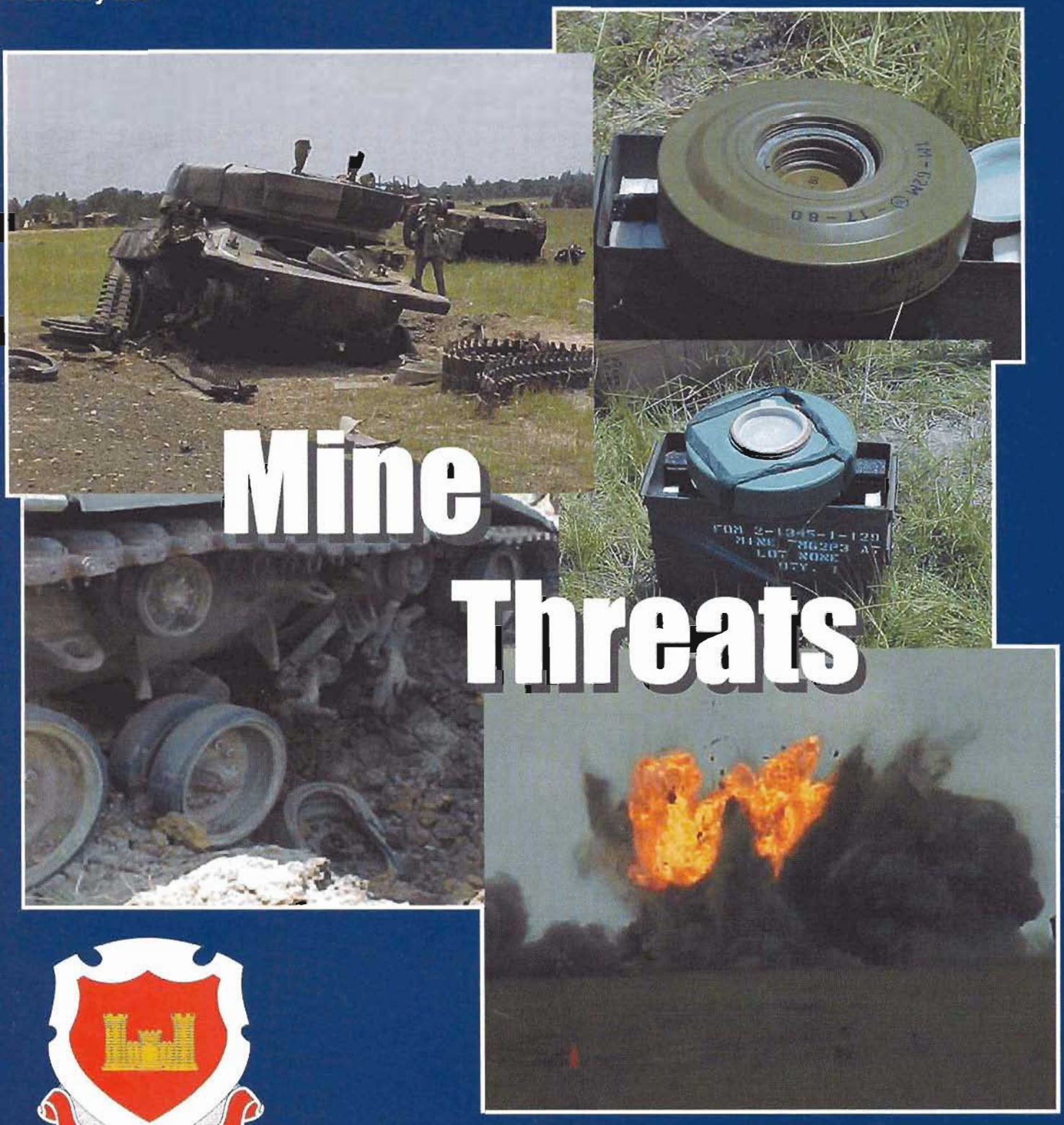
ENGINEER
The Professional Bulletin of Army Engineers

February 2001



Mine Threats

Headquarters, Department of the Army
PB 5-01-1 Approved for public release, distribution is unlimited.

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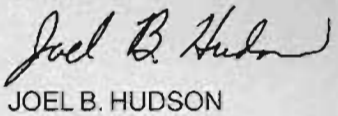
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Engineer (ISSN 0046-19890) is prepared quarterly by the U.S. Army Maneuver Support Center, 320 Engineer Loop, Suite 210, Fort Leonard Wood, MO 65473-8929. Second Class postage is paid at Fort Leonard Wood, MO, and additional mailing offices.

POSTMASTER: Send address changes to U.S. Army Maneuver Support Center, ATTN: ATZT-DT-DS-B *(Engineer)*, 320 Engineer Loop, Suite 210, Fort Leonard Wood, MO 65473-8929.

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: (573) 563-4104, DSN 676-4104. *Engineer's* e-mail address is: bridgess@wood.army.mil. Our Internet home page is located at: http://www.wood.army.mil/engrmag/emag_hp.htm.

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ENGINEER

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February 2001 | Headquarters, Department of the Army | Volume 31 PB 5-01-1

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Front Cover:

Mine threats in mission areas are real. Photographs show various mines and damage that can occur to vehicles from mine explosions. (Engineer Corps flag photograph by Mark Dean.)

Back Cover:

"We Clear The Way!" Engineers - The Proud Tradition. This historical painting was rendered during WWII by famed war poster artist Jes W. Schlaikjer.

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Clear The Way

By Major General Anders B. Aadland
Commandant, U.S. Army Engineer School



I am honored to be "back home" at the Home of the Engineers—Fort Leonard Wood. And I must say, the place has never looked better; the Maneuver Support Center is in full swing with great teamwork among the Military Police, Chemical, and Engineer Schools. I appreciate the tone of synergy that LTG Bob Flowers inspired during his command here; we all congratulate him on his promotion and selection as the 50th Chief of Engineers. We also congratulate Ron Johnson on his promotion to BG and thank him for his great work running the Engineer School and ensuring a seamless transition between commandants. The Engineer School will continue that vitally close liaison with the Chief, USACE, and Engineers in the field round the world in the spirit of "One Corps, One Regiment, One Fight." I see this post as a beacon of what is to come in TRADOC and the Army. Fort Leonard Wood is an enduring installation that is demonstrating how branches can maintain their proponency power and technical veracity while breaking down the stovepipe walls and working together to support the maneuver forces of our transforming Army. Clearly the power of the team is greater than the sum of its parts.

It's an exciting time to be an Engineer and a sapper! We are on the cutting edge of change in our Army and our Regiment. We Engineers must be an integral part of the Transformation effort; leaders down to battalion level must have their heads in this game. We owe you the leadership, azimuth, and dynamics of this effort; we will ensure that you know our priorities and issues for the Legacy, Interim, and Objective Forces. I encourage all Engineer leaders to share their ideas with the Engineer School on how to best transform our Regiment in pace with the Army. As we transform in systems, units, and operational concepts, we must be willing to part with the old. Remember, the old stuff never was perfect; we always wanted better, and we survived by making compromises and applying unit-level innovations along the way. Now is the time to catch up—that's why we Engineers should regard Transformation as an opportunity and an exciting challenge. Remember, the power and genius of our branch has always been its people, not its equipment.

One of my most compelling priorities is to establish and maintain an effective network with you—the leaders of our Regiment. I see support to and dialog with the field as the fountain of our wisdom; the key to our success in doctrine, training, leader development, organization, materiel, and soldiers (DTLOMS); and the vehicle for our "Speak-With-One-Voice" imperative. Supporting the field is our highest priority as a training base; supporting the warfighter is our highest priority as a branch. So let us hear from you—fill our rucksack with your ideas and issues. Here are some ways our network will stay energized: (1) Semiannual Commandant's VTC (2d and 4th quarters)—make sure you're on the net, and contact us if you were not notified for the 30 January VTC; (2) Annual Engineer Senior Leaders Conference—ENFORCE 2001 "Engineers Leading Transformation" will be conducted here from 8 to 11 May; we're looking forward to seeing you; (3) Semiannual Engineer Council of Colonels (1st and 3d quarters)—offsets the VTC; the next one is scheduled for 8 May during ENFORCE; (4) USAES Web site—check us out and tap in; see info on how to do just that in this bulletin (page 47); (5) Army Engineer Association (AEA)—use this great organization to stay in the loop on goings-on throughout the Corps; and (6) *Engineer*—help us make this bulletin speak for and to you; we welcome your input on how to make it better. With all these media, we hope you have ample opportunity to be heard; if not, your calls, cards, letters, and e-mails are always appreciated and encouraged.

We will keep the network energized to keep you informed so that you know our "One-Voice" positions and can promulgate them. Remember, challenge them back to us, and advocate them with your bosses. Be steady, positive warriors; remain linked arm-in-arm with us in the professional development of our NCO and officer leaders. Commanders in the field, always take the time and effort to counsel and mentor your junior leaders so that they understand the vibrancy of their branch, appreciate their tremendous career opportunities, and maintain confidence in their leaders.

I want to welcome CSM Rob Robinson to the position of Engineer Regimental Command Sergeant Major and thank CSM Art Laughlin for his distinguished service. We also want to thank CSM Bob Dils for his great service here as the MANSCEN CSM and congratulate him on his selection to be the USACE CSM. Finally, our thanks go to LTG Bob Flowers on leaving behind such a superb organization in MANSCEN, building a great team at the Engineer School, and brilliantly leading our Regiment for the past 3 years. I know the entire Corps joins me to wish him well in his tenure as Chief of Engineers.

Essayons!

"...the power and genius of our branch has always been its people...."

Lead The Way

By Command Sergeant Major Robert R. Robinson
U.S. Army Engineer School



As the new Command Sergeant Major of the Engineer School and the Regiment, I send my sincerest appreciation to the senior leaders of the Regiment for your vote of confidence that led to my selection. It means a lot to me to know that you all have faith in my abilities to perform these important duties. I pledge that I will always do my best to champion those issues and concerns you feel are vital to the future success of the Regiment.

I congratulate CSM Art Laughlin on his stellar career as he heads into life after the Army. I know you join me in saying to him from the Regiment, "Thanks for a job well done."

As I assume my duties as the Engineer School CSM, I have become painfully aware of the many projects, issues, and initiatives that our Engineer School is working and has been working for some time. The list is long, and the personnel available to work these issues are few. In the short time I have been at Fort Leonard Wood, I can tell you that I have gained a new respect for what our school does and the amount of work associated with improving our branch's relevance to the rest of the Army. It is a daunting task to say the least. BG Johnson has put together a quality team, and although few in numbers, the right people are here and doing their level best to help shape the Regiment, with respect to Transformation.

I have thought long about what I consider the important issues I need to focus on during my tenure as the Regimental CSM. I have formed this list based on my most recent challenges as the CSM of the 555th Combat Engineer Group: Transformation; guidance from my boss, BG Johnson; and from what I consider the most important element in our branch and Army—SOLDIERS. I intend to focus on the following areas:

Leader Development
- Engineer NCOES and Drill Sergeant School
- Sapper Leader Course

Soldier Development
- Engineer OSUT and AIT
- IET process
- Mental toughness in new soldiers
- Soldier retention

Training Development
- MOS qualification
- MOS consolidation
- POI revisions

To accomplish the above, I need to visit units and soldiers, all over the world, in the Active and Reserve Components. I need your insights and, specifically, trends you see, both good and bad, that need to be addressed. I know you all are very proud of your units and will put a lot of effort in telling me about them. I would prefer that you SHOW ME your units. I ask that you give me your candid opinions and time with your soldiers. I need to see them do what they do day-to-day. I don't necessarily want canned briefs, tours through barracks, or soldiers standing by. I do want to see them in the motorpools; in the field; up to their knees in mud; and at the ranges, training areas, and CTCs.

We have made great strides in team building among the senior leaders of the Regiment. We need to continue that, and the way we do that is by communicating with each other and attending ENFORCE and our other scheduled conferences. These are important to our Regiment and are key to addressing and fixing the issues we're faced with as a branch. I know we're busy and resources are tight, but we need to make the time and convince our commanders to make the resources available to attend these events.

The last key element in our branch's success is to "Speak With One Voice." We have been hearing that phrase since LTG Ballard coined it in 1992, but it's very important to our relevance as a part of the Objective Force. Speaking with one voice is the bridge between doing what we do at the Engineer School and what we do in units around the world. Speaking with one voice enables BG Johnson in winning the hearts and minds of our senior Army leadership and, more important, getting the resources we need to keep the Regiment relevant. It's what's going to perpetuate our existence as a force multiplier in the decade to come. And, if you don't know what you should be saying, call us or get on our home page to find out how you can help us help the Regiment.

I will close by telling you all that I am honored to be your Regimental Command Sergeant Major. I have done many things in my 28-year career that have given me great pride and a sense of fulfillment, but none more so than serving in this position. I will work diligently with BG Johnson and the other very important people at the Engineer School. I look forward to the challenges and working with you all.

Essayons!

"...show me your units."



Mine Threats in Mission Areas

By Colonel Andrzej Zarczynski

Mines are a very effective means of battle in international armed conflicts. The Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons–Protocol II, signed in 1980 in Geneva, Switzerland, bans the use of undetectable mines, booby traps, and other such devices, as well as the use of mines against the civilian population.

There are about 700 kinds of mines in the world, with about 300 of them being antipersonnel mines. Mines are often called "weapons of the poor" because most of them are simply constructed, inexpensive, simple to use, and very dangerous. Mines are used on a massive and uncontrolled scale—minefields are laid without plans, forms, or sketches in local armed conflicts. This weapon is always a threat to people, even after a war has ended.

The Problem

According to reports by the UN and nongovernmental organizations, about 35 countries produce mines. At present, about 110 million mines are laid in 64 to 69 countries, and each month, about 800 people around the globe are killed and 1,200 maimed by these mines. Some 300,000 people are living with shattered limbs and lives—and their number is still growing. Statistically, a new tragedy takes place every 20 minutes.

In Afghanistan, the most land-mined area of the world, there are probably 10 million mines. There are about 9 million mines in Angola; 7 million in Cambodia (left over from 25 wars); 6 million in the former Yugoslavia (Bosnia, Herzegovina, and Croatia); 2 million in Mozambique; and 1 million each in Somalia, Kuwait, Nicaragua, and West Sahara. There are also extensive minefields in Egypt and Libya that were laid during World War II.

Who laid these minefields? Probably everyone in a conflict area. For example, UN specialists estimate that in the former Yugoslavia, the laying of mines has gone through three distinctive phases:

The first phase involved demolition and laying minefields by the Yugoslav National Army (JNA) and the local civilian militia. Even if the regular army made partial records (such as maps, sketches, and forms) of the minefields, most of the mines laid by the militia were random and poorly recorded.

In the second phase (stabilization operations), intervention by the JNA brought some control over the mine warfare in the areas it controlled. Both sides brought some discipline to the mining practices and said that they established control only over the mines of the former Yugoslavia. Both sides agreed on clearing the mines to their rear areas so that only minefields in the front line would be left for protection of the units. In the same phase, civilians who were fleeing for their lives laid antipersonnel and antitank mines and booby traps in their homes, farms, fields, and forests.

In the third phase (ethnic and regional conflict), conflicting sides and civilians have continued to lay minefields randomly, with apparently no records made of their locations. Laid along roads and in forests, urban areas, and single houses, the minefields close convenient lines of activity.

In addition to the land-mine threat, unexploded ordnance (UXO) is also a problem. For example, during the civil unrest in Albania in March 1997, 38 storage buildings—containing about 5,700 tons of weapons, ammunition, mines, and TNT—exploded. (The explosions may have been caused accidentally by people who were searching for explosives or using unsafe electric lights.) Although some of the ammunition exploded completely, most of it was UXO and was delivered to 15 sites or "hot spots" that cover about 200,000 square meters. The sites are located in cornfields, on main roads that link villages, in forests, and near civilian houses. Local people, especially children, still perish as a result of both the explosions in those areas and the subsequent civilian handling of the UXO. So far, there have been 42 casualties and 59 wounded in Albania.

Mines

There are both antipersonnel and antitank mines in the conflict areas. These mines may be laid singly, in groups, and/or as minefields. Sometimes they are laid using an unconventional method (for greater effectiveness) and specially constructed booby traps. Following are examples of laying antipersonnel mines unconventionally:

- Using two fragmentation mines connected by one trip wire.
- Using a fragmentation mine with six wires extending from it. When one of the wires is touched, the mine explodes.
- Using a device which, when broken, completes a firing circuit. What appears to be a grey plastic box is attached to a fragmentation mine and, when the trip wire is cut, it completes the circuit and the mine detonates.

Following are examples of laying antitank mines unconventionally:

- Painting over the training markings on training mines. These would then be deployed in a group, with only one real mine in the group.



A minefield laid in Serb Krania, Croatia

- Turning a mine upside down with an antihandling device (AHD) in it. The mine could detonate when it is lifted.
- Piling mines to enhance an explosion. (An antitank mine could be combined with 15 to16 kilograms of explosives.)
- Laying an antitank mine as an antipersonnel mine. The mine is buried in a sand shoulder, and a trip wire linked to the top of the fuse is attached to a tree opposite the mine.

Booby Traps

Booby traps are a common means of protecting property. They are laid by both troops and civilians. (Both sides in armed conflicts deny using these devices but always accuse their opponent of using them.) The construction of the mines depends on the inventiveness of the people who construct them. In



Unexploded ordnance in Albania

booby traps, common-user items and military equipment (such as weapons and bayonets) are usually used. Following are examples of booby traps used in conflict areas:

- A fragmentation mine placed with two tight trip wires on both sides of the mine, going in the same direction. One end of the wire is attached to a tree trunk and the other end to a bent branch. If the wire leading to the trunk is cut, the mine explodes.
- A bounding mine attached to stakes at the height of about 1 meter. A wire under the ground attaches to 5 kilograms of TNT with a pull fuse.
- A grenade in a glass, which is attached to a door or window handle. When the door or window is opened, the device falls out of the glass and detonates.
- A video, record, or stereo booby-trapped, since these are attractive loot items.
- A glass setting on a small hole drilled in a tabletop. One end of a fishing line is glued to the bottom of the glass, and the other end is threaded through the hole and connected to an initiator (with an explosive or a grenade) below. Moving the glass sets off the trap.
- A propane bottle loaded with explosives and filled with gas. One such bottle was exploded on a road, causing a crater that was 2.5 meters deep and 7 meters wide.
- A dropped pen containing explosives. Children often pick them up and lose a hand as a result.

Mine Clearing

Mines are the main threat to missions (UN and NATO), troops, and clearing teams. Mine clearance is not only costly and slow but also extremely dangerous. After the war in the Falklands–Malvinas (a war that lasted only 2 months and was waged between two conventional armies), mine-clearing operations were begun at once. However, the operations were so difficult that they were finally abandoned. Think what the situation must be in countries where fighting has continued for years and mines have been used indiscriminately and on a massive scale?

For example, during mine-clearing operations in Bosnia-Herzegovina, the mine-field records were checked. Some were of good quality, with the recorded intervals between mines, the distance between rows and marking points, and the direction and distance of marking points relatively reliable. However, in other records, the amounts and types of mines did not match those actually laid in the land, the marking points were not given, and they were indistinguishable from the terrain.

Since the beginning of the Implementation Force (IFOR)/ Stabilization Force (SFOR) mission in Bosnia, there have been at least 10 casualties and 70 wounded as a result of mine explosions, and each month there are a few more. If clearing operations in this area proceed at the current rate, it will be 230 years before the last weapon is removed.

In Afghanistan, a country infested with mines, the UN Office for the Coordination of Humanitarian and Economic Aid to Afghanistan (UNOCHA) has launched a mine-clearing program. With the 27 mine-clearing teams now operating, it will take at least 15 years to clear the priority zones! At a rate of 30 square kilometers per year, it will take more than 4 years to clear mines manually from only 20 percent of the Afghan territory. Sixteen UNOCHA staff members have already been killed and 20 injured while removing mines from only 68 square kilometers of territory.

