANCOC students within their command are aware of the new POI and have copies of the Student Advance Sheets. When trained to standards in the new POI, the NCO's tactical skills will become a critical asset on the battlefield.

Sergeant First Class John Hurley is the chief of training at Libby NCO Academy at Fort Leonard Wood, Missouri. He may be reached at (314) 596-6942 or DSN 581-6942.

Sergeant First Class Steven Eberharter, the Project Warrior NCO, is an instructor for the Engineer Officers Basic Course at Fort Leonard Wood, Missouri. He may be reached at (314) 563-5581 or DSN 676-5581.

Tiered Readiness and Resident Schooling in the Reserve Components

By Brigadier General Thomas Whitecotton

Many Army combat engineer leaders are concerned about the large number of Reserve Component (RC) senior captains who have not completed the Combined Arms Service Support School (CAS3). Lack of this schooling may eliminate some fine soldiers from competing for promotion. The problem stems primarily from three roots:

- The recently implemented criteria requiring CAS3 for promotion to major. For the RC, this criteria took effect in October 1994.
- The dwindling combat support force structure, which causes some RC engineer units to continually deploy and redeploy while other units do not deploy.
- The zealous attitude of some dedicated captains, who have consistently performed missions beyond the point of reasonable personal sacrifice. Many captains delayed going to CAS3 in favor of numerous deployments; now their promotions or careers are in jeopardy.

We can solve this problem by applying resources at the right time and place and by putting mechanisms in place to ensure that our best and brightest captains survive the ongoing Army force structure downsizing. The following discussion is based on my experience as an RC commander, but I'm aware that similar problems are emerging in Active Component units.

Background

In the force structure of the U.S. Army, units are arrayed according to their relative priority as reflected in the war plans of the Commanders in Chief. Ultimately units appear in the Forces Command time-phased force deployment list (TPFDL). Force activ-

ity designators (FADs) assign each unit a numerical priority for resources, including schooling.

In the past, the relative priority for individual schooling was a distinction without a difference. Adequate training dollars ensured that officers and noncommissioned officers (NCOs) attended both basic and advanced courses. Professional development for officers continues with either resident or corresponding studies options for CAS3 and the Command and General Staff College (CGSC). Next is the Army War College (AWC), which is very selective, with attendance based on the "best qualified with most potential for advancement" criteria. That distinction separates the AWC from the mass-production environment of preliminary military schools. Today, the selection criteria for CGSC appears to be approaching that of the AWC.

The best-qualified selection criteria for AWC and CGSC may become the standard for attendance at other Army officer and NCO courses. Attendance qualifiers may be needed because of large reductions in school resource accounts. Such funding cuts cause readiness "tiering" by separating units into several resource categories based on their TPFDL priority.

Tiered Readiness

Tiered readiness is the concept some in the table of organization and equipment (TOE) Army call the "have" and the "have not" units. Contingency Force Pool (CFP) (soon to be Force Support Package) units are "haves." They deploy early and are required to maintain the force structure needed to fight two simultaneous major regional contingencies. These units are funded at 100 percent of optimum tempo (OPTEMPO). In the

reserves, CFP units have priority for personnel. They are authorized to be at 100 percent (or more) of TOE strength, have priority for recruiting, and maintain 100 percent of their full-time unit support (FTUS) personnel. Most importantly, CFP units have priority for attendance at military schools, including CAS3. A proposal under discussion is to modify the Army Training Requirements Resourcing System (ATRRS) to ensure that quotas for needed courses are given first to soldiers in CFP units.

Tiered readiness works! In my CFP units, funds are distributed according to the model, with expanded FTUS support and increased OPTEMPO. The additional training time and operation readiness evaluation (ORE) preparation in these units results in their increased readiness.

As units are arrayed in priority from CFP I through enhanced brigades to CFP II units, maneuver brigades, and divisions, and then to "all other units," resources for units not in the upper echelons are cut severely. The "all other unit" status means they have low FADs, 50 percent FTUS support, an 85 percent ceiling of TOE fill, 60 percent OPTEMPO, and no priority for schooling. With fixed or declining budgets, the cuts become more serious.

While the tiered readiness system is emerging, there is also turbulence in the force structure, constant change in TPFDLs, and declining balances in school and training accounts. Large deployments and training exercises, such as Reforger and Team Spirit, have been severely cut. School accounts today have less than one-third of the funding they had just two years ago. Man-day expenditures to support overseas deployment training have been drastically reduced in RC units.

Impacts on Schooling

Two years after record levels of participation in training exercises, RC units now participate in the minimum training opportunity required (i.e., authorized inactive duty training and a 15-day annual training (AT) period). The extra AT periods and man-days used to send people to resident schools are rapidly evaporating. There is bitter irony: Our collective training OPTEMPO has declined, allowing soldiers to attend required courses, but we now lack sufficient training funds to meet course demands.

The Fix

Army leaders must commit time and dollars now for our hard-charging captains to attend CAS3 so they remain competitive for promotion to major. The care factor is reciprocal. We must accommodate those who did double duty to deploy, took the risks, completed the missions, and redeployed year after year. Without additional paid man-days, officers must attend CAS3 on their own time.

As we adapt to declining structure and resources, other challenges will limit the number of RC soldiers attending schools. The select, train, promote, and assign (STPA) system provides "order of merit" lists for officers and NCOs. The STPA concept uses these lists to invest schooling dollars only where the potential for success is high. This concept introduces competition for available school quotas in a system where no competition existed before.

Tips for Commanders and Captains. The following suggestions may help RC units allocate their shrinking training resources:

- Thoroughly review the order-of-merit lists, ensure their accuracy, and use them to prioritize individual training requirements.
- Pressure captains to complete CAS3. Fort Leavenworth has increased the capacity of CAS3 courses to accommodate expected student loads. The U.S. Army Reserve Force school system has scheduled extra CAS3 sessions in FY 96; they are soliciting students.

- Ensure that each officer has consulted his or her mentor and has developed a plan to complete required military courses.

Institutional Training Challenge.

The Army's Training and Doctrine Command (TRADOC) needs to explore alternatives to the current RC CAS3 course format. RC officers interrupt their civilian careers to attend both the Engineer Officer Basic and the Advanced Courses (EOBC and EOAC). Now they must take additional time off for CAS3 and CGSC. It is increasingly difficult for RC officers to remain employed, serve in the ready reserve, and attend required courses in the formats that worked 20 or 30 years ago. TRADOC must adapt school formats to the needs of today's customers. A few ideas are—

- Integrate EOAC and CAS3 at the branch school and teach CAS3 as a follow-on to EOAC.
- Export CAS3 as interactive CD ROM.
- Drop the CAS3 requirement. Before CAS3, senior National Guard captains were expected to enroll in CGSC and complete the course under mentoring by experienced staff officers at their engineer battalion, group, or brigade while they served in a staff assignment through the rank of major. Perhaps it is time to reinstate that concept.

There is a price to pay for achieving enhanced readiness for CFP units at the expense of the rest of the force. Our captains are paying that price now in schooling. It may be heroic to say that all units can maintain their current readiness requirements under severe resource restraints, but practically we know that tiered readiness will cause degradation in many units unless we take action!

BG Whitecotton is Brigade Commander, HHC, 35th Engineer Brigade (Corps), Missouri National Guard. He has served in numerous assignments in both the Active and Reserve Components, including Korea and combat duty in Vietnam.

(Continued from page 11)

maneuver fight was separate from the support force mission. As we move toward Force XXI, the ability of the engineer commander and his staff in the engineer brigade headquarters to command and control additional assets will improve significantly.

In this scenario, the engineer brigade could conceivably command and control two or three corps engineer battalions with multirole bridge companies to cross the division and still support the maneuver fight. The concept of massing engineers on the battlefield is discussed often at the U.S. Army Engineer School, but we must demonstrate this ability to our maneuver brethren. One solution is for engineer participants in the Command and General Staff College exercise, Prairie Warrior '96, to mass engineers under the engineer brigade when they conduct river-crossing operations for the Mobile Strike Force.

Maneuver commanders will be interested in river crossings if engineers demonstrate that we can portray terrain accurately, that we understand our doctrine, and that we can tailor our flexible command and support relationships for specific missions. Advanced Course graduates are better trained in terrain visualization now than ever before. We must use them to demonstrate these capabilities. Let's keep education, doctrine, and debate on river crossings alive!

Major Fenton, the Australian exchange officer at the Engineer School, is chief of the Engineer Officer Advanced Course Division in the Department of Tactics, Leadership, and Engineering. Previous assignments include a two-year exchange with the 65th Engineer Battalion, 25th Infantry Division (Light), Schofield Barracks, Hawaii.

WANTED



U.S. Army Engineer Divers

*By Sergeant First Class Timothy Dillard and
Master Sergeant Peter Swenson*

Enemy sabotage and artillery deny the use of strategic ports. Harbors are jammed with sunken ships and downed aircraft. Underwater obstacles block advancing forces at river-crossing sites. Resupply efforts and mobility are halted. Rapid obstacle reduction and harbor clearance are vital, but who is trained, equipped, and available to quickly respond to support these critical engineer underwater missions? U.S. Army engineer divers!

"Be all you can be" is a slogan that has enticed many young soldiers into the U.S. Army. Behind this often-repeated phrase is an important question that anyone seeking a challenge or a change must ask. "What am I capable of accomplishing if I apply myself?" No one will take you by the hand and set goals for you. That is an individual responsibility. The only way to find the answer is to seize opportunities that present themselves. Becoming an Army engineer diver is one such opportunity.

The Army is looking for highly motivated soldiers to volunteer for engineer diver training, Military Occupational Specialty (MOS) 00B. Though divers have been a specialty within the Army for many years, the MOS is not well-known. This article answers some common questions about the diving field and what it takes to apply.

Missions

Engineer divers support all specialized underwater missions in communication and combat zones. In May 1995, the Engineer School's Directorate of Combat Developments prepared an Executive Summary *U.S. Army Concept for Engineer Diving Forces* that describes these missions.

Communication Zones. Divers provide sustainment engineering support in communication zones:

- Furnish combat swimmer, scuba, and surface-supplied diving assets to commanders in ports, harbors, and coastal zones.
- Construct port and logistics-over-the-shore structures, facilities, and floating barriers.
- Repair damaged piers, docks, wharfs, seawalls, and breakwaters.
- Clear and mark navigational waterways.
- Collect underwater terrain and structure data.
- Remove underwater obstructions.
- Reduce and emplace underwater obstacles, mines, and demolitions.
- Recover soldiers and materials.
- Install and maintain mooring systems and off-shore petroleum and water-distribution systems.
- Repair Army lighterage and vessels.



A diving crew aboard an LCU 1542 Malados diving platform in Pohang, Korea, perform maintenance on the ship's mooring system.

- Protect land forces, vessels, and underwater structures from underwater threats.
- Reduce the probability of damage to underwater structures.

Engineer divers proved their importance during Operations Desert Shield/Desert Storm. Except for one lightweight diving team in Panama, all active duty engineer diving units directly supported the conflict. They logged more than 1,000 hours of bottom time in five ports throughout Saudi Arabia and Kuwait. Other recent overseas missions include operations in Somalia and Haiti and harbor clearance in the hurricane-stricken Caribbean islands.

Combat Zones. Engineer divers provide support to maneuver units during river-crossing operations in forward combat zones:

- Cross wet-gap obstacles while minimizing losses.
- Perform bottom and bank approach surveys of proposed river-crossing sites.
- Locate, mark, and neutralize underwater obstacles using mechanical or underwater explosive methods.
- Assess bridge damage.
- Make in-water repairs to bridges, dams, pipelines, canals, and levees.
- Construct underwater bridge structures, obstacles, and floating barriers.
- Search for and recover water casualties and equipment.
- Clear and mark inland navigational waterways.
- Place underwater explosives on bridge supports to deny enemy use during retrograde operations.

Army engineer divers are the only diving teams in the Department of Defense that are trained and equipped to accomplish these missions. The Commander in Chief's reply to the 1992 Army Engineer School evaluation of Army diving and the performance of lightweight diving teams in Operations Desert Shield/Desert Storm and Operation Restore Hope confirm that these tasks are essential.

Professionalism

Within the engineer diving community, hard work and the desire to excel are the rule rather than the exception. Soldiers in the Army diving field are among the most professional in the military. Those who earn and wear the diver's badge understand and accept the responsibility that another person's life may depend on their ability to perform their job, not only in the stress of combat but on a daily basis during routine operations. Divers earn a paycheck by placing underwater explosives to flatten a sunken vessel that is obstructing ship traffic and by crawling inside the wreckage of a downed aircraft at depths of 190 feet, in total darkness, to recover equipment or casualties. These tasks require confidence in yourself, your team, and your equipment. Mutual trust and respect are the basis for the strong sense of camaraderie and esprit de corps that exist in all diving detachments.

Entry Requirements

AR 611-75, *Management of Army Divers*, lists entry requirements for MOS 00B and contains the *Engineer Diver Application* (DA Form 5030-R). The specialty is open to all soldiers, regardless of MOS or gender, who meet the requirements listed in the table on page 22.

Engineer Diver Requirements

Entry Requirements

- Be between 18 and 30 years old.
- Be in the grade of private through specialist with less than one year time in grade (engineer officers, second lieutenant or first lieutenant).
- Be in a nonpromotable status when reporting for diving duty.
- Score 100 or higher on the general mechanical test of the Armed Services Vocational Aptitude Battery (ASVAB).
- Score 110 or higher on the general technical or skilled technical test of the ASVAB.
- Have no conviction of illegal substance abuse.
- Have a physical profile of 111111.
- Undergo a diver medical examination and meet the medical fitness standards prescribed in AR 40-501 and AR 600-9.
- Attain a minimum score of 240 (minimum of 80 points per event) on the Army Physical Fitness Test.
- Pass the Diver Physical Fitness Test in the following sequence:
 - Swim 500 yards in 14 minutes or less, using the side

- stroke and/or breast stroke. Rest 10 minutes.
- Perform 42 continuous push-ups in 2 minutes or less. Rest 2 minutes.
- Perform 50 continuous sit-ups in 2 minutes or less. Rest 2 minutes.
- Perform 6 continuous pull-ups with the palms facing away from the body. Rest 10 minutes.
- Run 1 1/2 miles in 12 minutes 45 seconds or less.

Application Forms

- DA Form 4187, *Request for Personnel Action*, indicating your desire to reclassify as an MOS 00B, Engineer Diver.
- DA Forms 2A and 2-1, *Personnel Qualification Record*, Parts I and II.
- DA Form 5030-R, *Engineer Diver Training Application*, signed by the commander.
- DA Form 705, *Army Physical Fitness Test Scorecard*.
- SF 88 and 93, *Reports of Medical Examination and History*, (originals).
- Bonus, Extension, and Reenlistment Program application, if applicable.