In Kuwait, as many as 84 foreign and local experts were killed by mines in less than 10 months.

And in the former Yugoslavia, many mine incidents have occurred despite special training and prevention efforts. Between April 1992 and December 1995, there were 22 casualties and 217 wounded in the United Nations Protection Force (UNPROFOR) as a result of mine explosions. Of those incidents, 114 were due to antipersonnel mines, 82 due to antitank mines, and 19 due to booby traps. There were 112 vehicles lost or damaged and 72 incidents of people stepping on mines and losing a foot. In addition, there were 41 French, 38 British, 29 Canadian, 18 Ukrainian, 13 Danish, 13 Russian, and 10 Polish casualties.

Executing tasks under the threat of mines in mission areas is very difficult. You must never abandon your observation post or checkpoint or change your route because you will be in great danger. The table on page 7 shows the various causes of mine incidents.



Clearing mines in Serb Krania, Croatia

Cause of Incidents	Percentage of Incidents
Walking in unsafe areas	31.53
Performing mine-clearing operations	16.32
Encountering mines laid in previously cleared areas	14.11
Traveling in vehicles in unapproved areas	13.01
Traveling in vehicles on road shoulders	9.81
Encountering booby traps	8.71
Becoming lost	6.51

Conclusions

The dramatic mine situation in conflict areas indicates that the following problems remain to be solved:

- After international armed conflicts, all minefields should be marked (to include fencing) as a part of demobilization, and steps should be taken to provide for the safety of the local population.
- As mines often are not equipped with neutralizing or self-destruction mechanisms, conflicting sides need to disseminate all minefield information as soon as possible after a war.
- Mines are being produced that are virtually impossible to detect; therefore, the locations and characteristics of all minefields should be recorded.
- Clearing minefields is a long, costly, and dangerous task, but it needs to be done as soon as possible by those who have the means.
- In international armed conflicts, rules outlined in Protocol II of the 1980 United Nations Convention must be obeyed.

While the cost of laying one mine is only a few dollars, and laying a minefield is perhaps several hundred, clearing unexploded mines is very expensive. And the cost of treating surviving mine victims and preparing them to live in society (if this is at all possible) is still more.

Although the following cautions seem obvious, they cannot be stated too often:

- Do not drive past mine signs; they are there to alert you to danger.
- Do not ignore local advice.
- Listen to the advice of engineers.
- Avoid tracks that have not been used for some time.
- Stay within the known safe areas.
- Do not attempt to breach a roadblock.

The mine threat is real, and we must respect this threat. Mines kill!!

Colonel Zarczynski, an officer in the Polish armed forces, is the head of the Tactics Department of the Engineering Training Center, Tadeusz Kosciuszko Military Academy, Wroclaw, Poland. He has served in the UNEF mission in Sinai, the UNPROFOR mission in Croatia, and the ASIDT in Albania. He is currently training the Polish engineering units for UN and NATO missions.

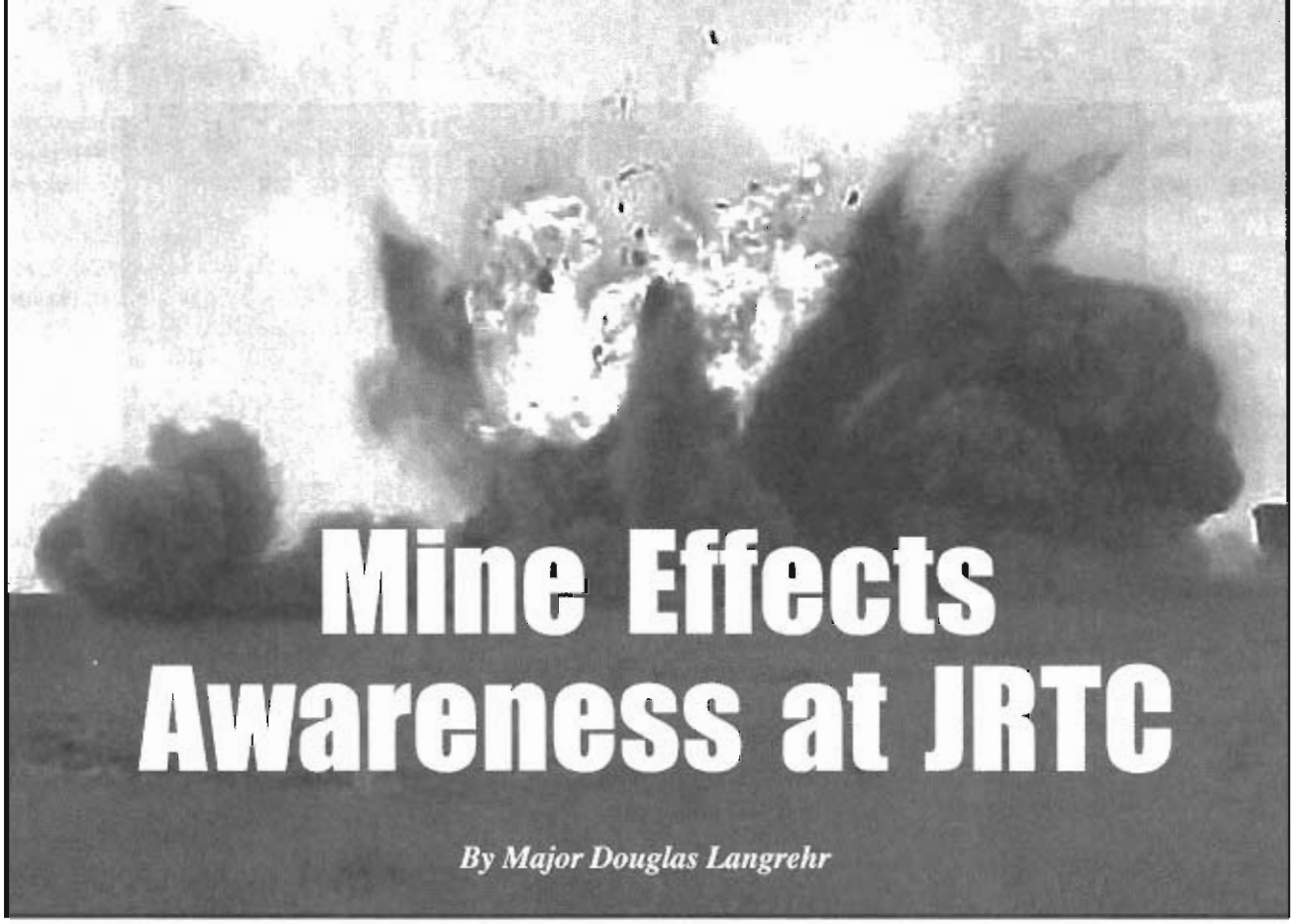
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Mine Effects Awareness at JRTC

By Major Douglas Langrehr

The spectators sweltered in the hot midmorning sun on the June 2000 day. It must have been over 100 degrees and as humid as a sauna. We stood behind a fence made of white engineer tape, staring at the distant targets that shimmered in the heat. The kevlar helmets we wore added to the discomfort, and the soldiers fidgeted, waiting in anticipation while the demolition experts attached the remote firing device to complete the preparation. As the captain gave the order to fire, everyone watched in awe as a Soviet TM-62 mine was detonated under the track of a 54-ton combat-engineer vehicle (CEV).

The flash and immense cloud of smoke and dust brought gasps of surprise from the crowd as the tank was physically picked up and moved like a child's toy. Next came the unmistakable "whomp" of detonating high explosives, followed by whining sounds as shards of shattered armor went flying through the air. Silence. "Dear God," muttered a sergeant, "I think we have been underplaying the effect of mines here at the Joint Readiness Training Center (JRTC)."

And so the aim of the first engineer mine-demolition practice at the JRTC was achieved. The intent of the senior engineer observer/controller (O/C) was to demonstrate the devastating effects of a selected range of Soviet and U.S. mines on a variety of vehicles. In addition to increasing the awareness of the O/Cs and capturing the display on video, we hope that the demonstration will encourage commanders to develop route-clearance and security plans and take the mine threat seriously in all future operations.

The Targets

The engineer team came up with an impressive display of working and hulk vehicles for targets for the demonstration: a working CEV, two Sheridan tanks, two M113 armored personnel carriers (APCs), a working jeep, and a 2.5-ton truck. And the Army and Air Force Exchange Service donated a mannequin to help demonstrate the effects of an antipersonnel mine.

The Mines

We sought assistance from the U.S. Army Communications-Electronics Command's Countermine Division, Fort Belvoir, Virginia, to provide the land mines to be used in the demon-stration. The agency sent a team with mines, explosives, and the expertise needed to make the demonstration a success. The mines included an Italian VS-50 antipersonnel mine; Soviet TM-62 antitank mines; U.S. M15 and M19 blast mines and M21 shaped-charge mines; as well as 1-, 10-, and 15-pound satchel charges. The team also brought a comprehensive display of the types of mines U.S. forces could encounter worldwide.

The Setup

The engineer team selected sites for each target to ensure that the audience would gain the best view of the practice. The vehicles were positioned and the mines were laid out in preparation for placement. The team wanted to ensure that the type of fuze, the location of the mine, how it



Sheridan tanks destroyed by a TM-62 (left) and an M21 (right)

was buried, and even the type of spoil that went on top of the mine were commensurate with the type of mine being used. The team also placed the mines so the JRTC video team could get the best angles for filming.

The video team consisted of four professional crews with eight video cameras. Four cameras were housed only 100 meters away from the targets in specially made protective boxes. The remaining cameras were placed around the targets, just outside the safety distance. At the end of the day, all mines were in place, the camera plan was perfected, and the range was ready to go.

The Practice

The busses arrived and the safety brief was given. The spectators inspected the targets and then moved back to the viewing area. For the next 2 hours, the mines and charges were detonated with a break in between to allow the spectators to view the results. Between each serial, a narrative was provided on the history of mine warfare.

The blast mines shattered tracks, destroyed suspension components, and buckled hulls. The shaped-charge mines penetrated the hulls and destroyed engine blocks. One of the APCs was picked up and thrown onto its side, and the other flipped onto its top. The wheeled vehicles were totally destroyed.



A jeep destroyed by a TM-62

The Conclusions

The aim of the mine-awareness demonstration was met—with some additional benefits. The video will be made available to all rotations that come through the JRTC and to the branch schools. Although the videos cannot show the psychological and physical effects of mines on humans, they should help soldiers understand the devastating effects of mines on equipment. The engineer team at the JRTC hopes that this demonstration and video will prove the need for mine-awareness training at the unit level.

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Units can request the video through MAJ Langrehr at *Douglas.Langrehr@polk-emh.army.mil.*



Ambush at Serzhen Yurt:

Command-Detonated Mines in the Second Chechen War

By Captain Adam Geibel

Our task is to find the bandits and destroy them. A special operation is now going on in the Vedeno and Shatoi gorges to destroy bandits.

Colonel-General Gennady Troshev
Commander of federal troops in the North Caucasus
22 April 2000

The Second Chechen War began in September 1999, when Russian forces crossed into Chechnya intent on crushing several armed groups that had attempted to create an Islamic uprising in Dagestan. The Russians quickly pushed Chechen units from the plains and laid siege to the capital, Grozny. After the city fell in February 2000, the remaining Chechen units exfiltrated into the country's southern mountains.

From their hideouts, the Chechens resorted to ambush tactics they had perfected during the First Chechen War (1994 to 1996). Using the best intelligence available, a terrain-favorable ambush site was picked and command-detonated mines were laid. When the Russian unit entered the kill zone, the result was predictable—the Chechens destroyed vehicles and killed Russian troops, then slipped away almost unscathed.

A February formal announcement that federal troops had crushed the backbone of Chechen resistance and were giving up large-scale operations was cast into serious doubt by three well-planned and costly Chechen attacks that month. OMON (special-purpose police detachments),[1] Spetsnaz, and airborne units were all hit hard, with command, control, and coordination problems later cited as the reason for heavy federal casualties. Yet complacency remained in the federal command. Despite late-March Russian estimates that 4,000 Chechen fighters were still operating in the southern Chechen mountains and that 1,000 more had escaped to the plains to blend in with the local population, Federal Interior Ministry unit commanders continued to be careless and failed to coordinate operations with the army.

On 2 March, a 98-man, Moscow-area OMON unit, traveling in nine Ural soft-topped trucks, was ambushed in Grozny. The Chechens had chosen a site at the entrance to the rubble-strewn Staropromyslovsky district where the road rises. There were no BRDM scout vehicles or BTR armored personnel carriers escorting the OMON, and the only armor protection the officers had were flak vests hanging on the sides of the vehicles. Reports gave varying casualty figures of 20 to 37 killed and 12 to 17 wounded. Most of the trucks were destroyed or damaged.

On the evening of 5 April, a Nizhnevartovskiy OMON unit bringing replacements from the Khankala air base was hit on the road to Kurchaloy. A command-detonated mine was blown under the lead vehicle, a BTR,[3] and only a large-caliber antiaircraft machine gun mounted on one of the UAZ jeeps kept the convoy from being overrun. The Russians admitted to one killed and eight wounded.

The Ambush

The military launched "a planned mop-up" of mountain areas" in mid-April, but sources in the Russian headquarters claimed that the federal command had somewhat bigger plans and estimated that about 3,000 troops were involved in the area. An airdrop was made south of Shatoi on 18 April, and Russian paratroopers went on search-and-destroy missions to eliminate small Chechen groups (and their bases) that had not been forewarned.

Probably due more to necessity than the operational luxury of a carefully chosen target, the Chechens targeted a rear (services) column of the 51st Parachute Regiment, 106th (Tula) Airborne Division, for their classic command-detonated-mine ambush. According to the Russian defense minister, at 1730 Moscow time on 23 April, a convoy carrying ammunition and other supplies to the airborne unit was ambushed 3 kilometers south of Serzhen Yurt. This area is about 25 kilometers/16 miles southeast of Grozny, in the Vedeno Gorge, and close enough to the mouth of this terrain feature to be considered a "covering position."

The Chechen Version

The "Jihad in Chechnya" Web site reported that field commander Abul Waleed Al-Kindi's unit was on a reconnaissance mission when it detected the moving 23-vehicle Russian armored column on the road from Serzhen Yurt to Vedeno. Abul Waleed's unit was joined by field commander Abu Ja'far Al-Yemeni's unit [4] (which had been stationed near the Serzhen Yurt-Vedeno road for more than 4 days), and both hastened to set up an ambush. According to one source, there were 75 mujahideen of the Islamic Peacekeeping Army and Spetsnaz units of the Central Front (5 Arabs, 11 Dagestanis, 4 Ingushs, 5 Karachayans, and 50 Chechens).

The Chechens triggered the ambush and, in less than an hour, claimed that they had "turned all 23 vehicles into masses of burning hulls and twisted metal." The French wire service *AFP* quoted a Chechen spokesman who said that a 4-hour battle erupted after a Russian column of 23 "tanks" was ambushed at 1500 hours in Serzhen Yurt. *AFP* originally reported that 18 tanks were knocked out and 80 Russians killed, while 5 tanks escaped. *Reuters* quoted the spokesman as saying that "the armored column was totally destroyed," with 13 tanks



Typical OMON transport (note fuel drum)



MT-LBs replace BTRs as convoy escorts in the mountains. Unpaved roads were easy to mine.

and troop carriers knocked out. However, there were conflicting figures on the Chechen side. The next day, Chechen fighters in Ingushetia told *The Associated Press* that 9 of 23 vehicles in the column were damaged after 40 minutes of fighting.

Initially, *Qoqaz* reported that 10 armored fighting vehicles were destroyed in the attack but that there was no specific count of enemy casualties (although they felt that there were very heavy losses amongst the Russian ranks). A later report from the same news Web site listed 10 trucks, 4 BMP infantry fighting vehicles, a Shilka (a self-propelled antiaircraft gun) vehicle, and several other Russian military vehicles destroyed, along with 56 Russian soldiers killed. The Chechen spokesman claimed that no prisoners were taken and that there were no losses on the Chechen side.

The Russian Version

As far as the Russian army was concerned, all necessary and possible protective measures had been instituted. The convoy left Khankala at 1400 hours, and the 106th Airborne deputy division commander told the press that "ahead of the airborne troops' rear convoy, two combat convoys had taken the same road. Evidently the gunmen deliberately let them pass, waiting for the vehicles carrying stocks of fuel and ammunition. They thought they would be easy prey."

Russian NTV quoted the commander of the joint group of forces as saying that the 22 vehicles had a two-vehicle combat reconnaissance patrol—a BMD air-droppable combat vehicle and a BTR with a sapper unit on board—at the head of the convoy. The convoy's main body was led by another BMD, as part of its five-vehicle protection force. The Russian Military News Agency (AVN) listed four BMDs and a Shilka (not a ZSU-23-4, but a 23-millimeter ZU-23-2 on a Kamov truck) at the rear of the convoy.

There were "more than a pair" of combat helicopters escorting the convoy, which was also within range of and directly supported by artillery. As a rule, helicopters operate as part of an aviation tactical group (2 to 4 Mi-24 gunships and 1 to 2 Mi-8 transports, each with 20 Spetsnaz troopers aboard), usually attached to a regiment. The route had been reconnoitered in advance, and the convoy was able to maintain radio communications.

The mujahideen had hidden on the back slopes of two dominant heights so that they remained unnoticed "until the beginning of their assault" despite the helicopter escorts hovering above (probably because of the long shadows, as it was late in the day). *Interfax* noted that the Chechens attacked the column with 15 radio-controlled mines and sniper fire, along with a volley from grenade launchers and firearms. The mujahideen said that they got as close as 15 to 20 meters to the Russian tanks and BMPs. A fueler and five ammunition-laden trucks were destroyed.

Both sides stated that the attackers were driven back when federal helicopters rocketed the area. Only the second pair of helicopters managed to detect the Chechen firing points and opened fire at 1740 hours. Since the Chechens apparently were within 60 meters of the column, supporting artillery initially couldn't react for fear of hitting the paratroopers. The Russian

"While there are many ways to create command-detonated mines, *how* they are employed determines their repercussions."

publication *Isvestia* reported that the helicopters' air strike on the outskirts of Serzhen Yurt was inflicted after 1800 hours—after the battle was already over.

Additional Russian troops (including airborne reconnaissance companies) surrounded the ambush area at 1805 and fighting lasted until 1930—when the attackers scattered (according to the Russians, towards the village of Marzoi-Mokhk). Udugov added that a Russian counterattack had left the village burned-out—even though Chechen fighters had left the area—while *Qoqaz* noted that the two mujahideen units returned to their bases laden with a significant quantity of captured arms.

The Aftermath

Russia's top spokesman on Chechnya, Sergei Yastrzhembskiy, had a slightly different version of the battle-damage assessment than his Chechen counterpart. He said that between 50 and 60 Chechens attacked the convoy near the village and initially reported eight rebels killed and two taken prisoner. He later said that 20 were killed and 14 captured. (The Russian Airborne Troops headquarters said that 20 Chechens were killed and 2 taken prisoner.)

General Troshev estimated that 80 to 100 "bandits" attacked from both sides, along the entire length of the convoy. A spokesman at the unified federal headquarters in the North Caucasus admitted that five federal troops were killed and nine wounded and a truck and a fueler were damaged. The Russian defense minister raised this to 15 government soldiers killed and 6 vehicles damaged, including the fueler.

On 24 April, Yastrzhembskiy admitted to 15 Chechens killed and 6 wounded. *AVN*'s final tally was 13 killed, but this climbed to 17 by 26 April. However, the news Web site *gazeta.ru* reported that up to 25 had been killed. General Troshev told the press that the bodies of 4 fighters were found and 11 prisoners taken in the area (but he could not say whether all of them were bandits, although his most current information indicated that).

The most significant Russian reaction came from the commander of the group of federal troops, who concluded that in order to prevent such incidents, the movement of rear convoys through Chechnya's territory should be substantially reduced. He also stated that in most cases, transport helicopters should be used to deliver material resources and ammunition to subunits stationed in mountain and foothill regions of the republic.

Thoughts for the Future

The Chechen units used classic guerrilla tactics to their best effect. Relying on good intelligence (including radio intercepts), they supported their command-detonated mines with direct-fire antitank and automatic weapons. Where possible, there was also mortar support.

The majority of command-detonated mines have been labeled "radio-controlled" in the Russian press, but there have been few technical details. During the First Chechen War, criminals in St. Petersburg were arrested for manufacturing such devices from remote controls of automobile alarms and explosives scavenged from World War II German ordnance found outside the city. The Russians have mentioned that the standard mine used for antitank attacks was the TM57, while antipersonnel mines were usually 152-millimeter, high-explosive shells with "several" slabs of plastic explosives packed around them.

While there are many ways to create command-detonated mines, *how* they are employed determines their repercussions. A rucksack full of explosives and a simple detonator, combined with skillful exploitation of an enemy's weaknesses, can become a tactical weapon that achieves strategic results. The Old Testament story of young David's pebble shot taking out the giant Goliath applies here. This was particularly true during the First Chechen War, when several senior-ranking Russian officers insisted on keeping set patterns and traveling along the same routes at predictable times. They paid for this mistake with their lives.

The Chechens chose their ambush sites carefully, making maximum use of dominant terrain, which placed them so close to the targeted unit that Russian helicopter gunships were frustrated. The Chechens also found the "seam" in the Russian phalanx —the coordination, control, and command nightmare that exists between the Russian army and the Interior Ministry.

The Relevance for Combat Engineers

American units' most recent experience with command-detonated mines was in Somalia. Pure luck has been the only thing preventing further incidents in Bosnia or Kosovo and, chances are, American forces will face this type of weapon and attack in the future.

While acting independently, American forces have standard operating procedures to deal with such ambushes. The danger lies in coalition-type peacekeeping forces, where any opposition will seek to find and attack the weakest link in the

force. These weak spots could range from language barriers and differences in levels or types of training to the degree of equipment modernization. It could be especially dangerous when military units have to work with police forces.

If American forces—specifically combat-engineer squads—are cross-attached to new allies, they need to review individual skills such as call for fire, map reading, and encoding grid coordinates (imagine if the allied force doesn't have the Single-Channel, Ground-to-Air Radio System [SINCGARS]). However, the best way to counter command-detonated-mine ambushes is through superior command-and-control coordination. This means that combat-engineer leaders need to know their hosts' plan and proactively ensure that everyone associated with the attached engineer group knows *their* plan. In short, make sure that the left hands know what the right hands are doing.

Captain Geibel is the S2 for 5/117 Cavalry Squadron, 42d Infantry Division, New Jersey Army National Guard. A former 19E crewman, scout, and tank-platoon leader, CPT Geibel has written on topics about the First Chechen War for Armor and Infantry Magazines, as well as Armed Forces Journal International, Army Aviation, and Military Review. He is a correspondent for the Journal of Military Ordnance and has written on command-detonated mines in the First Chechen War for the RTR Journal "Tank" and the African Armed Forces Journal. He is currently working on a book about the tactical use of command-detonated mines in the First and Second Chechen Wars.

All photos from Venik's "War in Chechnya" Web site.

Endnotes:

[1]The OMON, or "Omonovtsy," have been described as a secretive paramilitary force with a reputation for brutality. Part cop, part commando, a bit like a BATF raid team with some training like U.S. Army Rangers, there simply is no real equivalent to the OMON in the U.S. military or law-enforcement communities.

[2]A BTR is frequently called a "bicycle" by the troops, since they consider it to be equivalently armored and could only be called "serious protection" by a person who has never seen one.

[3]When mobilized for combat zones, the OMON are tasked with some of the war's dirtiest work—mopping up (known as "zachistki") Chechen villages and urban areas of stay-behind mujahideen, which means flushing them out of hiding places and/or separating them from the civilian population.

[4]The Russian military spellings are Abu-Valid (one of Shamil Basayev's lieutenants) and Abu-Dzhafar (adding that both were Arabs, with the fighters being "Arab and Pakistani mercenaries").

[5]"Fougasses" was the specific term used by *Nezavisimaya Gazeta's* Ilya Maksakov.

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BEWARE



MINES DON'T CARE

Mine-Clearing/Demining Operations: Developing Engineer Experts

By Captain Darren LeMaster

I believe that we need to develop engineer experts in the U.S. Army who possess both the knowledge and the capability to perform mine-clearing operations. During the past four years, our engineer soldiers have operated in areas contaminated with minefields and unexploded ordnance (UXO)—in Bosnia-Herzegovina and more recently in Kosovo. Their greatest challenge is that they typically lack both clearing/demining training and demining equipment. I believe that we failed to utilize opportunities in Bosnia to train; evaluate; and establish tactics, techniques, and procedures (TTP) for new demining equipment. Additionally, U.S. engineers are ignorant of basic foreign mines and UXO render-safe procedures. With these limitations, it is essential that a staff engineer becomes knowledgeable about basic humanitarian demining fundamentals.

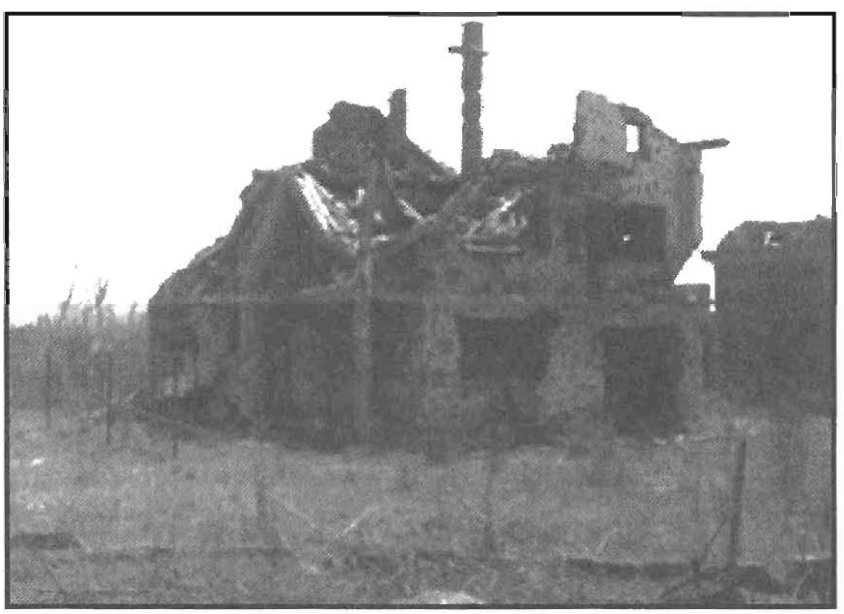
This article outlines the fundamental procedures of humanitarian demining operations as described in lessons from the French Army Engineer School, where I attended the Humanitarian Demining Course in Angers, France. The article also includes information from missions in Bosnia-Herzegovina and outlines some of the basic responsibilities of a properly structured demining operation.

Clearing vs. Demining

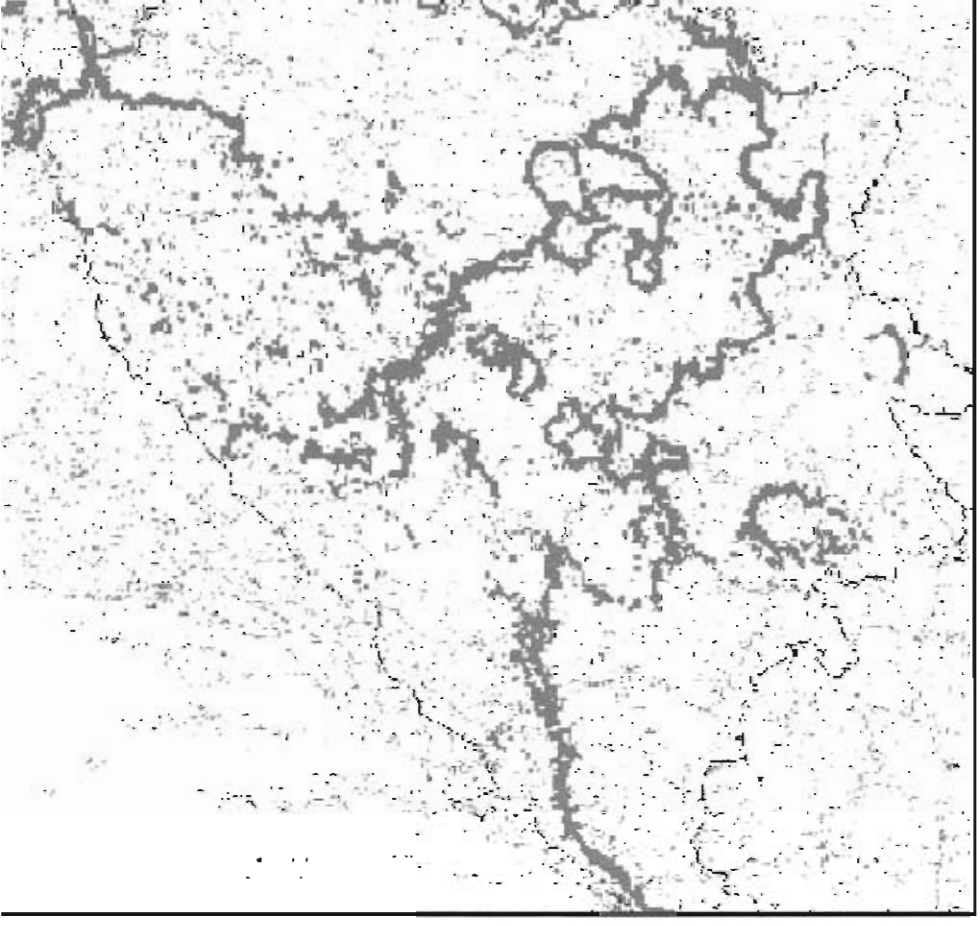
FM 20-32, *Mine/Countermine Operations*, Chapter 9, differentiates between the terms "clearing" and "demining" by describing clearing as operations for a military purpose and demining as operations typically for a civilian population (humanitarian purpose) after hostilities cease. In FM 20-32, the terms are defined as follows:

> ***Clearing** involves the total elimination or neutralization of mines from an area. It is not usually conducted under enemy fire, but it can be conducted by engineers during war or after hostilities as part of nation assistance.*
>
> ***Demining** is the complete removal of all mines and UXO to safeguard the civilian population within a geopolitical boundary after hostilities cease. It is an extremely manpower- and time-intensive operation and is normally contracted. Although not a formal Army mission or function, engineers and Special Operations Forces may provide special expertise in training demining organizations, acting as advisors, and taking the lead in providing clearing equipment or techniques that can be useful in demining operations.*

Whether clearing/demining operations involve the military or nongovernmental organizations, the overall objective is the same—to remove contamination and provide a safe area. And whether monitoring mine-lifting activities, conducting mine-clearing or humanitarian demining operations, or identifying a piece of a cluster-bomb unit, the critical factor is to determine if an area is safe. When soldiers are questioned about the safeness of an area, their answers will vary significantly based on their knowledge of the basic principles and organization of demining operations—training, information collection and surveys, planning, the mission, and mine-awareness training programs.



This photo of a destroyed building depicts a typical sight from operations in Bosnia-Herzegovina.



A minefield-contamination map from the U.N. Mine Action Center shows the extent of the contamination.

Mine Experts

Who are the U.S. Army mine experts? The knowledge is spread throughout various Army specialties:

- Explosive-ordnance-disposal (EOD) personnel, the technical experts in identification, render-safe procedures, and destruction or neutralization of ammunition, land mines, submunitions, and pyrotechnics.
- Special Operations Forces, who are currently instructing humanitarian demining efforts in numerous countries and possess a language proficiency, rapport, and cadre training ability to do so.
- Engineers, who have the basic knowledge of mine detection, demolitions, minefield reduction or breaching, and technical and tactical employment of U.S. mines.

Most foreign armies, to include the French army, have a combined engineer/EOD specialty. The U.S. Army lacks this type of expertise. Because the EOD and Special Operations Forces communities are relatively small and have a distinctly different mission, engineers have been forced into assuming the lead role in UXO/clearing operations.

In my opinion, nongovernmental organizations are often best suited to demining operations because of their experience, training, and structure. However, I believe that we also need engineers who are experts in clearing operations and identifying UXO/mines. We need engineer staff NCOs or officers who can advise commanders during missions in and around contaminated areas. To develop such experts, training should include information on—

- Safe operational procedures (a fundamental knowledge of clearing operations).
- Proper demining equipment usage and techniques (TTP).
- Facilitation of a unit UXO/mine-awareness training program.
- Families and characteristics of mines, submunitions, and pyrotechnics.

It is important to understand how mines and UXO affect battlefield operations due to changing factors such as temperature, wind, vegetation, and trees. An understanding of humanitarian demining operations, such as those conducted in Bosnia-Herzegovina, is necessary for the safe execution of military operations. Regardless of the mission TTP produced at the Engineer School, a bottom-line and fundamental knowledge of demining operations, such as the French humanitarian demining training, is needed now at the unit level in order to modify TTP to site-specific mission factors and requirements. *The goal is not to train deminers but to provide a basic knowledge so that when mine-clearing operations are conducted or observed due to a military necessity, the missions are conducted safely.*

Demining Training

Numerous humanitarian demining training programs exist today, ranging from various nongovernmental-organization programs to the United Nations Humanitarian Demining Training Program. The programs are very similar with respect to the type of training; however, each program is adapted to fit the local area, the personnel trained, and the type of contamination.

The underlying goal in Bosnia-Herzegovina was to develop a national-level demining training program to provide deminers for the local areas. The core functions of a demining program are individual and leader training, preoperations procedures, minefield marking, and survey training. A professional training staff is necessary, in addition to a suitable place to conduct training that simulates the operational area. Additionally, self-discipline is an essential factor to consider during training because of the seriousness of failing to conduct clearing tasks properly.

Individual/Leader Training

The training conducted depends on the initial knowledge level of the personnel being trained. The French approach to individual demining training is divided into the following basic tasks:

- Mine and booby-trap procedures.
- Prodder, trip-wire, and mine-detector procedures.
- Marking procedures.
- Actions on encountering a mine.
- Demolitions training.
- Job responsibilities.

Preoperations training establishes a basic knowledge of how to conduct a specific clearing mission:

- Setting up a clearance worksite.
- Site operational procedures.
- Reporting procedures.
- Equipment checks (detector and personal-protection equipment).
- Actions in case of injury and medical-evacuation procedures.

Personnel who demonstrate proficiency and leadership skills during the training process become leaders for the demining teams. In addition to individual training, selected leaders learn leadership skills, site-reconnaissance procedures, and route- and area-clearance methods. Typically, leaders manage the operations of three 2-man teams. The employment of these teams depends on the terrain, types of mines, detection methods, contamination information, and knowledge of each of the deminers. Demining leaders manage the daily demining operations and must know the psychological limits and mental condition of the deminers.

Training in Bosnia

In 1997, as a part of the Stabilization Force initiative in Bosnia-Herzegovina, the 16th Engineer Battalion's Task Force Catamount set up a program to train local Bosnian military deminers on humanitarian demining techniques. Based on the United Nations Humanitarian Demining Training Program and some aspects of other programs, the initiative focused on the local mines and incorporated the knowledge level of deminers participating in the training. The program, which established humanitarian demining standards for the Entity Armed Forces in Bosnia-Herzegovina, resulted in the following lessons learned:

- Knowledgeable instructors and quality interpreters were essential. Interpreters had to translate military terminology and technically specific words for proper communication to occur in either direction. Complicating translation even further was the fact that there were multinational instructors, which sometimes made two translations necessary.
- The location of the training played a significant role. An outdoor training area that simulated the local contaminated areas and minefield characteristics and a proper classroom environment were required for a successful training program.

Although the trainees were technical experts at mine employment, destruction, and render-safe procedures, even the most knowledgeable deminer learned procedural aspects of humanitarian demining. The most notable improvement was the establishment of safety procedures in accomplishing demining tasks ranging from basic demolitions and proper use of equipment to the safe conduct of operations in the minefield itself.

One of the biggest challenges was that instructors from the U.S. engineer units had little to no hands-on experience on some of the technical aspects of demining. However, the group discussions and lessons shared among the experienced deminers from various geographical areas within Bosnia-Herzegovina helped make up for any instructor shortcomings.

Some of the challenges deminers faced in Bosnia-Herzegovina included the fact that the deminer had fought near or on the ground he was demining and had possibly lost family or friends; family issues, with the foremost concern being how his family would be supported if he was injured or killed; and recent mine strikes that had killed or injured other deminers.

Minefield Surveys

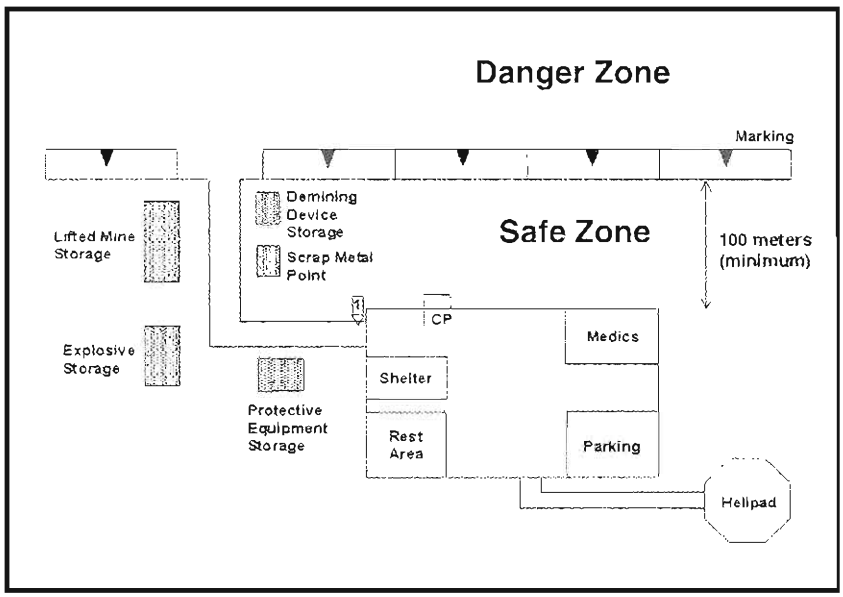
Intelligence and reconnaissance are the first steps of the mine-clearing process. The United Nations Mine Action Center formalizes this in a series of three standardized reports: the Mine/UXO Incident Report, Level One Survey (General Survey); Level Two Survey (Technical Survey); and Level Three Survey (Cleared-Area Completion Survey).

Level One Surveys provide information on the general location of contamination to help establish low- and high-risk areas, set priorities, and establish a database.

Level Two Surveys outline the conduct of a detailed technical survey to determine the contaminated-area perimeter – establishment of safe and danger areas. The survey identifies the types of mines, patterns, and vegetation and reference points and concludes with marking the area.

Level Three Surveys are the final reports that determine that the area is demined after operations. This survey involves turning over the land to the local government and recording the report at the national level.

No final reports of clearing were conducted during operations in Bosnia-Herzegovina. There was a need to maintain an up-to-date record of areas cleared by the military since there was no documentation on the areas cleared during the presence of the initial United Nations Protection Force. Documentation of the extent of military clearing operations—such as checkpoints, camps, and expansions and who conducted the clearance—is unknown. Most of the available clearance information is based on soldiers' knowledge that was passed on from unit transitions or even from foreign soldiers' visits to multinational camps.



Demining-Site Organization

Information Sources

Minefield information is gathered from a number of sources, to include hospitals, police stations, local governmental organizations, local civilians, international organizations (such as the United Nations/NATO), former warring-faction records, and local military forces. The objectives are to determine the force responsible for the contamination, reasons for mining, date and age of the ammunition, capabilities and characteristics of ordnance, and skills of the minelayers in order to determine proper clearing operations.