Application Packet

Application packets vary slightly but usually include the forms listed in the table above. Waivers may be considered for some vision or hearing requirements and for up to two years time in grade as a specialist.

The Surgeon General's office has changed the reviewing procedures for physicals. DA Form 5030-R, Part I, *Submission of Applications*, has a new "TO" address: Aviation Medical Consultant to the Surgeon General, U.S. Army Safety Center, Building 4905, 5th Avenue, Fort Rucker, Alabama 36362-5363. Send the entire application package to this address by registered mail. Include a memorandum requesting that the packet be forwarded, upon approval, to the appropriate Personnel Command department listed on DA Form 5030-R. Keep a copy of the application for your files.

Prequalification Course

Candidates accepted into the diving program receive orders to report to the U.S Army Diving Detachment (Provisional), Fort Eustis, Virginia, to attend the 10-day Diver Prequalification Course. It is both physically and mentally demanding, which allows the instructors to evaluate the candidate's ability to meet the physical, mental, and academic challenges presented during second class diver training.

The curriculum includes instruction in underwater physics, physiology, diving medicine, and dive charting. Instruction of academic material starts at a beginner

level with the assumption that the candidate has never seen the material before. Comprehension and retention are tested by a written examination.

Candidates must demonstrate their level of fitness during extensive physical training and by their performance on the Army and the Diver Physical Fitness Tests. Physical training, conducted twice daily, emphasizes pool training (swimming and treading water), running, pull-ups, push-ups, flutter kicks, leg spreaders, and abdominal exercises. When reporting to the Prequalification Course, it is wise to be in excellent physical condition, well above the minimum entry-level requirements.

Candidates must perform an indoctrination dive using surface-supplied (hard hat) diving equipment. A pressure-tolerance test is administered to determine if they can adjust to ambient pressure changes. Individuals who cannot adjust are rare. Successful completion of the Prequalification Course is required to attend the second class diver training.

Second Class Diver Course

This 20-week course is conducted at the Naval Diving and Salvage Training Center in Panama City, Florida. Students receive instruction in diving physiology, medicine, and physics; the operation and maintenance of scuba, surface-supplied diving systems, and recompression chambers; underwater demolitions, cutting and welding, hydraulic tools, and photography; and marlinespike seamanship, rigging, and basic salvage.

Graduates receive the MOS 00B and the second class diver's badge and become eligible for hazardous duty incentive pay. The diving school teaches confidence in the equipment and how to use that equipment to reach the work site. From the first assignment, an engineer diver learns to be productive in the water and to gain the experience needed to progress as a diver.

Levels of Expertise

Four levels of Army diving expertise are recognized by the award of diver rating badges: second class diver, salvage diver, first class diver, and master diver. As a diver advances in rank, he must advance in rating or be reclassified out of the field.

Second Class Diver. To receive this rating, a candidate must meet entry prerequisites and successfully complete the Prequalification Course and the Second Class Diver Course.

Salvage Diver. A diver must have performed satisfactorily as a second class diver for at least 18 months, be a specialist in a promotable status or a sergeant assigned to a salvage diver position, be able to perform as a salvage diver, be recommended by a master diver, and have passed the Underwater Construction Technician Basic Course to receive this rating.

First Class Diver. A candidate for this rating must have performed satisfactorily as a salvage diver for at least 3 years, be a sergeant who has attained promotion status or who becomes a staff sergeant while assigned to a first class diver position, be able to perform as a first class diver, be recommended by a master diver, and have passed the Basic Noncommissioned Officer Course and the First Class Diver Course.

Master Diver. To receive this rating, a diver must have performed satisfactorily as a first class diver for at least 3 years; be a staff sergeant who has attained promotion status or a sergeant first class; have passed the Advanced Noncommissioned Officer Course, the Underwater Construction Technician Advanced Course, and the Army Master Diver Certification Course.

"Be All You Can Be"

The limited assignment locations (Fort Eustis, Virginia, and Fort Shafter, Hawaii) and small number of engineer divers (approximately 90) create an environment where individual strengths and weaknesses are well-known and which encourages teamwork to overcome these weaknesses and build on strengths. The success of every mission directly depends on each soldier's contribution to the team—from the newest second class diver to the most senior master diver. The nature of the profession and the pride in being part of the Army diving community provide a strong incentive to "Be all you can be" and inspire supervisors and subordinates to perform to the



Soldiers receive scuba training at the Naval Diving and Salvage Training Center, Panama City, Florida.

best of their abilities.

The Army Engineer Diving Program gives qualified applicants the opportunity, training, and support necessary for success. The desire and determination must be yours. *Carpe diem!*

Sergeant First Class Timothy Dillard, a master diver, is a senior training developer at the Engineer School. He was previously assigned to the 502d Engineer Diving Detachment, Korea; the U.S. Army Diving Detachment, Fort Eustis, Virginia; and the Naval Diving and Salvage Training Center, Panama City, Florida.

Master Sergeant Peter Swenson is the senior coordinator for the 51 series career management field at the Engineer School. He previously served with the 34th Engineer Battalion (Combat Heavy), Fort Riley, Kansas; the 84th Engineer Battalion (Combat Heavy), Schofield Barracks, Hawaii; and the 802d Engineer Battalion, Korea. Master Sergeant Swenson is a graduate of the U.S. Army Sergeants Major Academy.

Soldiers interested in learning more about the Prequalification Course and the Naval Diving and Salvage Training Center can call the U.S. Army Diving Detachment, Fort Eustis, Virginia, at DSN 927-5658/5780 or commercial (804)-878-5658/5780; or Sergeant First Class Timothy Dillard at Fort Leonard Wood, Missouri, DSN 676-7611/7502 or commercial (314) 563-4125.

NCO Proficiency: Bridge Demolition

By Sergeant First Class Gary D. Glover

An item in the August 1995 issue of *Engineer* (page 64) notes that the Career Management Field 12 Advanced NCO Course (ANCOC) at Fort Leonard Wood will no longer instruct bridge demolition in depth because that instruction is provided in the Basic NCO Course (BNCOC). Incoming ANCOC students are expected to be proficient in bridge demolition. Since records indicate that fewer than 3 percent of ANCOC students arrive with this knowledge, this article will address the knowledge gap. An article by Major Davis in the February 1993 issue of *Engineer* describes the history and basic concepts of the Sheffield bridge demolition method.

Bridge demolition is outlined in FM 5-250, *Explosives and Demolitions*, Chapter 4, Appendix A, pages A-10 through A-14 and Appendix H. Although the following discussion refers to FM 5-250, some entries in the manual are incorrect and do not correspond to the answers provided below.

Determine Bridge Category. This is the first step in determining the proper attack method and number of cuts needed to demolish a bridge. The flow charts on page 4-10 of FM 5-250 (for simply supported bridges) and page 4-15 (for continuous bridges) assist in selecting the appropriate attack method from those described in Appendix H. Read Chapter 4 thoroughly to understand the various bridge types and how to identify them. A simply supported concrete T-beam deck bridge with bottom support is used in the following examples.

Determine and Verify the Proper Attack Method. Using Appendix H, Table H-3, page H-3, you must first categorize the bridge to determine the appropriate attack method. Given a concrete T-beam deck bridge with bottom support, turn to page H-6. Serial 20 tells us that a top attack can be performed. Table H-3 also stipulates that "E is less than ER." As explained in Chapter 4, page 4-14, this note applies only to bottom attacks. End clearance (E) is a determining factor for bottom attacks but does not apply for top attacks.

Top Attack

A top attack, the quickest method of bridge demolition, is outlined on page A-13. This method should be used on all preliminary targets and when a bottom attack is not feasible. To perform a top attack, complete the following steps:

First, determine the amount of concrete that must be removed to create a successful hinge, using the bridge measurements on page A-10 and information on Table H-2, page H-2.

Note: For arch and pinned footed bridges, use Table 4-1, page 4-20, instead of Table H-2.

Determine the height-to-length ratio (H/L). The height of the bridge is determined by measuring the distance from the bottom of the beam to the top of the roadway. In this case H = 1.2 meters (m). The length (L) is the total length of the span. In this case L = 30 m. Divide the height of the bridge by the length of the span as shown:

$$\frac{H}{L} = \frac{1.2}{30} \quad \frac{H}{L} = 0.04$$

Second, determine the average length of the bearing support (L_S). Add the lengths of the near- and far-shore bearing supports and divide the total by 2, as shown on page 4-13. For this example, use the measurements on page A-10:

$$L_S = \frac{L_S1 + L_S2}{2} \quad L_S = \frac{1.0 + 0.8}{2} \quad L_S = \frac{1.8}{2} \quad L_S = 0.9$$

Next, determine the L_S-to-L ratio, using the formula of L_S/L:

$$\frac{L_S}{L} = \frac{0.9}{30} \quad \frac{L_S}{L} = 0.03$$

Apply the values of H/L and Ls/L to Table H-2 to determine the length-of-cut-to-length ratio (Lc/L). Read Note 3 before applying the values to the table. In this example, both the H/L and the Ls/L values are on the chart exactly. The Lc/L value is the point where these values intersect. In this case Lc/L = 0.029.

Last, focus on the last sentence of Note 3. Multiply 0.029 (Lc/L) by 30 (L) to determine the actual length of cut (Lc).

Bottom Attack

Sometimes a bottom attack is needed, as for a reserved target where the roadway must stay open. The end clearance (E) is a primary factor in a bottom attack. Compare the actual end clearance (E) with the required end clearance (ER). Use the measurements shown in Annex A, page A-12 and Table H-1, page H-1.

First, determine the actual end clearance (E) of the bridge, which is the sum of the end clearances of the near and far shores. Using the formula on page 4-13 and the measurements on page A-12, we determine the actual end clearance is 0.4 m.

Next, determine the required end clearance (ER) needed to successfully drop the span. First, determine the height-to-length ratio (H/L):

$$\frac{H}{L} = \frac{2.1}{25} \quad \frac{H}{L} = 0.084$$

Using Table H-1, page H-1, locate the H/L value (0.084) on the chart. Read the first part of Note 2. Since 0.084 is not on the chart, round that figure up to 0.09. Read the number directly below 0.09 to determine the required end-clearance-to-length ratio (ER/L) — 0.0160. Apply Note 3 to this value to determine the required end clearance (ER):

$$0.016 \times 25 = 0.4 \text{ m}$$

This is the minimum value of total end clearance, in meters, required for a successful attack. Because the actual end clearance (E) is 0.4 and the required end clearance is 0.4, a successful bottom attack can be performed.

A bottom attack can be performed even if the ER value is greater than E value. In that case, it is also necessary to destroy the near-side abutment.

Failure to properly determine the required end clearances for a bottom attack can result in a three-pinned arch (Figure 4-10, page 4-5). During a bottom attack, the bottom ends of the bridge initially move toward the abutments. Without sufficient end clearance, the bridge will jam at these points before the hinge has moved far enough to compensate for the movement.

Charge Calculations

Determine the amount of explosives required for bridge demolition by using the predetermined critical measurements in the concrete stripping charge formula:

$$P = 3.3(3.3h + 0.5)^3$$

Appendix A, page A-10, shows the explosives calculation process. Using the measurements on page A-10, the procedure to determine the amount of explosives for the beams is—

Step 1: Determine the amount of explosives (TNT) required per meter:

$$P = 3.3[(3.3 \times 1.2) + 0.5]^3$$

$$P = 3.3(3.96 + 0.5)^3$$

$$P = 3.3(4.46 \times 4.46 \times 4.46)$$

$$P = 3.3(88.716536)$$

$$P = 292.76$$

Note: During this step the sum of 4.46³ is left in the calculator and is cut off only after the final step of multiplying by 3.3. The answer, 292.76456, is cut off at the hundredths place. In some situations it may be necessary to round the answer up to the next higher value of hundredths. Rounding may make a difference of 1 pound or 1 package of explosive.

Step 2: Determine the amount of explosives (TNT) required per beam:

$$P = 292.76(0.35)$$

$$P = 102.466$$

Note: At this point you can cut off at the hundredths place or round up from the thousandths place. Let's look at both scenarios.

Cut Off or Rounded Up

$$P = 102.46 \qquad P = 102.47$$

Note: If TNT is used for the demolition, round up the total pounds at this step. In both examples above, 103 pounds of TNT are required per beam.

Now let's determine the amount of explosives required using C4.

Step 3: Determine the equivalent amount of C4:

Cut Off or Rounded Up

$$\frac{P}{RE} = \frac{102.46}{1.34} \qquad \frac{102.47}{1.34}$$

$$P = 76.46 \qquad P = 76.47$$

Step 4: Determine the required packages of C4:

Cut Off or Rounded Up

$$N = \frac{\text{Charge weight}}{\text{Package weight}}$$

$$\frac{76.46}{1.25}$$

$$\frac{76.47}{1.25}$$

$$N = 61.16 \qquad N = 61.176 (61.18)$$

A total of 62 packages of C4 is required per beam.

Use the same process to determine the amount of explosives needed to demolish each slab section of the bridge. When determining the amount of charge needed for each slab in a concrete T-beam deck bridge, you must consider the dimensions of the end slabs. If the sum of the width of the two end slabs equals the width of the internal slabs, the end slabs can be counted as one when determining the total explosives needed. If the sum of the width of the two end slabs differs from the width of the internal slabs, they must be calculated separately and added to the total explosives needed.

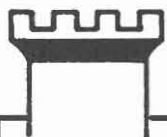
Determine the total explosives requirement. Multiply the number of beam charges by the required charge per beam to determine the amount of explosives needed to demolish the beams. Use the same process to determine the amount of explosives needed to destroy the slab sections. The sum of the beam explosives and the slab explosives equals the amount of explosives needed to destroy the bridge.

Explosives Placement. To assure a successful bridge demolition, the charges must be placed in appropriate positions. Annex A, page A-11, depicts a cross-sectional view of properly placed charges. Proper placement along the length of the span depends on the correct categorization of the bridge (simply supported or continuous) and the attack method (top, bottom or angled).

Note: In previous bridge-demolition procedures, it was necessary to compare the ditch width (Wd) with the "Lc". Current research shows that this step is not necessary and has no impact on successful bridge demolition, providing all calculations are correct. Therefore, the ditch width information on page 4-8 and the calculations on page A-11 of FM 5-250 no longer apply to bridge demolition. (See manual change dated 12 January 1994.)

Now test your knowledge of the Sheffield method of bridge demolition by completing the *Engineer Problem* on page 27.

This article and the following Engineer Problem/Solution were submitted by Sergeant First Class Gary D. Glover, an instructor/writer for CMF12 ANCOC at Fort Leonard Wood, Missouri. SFC Glover previously served in the 16th Engineer Battalion and the 66th, 567th, and 43rd Engineer Companies. He holds a bachelor's degree from Columbia College.



Engineer Problem

Situation: You have tasked a squad leader to perform a demolition reconnaissance mission on a bridge that is a preliminary target for demolition using C4. The squad leader's report provides the following information:

Bridge Type: Concrete slab, deck, with bottom support, simply supported.

Critical Dimensions:

Span length (L) = 35 meters (m)

Bridge height (h,H) = 1.1 m

Bridge width = 6 m

End clearances:

Near shore (E1) = 0.2 m

Far shore (E2) = 0.3 m

Bearing supports:

Near shore (Ls1) = 0.9 m

Far shore (Ls2) = 0.8 m

Type of Attack: Top attack. A bottom attack can be performed if the friendly side abutment is also attacked.

Amount of Explosives: 62 packages of C4.

As the platoon sergeant, you must determine if the squad leader's calculations are correct based on the given critical dimensions.

Reference: FM 5-250.

Engineer Solution is on page 42.



Letter To The Editor

I read with interest the article by Jeb Stewart ("Thinking Through Force XXI," *Engineer*, August 1995, p. 19). His personal views posed some engaging points. Of interest to me were his concerns about "...the absolute reliance on computer software." Mr. Stewart states that all of us who work with computers have been the victims of poorly designed or poorly adapted software. He witnessed what he called "overstressed computer networks shutting down under the workload." There probably is more truth than fiction to his assertions. Although he provided no facts related to his resentment of automation, especially computer software, I understood his point.

My response is to look at the everyday conveniences we now take for granted. Today, all cars and trucks are built, tested, and repaired with computers and software. The venerable television is a digital colleague of the personal computer, camcorder, VCR, and electronic games. Home appliances have sophisticated integrated circuitry

developed with the aid of computer software. Have you seen the educational software available to students? Do you have a cellular phone? The telephone systems in most cities consist of computer-controlling digital connections. Don't forget the Gulf War: It was as much a war about technology as it was anything else. Millions of people watched in astonishment as CNN televised live the impact and incredible accuracy of software-controlled, laser-guided smart bombs and missiles that found their way to Iraqi targets.

It's true that there have been many problems and many naysayers who did not believe in the changing technology. Mr. Stewart is not alone in this regard, and no doubt many mistakes have been made (and will continue to be made) by systems and software developers. It's still called progress even when we fail. But I venture to guess that most mistakes were the result of human errors not software errors. My point is that we cannot stop progress because we don't have a perfect solution or because it causes some inconveniences.

Michael J. Killoren, Assistant to the Garrison Commander, Fort Leonard Wood.

Letters to the editor are welcome. Address them to: Editor, Engineer Professional Bulletin, ATTN: ATSE-TD-D-EB, Fort Leonard Wood, Missouri 65473-6650.

Design at Your Fingertips:

The Theater Construction Management System

By Sergeant First Class Tony R. Arnold and Fred Steinman

Attention all combat heavy engineer battalions and above. Life in theater of operations construction will soon be much easier with designs at your fingertips.

In 1990, the U.S. Army Corps of Engineers began a study to update the Army Facilities Component Systems (AFCS), used by major commands as the principal source for standardized construction in theaters of operation. Maintained by the Huntsville, Alabama, Division of the Corps of Engineers, this system used information published in Technical Manuals 5-301, *Planning*; 5-302, *Design*; and 5-303, *Logistics Data and Bills of Material*. The system was too costly to maintain, with changes to existing drawings requiring many hours of drafting in addition to increasing reproduction expenses and problems in product distribution.

Objectives of the AFCS update were to decrease the time engineers spend planning and designing projects and to improve their ability to manage theater construction. With this in mind, the Construction Engineering Research Laboratory developed a computer database system to store the AFCS drawings. The result is the Theater Construction Management System (TCMS), now

the approved source for standard designs, bills of material, construction time estimates, and planning information for facilities constructed by Army engineers in OCONUS and in theaters of operation.

The Corps of Engineers began distributing 260 copies of TCMS version 1.2 in the second quarter of FY95 and will complete distribution in FY96. Units receive a 230-megabyte external hard drive with off-the-shelf software: Microsoft Projects version 4.0, AutoCad LT version 1.0, Close-up version 6.0, and the government-developed TCMS software and AFCS databases. The hardware that units must provide to run the system and its software are shown in the table on page 29. Improvements and additional designs to the system will be fielded annually.

The Engineer School has 30 systems in place and will receive 22 more during FY96. The school curriculum has included portions of the TCMS since April 1994. The 51T10 course includes computer-aided drafting and design (CADD) and Terra Model software for surveying. Project management using Microsoft Projects 4.0 is trained in the Engineer Officers Basic and Advanced Courses. The 51T30 course includes training in

CADD, project management, Terra Model, and files management for CADD. The automated training for the 51T30 Basic Noncommissioned Officer Course, which will focus on the use and management of TCMS, is scheduled to begin in FY96. As the systems and hardware become available, the Engineer School will incorporate more TCMS training in all courses.

With TCMS, engineer units can access the AFCS drawings and databases to speed up the planning and design phases of all theater construction. Since the user produces only the drawings needed for his project, reproduction costs are reduced 40 percent or more. In addition to drawings and databases, the system combines government-developed and commercial software to provide the capability to plan, design, and manage all unit construction missions.

Beginning in 1994, the AFCS program was expanded to include standard designs for facilities constructed by Army engineer units in support of nation-assistance programs. Army engineer construction units embark annually on OCONUS missions to construct schools, dispensaries, roads, bridges, wells, and other basic community projects. The engineer activities

Unit-Supplied Equipment for TCMS

Hardware	Recommended Configuration
Microprocessor	80486
Hard disc drive	120 MB or larger
Math coprocessor	Required
RAM	16 MB or larger
Monitor	Super VGA, 16- to 19-Inch
Mouse	2-Button
Printer	Laser (dot matrix will work)
Plotter	16-Pin
Modem	Optional, to receive updates in the future
CD ROM	Optional medium for future updates

required for these missions include planning, logistics, design, management, and construction. Before 1994, each unit accomplished these tasks independently, often without the benefit of past experience or standard designs (see sidebar). With the expanded mission of the AFCS program and the cooperation of involved Army units, a family of standard nation-assistance designs will be available through TCMS.

Units are encouraged to send their design drawings through their major command to the Huntsville Division of the Corps of Engineers so they can be added to the system. The ongoing effort to include standard designs depends on cooperation between the Huntsville Division, the U.S. Army Southern Command (USARSO), and the Active, Reserve, and National Guard units involved in theater construction in South and Central America. Other theaters will be handled in the same manner.

The cycle of incorporating and refining designs will expedite future construction missions and enhance the sharing of lessons learned. It's time to stop recreating the wheel and start it evolving into the engineer force of the 21st century.



Sergeant First Class Arnold is the senior training developer for 51T, Directorate of Training and Doctrine, U.S. Army Engineer School.

Mr. Steinman has worked in the Army Facilities Components System Program, Huntsville, Alabama, for 17 years and was instrumental in its design modernization. A Navy veteran from the Korean War Era, he is a certified professional logistician and a member of the Society of Logistics Engineers.

For more information about TCMS and system requirements call SFC Tony Arnold at (314) 563-4115 or DSN 676-7593. Questions may also be addressed to Fred Steinman or Sandra Mayes, Huntsville Division of the Corps of Engineers, at (205) 895-1783/1784.



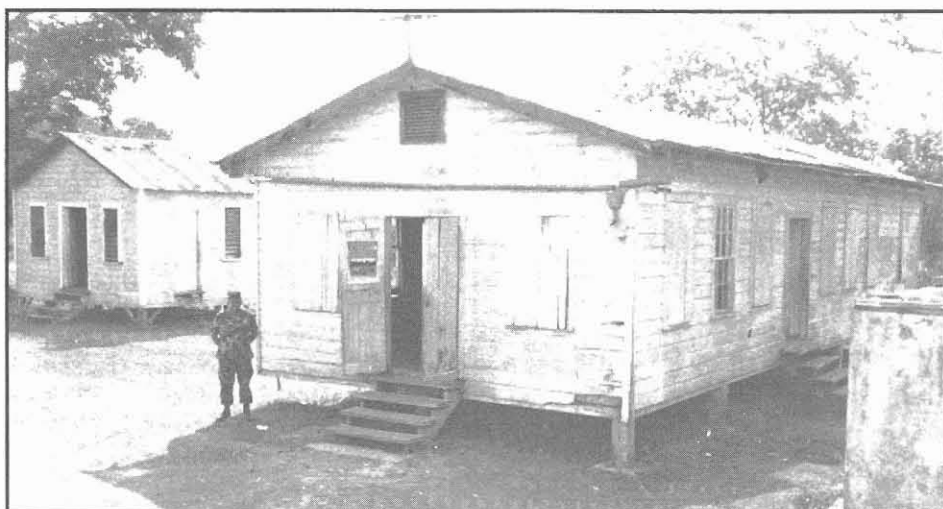
Engineers Build a School in Belize

By First Lieutenant Barry Wilson

Standardization is an important principle for the U.S. Army. Everything from a passing score on a physical fitness test to the number of bolts required to secure a Bailey bridge is standardized. Its importance was further emphasized to the South Carolina Army National Guard's 122d Engineer Battalion in January 1995 when we were tasked to build a primary school in Double Head Cabbage, Belize. The 122d designed the project, developed the construction plan, and determined the bill of materials. This process is nothing to raise the eyebrows of an engineer because that's what we do. However, the 122d had built a similar school in Pedasi, Panama, in 1994; but since we did not have access to the new TCMS database containing this plan, the unit's architect had to design the Belize school from scratch.

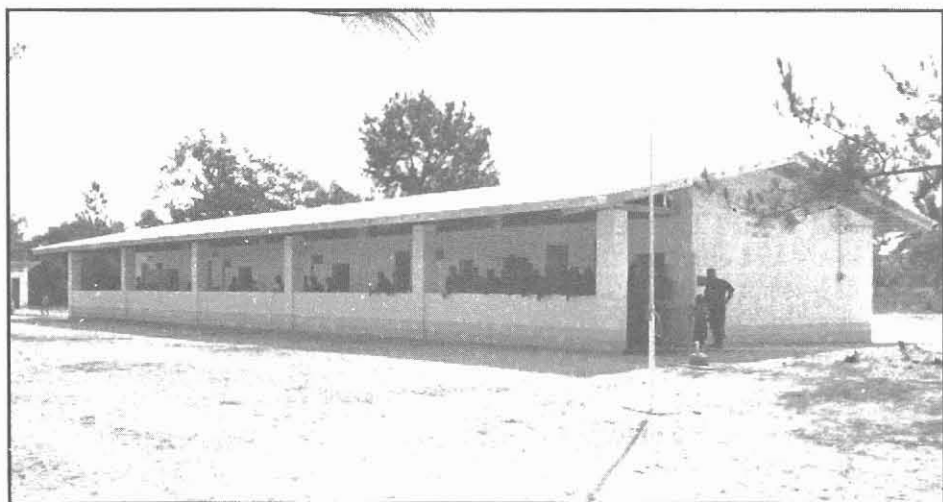
After successfully completing the 1995 mission in Belize, we submitted the school design through the U.S. Army Southern Command (USARSO) to the Huntsville Division of the Corps of Engineers. Now part of the TCMS, these design drawings, the bill of materials, and the construction plans are available to other units with similar missions.

As units submit drawings, USARSO will collect a variety of school designs for their customers to choose from, which will allow for nation-specific modifications. For example,



Data from previous exercises also will help the Army Contracting Office choose vendors that work well with the military in each country. With a standardized bill of materials, the contractor can shop for the best price instead of settling for an overpriced "bargain."

Standardized plans with realistic start and completion dates will take the guesswork out of construction projects by allotting the correct amount of time, manpower, supplies, and equipment. Plans should also show the type of work to be performed in certain weather and climates—for instance, scheduling new construction in the dry season and renovations in the wet season.



Top photo: The old school in Double Head Cabbage, Belize, was overcrowded and poorly constructed.


Bottom photo: Members of the 122d Engineer Battalion and children of Double Head Cabbage stand beside the new school.

Panamanians prefer block-designed school windows, while the Belizeans like windows with louvers that provide protection from the weather.

Standardized plans not only save time, they also allow better quality control. Each plan has a built-in waste factor that may vary from nation to nation. The 122d found that in Panama there is a 20 percent waste factor because of the cinder block quality. When the same percentage was used to order blocks in Belize, where

their quality is better, we ordered too many blocks and wasted project funds.

Standardized plans should indicate the amount of equipment to be drawn from the home station and from the main support area for theater equipment. This capability will improve coordination between the tasked unit and USARSO. It will also allow better programming for the limited air, sea, and land assets needed to transport equipment to the area of operations.

Standardization is an important concept for the Army because it saves time and money and eliminates waste. Standardized project plans are no exception. Engineer units are encouraged to cooperate with USARSO's effort to expand the TCMS so we can continue to complete our missions economically in an era of shrinking budgets. 

First Lieutenant Wilson is the S2 for the 122d Engineer Battalion. He previously served as the assistant S2 for the 4/118 Infantry Battalion at Union, South Carolina.

Active Engagement: Charting a Career Path

By Major James B. Balocki

Force XXI, E-Force, 10-division Army, downsizing, base realignment and closures... Today's rapidly evolving military force structure demands that every engineer officer be actively engaged in charting a career path. Selecting the right job after company command is difficult and getting more so by the day. Whatever you decide probably will take you away from troops. Among the potential assignments is duty with a U. S. Army Corps of Engineers (USACE) district. These assignments offer challenging work, professional experience, and excellent preparation for future duty assignments, but most engineer officers are not exposed to this part of our unique organization before being assigned there.

This article introduces company grade officers to the Civil Works and Military Construction districts and the engineer officer's role in their national and military infrastructure support missions. It is based on one soldier's experiences. Anyone considering a USACE tour should seek additional information from friends, mentors, or other senior officers.

Regardless of the path engineer officers follow to arrive there, they bring valuable qualities to a USACE district: organizational leadership skills, problem-solving abilities, a sense of mission, and a desire to work with people. Company grade officers are assigned to a district to broaden their leadership experience and understanding of the organization. These assignments expose them to the full spectrum of missions accomplished by the Corps of Engineers and prepare them for future senior leadership roles.

Preparation and Education

If you attend graduate school, design a training plan to enhance and complement your leadership skills. Courses in these subject areas will prepare you for duty in a USACE district:

Negotiations. Nearly everything you do in a district, whether working with contractors or staff team members, requires negotiations. This course is typically found in the school of business.

Construction Contract Law. It's essential to have a solid

foundation in the principles of construction law. This course introduces the government contracting process in a district, where you may manage multimillion-dollar contracts.