Challenges

The problems encountered with information collection are significant. The language barrier is the primary obstacle. Other problem areas include the difficulty in obtaining reports due to destruction and loss, conflict in determining accuracy in space and time, imprecise reports, withholding of information for personal gain, local government conflicts, and the fact that the soldier who laid the mine is not the person who is taking it out.

In Bosnia-Herzegovina, general problems included lost records, false reports, and the fact that battle lines fluctuated many times over the same ground. Opposing forces typically changed the original configuration of the minefield. The essential aspect is the collection of minefield information before an operation: How many mines are present? What are the pattern(s) and type(s) of mines? Who laid the mines? This was a significant challenge for the Stabilization Force and the Entity Armed Forces—the engineers on the ground. To obtain firsthand knowledge, the Entity Armed Forces tried to find the engineers who had originally emplaced the minefield, but they often had little success.

Demining Missions

Demining missions are highly detailed, dangerous, and time-consuming operations that involve identifying and clearing all contamination from an area. The missions include site setup and operations in the safe area; operations in the danger area (demining with or without a detector); and demolitions (storage, handling, transportation, and destruction methods).

Site Setup

Site setup is critical to safe demining operations. The safe area contains a command post (radio), check points where the locals/journalists and deminers enter the area, a medic post, a designated helipad, a scrap-metal point, explosive- and equipment-storage areas, a shelter or rest area, and lifted (in the French army, it is neutralized) mine-storage area (see figure above). Each aspect contains a specific function in the overall operation of the mine area and prevents accidents caused by improper storage or transport or lack of control on-site.

Demining Operations

Most humanitarian demining operations involve a mine detector, a probe, or both. Section leaders are responsible for organizing and modifying the detection techniques based on the weather, terrain, types of mines or UXO in the area, and other site factors. The clearance method and approach are typically determined in the site reconnaissance or Level Two Survey. Highly detailed TTP outline procedures for clearing operations, to include safe working distances, methods for marking lanes, establishment of safe lanes, and neutralization (a French army term) or destruction of mines once they are found.

It is outside the scope of this article to describe the demining techniques taught during the French Humanitarian Demining Course, but the planning factors used by the French verify that humanitarian demining is a time-intensive process. For example, on open terrain, a platoon (20 trained deminers) can clear only 600 square meters in 4 hours. In heavy vegetation, the same platoon can clear only 60 square meters in 4 hours.

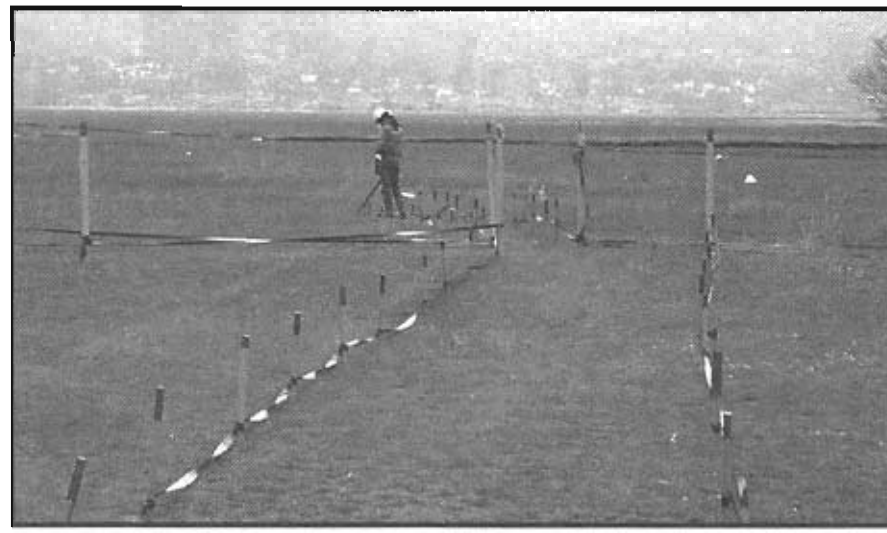
Final Survey

After completion of demining operations, boundaries are marked, the final Level Three Survey is completed, and the area is handed over to the local government. This handover is critical in establishing a legal transfer of the area and assurances that the area is 99.6 percent clear of mines to a depth of 15 centimeters.

Quality assurance and quality control are critical factors during minefield surveys and demining operations. Observers from the United Nations Mine Action Center or agents of the

organization funding the demining operation typically handle external checks. Routine inspections during the demining operation ensure safe operations and proper clearance.

Military organizations are particularly well-organized to conduct both demining and clearing operations such as this. In fact, civilian nongovernmental organizations and the structure of the United Nations Mine Action Center demining teams are very similar to the structure of a military platoon. The complexity of the overall mission regarding interaction with local governments and agencies, civilians, and other nongovernmental organizations and the overall lack of technical training (knowledge of foreign mines and UXO) lead to high-risk operations that are not normally the responsibility of U.S. Army engineers. Technical training is the key, and the nongovernmental organizations have the expertise to perform demining operations. Critical lessons learned and approaches from humanitarian demining can be applied to military clearing operations that are conducted due to a military necessity. Because of time limitations, military clearing operations may not consider all operational aspects at the same level of detail that humanitarian demining does.



A nongovernmental-organization personnel conducts humanitarian demining.

Mine-Awareness Training Programs

Mine-awareness training programs educate people to the danger of mines and UXO. The programs emphasize the importance of the contamination threat, risk involved with living in contaminated areas, and notification of the threat area. The programs disseminate information through posters, pamphlets, comic strips, stickers, T-shirts, newspaper articles, and radio announcements. The best distribution centers are churches, schools, and hospitals since typical mass-media technology such as television is not available to most of the people affected by mines.

The key to successful training programs is to establish them at the national level for standardized initiatives, information processing, and coordination of local demining programs. Local host-nation organizers are necessary to confirm that the message is adapted to the audience—along with being short, simple, and direct, the message must be politically correct. This assessment is best accomplished at the lowest level. Minefield information is also collected and reported through the local representatives to higher-level demining cells. The objective is for regions to continue awareness programs that are established by organizations such as the United Nations or the International Red Cross.

In Bosnia-Herzegovina, U.S. soldiers from psychological operations, EOD, and local civil-affairs teams—in conjunction with engineers—participated in a mine-awareness program. However, the key to a successful mine-awareness program is the establishment of local and regional coordinators, with assistance from international aid organizations. Miles of minefields were marked during the time of the Implementation Force and Stabilization Force, and until the local training program educates the local people to the need to leave minefield-marking material for its intended purpose, the mission will continue. This is just one of many mine-awareness problems that arise. Civilian organizations are best suited for this type of operation.

Conclusion

I believe that it is necessary to establish additional engineer training and expertise so an engineer staff NCO or officer can advise commanders of threats and considerations involving operations in contaminated areas. Engineer expertise is required to support operations that are focusing where contamination is prevalent. Whether the operation is a military area clearance or a nongovernmental organization humanitarian demining, the desired result is the same—a safe area. Important lessons can be drawn from humanitarian demining procedures when conducting clearing operations due to military necessity. Engineer staff officers can implement unit training programs and provide input to the overall operational considerations.

Captain LeMaster is assigned to the 864th Engineer Battalion Combat Heavy, at Fort Lewis, Washington. He attended the French Army Humanitarian Demining Course in 1997 and served in Bosnia-Herzegovina as the MND (North) Mine Action Center OIC and B/16th Engineer Battalion XO. CPT LeMaster is a recent graduate of the Engineer Captains Career Course.

Comments can be sent to the author at *d_lemaster@hotmail.com*.



Demining in Bosnia-Herzegovina

By First Lieutenant Eric Midden

The signing of the Dayton Peace Accords on 14 December 1995 brought an end to war in the former Yugoslavia. Shortly after bridging the Sava River in late December 1995, the Implementation Force (IFOR) began its mission of enforcing the Dayton Peace Accords. One of the primary concerns of the international community was the large number of land mines and minefields in the Bosnia-Herzegovina region. The Dayton Peace Accords addressed the topic of demining and established specific guidelines regarding how the minefields would be removed and what would happen to the stockpiles of land mines held by the former warring factions.

The region known as Bosnia-Herzegovina contains about two to three million land mines. With this many mines in an area about the size of West Virginia, it is easy to see why demining was so important to the IFOR/Stabilization Force (SFOR) and the indigenous personnel.

Command and Control

One of the key steps in demining such a large area was establishing command and control for the demining activities that were mandated by the Dayton Peace Accords. When the Mine Action Center (MAC) was formed in Sarajevo, it created the command and control needed. The MAC has the following missions:

- Tracking all demining operations that take place in Bosnia-Herzegovina.
- Providing overwatch for all demining operations, ensuring that demining is conducted safely and efficiently.
- Maintaining a database on all the known minefields in the region.

Although the MAC monitors demining, the standards by which demining is conducted come from other sources. The Dayton Peace Accords provide the general framework for demining in the former Yugoslavia. With the addition of several SFOR SOPs and the Entity Armed Forces (EAF) SOPs, the standards for humanitarian demining in Bosnia-Herzegovina can effectively be determined. The SOPs explain how many demining teams each EAF must field and specifics on the demining operations that are to be conducted. However, this article focuses on the SFOR monitoring of the demining effort.

From 1995 to 1999, the IFOR/SFOR monitored all EAF demining operations. This meant that in order for the EAF to earn credit for demining, IFOR/SFOR soldiers had to observe all the EAF demining efforts. As a result, monitoring demining operations became one of the primary missions of engineers deployed as part of the IFOR/SFOR.

During the 1999 demining season, ideas circulated about moving from 100 percent monitoring of the EAF to making periodic spot checks. The move has a two-fold purpose: First, spot checks significantly reduce the number of engineers required, allowing fewer engineers to monitor more minefields. Second, periodic checks transfer more of the responsibility of demining to the EAF, who are ultimately responsible for demining their country.

My experience with demining in Bosnia was at minefield 4185 near the town of Olovo in the Multinational Division North. Situated on the southern-facing slope of a ridge that runs for approximately 10 kilometers, minefield 4185 is comprised of several small minefields emplaced to protect the trench lines that run along the ridge. The minefield contains both antitank and antipersonnel mines.

Challenges

Removing any minefield is dangerous, but the minefields in Bosnia-Herzegovina present several unique challenges. While the MAC maintains records of most of the minefields in the region, most of the records are extremely outdated. Several minefields have no records at all—either the records were not recovered from the EAF that emplaced them or the records never existed.

The prevalence of antihandling devices and booby traps makes the minefields that much more dangerous. Furthermore, mines that have been armed and exposed to the environment for several years are more dangerous than mines that are new and simply need to be disarmed. This is because the fuse could be rusted to the body of a weathered mine, preventing it from being disarmed. The fuse also could be more sensitive than it was designed to be. In the best case, the fuse could have gone bad, rendering the mine harmless. The terrain on which the minefields were placed also makes demining difficult. Minefield 4185 is on steep, heavily vegetated terrain, and large amounts of ferrous ore in the soil make mine detectors useless.

Manual Demining

Because of these factors, demining at minefield 4185 and several other minefields in the region is done by hand. EAF deminers use a specialized drill that begins

(continued on page 26)

Moving a Volcano

By Captain Thomas Holland

The development of scatterable mines represents the first true paradigm shift in countermoblity since the American Civil War. The system tasked to emplace the bulk of these mines is the M139 Volcano. By itself the Volcano is portable, robust, and easy to use; it's the vehicle we use to transport the system that's the problem.

In this article, I will define this problem, list some facts that apply to the problem, and discuss some other issues that I omitted from the article. I will explain what I believe are the possible solutions for this problem and will test those solutions. I will conclude with my recommendation for the Bradley Fighting Vehicle (BFV) as the best choice for carrying the M139 Volcano into battle. The purpose of this article is to convince you that the M139 Volcano is our best countermobility system and that it cannot be used to its full capability as it is currently carried into battle.

Identifying the Problem

According to FM 5-100, *Engineer Operations*, "Offensive action is the most effective and decisive way to attain a clearly defined common objective. An offensive spirit must be inherent when conducting all engineer defensive operations." When we fix, turn, disrupt, or block an enemy's maneuver, we are attacking his decision-making process. When we are defending, countermobility operations allow us to seize, retain, and exploit the initiative. It can therefore be argued that countermobility is an offensive operation and then further argued that the Volcano is one of the most powerful offensive weapon systems organic to a brigade.

The problem with the M139 Volcano is the vehicle that transports it. The ground transportation currently available to the M139 Volcano is the M548A3 tracked cargo carrier, the heavy expanded-mobility tactical truck (HEMTT), the 5-ton truck, and (once the conversion kit is approved) the light medium tactical vehicle (LMTV). Anyone who is familiar with any of these vehicles knows that the front "armor" protection consists of a windshield. As a side note, the Volcano can be employed via air by the Blackhawk helicopter, but that is beyond the scope of this article.

It is not currently possible to use the Volcano to leverage our firepower in an engagement because the Volcano can't get to the fight if it is on a thin-skinned vehicle. The concept of the Volcano-emplacement team (VET)—where an armored company team moves forward with a Volcano to provide security—is a good temporary fix to this problem, but why should we allocate that much combat power to a system that can be disabled by small-arms fire?

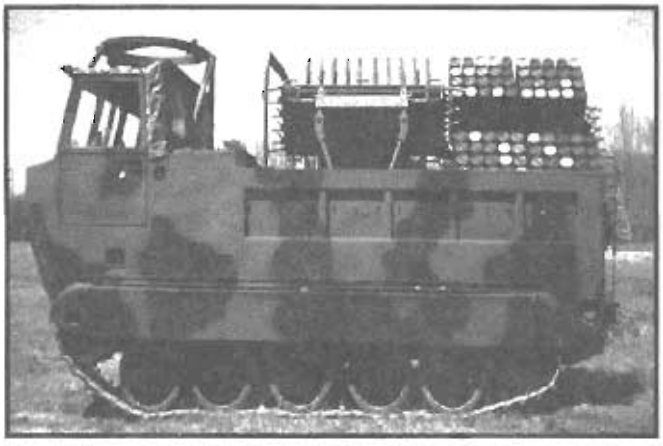
Facts About the Volcano

The M139 Volcano system consists of four launcher racks, a dispenser control unit (DCU), a hand control unit (HCU), and various cables and braces that connect components and hold the system in place. Each rack holds 40 canisters for a total of 160 canisters. Each canister holds 6 mines for a total of 960 mines. Each system can emplace an 1,100-meter by 120-meter minefield in a matter of minutes.

The M87 canister contains five antitank (AT) mines and one antipersonnel (AP) mine. The M87A1 contains six AT mines. The AT mines are bidirectional, magnetically fused and, therefore, antidisturbance. Once the AT mine has armed itself and adjusted to the earth's magnetic field, any disturbance of that field (such as a tank or moving the mine) will cause the 1.3 pounds of RDX (cyclonite) to explode, thus firing the S-F warhead. The AP mines deploy 8 trip wires up to 40 feet and require only 0.9 pounds of pressure to detonate the 0.9 pounds of Composition B that make up its main charge. Fatal casualties result at up to 15 meters. At the end of the set duration time of the mine (4 hours, 48 hours, or 15 days—as set by the operator), it will explode. The bottom line is that a Volcano minefield will kill anything that encounters it, is virtually impossible to breach by manual means, and goes away at a predetermined time (self-destruct occurs exponentially with 99.999 percent compliance).

Discussion

There are two important points to discuss concerning my screening and evaluation criteria. The first point is that the screening criteria I chose eliminate every vehicle we currently use to transport the Volcano. This was not



An M548A3 transporting the Volcano



An MLRS chassis with the Volcano

done intentionally and is not to say that our current choice for Volcano transporters was a mistake. The point is that we have recognized new uses for the system, and our current vehicles will not support those uses that carry the Volcano into direct-fire range.

The second point concerns a possible modified table of organization and equipment (MTOE) change. I am making the assumption that a choice to replace the M548A3 with the Multiple-Launch Rocket System (MLRS) chassis would be a one-for-one swap, and the Volcano system itself would not change. Conversely, a choice for the Bradley could mean either a one-for-one swap with the M548A3 or the elimination of the M548A3 and the outfitting of every "Engineer Bradley" with a Volcano. I did not look at MTOE as a criteria because I don't have the data to evaluate these two vehicles based on the multiple issues an MTOE change would bring, such as cost reduction by deleting the M548A3, cost increase by redesigning the Volcano to fit the Bradley, and doctrinal changes to the employment of combat engineers. These are important issues, but unless someone is willing to take this article from drawing room to boardroom, these issues will not materially affect this discussion.

Possible Solutions

I used the following screening criteria to determine what vehicles were acceptable to put the Volcano on:

- Already in the inventory.
- Survivability.
- Commonality of parts.
- Trafficability.

The two vehicles I came up with are the MLRS chassis and the M2 BFV. Both vehicles meet all the criteria and are familiar to most officers in a combat-arms branch. For this reason, I will skip the detailed explanation of each vehicle's capabilities and focus on the criteria I chose.

Already in the Inventory. It is important to consider a vehicle that is already in the Army's inventory because it takes too long to develop new systems, debug them, and then figure out how to maintain them. While there will be a requirement to test the viability of a Volcano on any new chassis, this process is much less complex than building a new system from scratch. Perhaps the best reason to choose a vehicle that is already in the system is the same reason that General Shinseki wants to field the medium brigades with "off-the-shelf" systems—momentum. The Army of Tomorrow, Force XXI, and the Strike Force were all valid concepts, but they lost funding because they lost momentum. We can put a Volcano on an MLRS or Bradley chassis within 18 months if we are decisive in our action.

Survivability. The primary reason that the Volcano should be on an armored vehicle is survivability. I don't know if there is a windshield made that will stop shrapnel, but I do know that such a windshield is not on any of the vehicles that currently carry the Volcano. The Volcano is relatively easy to operate, but it does require training. What are the implications of sending an armored company team forward to emplace a Volcano obstacle only to have the operator become a casualty before the mission is accomplished? Would a maneuver commander even be willing to send a thin-skinned vehicle into direct-fire range of the enemy? I believe the answers to these questions are apparent, and they relegate the best countermobility asset we have to a "second-string" role.

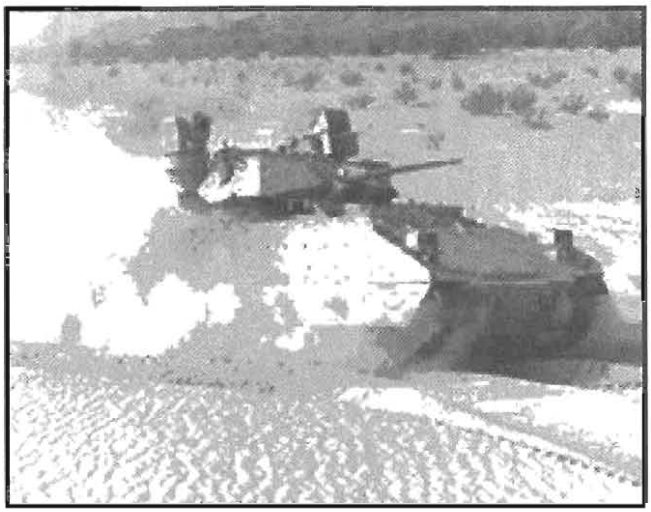
Commonality of Parts. If maintaining the operator of the Volcano is the number one priority, then maintaining the vehicle the Volcano rides on is a definite second. This is why a commonality of parts is important. With the Corps of Engineers due to turn in its M113s for BFVs, the next logical step is to find a Volcano transporter that will be able to share parts with the line-platoon vehicles. Choosing the Bradley has obvious implications for commonality of parts and therefore an advantage over the MLRS chassis. However, since the MLRS chassis has the same drivetrain as the BFV, it stands to reason that it will also keep down the number of lines of the prescribed load list needed to maintain the vehicle.