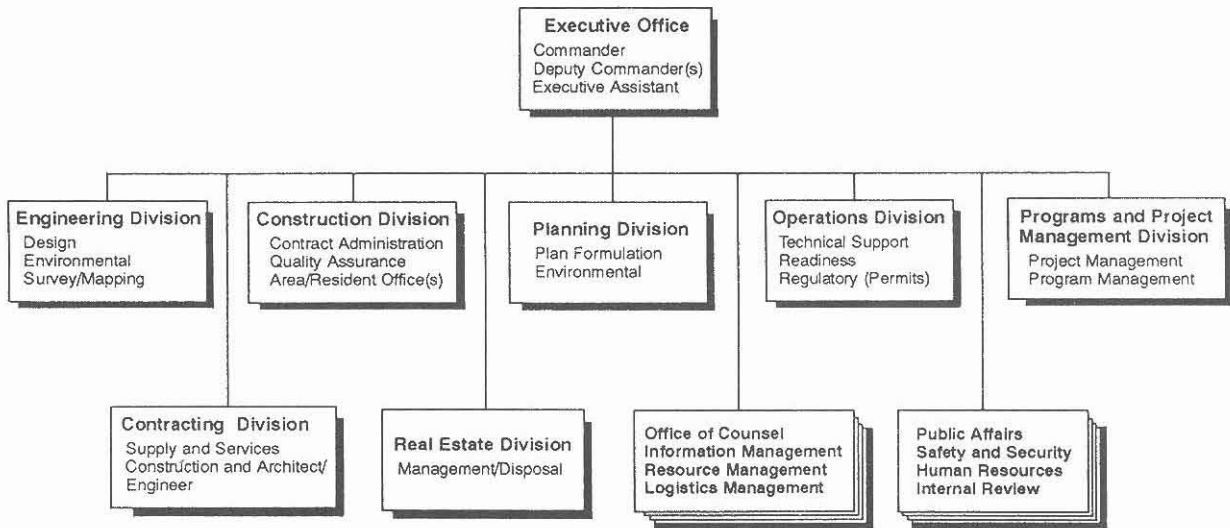
Construction Management. This is the heart of many military officers' duties in a district. Courses in project management and network analysis will serve you well. Work them into your training plan.

Environmental Engineering, Hydraulics, and Hydrology. Corps projects depend on



Understanding technical products is essential to effectively administer construction contracts, which are at the heart of a military officer's duties in a district.

U.S. Army Corps of Engineers District



Organizational structure of a typical U.S. Army Engineer District.

expertise in these areas, so become familiar with their fundamentals and language.

Soils. Gain an understanding of the basics of soil mechanics, stabilization, and failure mechanisms.

Other. One important course to complete before joining the district is "Management of Defense Acquisition Contracts (Basic)," offered by correspondence from the Army Logistics Management College. This introduction to government contracting will help decode many common acronyms.

The Corps' Huntsville Division offers "Civilian Personnel Management for Key Military Leaders" in residence. This essential course provides insight into the career development and management of civilian employees.

Once on duty, the Corps offers numerous professional development courses. Engineer Regulations 350-3-5 and 350-7-1(FR) itemize courses required for military officers in district assignments. HNBP 350-1-1, known as "The Purple Book," contains a comprehensive catalog of all courses. Subjects range from

finite element analysis to financial accounting systems.

Early in the tour, take time to learn how the authorization and appropriation processes work. Money is "painted different colors." Some funds must be used in the fiscal year Congress appropriates them, others expire after longer periods, and some don't ever lapse. This area is as confusing for seasoned Corps veterans as it is for rookies, but a good foundation will help avoid pitfalls.

Organization and Environment

The Corps is organized hierarchically. The figure above shows a typical (generic) district wiring diagram. Each district is structured to support and accomplish its primary mission and generally has the same functional divisions and offices, although some roles may be combined. For example, the construction and operations functions may be autonomous divisions in one district but be under one roof in another.

Like a brigade, each district is subordinate to a division, typically commanded by a general officer. The division reports to

Headquarters, U.S. Army Corps of Engineers, commanded by the Chief of Engineers.

Each USACE district's culture is unique and process-oriented. Laws, regulations, and individual personalities affect the decision making process in a district much more than in a troop unit. Because the "just do it" attitude can sometimes lead to disaster, recommendations usually are staffed and team consensus built before a decision is implemented.

Consider, for example, a seemingly simple change to a construction contract—adding an interior door. This idea might be initiated at a construction site for an office building. It will be reviewed by an engineer to ensure that the door's placement and construction conform with fire-protection codes, and a contract specialist will ensure that the change is within the scope of the original project. Next a cost estimator will assemble a government estimate to use in negotiating the change. The resource manager will review the estimate to ensure that sufficient and correct funds are available. After that, a contracting officer's representative will negotiate with the contractor to agree on the cost



Engineer officers in a district assignment often participate in disaster recovery operations as part of a Corps team. Responses to floods, earthquakes, or hurricanes present unique problem-solving and leadership challenges in an adverse environment.

and time needed to complete the change. Then a contract modification will be prepared, signed, and delivered to the contractor. Finally, you get a door! The process can be slow and frustrating at times, but staff skills acquired in a troop unit will prove valuable in accomplishing the mission.

District-division-headquarters staff chains also work differently than the chain in a troop unit because of the nature of each functional staff's mission and the long-term tenure of the dedicated civilian work force. This chain is often called a functional "stovepipe." Many tasks and much information are passed through these staff stovepipes, outside of the command channel. The stovepipes exert a strong influence on civilian career ladders, and people tend to be responsive to functional counterparts at higher command levels.

The Corps has worked hard to break out of the traditional hierarchical stovepipe paradigm. By introducing project management into the district structure and culture, they focus attention and

resources on successful completion and delivery of projects to customers. Project management involves assembling a tailored team from among the technical disciplines. The integrated team, led by a project manager, is responsible for ushering a project from inception through delivery and beyond—from cradle to grave.

To learn more about the organization, talk to the people who work there. Learn what they do and how they perform their jobs. Find out how their jobs fit into the district's mission and why they are important. Observe, learn, and ask a lot of questions. When someone uses an acronym you don't understand (and there are plenty), ask what it means. Chances are you'll encounter it again. Listen to "war" stories; they embody information about how the Corps works, what it does, and most importantly, the inner workings of the district—how things get done.

The Corps Team

The Corps is staffed with dedicated professionals and

leaders, managers and technical team members. Military officers fit into this team. However, they may have to prove their worth to the team before they are given a choice assignment. Engineer officers enter USACE district service with a solid reputation as hard-working, intelligent leaders. District staff members have high expectations of them but understand that the officers lack experience and exposure to the system.

Company grade officers may encounter different attitudes toward military officers serving in the district. Career civilian employees may label them "just passing through" because of their relatively short tenure. Because the job they fill may be a growth or developmental position for their career civilian counterparts, military officers may be viewed as restricting a civilian's career growth. Another tag they may inherit is "the colonel's spy." Military officers have a unique association and access to their commander, which many civilians feel they don't share. These labels may be a source of cloaked

resentment. You can't avoid them; simply be aware they exist and work hard to become a member of the district's team.

Leadership is the most valuable asset military officers bring to a USACE district assignment. The setting offers company grade engineers an opportunity to lead in an unfamiliar environment, which requires different leadership skills than those used with troops. Missions are assigned and tasks accomplished in an atmosphere of cooperation. Situational leadership skills are essential whether you're dealing with contractors who are behind schedule or quality assurance representatives who are inspecting the project. The Corps has many fine leaders, but you bring a unique perspective to the district.

Some USACE district assignments involve Military Construction or Civil Works projects. The Military Construction program supports infrastructure development and maintenance for the Army, the Air Force, and others. Hospitals and troop barracks construction, facilities rehabilitation, and hazardous-waste-site cleanup are among the many Military Construction missions. The Civil Works program is equally diverse but focuses on improving and maintaining the nation's rivers and harbors. Hydroelectric dam improvements, navigation lock construction, harbor dredging, and flood control are among the many Civil Works challenges.

One emerging area, the Work for Others program, is growing rapidly. It puts our skills as the nation's premier engineering organization to work for federal agencies outside the Department of Defense. Some projects are similar to traditional Corps roles, while others are unique, leading-edge engineering endeavors. The Environmental Protection Agency, the Department of

Energy, the Department of Agriculture, and other federal agencies are among a growing list of customers with diverse missions supported by the Corps. Regardless of where you end up, the work will be stimulating, intellectually challenging, and professionally demanding.

Performance

When beginning a USACE assignment, plan on spending time in at least two positions: the district headquarters and the field—at a project, resident, or area office. Keep in mind that every job should broaden your leadership skills, help prepare you to become a district engineer or a deputy district engineer, and enhance your value to the Army.

Be aware that the duties of a company grade officer within a district are probably not well understood by many who serve on selection boards. The jobs you are likely to hold are not universally recognized as "key positions" and do not possess inherent career-enhancing benefits. This makes your performance extremely critical.

It is important to communicate the level of your responsibility and the challenges of your duties in a district by writing a clear position description. This point cannot be overemphasized. The key to board recognition of your job is an accurate duty description in terms that are widely understood in the Army.

Benefits


USACE district assignments offer opportunities to invest time in professional, personal, and family development. The demands of duty and the daily schedule normally do not require the same personal sacrifices as duty with troops. Manage time wisely. Set yourself apart by working intelligently, accom-

plishing each task professionally, and showing enthusiasm.

Continue professional development by enrolling in and completing the Command and General Staff Officer's Course by correspondence. If selected to attend the resident course, much of the material will be review, or you may opt to attend a sister service school. Either way, you will be ahead.

Spend time with your family. It is easy to become so involved in a project that your home life is sacrificed.

USACE district assignments offer many opportunities to establish new professional contacts. Most districts have strong affiliations with organizations that offer a wide range of opportunities for professional growth through association with civilian counterparts and professional societies. These beneficial relationships can lead to long-term associations that increase the overall professionalism of the Corps and enhance your qualifications.

Engineers are constantly confronted with challenges—a changing force structure and a continuing need to achieve individual and career goals. These challenges mandate that we actively plan and manage our careers. A variety of interesting and demanding assignments are available after you've completed company command and leave a troop unit. You'll find that a USACE district provides challenging duty, personal satisfaction, and tremendous professional opportunities. 

Major Balocki is attending the Command and General Staff College, Fort Leavenworth, Kansas. He recently completed a second USACE tour, serving as deputy district engineer for the Walla Walla, Washington, District. He previously served with the United Nations and U.S. Joint Task Force-Somalia.



Engineer Battle Tracking

By Captain Kenneth J. Crawford and Major James E. Brooks

Through wars and engagements, command and control elements must continually maintain their focus on the combat power and capabilities of subordinate elements. This focus is critical for those involved with both deliberate and combat decision-making processes. The commander and his planning staff require immediate access to the critical information they need to make informed decisions affecting the lives of subordinates and the success of their missions. Through World War II, Korea, Vietnam, and Operation Desert Storm, staff planners and commanders often reinvented the wheel for tracking battles in their tactical operations centers and command posts because no standard reporting process existed. Today units need complementary tracking systems that are applicable to the various task organizations in the combined arms environment. This article describes select elements of engineer support to a combined arms task force and presents some standard, complementary charts staffs and leaders can use to track those elements.

Historical Reference: General George Patton successfully launched a "reconnaissance-in-force" and seized Palermo on 22 July 1943. Given his staff's ability to maintain a vigilant perspective on the combat power of his two (+) divisions, Patton changed a defensive mission to an attack on Palermo with a great deal of success.

Elements of Engineer Support

We cannot standardize the precise information engineers need to report because requirements vary by theater and mission. Maneuver support, reports, and data for engineer requirements apply across a broad spectrum, with little change in how to sort and post information related to each operation. However, engineer support for maneuver forces conducting peacekeeping operations, low-intensity conflicts, and training exercises have one thing in common—the decision-making process. Engineers use battle tracking as a tool to provide timely, doctrinally based information to maneuver

commanders as they implement the tactical decision-making process. The tracking system must be simple to maintain and easy to reference. First, we will discuss how we sort information and apply doctrinally correct and timely information to battle tracking.

Flow of Information

The commander's critical information requirements drive the staff's focus for battle tracking. Information flow is a two-way network. Subordinate elements, the eyes and ears on the battlefield, provide timely *ground truth* to leaders for dissemination as required in situation reports, scatterable mine warnings (SCATMINWARNs) and size, activity, location, unit, time, and equipment (SALUTE) reports. Higher headquarters provide subordinate elements with directives and information through operation orders (OPORDs), fragmentary orders (FRAGOs), and warning orders (WARNORDs), which have clear tasks and purposes.

Timeliness of Information

Disciplined units thrive on accurate and complete information disseminated both up and down the chain of command. Success prevails when commanders make decisions based on current information, while decisions made with outdated information often lead to disaster. Commanders at all levels also rely on the information reported to be useful. The old adage "garbage in—garbage out" will not apply if engineers ask the right questions and clearly and concisely report essential data. For example, reconnaissance elements must be given specific tasks that support current and future tactical information requirements so that the staff can track reports received on standard charts. Engineers must ensure that the information they receive and provide is relevant to each special staff's needs for operational planning and execution (intelligence, operations, logistics, transportation, and maintenance). If each

staff element generates additional requirements based on its needs, subordinates may get caught in the research of outdated or superfluous data. Bottom line: ensure that the information you provide is relevant to the situation and don't create undue reporting requirements for others.

Doctrinal Information

Tactical and operational input must have a doctrinal base as an initial reference. Engineers use doctrinally based battle-tracking charts to refine the information required for a mission. The charts below are designed to provide each staff position and user with compatible and doctrinally based information.

The commander decides how to successfully attain the advantage over the enemy with minimal losses to his troops and equipment. To facilitate those decisions, the staff provides the commander with brief updates regarding his combat power capabilities. Combat power has four primary elements: maneuver, firepower, protection, and leadership (FM 100-5, Chapter 2). For engineers, the definition of combat power differs by unit based on its capabilities and support roles.

Maneuver is the movement of combat forces to gain positional advantage. Mobility and countermobility are the engineers' implied support tasks. Mobility includes the unit's capability to successfully breach obstacles (friendly and enemy) as part of the attacking or movement-to-contact force. To clear and maintain lines of communication (LOC), engineers must perform several mobility, sustainment, and force-protection tasks. They perform countermobility tasks when reinforcing terrain to disrupt, turn, fix, or block an enemy force.

Firepower is the destructive force determined by the amount of fire delivered by a unit, position, or weapon system. As combat multipliers, engineers provide countermobility and survivability support to maneuver forces. By integrating obstacles with firepower, engineers maximize the standoff and probability of kill to the friendly units' advantage. To maximize the unit's ability to survive and fight, they provide equipment to develop and improve individual and vehicle fighting positions and unit battle positions. Engineer "firepower" is their ability to shape the battlefield by tying in natural and man-made obstacles. The primary weapons systems or platforms used to accomplish those tasks are the Volcano, MOPMS, conventionally placed mines, and digging assets.