Trafficability. The Chief of Staff of the Army has declared that the Army is going to get lighter. However, I cannot help but think that we may be missing an important lesson—that the failed German invasion of Russia may have been as much from not choosing the proper equipment as from overextending lines of supply. During Operation Barbarossa, the German army had to use its tanks (when it could get them unfrozen) to tow its trucks because the trucks just could not move in the mud and snow. So, since the Germans could not get their wheeled trucks to the front, I draw the correlation that a "wheeled" Volcano will not always get to the fight.

Testing the Solutions

I chose the following criteria as being feasible to evaluate, acceptable after a reality check, suitable for the problem, and distinguishable between the two options:

- Recognizability.
- Availability.



The M2 Bradley Fighting Vehicle

- Trainability.
- Reporting.

I established these criteria based on my 32 months as a combat-engineer platoon leader, 10 of which were spent as a Volcano platoon leader (my battalion formed a platoon from the line companies' Volcanoes). These are issues I faced when making recommendations for the best way to employ Volcanoes in missions such as Bright Star and the defense of Kuwait by the Division Ready Brigade.

Recognizability. This ties directly to the screening criteria of survivability. The intent here is to facilitate the standard essential elements of friendly information requirement to "hide" Volcanoes because they are high-value targets. The current problem is that the Volcano is easy to identify because it is carried by the M548A3, which has only one purpose—carry the Volcano. While moving the system to the MLRS chassis would confuse the enemy about what it might be shooting at, it probably would not care because the MLRS is also a high-value target. However, a Volcano on a BFV could easily be confused for a Bradley Stinger Vehicle, a Linebacker, a Bradley Smoke Vehicle, or any one of the 200+ BFVs in a mechanized infantry brigade. A Volcano on a Bradley would be difficult to recognize.

Availability. This criterion follows the logic of fielding the medium brigades with off-the-shelf technology—that the changes that are necessary will not take place if the concept does not achieve and maintain the momentum necessary to complete the task. In comparing the two vehicles, MLRS chassis (in the words of one United Defense employee) "are as rare as hen's teeth." And although no more BFV hulls are being made, the fielding of the Operation Desert Storm Bradley, the turn-in of Bradleys by mechanized scout platoons, and the fact that the Bradley is the most widely used combat-vehicle platform in the U.S. Army make the Bradley much more available for use than the MLRS chassis.

Trainability. This refers to the friction a battalion commander must overcome to keep a Volcano crew trained. Since the death of the 12F military occupational specialty (engineer tracked-vehicle crewman), 12Bs (combat engineers) have taken over the responsibility of operating assault and obstacle (A&O) platoon equipment. This means that a Volcano operator today may be a grapnel man tomorrow and vice versa. By the same token, the skills necessary to operate the MLRS in an A&O platoon (where I am assuming the Volcanoes would stay) will not transfer directly to the skills necessary to operate the BFVs in a line platoon. It is apparent that the skills necessary to operate a Bradley with a Volcano would translate directly to the skills necessary to operate a Bradley without a Volcano and, therefore, the Bradley has the advantage for trainability.

Reporting. Although the Bradley has the advantage in the first three criteria, the MLRS chassis has a definite advantage in reporting. This is because the celestial navigation system available with the MLRS chassis will facilitate quick, accurate reporting of minefield locations without worrying about "plugger" batteries. Planning minefields is important, emplacing minefields is critical, but reporting on the location of minefields is the long pole in the tent for an Army that expects victory via agile, decisive maneuver. The Bradley has no discernable advantage over the M548A3 for reporting, but the MLRS chassis provides a capability that no other system evaluated can match.

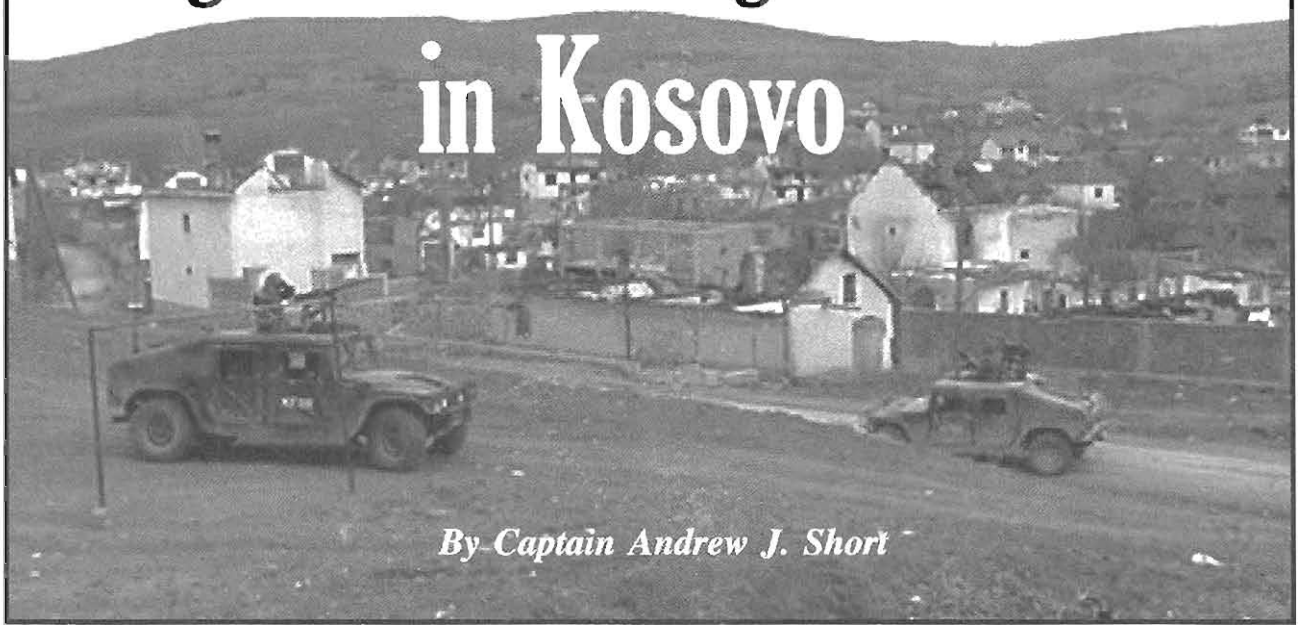
Conclusion

The Duke of Wellington said that "Junior officers must either master terrain or the language of the conqueror." His words are as true today as they were in his day. No system in our arsenal has ever let us dominate terrain the way the Volcano has. However, leveraging combat power by means of the Volcano is only possible if its transporter is a vehicle that can go into the fray and survive. I believe the best vehicle to accomplish this mission is the Bradley Fighting Vehicle. Although it does not have the reporting advantage of the MLRS chassis, it is less recognizable, more readily available, and simplifies training and maintaining qualified crews.

The whole point of this article is to substantiate my claim that we are underutilizing our most lethal countermobility asset and thereby limiting the commanders' ability to apply combat power to the decisive point of a battle. In short, the Volcano cannot be used properly if it cannot cross lines of departure.

CPT Holland is the S1, 577th Engineer Battalion, Fort Leonard Wood, Missouri. He was previously the Assistant S3, 5th Engineer Battalion, Fort Leonard Wood. At the 317th Engineer Battalion, Fort Benning, Georgia, he was a line platoon leader, an A&O-platoon leader, and a Volcano-platoon leader. CPT Holland has two NTC rotations as a platoon leader and numerous platoon through task-force combined-arms field problems.

A Light Combat-Engineer Platoon in Kosovo



By Captain Andrew J. Short

When the 1-187 Infantry Battalion, Fort Campbell, Kentucky, deployed to Kosovo in February 2000 to participate in Operation Joint Guardian, it left with a complete task force to enhance the battalion's operations and effectiveness. Subsequently, Fort Campbell's 326th Engineer Battalion (Air Assault) attached a sapper platoon to the task force. The habitually associated platoon from Charlie Company deployed with the infantry battalion. While engineers comprised only a small number of the 900-man task force, the diversity and flexibility of the light combat-engineer platoon made it a valuable asset.

Task Organization

The sapper platoon (1/C/326th)— three 8-man squads, a platoon leader, a platoon sergeant, and a driver— deployed with its entire modified table of organization and equipment. In keeping with the divisional readiness force package, two small emplacement excavators (SEEs) and their operators and a medic also deployed with the platoon. Because an infantry task force has no 62B mechanics, a skilled junior mechanic was included to work on any problems associated with the SEEs. The battalion also requested that a vertical engineer squad from the XVIII Airborne Corps be attached, so a squad from the 27th Engineer Battalion, Fort Bragg, North Carolina, was added to the task force.

Instead of having each squad of the platoon tasked to each infantry company, the task-force commander decided to keep the sapper platoon together and attach it to one of the infantry companies. The decision made it necessary to include an additional lieutenant to serve as the task-force engineer so the platoon leader could stay with the platoon. The vertical squad fell under Headquarters and Headquarters Company/1-187 and worked for the task-force engineer.

Sapper Platoon

Unlike in the mechanized world, where an engineer company supports a maneuver battalion, the air-assault infantry battalion is supported by one sapper platoon. Throughout the deployment, the sappers showed the diversity of 12B soldiers and their ability to serve in many different capacities. While in Kosovo, the platoon served as another light infantry element. Initially serving with D/1-187 in the town of Klokot, the platoon conducted both dismounted and mounted patrols, guarded Serbian churches, and manned traffic-control points (TCP). In addition, both the platoon leader and squad leaders worked with the local mayors and people in the cities of Klokot, Zitinje, and other surrounding villages on a daily basis. They conducted numerous house searches of suspected criminals or curfew violators, looking for weapons or other contraband. The platoon's ability to serve as infantry was a great asset to the task force. More than 80 percent of the platoon's NCOs have attended Sapper School, and the skills they learned there, along with the training performed as part of the 101st Airborne Division, provided them with the skills needed for mission success.

In May, the platoon moved northeast into the Russian sector to run a checkpoint along the Kosovo-Serbian border with the Russian soldiers. Here, U.S. and Russian soldiers ran a TCP and searched every vehicle and person entering Kosovo. Working out of Camp Monteith in Gnilanje, the platoon rotated the squads every 8 hours for the 10 days they were there. As part of a joint Kosovo Force effort, it was an experience that the platoon will never forget.

On four occasions, members of the platoon participated in battalion-level cordon-and-search operations. The sapper squads were equipped with AN/PSS-12 mine detectors but served in many different roles. In some cases, an element would

perform a deliberate route clearance of a road or path so either vehicular or dismounted traffic could pass. The squads also swept haystacks, barns, and the surrounding grounds of houses with the mine detectors in search of buried caches of weapons or mines. In addition, the squads sometimes set aside the detectors and searched houses. On one mission, the engineer squad served as the battalion main effort and conducted a deliberate route clearance and searched suspected cache sites. Another mission called for a sapper squad to be on the first lift of an air assault into a village in order to clear a route through a suspected mine area.

The sappers also conducted three tree-cutting missions for the task force. In one case, trees were cut down with chain saws to improve fields of fire and clear dead space next to the battalion headquarters complex. In the other two missions, sappers helped the battalion S5 supply local Serbs with trees for firewood for the upcoming winter. The trees were taken down with detonation cord and C4. The squads conducted a recon of the site, performed hasty calculations, and then moved to the area the following day to conduct the mission.

In addition to the tree-cutting missions, a squad conducted a live breach with bangalores on a range. The sapper platoon also put up wire for protection around the battalion headquarters, conducted aerial reconnaissance of the sector to view possible obstacle sites, emplaced wire at a TCP site in anticipation of a possible riot, and conducted bridge and ford reconnaissance in sector to improve the mobility of tracked vehicles. Certainly, the engineer platoon offered the task force a very flexible element that could perform a multitude of tasks.

Vertical Engineer Squad

Most of the projects performed by the vertical engineer squad involved improving the quality of life for soldiers at remote sites. The six-man squad constructed six permanent, general-purpose, medium tent "huts" and more than 70 bunk beds. Other projects included designing and building the interior of the battalion mailroom, desks and tables for the battalion administrative area, and guard towers and detention shacks at the company command posts. During cordon-and-search operations, the squad repaired any damage to local houses that occurred during the searches. In addition, they ran a TCP during a crisis operation. The vertical engineer squad enabled Task Force 1-187 Infantry to complete projects without requesting support from the parent engineer battalion attached to Task Force Falcon.

Task-Force Engineer

The task-force engineer worked in the battalion headquarters and served as the principle advisor to the commander. In addition to working with the 1-187 staff members, the task-force engineer dealt extensively with the Base Camp Coordinating Agency, the construction management section, and the contractor (Brown & Root Services Corporation). The task-force engineer was the primary spokesman for the battalion while planning and developing its headquarters in Vitina. He also coordinated with the 16th and 82d Engineer Battalions for other projects and missions, pulled battle-captain shifts, helped the local civil-affairs team with a cleanup project, and advised the battalion commander on force-protection issues.

Lessons Learned

The deployment of 1/C/326th Engineer Battalion to Kosovo was a true test of the capabilities of an air-assault sapper platoon. Several lessons were learned from the deployment:

- A platoon should deploy with all of its equipment. Before leaving, many items on the platoon leader's hand receipt were questioned as to whether they should be taken to Kosovo, but the decision to take all equipment paid dividends. Even though the mentality was of operating as a light infantry platoon, the 1-187 used the platoon as engineers on many occasions. Having properly maintained chain saws, tools, and equipment allowed the platoon to complete every mission.
- The vertical engineer squad from the 27th Engineer Battalion was a valuable asset to the task force in Kosovo. However, future deployments by light infantry



Soldiers from C/326th Engineer Battalion conduct a tree-cutting operation in Kosovo.

task forces to this theater will probably not need this attachment. The infrastructure has been established in Kosovo, and the projects for vertical engineers are decreasing.

- An additional officer to serve as the task-force engineer is needed only if the sapper platoon is kept together. Should a task-force commander decide to split up the platoon and attach engineer squads to infantry companies, the platoon leader can easily perform both platoon-leader and task-force-engineer duties.
- Training on soldier tasks other than 12B-specific ones will help improve the readiness of engineers on future Kosovo deployments. Devoting time to patrolling, military operations in urban terrain, checkpoints, searches (vehicle and individual), and other squad- and platoon-level tasks during training will help prepare engineers for missions they will perform on a Balkan deployment.

Redeployment

The leaders and soldiers of C/326th Engineer Battalion returned to Fort Campbell with the confidence and knowledge of the great job they did in Kosovo. The importance of training as both a combat engineer and an infantryman took on new meaning to them. The light combat-engineer platoon's diversity and flexibility made it a valuable asset to the battalion.

Captain Short was the task-force engineer for 1-187 Infantry Battalion. He previously served as a platoon leader and executive officer in the 326th Engineer Battalion, Fort Campbell, Kentucky. A graduate of the United States Military Academy, CPT Short has completed the Engineer Officer Basic Course and the Airborne, Air Assault, Ranger, and Sapper Schools.

Editor's Note

The bulletin staff thanks Mr. Brian M. Green, a project management engineer for the U.S. Army Project Manager for Mines, Countermine and Demolitions, Countermine Division, Fort Belvoir, Virginia, for reviewing the mine articles in this issue. Mr. Green is a Marine combat-engineer officer who fought in the Gulf War and has been to Somalia, Bosnia, and Korea (three times). He advised on the removal of minefields in Guantanamo Bay, Cuba, and wrote and edited the Humanitarian Demining Equipment Planning Guide for the theater commanders in chief. He has been officer-in-charge of the Marine detachment at the National Ground Intelligence Center, a mine-warfare analyst, chief of the Mine Warfare Branch and instructor at the U.S. Army Engineer School, and subject-matter expert on mine/countermine warfare for the school for two years. Mr. Green has authored several articles for *Engineer*.

(continued from page 20)

when the deminer establishes the start point of the 1-meter lane that he will work. After checking the area immediately in front of him with a trip-wire feeler, the deminer removes all the vegetation from the area that he has cleared of trip wires. Then he probes the area for mines, inserting the probe 6 centimeters into the earth at about a 30-degree angle every 2 centimeters across the entire 1-meter width of the lane. If nothing is found, then the deminer moves forward 6 centimeters and probes again. Once he reaches the end of the area he has cleared of vegetation, he starts the entire drill again. This slow and tedious process typically results in one lane—about 50 to 60 square meters—being cleared each day.

At minefield 4185, about 100 to 120 square meters were cleared in a day. While this may sound like comparatively good progress, it is important to look at in relation to the area that the minefield covers, which is about 4 grid squares or about 4,000,000 square meters. At the current rate of demining, it will take 33,000 to 40,000 days to clear this minefield.

Lessons Learned

While deployed as part of SFOR 6 from August to December 1999, our platoon learned several valuable lessons about demining in Bosnia-Herzegovina:

- Establish a good working relationship with the EAF deminers. We found that by doing this, our EAF team would do the things that we asked them to do. But even though a good working relationship helped make the job easier, it did not replace the need for supervision.
- Establish strict standards by which deminers are to work. If our standards were not met, the team knew that it would not receive credit for its efforts. This encouraged deminers to safely and effectively work the required 4 hours a day.

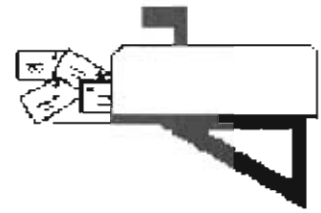
Conclusion

While the war in Bosnia-Herzegovina may be over, the country is far from being where it was before the outbreak of the fighting. The efforts of the IFOR/SFOR have made a difference. Although it is several years from being completed, the demining of the region is well underway. More important are the decreasing SFOR troop strengths. The people of the country are beginning to govern themselves again and take responsibility for their actions. The move from constant monitoring of demining to periodic spot checks is a prime example of this progress.

Where there has been conflict, there will be mines, so future contingency operations will require expertise in mine clearance and humanitarian demining. That means that engineers will be needed to oversee the clearing operations of every mission.

First Lieutenant Midden is the maintenance officer for the 1st Engineer Battalion, Fort Riley, Kansas. While in Bosnia, he was a platoon leader in B Company, 1st Engineer Battalion. 1LT Midden is a graduate of the University of Missouri-Rolla.

Letters To The Editor



Engineers Train With New, Advanced Equipment

The October 2000 issue of *Engineer* contained an article by PFC Matthew J. Jenkins titled "Engineers Train With New, Advanced Equipment." This equipment, which was a part of the Joint Contingency Force Army Warfighting Experiment held at Fort Polk, Louisiana, in September 2000, included a description of the Volcano (Light).

Paragraph one states that "The Volcano (Light) is designed to lay a minefield about 900 feet long and more than 110 feet wide." Minefield size in any Volcano-installed minefield is directly related to the density (number of mines per square meter) and the total number of mines dispensed for the minefield. I caution readers to keep this in mind. A large minefield may contain many or few mines. The same is true for a small minefield. Minefield density and minefield size are independent of each other and are determined by the commander and the laying crew, not the device. Do not jump to conclusions that the Volcano (Light) has this amazingly advanced capability in such a small HMMWV-mounted package that it is able to replace the normal Volcano in the normal Volcano mission.

Paragraph two states that "...canisters, each containing five antitank mines and one antipersonnel mine. ...When the mines hit the ground, trip wires spring out of each mine to prevent the enemy from passing safely."Only the M87 mine canisters contain an antipersonnel mine along with the five antitank mines. The main canister in our war stock is the M87A1, which contains only antitank mines. Most importantly, only the antipersonnel mines contain/eject wires. Antitank mines contain none.

A warning note: Volcano-launched antitank mines do not have antihandling devices, but they DO have antidisturbance integrated into them. Movement of an armed Volcano mine is extremely technologically complicated and is NEVER safe. NEVER attempt to move ANY Volcano mines that have been dispensed!