Protection is the conservation of the fighting force. Engineers provide sappers to gather obstacle intelligence (OBSINTEL), conduct covert breaches, and support deep interdiction. Blade assets provide increased survivability and protection to maneuver and support forces. Properly integrated survivability and force-protection efforts can significantly increase the maneuver forces' success when they are applied against defending, withdrawing, or even attacking forces. When engineers provide higher headquarters with timely, accurate, friendly and enemy obstacle data, they increase the commander's overall situational awareness and decrease the number of potential fratricides.

Leadership drives the competence and courage of a unit's soldiers. Unit commanders and leaders must know where their presence can make the greatest impact on the morale, motivation, and success of their soldiers. To the engineer, leadership represents the backbone of mobility and countermobility support tasks. It is not merely the presence of leaders, but the presence of qualified and trained leaders who successfully support maneuver forces.

Flow of Missions

Missions are generated either as proactive or reactive measures. For example, staffs are proactive when they generate OPLANs as missions to be executed at a prescribed time or when specific conditions occur. OPORDs often are reactive because they prescribe orders based on current intelligence, actions taken, or missions generated from either higher or subordinate headquarter's requirements. OPLANs take units to the initial encounter, where they expand through branches and sequels to the operation. Proactive planning provides the commander with the flexibility to execute battlefield missions based on his assumed or projected combat power and capabilities. The execution phase changes as a result of reconnaissance; loss of combat power; and discovered or identified obstacle locations, disposition, type and quantity. By tracking this critical information, engineer planners and commanders maintain the tools they need to plan for changes in mobility support. Units disseminate FRAGOs and OPORDs to subordinate elements so they can develop supporting tasks to meet the tenets of Army operations (agility, initiative, depth, synchronization, and versatility). Information received by supported or supporting units may affect routes, force array, or equipment limitations/capabilities.

Service Support

Users need quick-reference charts that show critical engineer classes of supply that may affect current or future operations. Both the engineer and the

S4/logistician must closely monitor these data. Subordinate elements must be accountable for the receipt and expenditure of resources affecting future operational planning, forecasting, and cross-leveling.

Service Support

As of: _____

	Unit	Concertina	Wire	AT Mines	AP Mines	NE Caps	C4	MICLIC	APOBS	MOPMS
(G)	C/27	360/350	52/50	520/500	127/100	84/75	190/184	2/2	5/5	2/2
(G)	B/307	300/300	46/45	813/800	107/100					
(A)	A/326	280/350	41/60							
(A)	1/C/41	120/150								

(Required/On Hand)

Critical Engineer Equipment

The maneuver force's primary means of mobility (ACE, CEV, AVLB, MICLIC), countermobility (Volcano, MOPMS, ADAM/RAAM), survivability and force protection (digging assets), and engineer forces'

mobility (M113, dump trucks, HMMWV) are critical systems to track. When planning and executing missions, commanders and staffs need the capability to quickly update the number, condition, and location of these assets.

Critical Engineer Equipment

As of: _____

	Unit	Volcano	MICLIC	M998	M929A2	M916A2	M870	Scoop Loader	SEE	D5
(G)	C/27	2/2	2/2	5/5	8/8	5/5	5/5	3/3	6/6	5/5
(G)	B/307	1/1	0/0	13/13	2/2				6/6	
(A)	A/326	2/2	1/2	14/15						
(A)	1/C/41	0/2								

(Operational/On Hand)

Minefield Tracking

Friendly. To expedite the reporting and tracking of minefields, subordinate elements provide friendly minefield information via FM radio or multiple subscriber equipment and follow up with copies of DA

Forms 1355 or 1355-1-R. Data for zones, belts, groups, intent, executing element, status, etc., are taken from initial entries on minefield records. The hard-copy records are used to verify data received and changes disseminated by the staff engineer and the maneuver S3.

Friendly Obstacles

As of: _____

	Lay Unit	Zone/Belt/Group	Type and Number	Status	Start DTG	Comp DTG	Fr Grid(s)	To Grid(s)	Rpt Rcv'd	Remarks
(A)	2/C/27	1082C3D	MT05	75%	080330Sep		WE123456	WE124458	Initiation	
(G)	1/B/307	1082B1E	BS02	100%	081600Sep	082315Sep	WE023556	WE023556	Completion	(+) Armed
(R)	3/A/326	1101C3D	RM09	50%	081330Sep		WE456789	WE456789		RC 100%
(B)										

Enemy. This information, in conjunction with the S2's reconnaissance plan, drives route clearance, mobility planning, and reconnaissance missions. The sample minefield report on page B-3 of FM 20-32, *Mine/Countermine Operations*, can be

revised to this format for battle-tracking purposes. Lines A (map sheets) and H (estimated material and equipment to clear) are omitted because those data should be decided by the executing unit.

Enemy Minefields

As of: _____

	Unit	Info DTG	Type MF	Grid(s)	Depth	Marked	Reduced	Cleared	Lane Grids
(G)	1/1/C/27	081705Sep	(B) TM62	WE 123456	60 m	L/R Handrail	081735Sep	082013Sep	N/A
(A)	3/2/B/307	090035Sep	(S/B) YAM5	WE234567	120 m	L Handrail	090215Sep		
(R)	2/3/A/326	090835Sep	(S) TMBD	WE345678	40 m				
(B)	2/1/C/41	100127Sep							

Situational Obstacles

A similar chart is used for situational obstacles. Engineers extract basic data from Chapter 7,

Figures 7-5a through 7-9, FM 20-32, apply them to the supported situation, and disseminate critical information to the maneuver force.

FASCAM

As of: _____

	Lay Unit	Tgt/Obs #	System	Mine Type(s)	Start DTG	Life Cycle	Fr/To Grid(s)	Safe Zone	Rpt Rcv'd	SCATMIN-WARN
(G)	1/C/27	1082A1TSV01	Volcano	AT/AP	080330Sep	48 hr (long)	WE123456-WE129455	235 m	Completion	080300Sep
(G)	3/B/307	1082B4QSM22	MOPMS	AT/AP	072300Sep	4 hr (short)	WE023556	235 m	Completion	072230Sep
(G)	2/A/326	108217MSW13	WAM	AT(75m)	080030Sep	12 hr	WE456789	200 m	Completion	072355Sep

Mission Status

This chart focuses on all aspects of missions generated or received. It provides the commander or

user with a mission-status summary that enables him to quickly track current operations and plan future operations.

Mission Status

As of: _____

	Number	Mission	Type	Resp Unit	Location	Start DTG	Status	Comp DTG	Secure By	Remarks
(A)	C4203	Road Repair	Crater	C/27	WE125456	081500Sep	75%		D/1-325	
(G)	B128	Clear Minefield	AP	1/B/307	WE1334418	090015Sep	100%	090415Sep	A/1-325	
(G)	A300	Destroy Cache	CL V	3/A/326	WE234567	080830Sep	100%			
(B)	C101	Clear Route	Hasty							

Route/LOC Status

Reconnaissance elements or units report route and LOC trafficability data to their supported headquarters. Depending on the route's intended use and

the accuracy of information reported, these data may generate route clearance, mobility, or repair missions for engineers.

Route Status

As of: _____

	Route	Fr Grid	To Grid	Surface	Status	Repair Req'd	Start DTG	Comp DTG	Secure By	Remarks
(G)	RED	WE123456	VE876543	crsh gravel		rain erosion	082330Sep	100810Sep	D/1-325 Inf	
(B)	WHITE	WE234567	VE889722	sandy loam	impassable	landslide	090800Sep	091500Sep	B/1-325 Inf	
(R)	BLUE	WE123456	VE998490	asphalt	sev restric.	bridge out	090500Sep			fordable
(B)	TEXAS	WE123456								

Summary

This article provides some doctrinally based battle-tracking charts that commanders and staffs can modify to fit their experience, requirements, and METT-T. While doctrine provides report formats to aid in the currency of reported information, the Army lacks standard, basic charts to track this information. Given a doctrinally based tracking document and the necessity to maintain and report timely information, the potential application of these charts is limitless.

Engineer leaders must focus on applying and maintaining the information they provide to maneuver force commanders and staffs, who rely heavily on timely and accurate information that supports their decision-making processes. In today's fluid environment, the Army executes a myriad of missions with nonhabitual task organizations around the globe. Based on the tactical situation, information flow

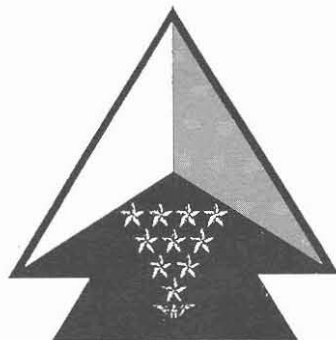
within units and the Engineer Corps must be compatible to ease the transition to mission execution and battle tracking for maneuver commanders and staff officers.

Captain Kenneth J. Crawford is the senior engineer Company observer/controller at the Joint Readiness Training Center (JRTC). Previous assignments include company commander, 27th Engineer Battalion (Combat) (Airborne) and 362nd Engineer Company at Fort Bragg and Somalia. He holds a bachelor's degree from Texas A&M University and is a graduate of the Combined Arms Services Staff School.

Major James E. Brooks is the senior engineer observer/controller at the JRTC. He previously served as the assistant division engineer XO and S3 of the 307th Engineer Battalion (Airborne). Major Brooks holds a master's degree from Texas A&M University and is a graduate of the Command and General Staff College.



CTC Notes



Battle Command Training Program

By Lieutenant Colonel Greg Stanley

Engineer Brigade Tactical Operations Center (TOC) Operations

Many engineer brigades struggle with the setup and operation of the brigade TOC. The following tactics, tips and procedures will help the TOC run smoothly:

1. Use flat maps to track the current situation and vertical (hanging) maps to display plans and template enemy activity. Flat maps are preferred for current needs because more people can work around them. They provide good visibility during briefings and allow several soldiers good views without

having to look over the shoulders of others. Additionally, both the S2 and the S3 can track ground truth on the same flat map.

2. Separate the plans area from the current operations area. The plans area can double as a briefing area for issuing orders or meeting with subordinate units. Integrate staff sections in the operations area rather than separate the cells by function. Both the S1 and the S4 must know what is happening in the current operation.

3. Use information displays within the TOC to provide commanders and key personnel with a quick update without the need for numerous questions. Determine what information is critical to the commander and then track and display that information with charts. Avoid too many charts.

Key engineer information is determined by the commander. It normally includes—

- Task organization.
- Elements of the engineer commander's situation report (engineer equipment, personnel, and the commander's assessment).
- Status of Class IV and Class V materiel.
- Main supply routes.
- Current engineer missions.
- Commander's critical information requirements.

4. Place desks for the commander and the executive officer (XO) in the center of the action where they can see, hear, and supervise all activity. Radios, phones, and radio-telephone operators (RTOs) should be next to the commander and XO. Attach speakers to phones and radios so the commander and XO can turn up the volume when they want all members of the TOC to hear conversations (e.g., conference calls with the division commander or subordinate engineer commanders).

5. Use NCOs to ensure that reports and messages are distributed properly, update the status of maps and charts, supervise the publication of orders and graphics, and assist in developing and war gaming courses of action. RTOs monitor radios, receive reports, and update status charts as necessary. All members of the TOC must understand the concept of the operation and the commander's critical information requirements.



National Training Center, Sidewinder Team

By Major Tom Buning

Engineer Strengths. Most engineer battalion combat service support planners, headquarters and headquarters company commanders, and the support platoon leadership are planning, coordinating, and executing resupply operations to standard. They are addressing the following tasks:

- Order the correct type and number of logistics packages (LOGPACs).
- Coordinate movement to and from logistics rally points with a battalion LOGPAC or with task force LOGPACs. This distribution system increases command, control, security, and synchronization with the supported maneuver unit's time line.
- Develop a system to coordinate changes in logistics requirements due to last-minute adjustments in task organizations and critical requirements received from status reports.
- Release and return LOGPACs promptly.
- Establish a standard resupply technique that meets your requirements.

Recommend each battalion develop a standing operating procedure (SOP) for LOGPAC operations.

Engineer Weakness. The Family of Scatterable Mines (FASCAM) planning and trigger points need emphasis. Recommend engineers know the doctrine for planning and employing FASCAM, as described in FM 90-7. To provide the commander maximum flexibility, develop plans to employ FASCAM throughout the depth and width of the sector or zone in sufficient numbers to support the base plan and all branch plans. Execute FASCAM based on an enemy event trigger, using named areas of interest (NAI) in the deep battle area that are tied to decision points. Assign dedicated observers (both primary and alternate) to overwatch the NAI. Assign other dedicated observers to the FASCAM target area to direct artillery and close air support. They must synchronize the location, trigger, and execution criteria for FASCAM during war gaming.



Engineer Solution

The squad leader's assessment and calculations are incorrect. The following calculations are correct:

Top Attack

1. Determine the height-to-length ratio:

$$H/L = 1.1/35 = 0.031 \text{ (Round up to 0.04 on Table H-2.)}$$

2. Determine the average length of the bearing supports:

$$\frac{(L_S1)0.9 + (L_S2)0.8}{2} = \frac{1.7}{2} = 0.85 \text{ m}$$

3. Determine the average length of bearing supports to the length ratio (Ls/L):

$$\frac{0.85}{35} + 0.24 \text{ (Round up to 0.03 on Table H-2.)}$$

4. Determine the length of cut (Lc):

Using FM 5-250, Table H-2, intersect the values from steps 1 and 3, above, to get Lc/L:

$$Lc/L = 0.029$$

Multiply (Lc/L) 0.029 by (L) 35 to get Lc; Lc = 1.01 m

Charge Calculations

1. Determine the amount of TNT required:

$$P = 3.3[(3.3 \times 1.1) + .5]^3$$

$$P = 3.3(3.63 + .5)^3$$

$$P = 3.3(4.13 \times 4.13 \times 4.13)$$

$$P = 3.3(70.444997)$$

$$P = 232.46$$

2. Determine the amount of explosives (TNT) for the slab:

$$P = 232.46 \times 6$$

$$P = 1394.76$$

3. Determine the equivalent amount of C4:

$$P = \frac{1394.76}{1.34} = 1040.86$$

4. Determine the required packages of C4:

$$N = \frac{1040.86}{1.25} = 832.68 \text{ (round up) } 833 \text{ packages of C4}$$

Bottom Attack

1. Determine the height-to-length ratio:

$$H/L = 0.031 \text{ (same as Top Attack calculation)}$$

2. Determine the total end clearance (E):

$$E = (E1) 0.2 + (E2) 0.5; E = 0.5 \text{ m}$$

3. Determine the required end-clearance-to-length ratio (ER/L) using Table H-1:

$$ER/L = 0.003$$

$$(ER/L) 0.003 \times (L) 35 = 0.105; ER = 0.105 \text{ m}$$

Again, the squad leader's assessment is incorrect. Because this is a preliminary target, the unit should use the quickest method of demolition—in this case, a top attack. Since E (0.5) is greater than ER (0.105), a bottom attack can be performed successfully without attacking the abutment.