Mr. Glenn Boxley
Combat Developer
U.S. Army Engineer School
DSN 676-7337

U.S. Army Prime Power: A Tradition of Innovation and Excellence

An article by CWO2 Andrew K. Potter in the July 2000 issue of *Engineer* ("U.S. Army Prime Power: A Tradition of Innovation and Excellence") refers to Camp Century, Greenland, a site that "generated power from more than 30 feet below the polar ice cap" as part of the Army Nuclear Power Program.

I'm glad to see there is some solid, accurate recognition of Camp Century and what we tried to do there. As a young SP4 radio-teletype operator with the Polar Research and Development Center at Fort Belvoir, Virginia, I made four trips to Greenland in the early 1960s. A lot of our communication from the camp was by Morse code—there was no such thing as a Global Positioning System! It was an adventure and perhaps the most memorable time of my life. Thanks for remembering what we did.

Robert P. Radzyminski
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Dynamic Theater Bridge Management: The Korea Challenge

By Lieutenant Colonel Scott F. "Rock" Donahue

"Bridges are always central features in war. Battles and campaigns are often decided by who holds the bridge, or seizes the bridge, or destroys the bridge."

Stephen E. Ambrose
Pegasus Bridge

The Korean peninsula is 84,542 square miles (219,020 square kilometers). About 80 to 85 percent of it is mountainous, and it is cut by nearly 2,400 miles (3,862 kilometers) of waterways. The rugged terrain and temperate climate produce a land with literally thousands of wet and dry gaps. It is clear that if the campaign plan to deter hostile acts of external aggression against the Republic of Korea (ROK) and defeat an external armed attack against the Republic should fail, decisive operations would entail multiple river crossings. The relative shortage of standard military bridging assets to support these potential operations posed a significant challenge to both ROK and U.S. engineers.

In January of 1999, the Commander in Chief (CINC) of the United Nations Command and Combined Forces Command and the Commander, United States Forces Korea, directed the development of a detailed theater bridge-management plan (TBMP) to support component schemes of maneuver. The significance of his guidance is adequately summed up by noted military historian Stephen Ambrose, who concluded that bridges can be the decisive element in military campaigns.[1] This axiom holds equally true for the battlefield employment and management of military float and fixed bridges in the Korean theater of operations (KTO).

The Challenge We Face

To meet the CINC's intent, the Combined Forces Command engineer staff—with direct support from the United States Forces Korea, Eighth United States Army, and ROK field army engineer staffs—developed a dynamic TBMP to optimally allocate limited theater bridging assets to meet campaign requirements. Additionally, the TBMP provides guidance on the appropriate forward movement of assault float bridges in the forward combat zone and the timely replacement of military bridging in the corps rear areas and communications zone. Bridging stock such as the ribbon bridge, the medium girder bridge (MGB), and the M2 Bailey bridge must be aggressively managed throughout the condition-based campaign to sustain the tactical mobility of assaulting forces, to facilitate the operational momentum provided by support and follow-on forces, and to sustain the lines of communication (LOCs) from rear areas to allow sufficient throughput capacity on main supply routes.

Several alternatives were examined to mitigate bridging shortfalls. These options included ensuring the early arrival of off-peninsula U.S. Army ribbon-bridge companies to meet the CINC's required delivery dates; tailoring U.S. and ROK bridge-modernization programs to meet the theater's unique needs (for example, converting to the multirole bridge company, fielding the Wolverine heavy assault bridge, and developing a suitable LOC bridging system); and employing military causeway systems as well as proven, commercially manufactured panel bridging.

Bridge-Employment Concepts

The purpose of a deliberate wet-gap river crossing is to rapidly project combat power across a water obstacle at a faster rate than the enemy can generate his counterattack forces, while minimizing the impact of the river on the ground commander's ability to maneuver his forces.[2] In the KTO, three types of bridging operations are conducted throughout the campaign under various battlefield conditions:

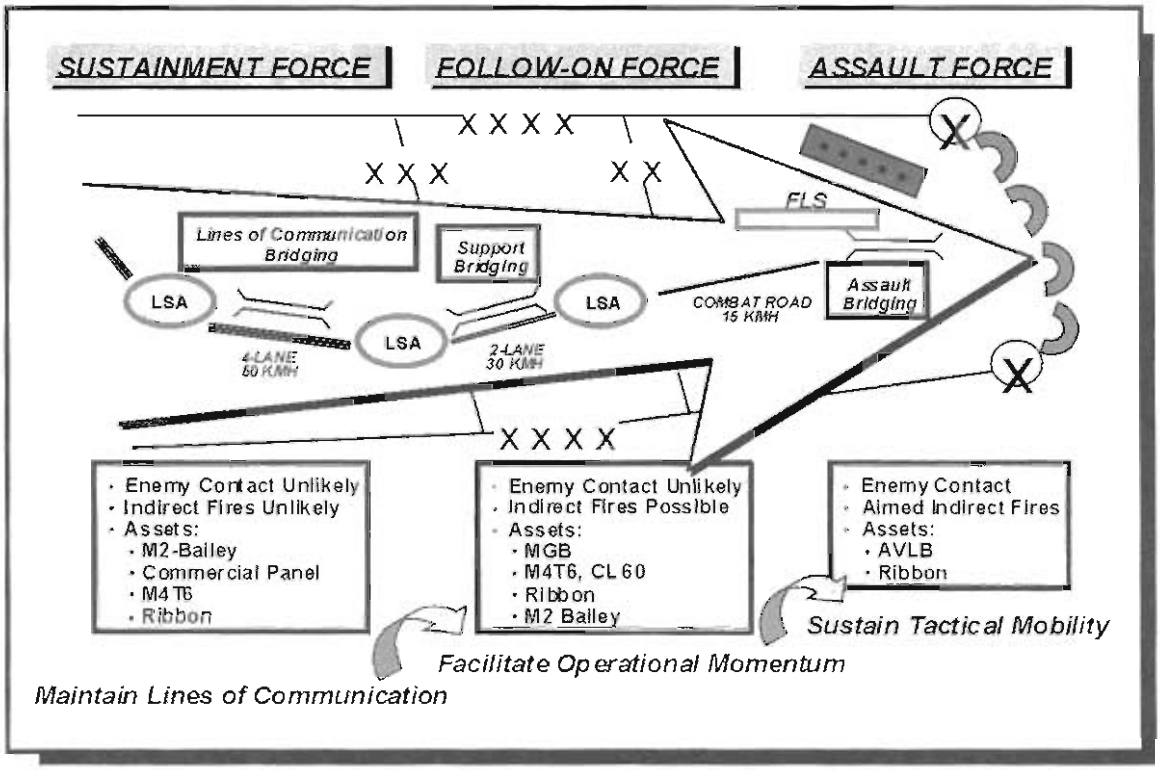


Figure 1. Employment of theater assault, support, and lines-of-communication bridging throughout the battlefield framework

- Assault bridging (when in contact with the enemy and exposed to direct and observed indirect fires).
- Support bridging (when enemy contact is unlikely but the possibility exists of exposure to observed indirect fires).
- LOC bridging (when enemy contact is very unlikely and there is no imminent threat of direct or indirect fires).

Both ROK and U.S. assault bridging assets (such as the armored vehicle-launched bridge [AVLB] and the ribbon bridge), support bridging assets (such as the MGB, M4T6, and Class [CL] 60), and LOC bridging assets (such as the M2 Bailey bridge and commercially available panel bridging) are an integral part of the maneuver commander's combined assault, follow-on, and sustainment forces, respectively. They are doctrinally employed throughout the depth of the battlefield framework, as depicted in Figure 1, to ensure continuous operational tempo. The preferred bridging assets to support these three forces are prioritized based on the likelihood of enemy contact, the threat of indirect fires, and the speed at which the assets can be employed.

Both ROK and U.S. ribbon-bridge companies have the same organization and equipment. Consequently, these units are interchangeable. Combined training between ROK and U.S. Army ribbon-bridge companies is conducted routinely on the Korean peninsula. This is critical to support the flexible task organization required to support decisive operations. A ROK or U.S. ribbon-bridge company can span 215 meters and cross 200 vehicles per hour under normal crossing conditions. The two most limiting factors for ribbon-bridge employment are the required river depth of 24 inches (0.61 meters) to support the minimum draft of the bridge and the river velocities. Higher river velocities necessitate crossing under caution or risk conditions. The table below depicts the maximum capabilities and planning factors for employing ROK and U.S. ribbon bridges.[3]

ROK/U.S. Ribbon-Bridge Company

Components	Quantity	Capability	Planning Factors
Bridge platoons	2	Six 6-float rafts (2 ramp bays/ 4 interior bays): MLC 70* or 215 meters of bridge (2 ramps/ 30 interior bays): MLC 96* wheeled/70* tracked (*normal crossing w/max current velocity of 1.75 mps [6 fps])	Raft construction: 15 min/6-float raft Bridge construction: 200 m/hr (day); 133 m/hr (night) Bridge retrieval: 1-2 hours/215 m Crossing rate (200 m): 200 veh/hr at 16 km/hr per vehicle and 30 m spacing
Support platoon	1		
Interior bays	30		
Ramp bays	12		
Bridge-erection boats	14		

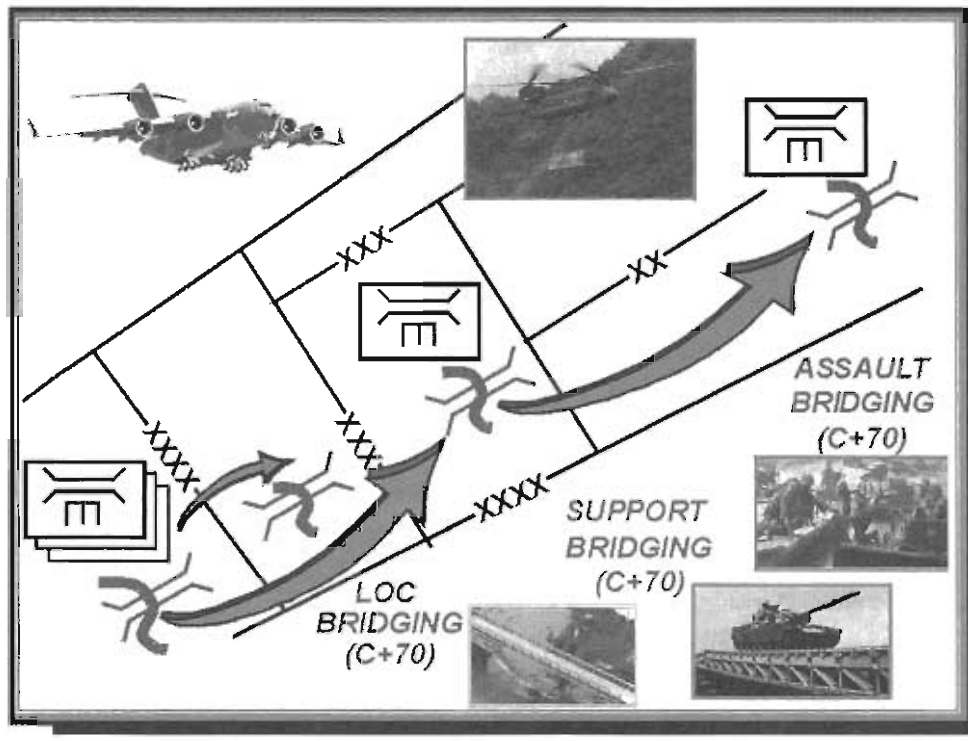


Figure 2. Dynamic assault float bridging on successive river crossings over a notional timeline

Both ROK and U.S. MGB assets, as well as ROK M4T6 and CL 60 support bridging, must be rapidly emplaced to return assault bridges to the close battle. Additionally, fixed bridges such as the ROK and U.S. M2 Bailey bridge, the theater's primary LOC bridging asset, are required to replace bridges lost due to friendly interdiction and friendly/enemy denial operations throughout the campaign. These assets will open and sustain movement along mobility corridors. Fixed bridges are "labor-intensive and expose personnel to enemy fire during construction but provide stable gap-crossing support for continuous operations."[4]

Dynamic Assault Float Bridging

The ribbon bridge is the theater's primary assault float bridge. Both ROK and U.S. ribbon bridges must be continuously and dynamically emplaced, retrieved, replaced, and then moved forward ("leap-frogged") with assaulting forces to adequately support successive deliberate river-crossing operations to sustain tactical mobility. These assets are moved forward via airlift or ground/air transport. Assault float bridges are then replaced by support/LOC bridging within 4 to 10 days, or as soon as battlefield conditions and equipment availability permit. The assault float bridges are then returned to attacking forces. U.S. doctrine recommends recovery of these bridges after 72 hours; however, extended lines of communication, constrained logistics and transportation assets, and extensive fixed-bridge requirements make this nearly infeasible in the KTO.[5]

Dynamic assault float bridging was deemed the most suitable, feasible, and acceptable course of action to provide component commanders the capability to conduct river-crossings within available time, space, and resources. Additionally, this method of assault-float-bridge employment provides a tactically and operationally advantageous scheme of bridging operations, within acceptable risk, that justifies the dynamic allocation of this critical resource. Figure 2 depicts the concept of dynamic assault float bridging on successive river crossings over a notional timeline. The snapshot at C+70 indicates that assault, support, and LOC bridging will likely be conducted concurrently across the battlefield throughout the campaign.

Component Estimates and Analysis

Estimates for component float- and fixed-bridge requirements were developed and analyzed over the course of approximately 18 months. Combined Forces Command engineers published several point papers for senior military decision makers to frame the theater bridging challenges and present the concept of dynamic bridge management. Additionally, numerous combined deliberate planning sessions were conducted between December 1998 and March 2000 to refine bridging estimates and develop the TBMP. Amphibious operations analysis conducted by the U.S. Army's TRADOC Analysis Center at Fort Leavenworth, Kansas, from 1998 to 1999 was also used to assess the impact of additional theater bridging operations.

The following assumptions were made to analyze component estimates within the context of dynamic assault-float-bridge management:

- Arriving U.S. Army bridge companies will be fully sourced.
- Reception, staging, onward movement, and integration of arriving U.S. Army bridge units will take an average of 12 days.
- Successive river crossings will take place at the times estimated by the C3 Operations Analysis Branch and the Center for Army Analysis modeling efforts.
- One hundred percent of the assault float bridges will be leap-frogged from one river crossing to the next, excluding the additional assets allocated for maintenance and loss or damage.
- Assault float bridges must be replaced by support or LOC bridging.
- Existing fixed bridges that span less than 18 meters will remain intact.
- Twenty-five percent of the existing fixed bridges between 18 and 50 meters in length will have one span destroyed, but the piers and abutments will remain intact.
- Fifty percent of the existing fixed bridges that are more than 50 meters in length will have two spans destroyed, but the piers and abutments will remain intact.

Based on historical data from the most recent U.S. contingency bridging operations on the Sava River in Bosnia in 1995, we estimated three different factors for maintenance and loss or damage to assault float bridges: 10 percent for supporting-effort river crossings, 20 percent for main-effort river crossings conducted early in the campaign, and 30 percent for main-effort river crossings conducted in support of decisive operations later in the campaign. The 10 percent increase for main-effort river crossings accounts for the extended use and expected loss, damage, and accumulated wear on component bridging assets. Fundamentally, these planning factors imply that 70 to 90 percent of all assault float bridges are retrieved, replaced by support or LOC bridging, then moved forward to the next crossing site. Additionally, we estimated a 25 percent redundancy for bridge-erection boats at each crossing site and that assault bridging units that were reduced to below 75 percent combat effectiveness would be reorganized to sustain tactical mobility.[6]

Preliminary analysis was conducted using a heuristic algorithm that fully resourced assault float bridges for one river-crossing operation before resourcing the next. Initial results indicated that unconstrained bridging estimates exceeded available resources. Several alternatives were examined to mitigate the shortfall. Options included continually refining river-crossing estimates to adequately support component schemes of maneuver, decrementing supporting-effort river crossings within an acceptable degree of risk, adjusting the arrival date of off-peninsula U.S. Army ribbon-bridge companies to meet the CINC's required delivery dates, enhancing fixed-bridge denial plans to preserve assault float bridging early in the campaign, and employing military causeway systems as well as proven, commercially manufactured panel bridging to lessen the burden on standard military support and LOC bridging.

The Theater Bridge-Management Model

Combined Forces Command engineers concluded that although the heuristic algorithm approach was an acceptable technique to analyze assault-float-bridge requirements, it didn't guarantee a mathematically optimal solution. Additionally, this approach couldn't handle the mixing of different bridging factors or varying constraints. Most importantly, it couldn't provide the detailed sensitivity analysis necessary to develop a balanced theater-wide float- and fixed-bridge emplacement strategy. As a result, Combined Forces Command engineers initiated a cooperative modeling effort with the C3 Operations Analysis Branch in October of 1998 to develop an interactive, versatile, responsive, and transportable PC-based analytical tool using cost-effective, commercially available, off-the-shelf software that allows timely analysis on multiple river-crossing schemes to ensure near-optimal allocation of scarce bridging resources.

Visual Thinking International's object-oriented simulation package, SIMUL8, was used to develop the Theater Bridge-Management Model (TBM2).[7] A working prototype was completed by September 1999, and the model was fully verified and validated by May 2000. The TBM2's flexible network methodology provides unique interactive assumption testing and rapid course-of-action building and feasibility analyzing that complement the capabilities of existing combat models (such as TACWAR and ELIST). Its versatile architecture provides the capability to rapidly modify the model and input parameters to reflect the specifications and framework of a wide variety of logistics and transportation problems (such as demilitarized-zone obstacle breaching and lane expansion). Model results are then easily exported to Microsoft® Excel to generate parametric statistics and evaluate measures of effectiveness.

Key Bridging Issues

Three key bridging issues continue to be examined in support of the TBMP:

- Increasing the number of U.S. Army assault-float-bridge companies allocated to the KTO in the event of a major theater war.
- Assessing the availability and employment of nonstandard-bridging stock (such as military causeway systems and commercial panel bridging) to mitigate theater fixed-bridge shortfalls.
- Refining the plan for employing fires to limit damage to key bridges to minimize engineer repair efforts.

Although not all-inclusive, these issues represent the general focus of the Combined, Joint, and Army engineer staffs to finalize the TBMP.

(continued on page 33)

PERSCOM Notes

By Lieutenant Colonel John R. Luce

Here is a quick update on a couple of important items and some additional information you may find useful.

Current MOS Strengths

Overall, we are doing very well in the Regiment. Several of our MOSs have made great increases in strength during the last two years. The table below shows our current strengths.

MOS	Authorized Strength	Strength (percent)	MOS	Authorized Strength	Strength (percent)
12B	8,076	108	52E	187	87
12C	655	112	62E	1,339	109
12Z	264	101	62F	263	111
00B	133	63	62H	98	90
51B	872	100	62J	719	88
51H	420	99	62N	438	102
51K	112	125	81L	255	103
51M	243	124	81T	411	86
51R	129	124	81Z	25	88
51T	245	118	82D	110	105
51Z	134	107	Total	15,128	106

As you can see, the strength of many of our MOSs is at or above 100 percent. This is great news. However, there are several we need to improve: diver (00B), prime-power-production specialist (52E), and topographic analyst (81T). Additionally, we have a very critical need for airborne-equipment operators (62E and 62J, especially privates to specialists). These are critical to our success as engineers. If you have a desire to work in these fields, contact us or your retention noncommissioned officer or discuss it with your chain of command. We can help you make the transition to these fields! Any 62E10 or 62J10 who wants to attend Airborne School and enter the exciting life of a paratrooper should call us; we can help get you a school slot to get you on your way!

Also note that 100 percent strength does not mean that every position will be filled. We currently are required to fill recruiters, drill sergeants, and Active Component/Reserve Component (AC/RC) over the number of authorized positions for those organizations. When we fill those positions, other areas in the Army must go short.