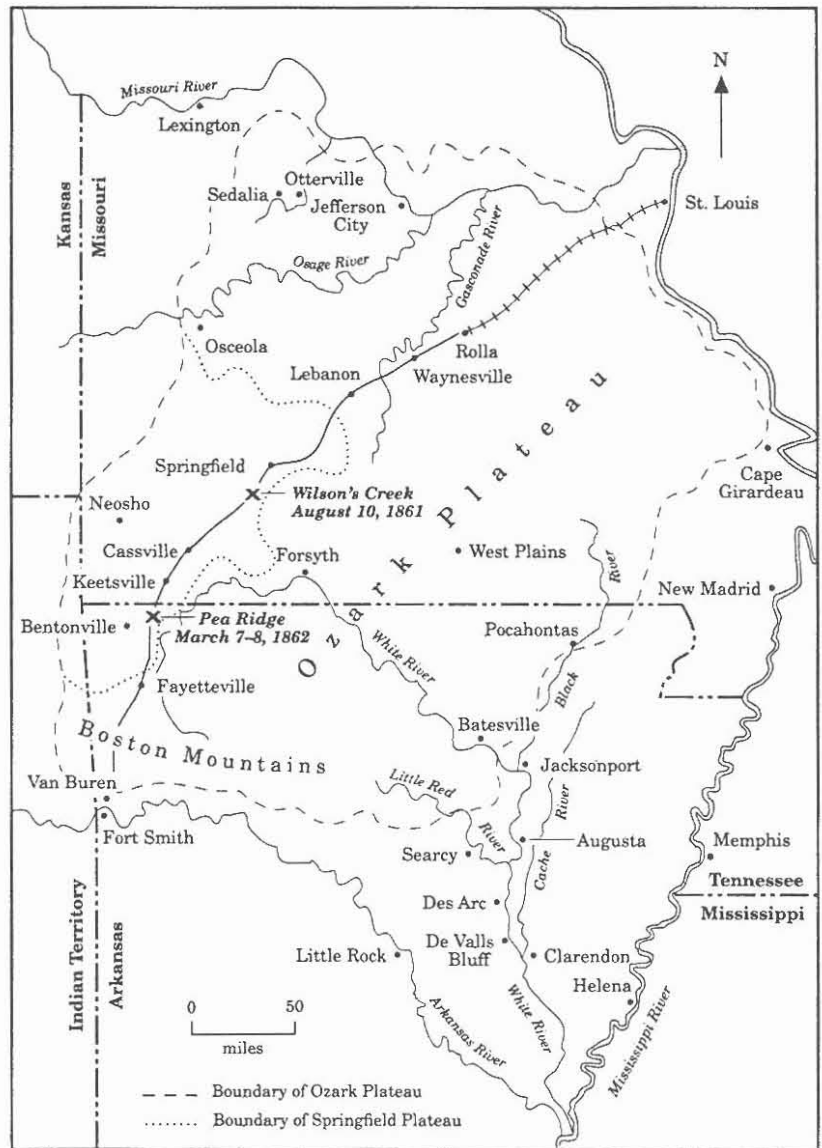
"Go and Do It":

Obstacles at the Battle of Pea Ridge

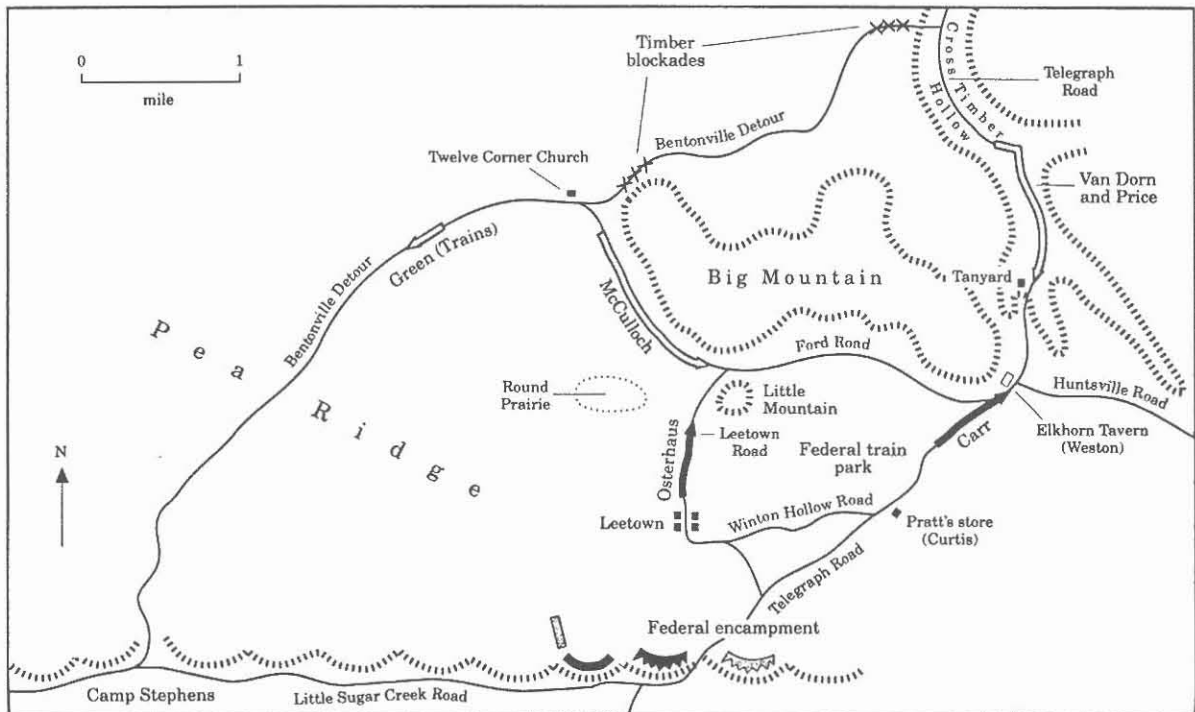
By Lynn McFarland

In 1816, Napoleon wrote in a letter, "A battle sometimes decides everything; and sometimes the most trifling thing decides the fate of a battle."¹ A perfect example of this occurred during the Civil War when, in early March 1862, two road obstacles helped the U.S. Army of the Southwest secure Missouri. Brigadier General Samuel R. Curtis, commander of the Army of the Southwest, placed two obstacles behind his army's right flank to deny Confederate forces access to the rear. As the Confederate Army of the West maneuvered around Curtis' position, the obstacles caused its forces to split. Curtis was then able to turn his army and defeat the divided Confederates at the Battle of Pea Ridge. This ended any serious Confederate threat to Missouri for the remainder of the war.

In late 1861, the fight for Missouri was at a standstill. Union forces held St. Louis and the Missouri River Valley, but the pro-Confederate Missouri State Guard, commanded by Major General Sterling Price, held Springfield, located in the southwest corner of the state. The overall Union commander of Missouri, Major General Henry W. Halleck, knew that Price's ragtag force threatened to disrupt his upcoming offensives on the Mississippi, the Tennessee, and the Cumberland Rivers. St. Louis was the main



Map 1



Map 2

base of operations for these campaigns, and if Halleck moved forces out of Missouri to support the operations, Price could move into the interior of Missouri and threaten St. Louis. In this way, Price could use a comparatively small force to check a much larger one.

Halleck realized that he must go on the offensive in Missouri and push the Missouri State Guard out of the state as quickly as possible. On 25 December, he placed Curtis in command of the Army of the Southwest and ordered him to launch an offensive and defeat the Missouri State Guard. Once this was done, Halleck could take the idle garrison troops across Missouri and reinforce the river campaigns.

Curtis' four-division army of 12,000 soldiers left Rolla, Missouri, in mid-January 1862, headed for Price's 7,000-person army in Springfield. On 13 February, Curtis was ready to attack Springfield; but Price had moved the Missouri State Guard southwest along Telegraph Road, trying to reach Arkansas and Confederate reinforcements before Curtis could pursue and catch up.

Confederate forces in northwest Arkansas were commanded by Brigadier General Ben McCulloch. Even though McCulloch and Price had teamed up to defeat Union forces at the Battle of Wilson's Creek on 10 August 1861 (see Map 1), the two frequently quarreled over authority and objectives. To defuse the Price-McCulloch feud, Confederate President Jefferson Davis ordered Major General Earl Van Dorn to take command of all Confederate troops in Missouri and Arkansas.

On 14 February, the Army of the Southwest started after Price, but he escaped Curtis' pursuit. In late February and early March, Van Dorn ordered Price and McCulloch to unite forces, giving Van Dorn more than 15,000 soldiers. His plan was to attack and defeat Curtis' army and then advance toward St. Louis.

Curtis faced a dilemma. He had chased Price out of Missouri but had been unable to bring him to battle. Curtis' supply line was stretched to its limit with supplies having to come from Rolla by wagon. After dropping off detach-

ments to protect the supply line, the Army of the Southwest was now down to 10,500 troops. If he wanted to continue to advance, Curtis would have to spread them out so they could forage off the countryside, which would expose them to a consolidated enemy force. If he retreated to Springfield, Price would be free to re-enter Missouri. Curtis decided to concentrate his forces in a defensive posture along Telegraph Road where it crossed Little Sugar Creek (see Map 2). Curtis told his army to dig in along the bluffs, facing south and overlooking the creek. It was a formidable defensive position.

Van Dorn's Plan

Not wanting to attack Curtis in this position, Van Dorn ordered his already-tired army to Camp Stephens, an old Confederate camp a few miles west of Curtis. They reached the camp in the afternoon of March 6th, worn out from marching through the cold, wet weather. McCulloch suggested that the army rest overnight, then move

along the Bentonville Detour to a position behind Curtis. This would force Curtis to either turn and fight at a disadvantage or try to retreat to Springfield. Van Dorn agreed to the plan but ordered the exhausted army to begin the movement immediately. McCulloch was shocked. He told Van Dorn "for God sake to let the poor, worn-out and hungry soldiers rest and sleep that night ... and then attack the next morning."² Van Dorn disagreed and ordered the movement to begin.

The Bentonville Detour went northeast from Camp Stephens for eight miles and intersected with Telegraph Road five miles north of—and behind—Curtis' position (see Map 2). Van Dorn's march along the road would be hidden from Curtis' view by Big Mountain, a three-mile-long ridge extending from Telegraph Road on the east to Twelve Corner Church on the west. The Bentonville Detour ran along the north side of Big Mountain.

Even though Van Dorn's plan was bold and brought his forces to Curtis' rear, there were risks involved. It meant that the exhausted Confederates had to march eight miles to Telegraph Road, turn south, march another two miles through difficult terrain to reach the open fields north of Curtis' position, and then possibly fight a major battle. If Van Dorn's troops did not remain undetected, Curtis could turn his army and keep the Confederates bottled up in the rough terrain north and east of Big Mountain. Speed and surprise were critical to Van Dorn's plan.

The Confederate plan had another problem. Apparently, Van Dorn failed to understand that Curtis was looking for a fight instead of trying to avoid one. A few days after the battle, Major Ross of the 6th Texas Cavalry wrote, "The truth of the whole matter was, General Van Dorn did not believe the Federals would fight him, but rather, that they would get

away from him."³ Ignoring McCulloch and the fact that his army was deteriorating, Van Dorn went ahead with the plan.

In the meantime, the Federals had been busy. An enemy force of unknown size at Camp Stephens made Curtis nervous. Curtis ordered the units on his right flank to face west and dig in. He also ordered the roads in his immediate rear kept clear so he could maneuver troops in case his right flank was threatened. When asked what would happen next, Curtis replied, "I will either fight them tomorrow or they me."⁴

"...Do It"

About sunset on 6 March, Colonel Grenville Dodge, one of Curtis' brigade commanders, suggested that the Bentonville Detour be blocked to prevent or delay Confederate movement around the Union position. Curtis told Dodge, "...go and do it."⁵ Dodge assembled six companies of the 4th Iowa Infantry and one company of the 3rd Illinois Cavalry and headed north on Telegraph Road. By 2100 hours, Dodge's detachment had turned onto the Bentonville Detour. Approximately one mile east of Twelve Corner Church, where the Bentonville Detour runs through a deep ravine, Dodge ordered his troops to cut down trees and form an abatis across the narrow road (see Map 2). Then the soldiers moved back east toward Telegraph Road and created another obstacle across the detour.

Around midnight, Dodge's pickets heard a great deal of noise on the west side of the first obstacle. Dodge gathered his makeshift engineers and returned to the main Union position along Little Sugar Creek. When Dodge reported to Curtis around 0200 hours on 7 March, Curtis did not seem alarmed at Dodge's account of enemy activity along the Bentonville Detour. He thought that Dodge had heard only a Confederate

scouting party. Curtis believed that Van Dorn would spend the night at Camp Stephens—since pickets had reported seeing hundreds of campfires burning—and either attack the Union position head on or on the flank on 7 March.

Van Dorn and his subordinates ended their meeting at Camp Stephens around 1800 hours on 6 March. The march along Bentonville Detour was to begin at 2000 hours. If all went according to plan, the Army of the West should cover the eight miles to Telegraph Road by dawn and as dawn broke, be in position along Telegraph Road to attack Curtis from the rear. Confederate troops stoked their campfires before moving, hoping to deceive the enemy into thinking they were spending the night at Camp Stephens.

Things began to go wrong for Van Dorn from the beginning. He wanted Brigadier General James McIntosh's cavalry brigade in the front. But as McIntosh's cavalry tried to move up the road, its path was blocked by a horde of men and equipment. Somehow, Price's Missouri State Guard had formed up on the road ahead of McIntosh. Instead of having faster-moving cavalry scouting ahead of his march, Van Dorn was leading with a slow-moving mass of infantry and artillery.

By 2000 hours, most of the Confederate regiments were in column along the road, but they were plagued by disorganization, confusion, and dropping temperatures. Near the Bentonville Detour, troops were hampered by the lack of a bridge across Little Sugar Creek. Soldiers threw logs into the creek, broke ranks to cross the freezing water, and then reformed on the other side. It wasn't until 2300 hours that the last of Price's men crossed the creek and started along the Bentonville Detour. Colonel Louis Hebert's infantry brigade came next, and about 0200 hours on 7 March, McIntosh's cavalrymen, who were



General Grenville M. Dodge

supposed to be leading the march, crossed the creek. Around dawn, the last units of the army finally began to cross.