Promotions

Promotion is a topic near and dear to everyone, and there are no new secrets here. However, there are MOSs where we are short NCOs at the sergeant and staff-sergeant levels. These are called STAR MOSs. This means that soldiers in the MOSs (shown by grade on page 33) will be promoted to sergeant after they complete the Primary Leadership Development Course and have their points validated. Soldiers may be promoted conditionally to staff sergeant when their points are validated, but they must complete the Basic Noncommissioned Officer Course within one year.

- Sergeant STAR MOSs: 00B, 51K, 51M, and 62H
- Staff sergeant STAR MOSs: 00B, 51M, and 52E

Leaders should look at this list closely. If you have soldiers in these MOSs who are eligible for promotion, any unnecessary delay in getting them to the board or school will delay their promotion. If they are not qualified for promotion, be specific in your counseling and give the soldiers concrete guidance on areas to improve for promotion. Advising them of this current situation could provide them the extra motivation to correct their deficiencies so they can get boarded, schooled, and promoted as soon as possible.

Assignment Priorities and Guidance

Man the force. Get divisions and armored cavalry regiments (ACRs) to 100 percent strength. This is the guidance we are following today as directed by the Chief of Staff of the Army. We currently have two categories for assignments: Fill Priority 1 and 2. Fill Priority 1 assignments are the divisions and ACRs, recruiters, drill sergeants, Army combat-training centers (National Training Center, Joint Readiness Training Center, and Combat Maneuver Training Center), AC/RC positions, and other joint-duty and high-priority assignments. The rest of the Army is Fill Priority 2. This means that we fill 100 percent of the positions in Fill Priority 1 units and fair share the remaining soldiers in Fill Priority 2 units.

Soldiers Needed!!!

We need soldiers for the following MOSs:

- 00B diver
- 52E prime-power-production specialist
- 81T topographic analyst
- 62E/J airborne-equipment operators

If you are interested, call us at commercial (703) 325-4824 or DSN 221-4824.

Call Us

Feel free to contact us, or your assignment personnel, with any questions. Remember that we can't help if we don't know there is a problem. And we surely can't send you to the assignment of your choice if you don't tell us what it is *before we make your next assignment.*

Lieutenant Colonel Luce is the Branch Chief for Engineer Enlisted Assignments.

(continued from page 31)

The Road Ahead

Validating the TBMP is an ongoing and evolutionary process. The main effort for both ROK and U.S. engineers over the next several months will be to implement the TBM2 to conduct detailed analyses on a wide range of dynamic float- and fixed-bridge employment schemes. We must integrate recent analyses of Korean roads, bridges, tunnels, and underground facilities to validate planning assumptions and enhance fixed-bridge repair and replacement strategies. Additionally, we must monitor bridge-modernization programs to explore and refine options to mitigate bridging shortfalls throughout the campaign.

Specifically, we must carefully evaluate the impact of the U.S. conversion to the multirole bridge company and the turn-in of ROK bridging stocks (M4T6 and CL 60) in future years. We must also assess older ROK and U.S. bridging stocks (like the M2 Bailey bridge) with respect to readiness, maintenance, and training to maximize LOC bridging capability, employment, and sustainment. Finally, we must determine the availability of potential bridging stock that is not currently allocated to this theater. This includes bridging stock in Sagami Depot, Japan; U.S. Army ribbon-bridge components throughout the Active and Reserve Components; and commercially available stocks such as the floating MGB and prefabricated modular steel bridges. Exploring these options will ensure optimal battlefield employment and management of military float and fixed bridging in the KTO.

LTC Donahue commands the 41st Engineer Battalion, 10th Mountain Division, Fort Drum, New York. Previously, he served as Chief, Studies & Analysis Branch, Plans Division, Assistant Chief of Staff, Engineer, Combined Forces Command, Seoul, Korea, as well as the Engineer Brigade S3 and 11th Engineer Battalion S3, 3d Infantry Division (Mech) at Fort Stewart, Georgia. A graduate of the Virginia Military Institute, LTC Donahue holds a master's in operations research from the Naval Postgraduate School and is a licensed professional engineer in Virginia.

Endnotes:

[1] Ambrose, Stephen, *Pegasus Bridge*, New York: Simon & Schuster Inc., 1988, p.10.

[2] FM 90-13/MCWP 3-17.1, *River-Crossing Operations*, Headquarters, Department of the Army/U.S. Marine Corps, 26 January 1998, pp. 1-1 and 1-3.

[3] Ibid., pp. C-9, C-10, and C-13.

[4] Ibid., p. 1-4.

[5] Ibid., p. 9-5.

[6] E-mail correspondence between Colonel John F. Troxell, Chief of Plans Division, CFC ACofS, Engineer, and Colonel Steven R. Hawkins, Chief of Staff 3d Infantry Division (Mech), on 30-31 July 1998, and Operation Joint Endeavor Bridging Research Analysis conducted by BRTC Technology Research Corporation, 15 July 1998.

[7] SIMUL8, Visual Thinking International, http://www.visualt.com.



CTC Notes

Obstacle Numbering...Critical to Planning, Tracking, and Reporting

By Captain William G. Tennant and Lieutenant Colonel Thomas P. Smith

A common problem for engineer units training at the Combat Maneuver Training Center (CMTC) is visualizing the countermobility effort. Specifically, most units have poor tactics, techniques, and procedures (TTP) for planning, tracking, and reporting obstacles. Unit problems are compounded by a lack of familiarity with the doctrinal obstacle-numbering convention described in FM 20-32, *Mine/Countermine Operations*. They routinely use nonstandard numbering, resulting in confusion during planning, difficulty with tracking, and poor reporting of the countermobility effort. Used properly, the doctrinal 12-character obstacle-numbering system facilitates planning, tracking, and reporting of obstacle information.

FM 20-32 states, "The minefield/munition field obstacle-numbering system consists of 11 characters and 1 obstacle status symbol. It shows the type of obstacle, the belt and the zone in which it is located, and the headquarters that established the zone." All the information needed to plan, track, and report obstacles is present. Figure 1 is an example of the obstacle-numbering system.

The doctrinal numbering system corrects a unit tendency to treat obstacles like artillery targets. The "target" technique assigns a series of obstacle numbers to each emplacing unit. The problem with this technique is terrain visualization. Higher headquarters cannot readily associate the obstacle number with a location on the ground. The doctrinal numbering system provides terrain visualization by answering *where* (zone, belt, group), *what* (obstacle type), and the *status* (planned/, being prepared -, prepared + [for reserve obstacles], and complete **X**).

Units adapt the target technique because the doctrinal system appears to be complicated; however, the doctrinal system is deceptively simple. For example, at brigade level and below, the obstacle prefix (division-level headquarters) is the same for all obstacles. Similarly, task-force-level engineer effort is normally contained within one obstacle zone and sometimes within one obstacle belt. Therefore, the task-force tactical-operations center records the zone and belt for submitting reports to higher headquarters. Finally, the engineer platoon leader only tracks the belt and group. What initially appears to be a cumbersome numbering system gets progressively simpler at lower levels.

Another problem with tracking the countermobility effort is a tendency to track several distinct obstacles as a single obstacle. This oversimplification of the obstacle plan disregards the purpose of bottom-up refinement. For example, many units track a wire-mine-wire obstacle as a single obstacle rather than an obstacle group consisting of *wire, triple-standard* (WT)-*minefield, fix* (MF)-and *WT*. To clarify tracking and reporting, the platoon leader plans multiple obstacles in each group and assigns obstacle numbers. In doing so, he completes the planning process by providing bottom-up refinement. The result is a completed obstacle plan at the origination headquarters (Figure 2).

Proper use of the obstacle-numbering system is shown in Figures 2 and 3. A sketch of a block obstacle group (A1B) is shown in Figure 2. The group was planned at the task-force level. The platoon leader knows the obstacle intent and the general geographic location based on top-down planning. From detailed reconnaissance, he plans to complete this obstacle group with five individual obstacles: *wire, triple-standard* (WT01); *minefield, nuisance* (MQ02); *wire, triple-standard* (WT03); *minefield, nuisance* (MQ04); and *road crater, hasty* (RH05). The company tracks the obstacle group on an execution matrix (Figure 3).

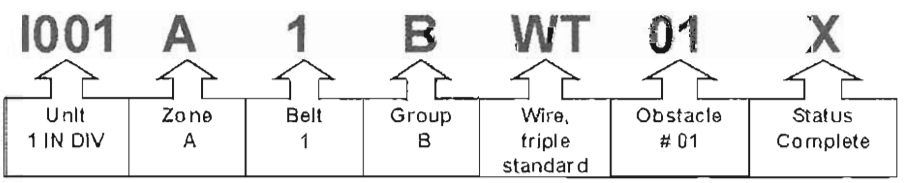


Figure 1. Obstacle Numbering

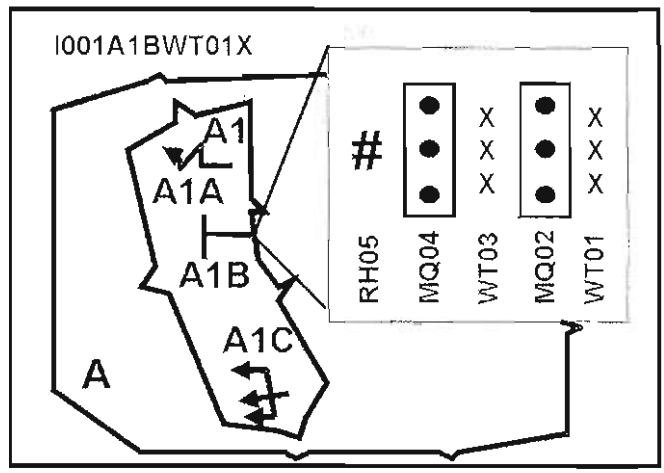


Figure 2. Obstacle Planning

Zone/Belt/ Group/ Obstacle Number	Location	Effect	Priority	Emplacing Unit	Owning Unit	Lane Location	Lane Closure Responsibility	Materials Assets Required	Materials Location	Special Instructions
I001A1BWT01X	[illegible]	Block	1	1/A/23EN	A/1-76 AR	NA	NA	Kit 1	CLIVIV #1	
I001A1BMQ02	[illegible]	Block	2	1/A/23EN	A/1-76 AR	NA	NA	Kit 3	CLIVIV #1	
I001A1BWT03/	[illegible]	Block	3	1/A/23EN	A/1-76 AR	NA	NA	Kit 1	CLIVIV #1	
I001A1BMQ04/	[illegible]	Block	4	1/A/23EN	A/1-76 AR	NA	NA	Kit 3	CLIVIV #1	
I001A1BRH05/	[illegible]	Block	5	1/A/23EN	A/1-76 AR	NA	NA	Kit 5	CLIVIV #1	

*Reference to reserve-obstacle execution matrix

Figure 3. Directed-Obstacle Execution Matrix (from FM 90-7, Figure 5-1)

The platoon leader uses the same matrix as an execution-and-report matrix. For example, assume the first obstacle is complete (A1BWT01X). The platoon leader reports "A1BMQ02-" when beginning the second obstacle. Upon completion, the report becomes A1BMQ02X. The company then reports to higher headquarters on the status of the group. Since Group A1B consists of five obstacles and two of the five obstacles are complete, the status report is "Group A1B 40 percent complete." The zone-belt designation is nearly transparent at the platoon level but easily used at higher levels for visualization of the countermobility effort.

Using the proper numbering convention facilitates top-down planning and bottom-up refinement. It helps subordinate units refine the plan and send information to higher headquarters. The numbering system feeds directly into a tracking system and prompts leaders on the ground to send reports. A clear understanding of the doctrinal numbering system will help alleviate problems with obstacle planning, tracking, and reporting.

Captain Tennant, a brigade engineer observer/controller at the CMTC, was previously a platoon leader and XO, 16th Engineer Battalion (Corps Mech), in Bamberg, Germany and Bosnia. He also commanded C/326 Engineer Battalion, Fort Campbell, Kentucky.

Lieutenant Colonel Smith, the senior engineer observer/controller at the CMTC, was previously the executive officer for the 54th Engineer Battalion, Bamberg, Germany.



Engineer Success on the JRTC Battlefield:

An OPFOR Engineer Perspective

By Captain James S. Matthews

Serving as the Opposing Force (OPFOR) task-force engineer for 18 rotations at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana, provided key insight on how successful engineer operations allow a brigade-plus organization to accomplish a wartime mission. Each year, 10 light infantry brigades came to JRTC to participate in one of the most realistic combat-training exercises in the U.S. military. Brigade commanders are expected to accomplish the given mission while leading 6,000 soldiers, dealing with the challenge of a role-playing civilian populace and news media and, of course, conducting combat operations against the insurgent and invading forces of Cortina, a fictitious country developed by the staff at JRTC. An important lesson learned by each brigade is the importance of mobility, countermobilty, and survivability operations to mission accomplishment.

Engineers preparing to enter Cortina need to understand a few important concepts to enjoy success on this light battlefield. First, they must understand the strengths and weaknesses of the OPFOR. Second, a Blue Force (BLUFOR) unit must secure and guard an OPFOR obstacle once it is encountered. Third, and most important, securing the breach site is the key to a successful breach on the JRTC battlefield.

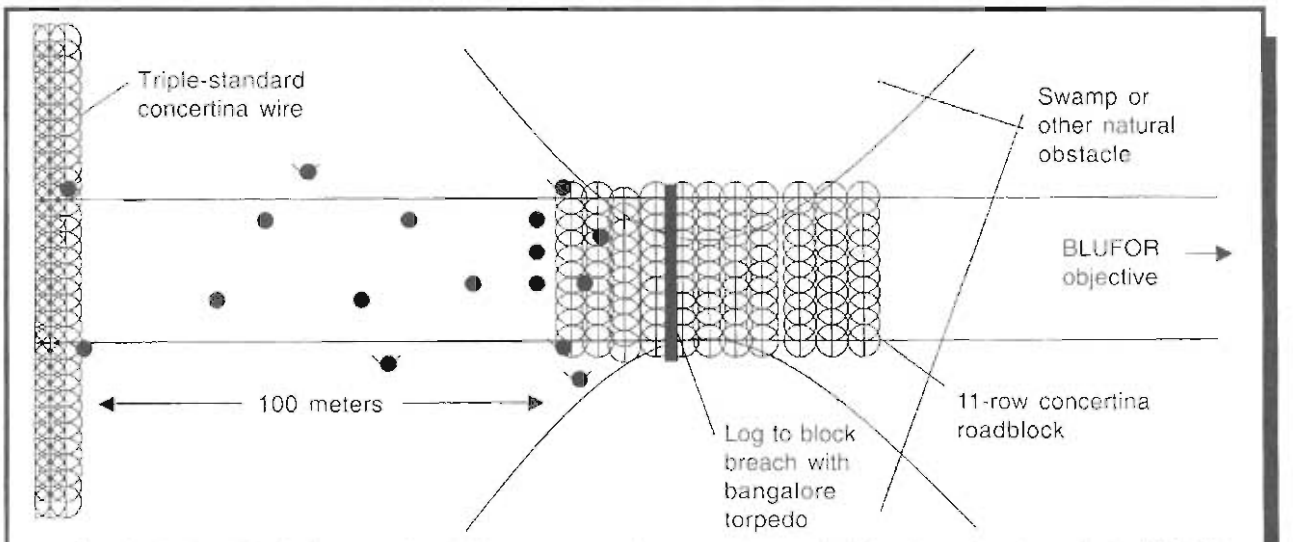
Understand OPFOR Strengths and Weaknesses

The OPFOR at JRTC has many strengths and weaknesses that differ from U.S. units. The forces of Cortina do not have the resources on which U.S. soldiers rely. The enemy soldiers are forced to substitute ingenuity and tenacity to compensate for this lack of resources. Success can be gained by understanding the strengths and weaknesses of this enemy.

OPFOR Class IV and V supplies are very limited for countermobility operations. An S2 can analyze the known enemy obstacle on the ground against the templated Class IV and V resources to determine future countermobility capability. The typical complex obstacle found in Cortina during a People's Democratic Republic of Atlantica (PDRA) defense contains 40 rolls of wire and 15 mines (see figure on page 37).

The TM-62 is used in probable breach points due to the effectiveness allowed by its fuse. Although there are many variants, the version of the TM-62 portrayed at JRTC has a seismic, magnetic, and pressure fuse. It is the antitank (AT) mine preferred by OPFOR soldiers on the ground. The box mines (YAM-5 and TMB-D) are not as effective, and they are difficult to bury properly because of their large size and rectangular shape. The AT mines will be reinforced and protected by antipersonnel (AP) mines, typically OZM-3s, either placed on the flanks or tied in to the wire obstacle (very effective method). Air-delivered scatterable mines can be used by the PDRA. The system requires multiple passes from the MI-17 HIP (helicopter) for emplacement. This platform is extremely vulnerable to U.S. Army air-defense-artillery assets and is not as capable as an air Volcano for seeding a large area (only 200 by 100 meters).

The OPFOR in Cortina has a very limited amount of combat power to maneuver against the enemy. The Cortina Liberation Front typically fields about 150 soldiers during the low-intensity conflict. The PDRA will have less than 250 soldiers and a small mechanized counterattack force during defensive operations. The importance of these numbers to the task-force engineer is the limited number of troops providing security at the obstacles. A platoon or less will provide cover and observation for a major tactical obstacle. The OPFOR infantry has very few transportation assets and therefore a limited ability to move forces quickly in the area of operations. The tanks and Soviet mechanized infantry vehicles (BMPs) can move quickly to provide supporting fires, but once they have started their engines, it is only a matter of time before OH-58 helicopters or AC-130 aircraft will find them by their thermal image. Therefore, the OPFOR commander will only bring mechanized forces out of hide sites when he sees that the situation is urgent and is willing to risk those assets. One important method the OPFOR uses to make up for a lack of troops is employing the Leesville Urban Group (LUG). These terrorists in civilian clothes and long hair blend with the population to provide intelligence on BLUFOR activities. They routinely infiltrate a U.S. perimeter under some false pretense of making site sketches to post in the Cortina Liberation Front's tactical-operations center. They will also be called on to execute offensive terrorist operations such as ruck bombs, truck bombs, sniper attacks, and ambushes.



- The first wire obstacle is more than 100 meters from the second to avoid being breached by a single MICLIC.
- AP mines are tied to the wire and placed on flanks to stop dismounted forces.
- A series of AT mines is placed in a row to defeat a roller or plow by causing multiple hits in the same spot.
- All wire is tied with barbed wire on the top with 6-inch ties.
- The separations between the sets of wire allow vehicles to be trapped.
- Mines are placed in the wire to stop a charging M1 tank. A damaged or destroyed heavy tank in the wire is an extremely effective obstacle.
- A log is placed between rows 4 and 5 to block the breach with a bangalore torpedo.

Typical complex obstacle used by the PDRA during the defense

OPFOR indirect-fire assets used against breaching forces are also at risk. Mortar teams have to displace quickly to avoid counterfire (typically 4 minutes or less). Artillery acquired by the AN/TPQ-36 Fire-Finder Radar System will usually receive counterfire before it can displace. The OPFOR will have soldiers or terrorists from the LUGs that report the direction of the AN/TPQ-36. The task-force engineer should ensure that his soldiers are receiving radar coverage during breaching operations. When covered by the AN/TPQ-36, the OPFOR's willingness to fire on a breach point will be affected. The obstacle will be tied in to the terrain (usually water or a swamp) and covered by 82-millimeter mortar, if not by artillery or rocket fire.

BLUFOR engineers preparing for the defense need to understand the mobility of the OPFOR while fighting as the PDRA. The day before the attack, division recon units travel the planned mechanized attack routes to report obstacle construction and disposition of BLUFOR troops. They are followed by the brigade recon to give an updated status. Both recon forces avoid contact unless a high-payoff target presents itself (parked Volcanoes are a favorite). Light forces begin marching the night before the attack, clearing the route with attached sappers and killing the BLUFOR securing the route.