The unbridged Little Sugar Creek was not the last obstacle that Van Dorn's tired and cold soldiers had to contend with. About midnight, the head of Price's column found the maze of trees felled by Dodge's makeshift engineers. The entire column waited as the Missouri State Guard cleared the road. After a two-hour delay, the advance began again, only to find a second abatis farther down the road. Two more hours were lost while the Guard cleared the road once more. At dawn, when Van Dorn planned to have his entire force assembled on Telegraph Road, the head of his column was

just reaching the Telegraph Road intersection, while the tail was still at Camp Stephens.

Not only was Van Dorn falling behind schedule, his army was falling apart also. The hard march to Camp Stephens, the cold weather, a shortage of food, and the lack of rest were causing Van Dorn to lose his numerical superiority. A Texas cavalry officer wrote, "Every half mile I saw infantry in squads of 50 or 60, and even more lying on the roadside, asleep and overcome with hunger and fatigue."⁶

The Battle

At 0700 hours on 7 March, Missouri State Guard cavalry turned off the Bentonville

Detour onto Telegraph Road and began moving south. Not a Yankee was in sight. Van Dorn's plan had worked; he had deceived Curtis and was now behind him. But Van Dorn's forces were spread out, and it would be well into the afternoon before he could consolidate his column, giving Curtis plenty of time to detect him and react. Van Dorn had to find a way to unite his army quickly.

Van Dorn, traveling near the head of the column with Price, decided to divide the army. Price's Missouri State Guard would turn south off the Bentonville Detour onto Telegraph Road and advance two and a half miles to Elkhorn Tavern (see Map 2). McCulloch's Confederate division would leave the Bentonville Detour at Twelve Corners Church and turn south on Ford Road, uniting with Price's forces at Elkhorn Tavern. Ford Road lay along the south side of Big Mountain and intersected Telegraph Road just south of Elkhorn Tavern. By taking Ford Road instead of the Bentonville Detour, McCulloch would march only three and a half miles instead of seven.

McCulloch received the orders after the head of his column had passed Twelve Corner Church. He ordered a time-consuming countermarch to Ford Road. As he traveled down the column of cold, weary soldiers, he said, "We are going to take 'em on the other wing."⁷ It was well into the morning before McCulloch's troops finally turned south on Ford Road. Just before noon, the head of his column was two and a half miles from Elkhorn Tavern. Van Dorn was about an hour away from uniting his army at the tavern.

Van Dorn's army was in a precarious situation. The two halves were separated by Big Mountain and each half was smaller than Curtis' entire force. But Van Dorn was confident that Curtis had not detected his movement and that by the time Curtis did notice him and react, the two halves would be reunited at Elkhorn Tavern.

But the Yankees had already observed the Confederate force and were reacting. At 0800 hours, Curtis' provost marshal reported Confederate cavalry north of Elkhorn Tavern, and a scouting party had seen Confederate infantry on the Bentonville Detour near Twelve Corner Church. By 1100 hours, Curtis had Colonel Peter J. Osterhaus' troops moving toward the church to develop the situation. He also had Colonel Eugene A. Carr's division moving toward Elkhorn Tavern. Curtis believed he was facing two Confederate forces: one at Camp Stephens preparing to attack and another on the Bentonville Detour trying to get around his right flank.

Just before noon, near the village of Leetown, Osterhaus' soldiers met with McCulloch's column. McCulloch, who had the superior numbers, quickly seized the initiative and prepared to attack Osterhaus' force. Osterhaus, realizing he was facing a significant part of the Confederate force, asked Curtis for reinforcements. Meanwhile, in the rough terrain north of Elkhorn Tavern, Carr ran into the Missouri State Guard.

Curtis soon realized that the entire Confederate army had moved to his rear. He told Carr to conduct an economy-of-force mission and try to keep the Missouri State Guard from breaking through while most of the army went to Leetown to support Osterhaus. After helping Osterhaus, the army would move to assist Carr.

As McCulloch's forces prepared to attack Osterhaus, McCulloch moved forward with the 16th Arkansas Infantry Regiment on a personal reconnaissance and was killed by skirmishers of the 36th Illinois Infantry Regiment. Brigadier General McIntosh assumed command and advanced with the 2nd Arkansas Mounted Rifles, but the 36th Illinois skirmishers killed him also. Command now fell on the shoulders of Colonel Hebert, although he never learned that he was in command. Hearing

the firing from the 36th Illinois, Hebert took it as the signal to attack. He led his command of four infantry regiments into arriving Union reinforcements and, after some initial success, his attack was broken up and he was captured. Because of the deaths or capture of the three Confederate commanders, McCulloch's division never was able to bring its superior numbers to bear on Osterhaus.

Late in the day, McCulloch's division, now commanded by Colonel Elkanah Greer, returned to Twelve Corner Church. Some of the Confederate soldiers returned to Camp Stephens while others took the Bentonville Detour, trying to find Van Dorn and the rest of the army.

While Osterhaus held off McCulloch's unorganized attack, Carr earned a Medal of Honor for keeping the larger Missouri State Guard in the rough terrain north of Elkhorn Tavern. By using artillery early in the fight and small counterattacks at critical moments and by bending back his right flank, Carr kept Price and Van Dorn off balance most of the afternoon. It wasn't until late in the day that Van Dorn was able to mass the larger Missouri State Guard against Carr and drive him away from Elkhorn Tavern. But by then it was too late; the sun was gone, Union reinforcements were arriving, and McCulloch wasn't coming to help.

That night the Union Army, resupplied from their wagons, deployed to deliver the decisive blow against Van Dorn, who was unable to resupply because his supply wagons were still at Camp Stephens.

Victory

On 8 March, realizing he was almost out of ammunition, Van Dorn ordered his army to retreat eastward. Just as the Confederates were leaving, Curtis attacked. He misinterpreted the direction of the

Confederate withdrawal, believing that Van Dorn was retreating northward up Telegraph Road along the route of his advance the day before, and ordered the pursuit northward. What was left of Van Dorn's army slipped away to the east.

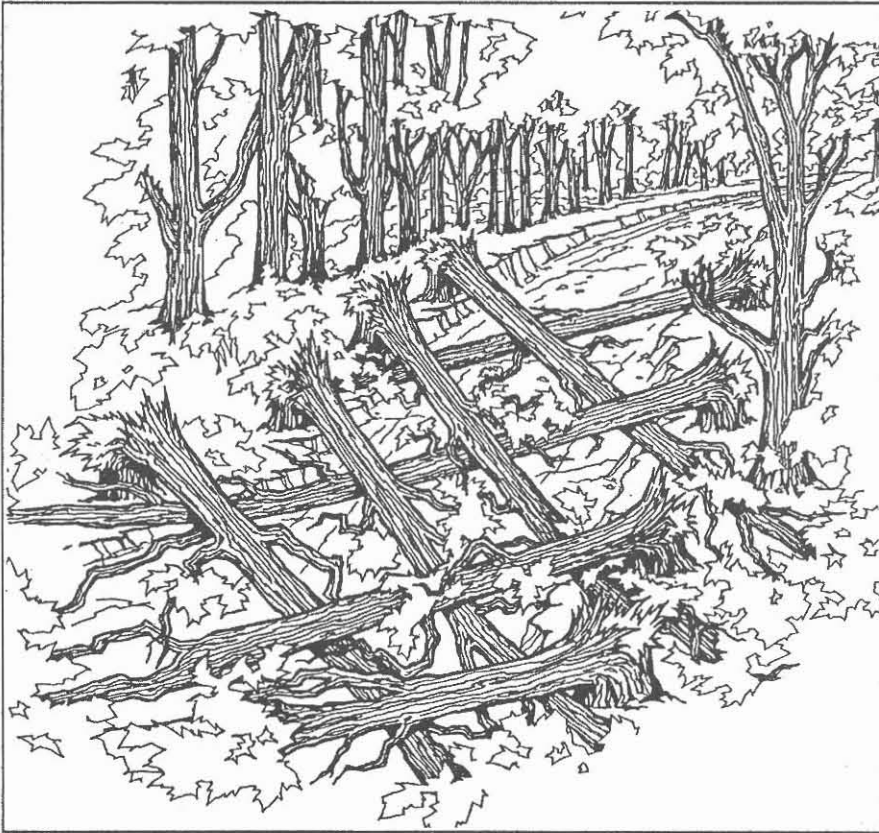
The Battle of Pea Ridge was a tactical draw. Van Dorn had turned Curtis' superior position, but Curtis was able to keep him from massing the Confederate Army. The Union Army suffered approximately 1,400 casualties in the battle. Confederate losses were hard to establish and may never be known, but they were at least as high as the Union's and probably higher.

Strategically, the battle was a Union victory. Curtis used the battle to regain the initiative and moved his army into central Arkansas. Van Dorn's commander, General Albert S. Johnston, ordered Van Dorn's soldiers to reinforce Confederate troops in Mississippi. Even though skirmishing and bushwhacking continued in Missouri for another three years, Missouri was securely in Union hands.

Obstacle Integration

Van Dorn's turning movement along the Bentonville Detour faltered for a number of reasons: poor staff work, tired soldiers, and quick reaction from Union forces. However, Dodge's obstacles may have been the most important reason since they cost Van Dorn four hours and caused him to divide his army.

What factors did Curtis and Dodge consider at Pea Ridge that are still important to obstacle planners today? One of the most important aspects of obstacle planning is the engineer battlefield assessment (analysis of terrain and enemy and friendly forces). Certainly, both Curtis and Dodge considered the terrain and possible avenues of approach when they discussed creating



An abatis such as this was used in the Battle of Pea Ridge.

obstacles along the Bentonville Detour. Dodge took the terrain into consideration when he decided to chop down the trees in the two deep ravines. They also considered the fact that the enemy's tactics would likely include an envelopment or turning movement. The choice of abatis as obstacles was probably based on the amount of time and friendly assets (infantry with hand tools) available and an analysis of the Confederate's assets (infantry with hand tools).

Today's army would classify Dodge's obstacles as reinforcing obstacles. FM 90-7 states, "Reinforcing obstacles are obstacles specifically constructed, emplaced, or detonated by military forces. The categories of reinforcing obstacles are tactical and protective."⁸ Dodge's obstacle would best be described as a tactical obstacle because they attack enemy maneuver. According to FM 90-7, "Tactical obstacles directly attack the enemy's ability to move, mass, and reinforce."⁹ This is what Curtis and

Dodge were trying to do. They wanted the obstacles to delay any Confederate units that were using the Bentonville Detour to move around the Union right flank.

FM 90-7 explains, "Obstacle intent is how the commander wants to use tactical obstacles to support his scheme of maneuver."¹⁰ Obstacle intent consists of three components; target, effect, and relative location. Curtis and Dodge must have also considered these things.

The target of an obstacle is the enemy force that the commander wants to affect with the tactical obstacle. Commanders usually identify the target in terms of size, type of enemy force, echelon, the avenue of approach, or a combination of these. Curtis and Dodge simply targeted any size Confederate force attempting to use the avenue of approach defined by the Bentonville Detour.

The effect that a commander wants the obstacle to have on the enemy is called the obstacle effect. Tactical obstacles produce one of

four effects; disrupt, turn, fix, or block. Curtis probably intended the obstacle to disrupt the Confederates. According to FM 90-7, "The disrupt effect focuses ... obstacle effort to cause the enemy to break up its formation and tempo, interrupt its timetable, ... and piece-meal the attack."¹¹

Dodge's obstacles could not possibly have stopped a determined Confederate movement, but they certainly could, and did, interrupt the Confederate timetable and disrupted Van Dorn's command and control. Curtis probably did not want to block Confederate movement. Evidence of this is that he did not cover the obstacles with fire. If he had wanted to deny the Confederates use of the road, he probably would have deployed forces at the obstacles.

Relative location of an obstacle refers to where the commander wants the obstacle to affect the enemy. Curtis was not specific about this aspect which allowed Dodge to choose the best location for the obstacles based on his ground reconnaissance.

FM 90-7 emphasizes the importance of integrating fires and obstacles: "All leaders must understand how obstacles and fires mesh to achieve the obstacle effect."¹² Dodge's obstacles were not covered by fire, yet they seemed to be effective for a number of reasons.

First of all, the Confederates failed to conduct a reconnaissance. Due to poor staff work and the condition of Van Dorn's troops, Missouri State Guard units led the advance instead of McIntosh's cavalry brigade. Had Van Dorn led with cavalry, they might have discovered the obstacles, allowing him to plan how to deal with them. Van Dorn might have even decided to turn the entire force at Twelve Corner Church instead of just McCulloch's division. This would have completely changed the nature of the battle.

Another reason the obstacles were effective was that they were deployed in depth. By using two

obstacles instead of one, Dodge forced Van Dorn to stop and restart his column twice. Stopping and restarting movements is difficult for even the best staff. After working hard for two hours clearing an obstacle, imagine the impact on morale of coming across another obstacle two miles later.

Of course, the location of the obstacles increased their effectiveness. Dodge chose natural choke points—where the road ran through deep ravines. The steep sides of the ravines made it very hard, if not impossible, for Van Dorn's soldiers to leave the road, march around the obstacle, and return to the road on the other side. It probably would have taken just as long to struggle around the obstacles as it would have to breach them.

Major General Franz Sigel, one of Curtis' division commanders, summed up the Battle of Pea Ridge very appropriately:

*It was not a great battle, like that of Gettysburg or Chattanooga; it was not of such preponderating national importance; it did not break the backbone of the Rebellion, but it virtually cleared the Southwest of the enemy...and made it possible for our veterans to reinforce the armies under Buell, Rosecrans, Grant, and Sherman.*¹³

Dodge's obstacles obviously played a key role in the Union victory. As Napoleon wrote, "A battle sometimes decides everything; and sometimes the most trifling thing decides the fate of a battle."¹⁴

Mr. McFarland is the military history instructor for the Engineer Officer Basic and Advance Courses at the U.S. Army Engineer School. He also conducts staff rides to Wilson's Creek and Pea Ridge National Battlefields. Mr. McFarland was a Park Ranger with the National Park Service for 10 years. He is a graduate of Eastern Illinois University.

Maps reprinted from William L. Shea and Earl J. Hess, *Pea Ridge: Civil War Campaign in the West*. Copyright © 1992 by the University of North Carolina Press. Used by permission of the publisher.

Endnotes

¹ Heintz, Robert Debs, Jr., Editor. *Dictionary of Military and Naval Quotations*. Annapolis: U.S. Naval Institute, 1966, p. 26.

² Shea, William and Earl Hess. *Pea Ridge, Civil War Campaign in the West*. Chapel Hill: University of North Carolina Press, 1992, p. 80.

³ Shea, p.82.

⁴ Ibid.

⁵ Ibid.

⁶ Shea, p.86.

⁷ Shea, p.87.

⁸ Department of the Army. FM 90-7: *Combined Arms Obstacle Integration*. Washington: Headquarters, Department of the Army, 1994, p. 2-1.

⁹ Department of the Army, p. 2-2.

¹⁰ Department of the Army, p. 2-4.

¹¹ Ibid.

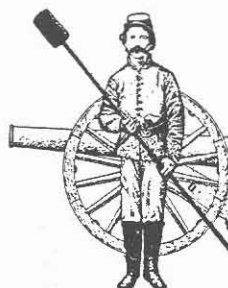
¹² Department of the Army, p. 3-2.

¹³ Hughes, Michael. "A Forgotten Battle in a Region Ignored, Pea Ridge of Elkhorn Tavern, Arkansas, March 7-8, 1862: The Campaign, the Battle, and the Men Who Fought for the Fate of Missouri." *Blue and Gray Magazine* January 1988, p. 32.

¹⁴ Heintz, p. 26.

Reference

U.S. War Department. *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies*. 70 volumes, Washington, D.C., 1880-1901.



(Continued from page 16)

Understanding. The engineer community is not fully trained about EBA. Many units gloss over the importance of EBA, and this weakness is immediately apparent when they go to the Combat Training Centers. Units must consistently use the intelligence NCO and the EBA process during all exercises. To increase the effectiveness of the brigade combat team, the intelligence NCO, the assistant brigade engineer, and the brigade S2 sections must find ways to train together frequently.

Conclusion

The EBA is a continuous process that requires frequent updating from the time a mission is received until it is accomplished. The EBA must be adjusted based on information from both higher and lower echelons. Initially, the EBA is part of the situation report in the mission analysis brief to the commander. The EBA/IPB and the situation template/most likely course of action drive the planning process from start to finish. When executed poorly or not at all, the EBA and the parallel planning process hinder even the best plan. When they are executed well, the processes complement each other and ensure mission accomplishment on the battlefield.

Michael W. Sayer is a military analyst for the Sidewinder Engineer Battalion Trainers, Operations Group, National Training Center, Fort Irwin, California. He recently retired from active duty after spending two years as the intelligence NCO for the 4th Engineer Battalion at Fort Carson, Colorado.

Enlisted Insignia of the United States Armed Forces

E-1

E-2

E-3

E-4

E-5











E-6

E-7













E-8

E-9












AIR FORCE

(no insignia) Airman Basic	 Airman	 Airman First Class	 Sergeant  Senior Airman	 Staff Sergeant	 Technical Sergeant	 Master Sergeant	 Senior Master Sergeant	 Chief Master Sergeant	 Chief Master Sergeant of the Air Force
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ARMY

(no insignia) Private	 Private	 Private First Class	 Corporal  Specialist	 Sergeant	 Staff Sergeant	 Sergeant First Class	 First Sergeant	 Command Sergeant Major	 Sergeant Major of the Army  Master Sergeant  Sergeant Major
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MARINES

(no insignia) Private	 Private First Class	 Lance Corporal	 Corporal	 Sergeant	 Staff Sergeant	 Gunnery Sergeant	 First Sergeant	 Sergeant Major	 Sergeant Major of the Marine Corps  Master Sergeant  Master Gunnery Sergeant
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NAVY

 Seaman Recruit	 Seaman Apprentice	 Seaman	 Petty Officer Third Class	 Petty Officer Second Class	 Petty Officer First Class	 Chief Petty Officer	 Senior Chief Petty Officer	 Master Chief Petty Officer	 Master Chief Petty Officer of the Navy
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Officer Insignia of the United States Armed Forces

O-1 O-2 O-3 O-4 O-5 O-6 O-7 O-8 O-9 O-10 Special











AIR FORCE

										
Second Lieutenant	First Lieutenant	Captain	Major	Lieutenant Colonel	Colonel	Brigadier General	Major General	Lieutenant General	General	General of the Air Force












ARMY

										
Second Lieutenant	First Lieutenant	Captain	Major	Lieutenant Colonel	Colonel	Brigadier General	Major General	Lieutenant General	General	General of the Army


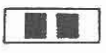


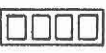






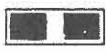







MARINES

										N/A
Second Lieutenant	First Lieutenant	Captain	Major	Lieutenant Colonel	Colonel	Brigadier General	Major General	Lieutenant General	General	N/A

NAVY

										
Ensign	Lieutenant Junior Grade	Lieutenant	Lieutenant Commander	Commander	Captain	Rear Admiral (Lower Half)	Rear Admiral (Upper Half)	Vice Admiral	Admiral	Fleet Admiral

WARRANT

	Warrant Officer W-1	Chief Warrant Officer W-2	Chief Warrant Officer W-3	Chief Warrant Officer W-4	Chief Warrant Officer W-5	COAST GUARD
ARMY						 Coast Guard officers use the same rank insignia as Navy officers. Coast Guard enlisted rating badges are the same as the Navy's for grades E-1 through E-8. E-9's have silver specialty marks, eagles and stars, and gold chevrons. The badge of the Master Chief Petty Officer of the Coast Guard has a gold chevron and specialty mark, a silver eagle and gold stars. For all ranks, the gold Coast Guard shield on the uniform sleeve replaces the Navy star.
MARINE						
NAVY	 	 	 	 	N/A	

The Air Force does not have warrant officers.



ENGINEER UPDATE

Commercial numbers are (314)563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Directorate of Training and Doctrine (DOTD)

New Field Manuals (FMs). Four FMs were distributed in October:

- FM 5-10, *Combat Engineer Platoon*, is a companion manual for FM 5-34 that describes how the engineer platoon supports the total combined-arms effort.

- FM 5-125, *Rigging*, addresses the types of rigging and the applications of fiber rope, wire rope, and chains used to move heavy loads.

- FM 5-426, *Carpentry*, is a guide for engineers responsible for planning and executing theater-of-operations construction.

- FM 5-71-3, *Brigade Engineer Combat Operations (Armored)*, is a guide for brigade engineers, their staffs, and subordinate commanders.

POC is Sandra Gibson, -4100.

New Army Training and Evaluation Programs (ARTEPs). Three ARTEPs distributed in October provide programs to train units in their critical wartime missions:

- ARTEP 5-402-33-MTP, *Mission Training Plan for Engineer Groups and Brigades*.

- ARTEP 5-413-33-MTP, *Mission Training Plan for Engineer Support Companies*.

- ARTEP 5-500-24-MTP, *Mission Training Plan for Engineer Diving Teams - Heavy Engineer Diving Team/Light Engineer Diving Team*.

POC is Rayburn Toy, -4102.

Directorate of Combat Developments (DCD)



COTS Blasting Machine

Commercial Off-The-Shelf (COTS) Blasting Machine. The new CD450-4J blasting machine to replace the current M-34 will be available in January 1996. Units will be able to requisition this item through normal supply channels using the assigned NSN 1375-01-417-7104. The item manager reports that back-order requisitions for M-34s will be filled initially with this item; follow-on requisitions will be filled after all back orders are filled. POC is Larry Allen, -4080.

Small Emplacement Excavator (SEE) Attachments. Fielding of a boom-mounted earth auger for the SEE began in April 1995 and will be completed in February 1996. This auger provides engineer units the capability to bore holes 6 feet deep and 12 inches across. Units can also purchase a boom-mounted pavement breaker and a tamper/compactor. A front-mounted rotary sweeper and a snow-blade attachment have been approved for use. The U.S. Army Tank-Automotive and Armaments Command is completing a Technical Data Package List of all attachments that will be available soon. It will include drawings, instructions, and suggested manufacturers for equipment procurement. POC is Cathy Pryor, -6185.



BRIDGE THE GAP

By Command Sergeant Major Roy L. Burns, Jr.
U.S. Army Engineer School

Physical Fitness and NCO Professional Development

"The best form of "welfare" for the troops is first-class training, for this saves unnecessary casualties."

Field Marshal Erwin Rommel

Since enrollment requirements for attendance at Noncommissioned Officer Education System (NCOES) courses changed in April 1995, many eyebrows at the Engineer Center and throughout the Army have been raised in concern. Department of the Army message, DTG 081650Z, March 95, subject: APFT Height and Weight Requirements, states that soldiers must pass the Army Physical Fitness Test (APFT) and meet height/weight requirements prior to enrollment in NCOES courses.

Senior Army leaders are concerned because many NCOs fail to meet these requirements. Since April, Engineer Center records show that 31 soldiers enrolling in the Primary Leadership Development Course (PLDC), 15 enrolling in the Basic NCO Course (BNCOC), and 7 enrolling in the Advanced NCO Course (ANCOC) failed to meet entry requirements. Those soldiers were denied training and returned to their units—with their units absorbing the temporary duty (TDY) expenses.

These figures should be zero! They cause us to question the physical condition of engineer soldiers and the physical fitness standards upheld in units. When we must return soldiers to their units, it directly impacts the soldiers' careers and indirectly impacts their units' readiness. It sends a clear message that the soldier and the unit are not upholding the standards outlined in Army regulations.

Notice: In accordance with the Department of the Army (DA) message dated March 1995, the Commandant of the Libby NCO Academy must forward a letter of release to the first general officer in the student's chain of command. This policy was established by DA and is strictly enforced at Fort Leonard Wood. We are the leaders who must send soldiers who do not meet enrollment requirements back to their units, but we are not the "bad guys" some call us. The Engineer Center is committed to helping soldiers succeed!

The leadership in our corps must prepare soldiers for NCOES schooling. First-line leaders and commanders

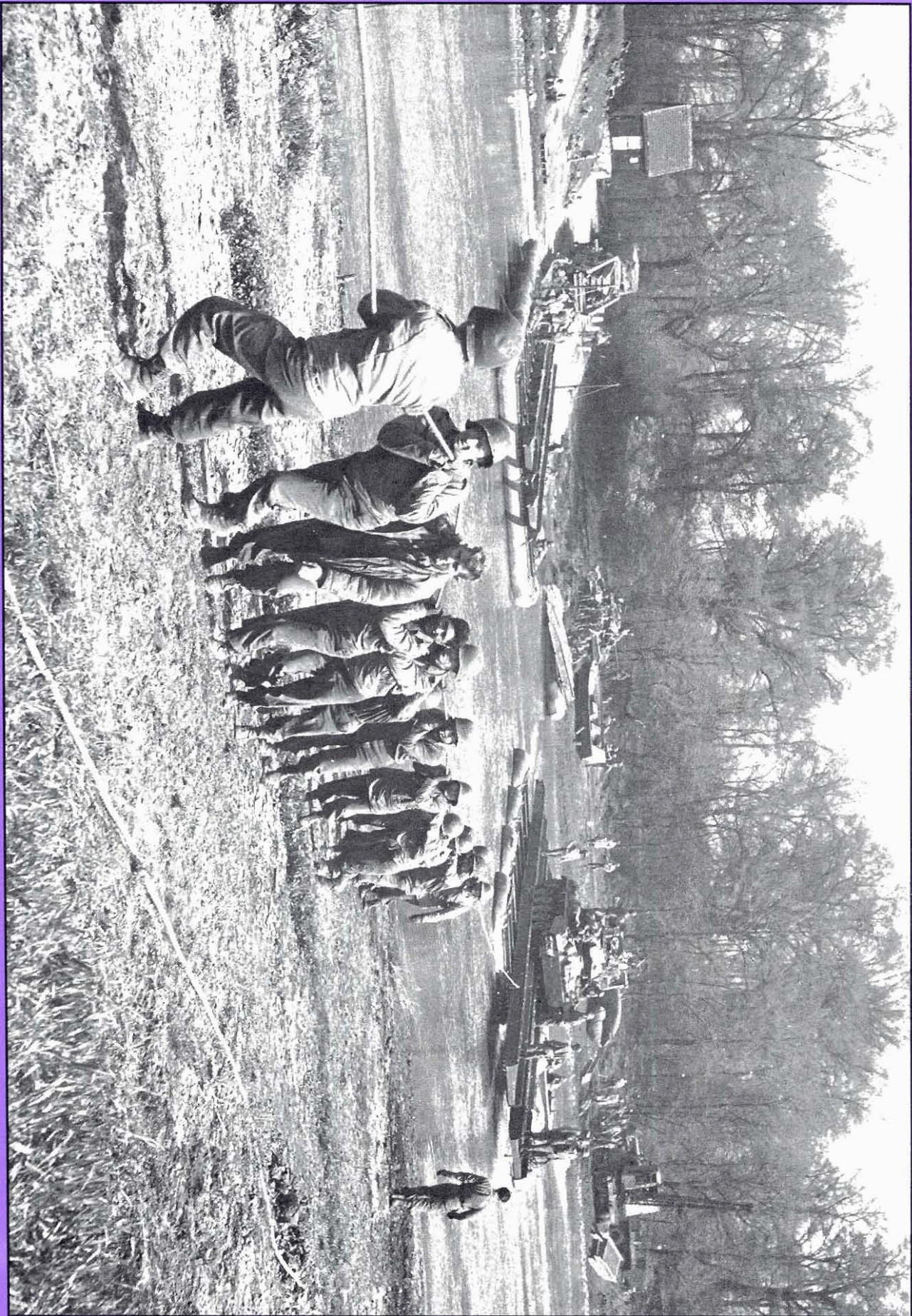
are responsible for helping young NCOs better prepare for their careers and provide time for them to prepare for schooling. Many students arriving at the Engineer Center say they had only a week's notice, or less, before reporting to school. This is not the way to take care of soldiers.

To improve NCOES entry rates, first-line leaders must take time to know their soldiers' strengths and weaknesses and then provide training to overcome the weaknesses. This strategy will prepare soldiers for successful entry to NCOES courses—and for the demands they will face on the battlefield.

Training Strategy: The following suggestions will help prepare soldiers for NCOES courses.

- Ensure that soldiers scheduled to attend schools are mentally and physically prepared.
- Give a thorough physical fitness test, to Army standards, 30 days prior to the soldiers' report date. Send only those who pass to the course.
- When necessary, administer a tape test and counsel soldiers on the weight-control policies outlined in AR 600-9. Do this long before soldiers with potential weight problems must report. Failure to meet the standards outlined in AR 600-9 affects school attendance and is detrimental to the career potential of otherwise outstanding soldiers.
- Set a positive example for your soldiers. Make and take time to counsel, train, and lead by example. Soldiers expect and desire strong role models who uphold strong Army standards and traditions.
- Discuss with your soldiers their responsibility to be strong and to stay strong. The bottom line is that soldiers must assume responsibility for their physical fitness.

NCOs in the Engineer Regiment must invest more time in training high-quality soldiers—those who are prepared to meet any challenge at a moment's notice. We must maintain our great NCO Corps, Regiment and, above all, our great Army.



Combat engineers of the 83rd Division pull a tank across Germany's Seale River in April, 1945.