Important targets for the dismounted forces are Volcanoes, Modular Pack Mine Systems (MOPMS), and Hornets that have yet to be employed. The BLUFOR typically do not employ these systems more than 4 hours before the attack due to the short-duration destruction times. Dismounted forces that find and destroy these assets before they are activated avoid a tactical breach, which makes it difficult for the BLUFOR to fill the gap before the main effort arrives. OPFOR companies on the dismounted routes leave a soldier at each point of breach to ensure that the mechanized attack finds the lane and passes through the obstacle. The mechanized attack launches at first light on the morning of the attack. The OPFOR is prepared to shift its main effort minutes before rollout.

The mobility of the T-62s is an important factor to consider when preparing an obstacle plan. The OPFOR mechanized troop is accustomed to travelling through the swamps. Do not expect them to follow the road or well-established trails. They regularly surprise U.S. forces by emerging from the wood line at a high rate of speed, at times within the arming range of a tube-launched, optically tracked, wire-guided (TOW) missile. They also are not afraid of the poor traction in the lowlands. During some rotations, the OPFOR loses more tracks by getting stuck in the mud than from enemy fire. By moving through these unexpected avenues of approach, they are able to appear at the brigade support area or tactical-operations center with few casualties. Some T-62s are equipped with a mine-clearing plow. This is an important fact to remember when templating a scatterable minefield. The low density of AT mines in scatterable minefields makes them an easy breach for mechanized forces trained in proper plow techniques. The mechanized attack has several plow tanks that are proficient in the breaching drill.

Secure OPFOR Obstacles

The BLUFOR must secure the area around an OPFOR obstacle once it is encountered on the JRTC battlefield. The OPFOR uses an obstacle as a choke point to commit its limited forces. The PDRA commander often launches his limited mechanized assets or even moves infantry to capitalize on BLUFOR preoccupied with beaching operations. Many times BLUFOR troops encounter an obstacle and either fail to report its location or their report is ignored. These mistakes cause other BLUFOR vehicles to be involved in mine strikes or an ambush.

The engineer company needs to identify, mark, and breach each obstacle. In addition, the obstacle needs continued observation and clearing to protect against reseeding of the minefield. OPFOR soldiers will place an additional mine at the end of a breach lane to produce casualties and weaken the BLUFOR's confidence in the routes. Any minefield that is cleared and then left unsecure will have the same wire strung back across the road. Mines taken from a local cache are also emplaced. If a minefield is not to be completely cleared, the cleared lane needs to be marked with a system that will withstand heavy military traffic and forces civilian traffic to drive only through the cleared lane.

Concertina wire that funnels the traffic is a proven technique. Any marking system that allows a driver to stray from the lane, go around the marking system, or knock down the markers will lead to BLUFOR casualties. In addition, Cortinian natives who were not briefed on a lane-marking system will also use the breach lane during their daily travels. A destroyed civilian vehicle in a BLUFOR-controlled obstacle does not look good on the national newscast.

Secure the Breach Site

Securing the operation site is the key to a successful breach on the JRTC battlefield. The other breaching fundamentals—suppress, obscure, reduce and secure—must also be completed to standard, but the enemy's eyes on the obstacle are his strength. Properly securing the obstacle will prevent the OPFOR from observing the attacking BLUFOR and calling observed indirect fire.

Suppress. Suppression of the target is most effectively executed by using indirect fire. The OPFOR providing security of the obstacle will not show itself when presented with an organized breach force. This makes direct-fire suppression very difficult. The OPFOR remains in the vegetation and interdicts the enemy using its own indirect assets (primarily 82-millimeter mortars). In addition, small-arms direct-fire engagements typically come out in the OPFOR's favor.

Obscure. Obscuration of the obstacle reduces the number of direct-fire casualties but will not eliminate casualties due to indirect fire. Keeping in mind the small size of the typical obstacle emplaced by Cortinian forces, obscuring the exact location of soldiers is not sufficient to save them from mortar rounds. The OPFOR commander will direct his troops to have a 10-digit grid coordinate for the obstacle and probable breach points. The blast radius of an 82-millimeter mortar or a 152-millimeter artillery round will affect the engineers in and around the wire. Coordinate with the chemical units or fire-support officer to assure that the smoke will arrive on time and on target.

Reduce. Reduction of the obstacle needs to be executed quickly. All mines are subsurface unless placed on a hardball road. Do not attempt to remove the mines from the route. The seismic fuse on the TM-62 will kill anyone who attempts to remove it. Be aware of OZM-3 trip wires while approaching and cutting the concertina. The OPFOR in the defense shifts forces to affect BLUFOR troops during a breach. The force augmentation could range from a few scouts to a tank-BMP team. Moving BLUFOR forces through the breach allows them to fight in an open area past the obstacle and out of the planned engagement area.

Secure. Securing the operation site is the key to a successful breach on the JRTC battlefield. The small number of OPFOR soldiers providing observation on the obstacle demonstrates that indirect fire is the key to obstacles in Cortina. The first rounds cause casualties and begin the casualty-evacuation process. Each successive wave of BLUFOR trying to breach and rescue fallen comrades only adds to the pain of the process. Infantry forces must secure the point of breach and clear the surrounding area through occupation before the obstacle can be reduced. Searching the immediate area flushes out OPFOR and identifies hide sites. Once the immediate area is secured, the surrounding terrain needs to be swept to ensure that OPFOR scouts are not waiting to call a fire mission. Removing OPFOR eyes from the obstacle makes the reduction an easy battle drill.

Conclusion

Engineers who heed these suggestions will be more successful both on the JRTC battlefield and in light conflicts. Remember to know and understand the OPFOR. Locate the obstacle, secure the site, and remain in control of the area after the breach. This knowledge will allow the most intelligent use of engineer forces in the breach and the defense, greatly improve the BLUFOR's performance, and produce a better-trained and -prepared force.

Captain Matthews is the S4 of the 27th Engineer Battalion (ABN), Fort Bragg, North Carolina. He was previously the OPFOR task-force engineer, 1/509 Infantry (ABN), at the JRTC; assistant operations officer, HHC/20th Engineer Brigade (ABN), Fort Bragg; and vertical platoon leader, Fort Polk. CPT Matthews holds a bachelor of science degree in civil engineering from the Georgia Institute of Technology and is a graduate of the Airborne, Jumpmaster, and Ranger Schools. He is a professional engineer in Missouri.

West Point Cadets Train With the 416th ENCOM

By Colonel Robert Phillips

Traditionally West Point cadets are assigned to active Army units for their cadet troop-leader training (CTLT). However, this year two cadets completed their troop-leader training with Army Reserve engineer units that were on annual training in an installation-related construction mission at Fort Dix, New Jersey. According to the academy's Engineer Branch representative for the Department of Military Instruction, this year's Reserve Component CTLT with the 416th Engineer Command (ENCOM), headquartered in Darien, Illinois, was a first for the United States Military Academy.



A cadet operates a vibratory roller at the Manchester Road project site.

After arriving at Fort Dix on 10 July 2000, the cadets were assigned to companies of the 458th Engineer Battalion (Combat) (Wheeled). The cadets gave classes on troop-leading procedures and the proper placement of obstacles to deter an enemy. They led squads on ambushes, helped run several weapons ranges, participated in demolition training, and learned to deploy bangalore torpedoes. The cadets also took part in the unit's 72-hour Sapper Stakes tactical operation against an opposing force. The executive officer of the 458th Engineer Battalion stated that the cadets worked hard and had fun but did not hesitate to ask questions, especially concerning platoon-sergeant and platoon-leader responsibilities.

During the second half of their CTLT rotation, the cadets were assigned to the 365th Engineer Battalion (Combat) (Heavy). One cadet led the horizontal platoon for A Company and was designated the officer in charge of the Manchester Road resurfacing project. In addition to his supervisory duties, he was given the opportunity to operate some road-construction equipment. As platoon leader, he attended battalion staff meetings and briefed his platoon's progress. By training with Army Reserve units, he learned that troop leading is the same whether working with active or reserve personnel. After completing his CTLT rotation, he decided that his branch of choice would be engineer.

The second cadet was assigned to the equipment platoon of the battalion's Headquarters and Headquarters Company during the second half of the training period and supervised his platoon's construction of a helicopter gunnery staging area. He attended battalion staff meetings to brief the progress of his platoon's project and served as an assistant range officer for the rifle and .50-caliber ranges. Believing that the training was one of the more interesting experiences he had had in the military, the cadet recommended that the Academy send more cadets to participate in annual training with Reserve units.

The two cadets were pleased with their Reserve Component CTLT rotations. They especially appreciated being given an opportunity to train in two different types of engineer battalions. Serving in both combat-heavy and combat-wheeled units gave them a broader training experience in engineer operations. A spokesman for the 416th ENCOM observed that the two cadets received training time equal to the West Point cadets he sponsored while on active duty. He explained that Reserve units are out in the field the majority of the time while on annual training in order to maximize their training opportunities, while the cadets he sponsored on active duty spent much of their time in garrison and not in the field on engineer missions.

Within the past few years, the term "seamless Army" has been replaced by "the Army," connoting that the active Army, the United States Army Reserve, and the Army National Guard are all partners in the total-force concept. The 416th ENCOM's participation in the United States Military Academy's CTLT program is but another example of the relevancy of the Reserve Components in the Army.

Colonel Phillips, a comptroller in the 416th ENCOM, has over 29 years of commissioned service. A graduate of the Judge Advocate General's School and the Judge Advocate General's Officer Advanced Course, he holds degrees from Indiana University and the DePaul University College of Law, Chicago.



UNIT HISTORY: A TWO-EDGED SWORD

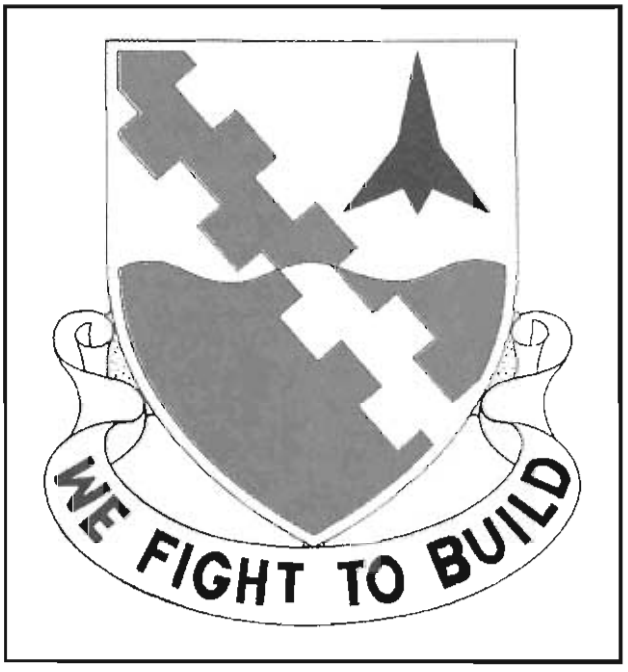
By Dr. Larry Roberts

This article is reprinted from the April 1994 issue of Engineer.

In more than one instance, young officers have walked into the History Office at the Engineer School with the mission of writing a history of their unit. Usually, the task was given to them by a battalion commander who wanted something for new soldiers to read. The obvious purpose of such a document is to instill a sense of pride in the unit, fostering unit morale and esprit de corps. This is the traditional view of unit history. It is the reason units are allowed to maintain an organizational history file within the Modern Army Recordkeeping System (MARKS). However, that file—and unit history in general—can actually serve the unit commander in two ways: It can enhance unit morale and esprit de corps and provide information for command decision making. This is possible only if there is command emphasis.

Few of those young officers who entered my office knew of a unit history file. Once informed of its possible existence, they went to it and often found little of value to their task. Unit history files run the gamut from little or nothing (except for last year's annual history report) to a collection of random newspaper clippings, change-of-command brochures, and pictures of changes of command and organizational-day activities. While these later items have merit, they do not completely document the unit's accomplishments in war or peace. Invariably, those same officers returned to my office in search of more information. They ultimately learned that gathering material on their units is a slow process that involves working with a number of federal organizations. However, with patience and determination, they can get what they need.

Before contacting federal organizations for information, the unit historian should examine the unit's lineage and honors (see page 41), often found in the commander's office. This will save a lot of time. The lineage and honors details the unit's federal service and identifies the various campaigns for which the organization has service credit. By knowing the periods of federal service, the action officer can disregard those conflicts during which the unit was inactive. The lineage and honors also identifies parent organizations. Their files and histories are logically a part of the heritage of the unit and should be examined as well. The campaign credits tell the researcher where the unit served. Campaign credits for the Pacific in World War II means that the officer can ignore the European theater when doing work in published historical works. After reviewing the lineage and honors, the action officer can begin contacting other organizations for additional information.



Unit crest of the 479th Engineer Battalion

DEPARTMENT OF THE ARMY

Lineage and Honors

479th ENGINEER BATTALION

Constituted 22 February 1944 in the Army of the United States as the 1285th Engineer Combat Battalion

Activated 3 April 1944 at Camp Howze, Texas

Inactivated 29 January 1946 at Camp Bowie, Texas

Redesignated 15 April 1947 as 1285th Engineer Construction Battalion; concurrently allotted to Organized Reserves and assigned to First Army

Activated 1 May 1947 at Buffalo, New York

(Organized Reserves redesignated 25 March 1948 as Organized Reserve Corps; redesignated in 1952 as Army Reserve)

Redesignated 16 June 1948 as 479th Engineer Construction Battalion

Inactivated 6 July 1950 at Buffalo, New York

Redesignated 22 April 1959 as 479th Engineer Battalion (Amphibious)

Activated 1 May 1959 with Headquarters at Watertown, New York

Reorganized 18 January 1963 as 479th Engineer Battalion (Combat) (Army)

HOME AREA: First United States Army (II United States Army Corps)

CAMPAIGN PARTICIPATION CREDIT

World War II
Central Europe

DECORATIONS
None

By Order of the Secretary of the Army:

J. C. LAMBERT
Major General, USA
The Adjutant General

FEB 10 1954

There are a number of sources of unit history. The National Archives in Washington, D.C., contains unit files for hundreds of organizations, especially for the years of World Wars I and II and the Korean and Vietnam Wars. The major disadvantage of using the Archives is the cost charged to reproduce the files. A unit that chooses to purchase complete files normally finds copies of material (such as unit orders and correspondence) that have little merit for a written history. However, scanning the files to sort out the unwanted material requires a trip to the Archives, something few units can afford. One of the best approaches is to contact friends or associates in the Washington area and ask them to spend a couple of hours in the Archives.

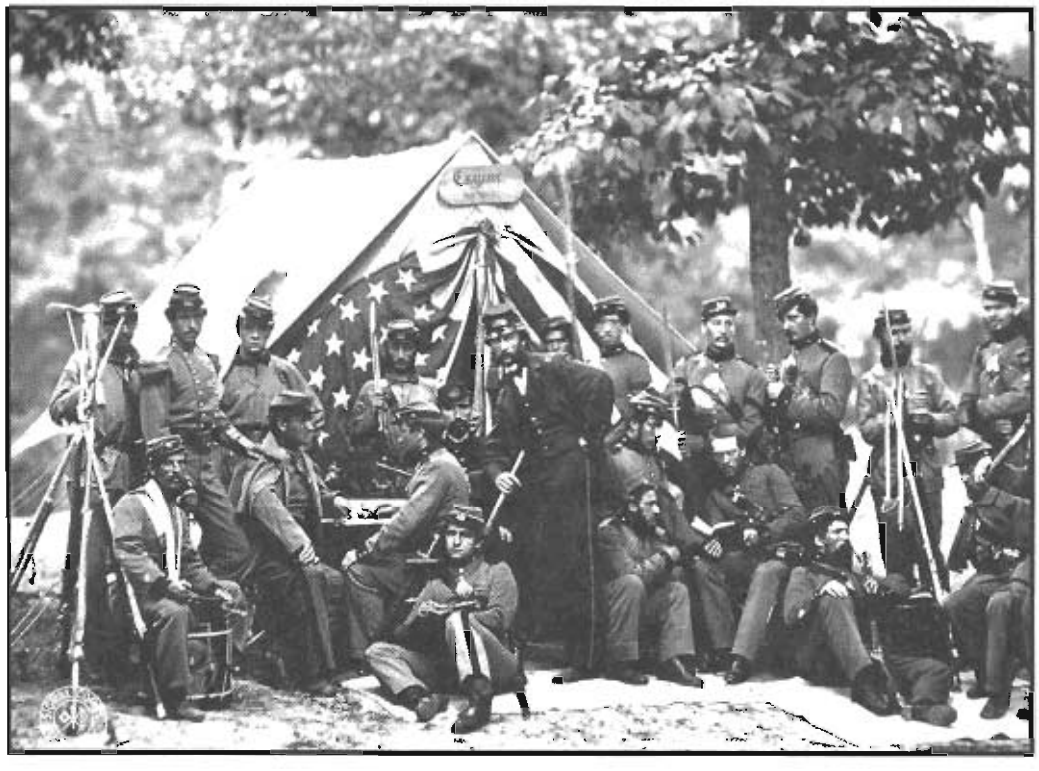
Other information can be found in written histories, such as the official history of World War II published by the Center of Military History, Washington, D.C., or books written by participants. Some material can be found in publications such as the *Stars and Stripes* and *Yank* magazines. Command newsletters, such as the *Castle Courier* (the newsletter of the engineer command in Vietnam), are excellent sources for units that served in Southeast Asia. Often, the Military History Institute at Carlisle Barracks, Pennsylvania, is the best single source for much of this type of publication. *Military Engineer* and *Engineer*, the professional bulletin of Army engineers, have traditionally published articles on unit activities. The Defense Technical Information Center (DTIC) has some of the quarterly reports (lessons learned) written by engineer units in Vietnam. Many Army libraries have access to DTIC and can order these reports.

The History Office, Office of the Chief of Engineers, at Alexandria, Virginia, has an extensive unit-history collection. A master index for each unit identifies what type of material is present, including oral interviews with senior engineer officers. In addition, a call or note to the Organizational History Branch of the Center of Military History can produce information on the unit's history and the symbology of the organization's crest or distinctive unit insignia.

While the Engineer School at Fort Leonard Wood has been slowly collecting unit material, there is much we do not have. A call or note would determine what is available. Again, with patience and determination, enough material can be collected to write a unit history that is useful in telling new soldiers a story of challenges and accomplishments.

That story normally deals with operations in war because most of the information found in the Archives, Carlisle Barracks, and other places deals with units in war. While that is important, combat constitutes only a small part of any unit's overall history. A greater amount of time is spent in peacetime and involves the countless challenges and requirements of an Army not at war.

Ironically, the unit's efforts in peacetime in such areas as training can provide the second important benefit of unit history and the organizational history file—support for decision making. Unit commanders face numerous challenges over the course of their command. Requirements for maintenance, training, and post and family support compete for attention and resources. This is not new. Peacetime is traditionally the most demanding period for an army because resources are scarce



This historical photo of the 8th New York State Militia is an example of recording unit history.



This photograph, taken by CPT Dunham of the 43rd Engineer Battalion, Fort Benning, Georgia, shows humor in recording his unit's history.

and requirements are not. The knowledge of how one's predecessors handled these conflicting demands would benefit any commander.

For example, if after-action reports from unit field training exercises (to include those at the National Training Center) were maintained over time, the current command could identify areas of consistent strength or weakness. When coupled with completion reports of construction projects, post-support detail summaries, etc., new commanders would know quickly what challenges to expect. Copies of annual organizational inspections, especially in the areas of maintenance, would reveal the impact of these demands on the readiness of equipment, unit morale, and soldier support.

Many of these reports are found in other files in the headquarters, such as the S3 and S4 files. However, these items normally have a comparatively short file life. Regulatory requirements to retire certain files after a cutoff date, and the simple need for file space, normally account for the demise of historically significant documents. By contrast, the Organizational History File, MARKS number 870-5a, is a permanent file. Regardless of who maintains the file, it exists as long as the unit does. Therefore, the material placed in that file will always be available to commanders or their staffs.

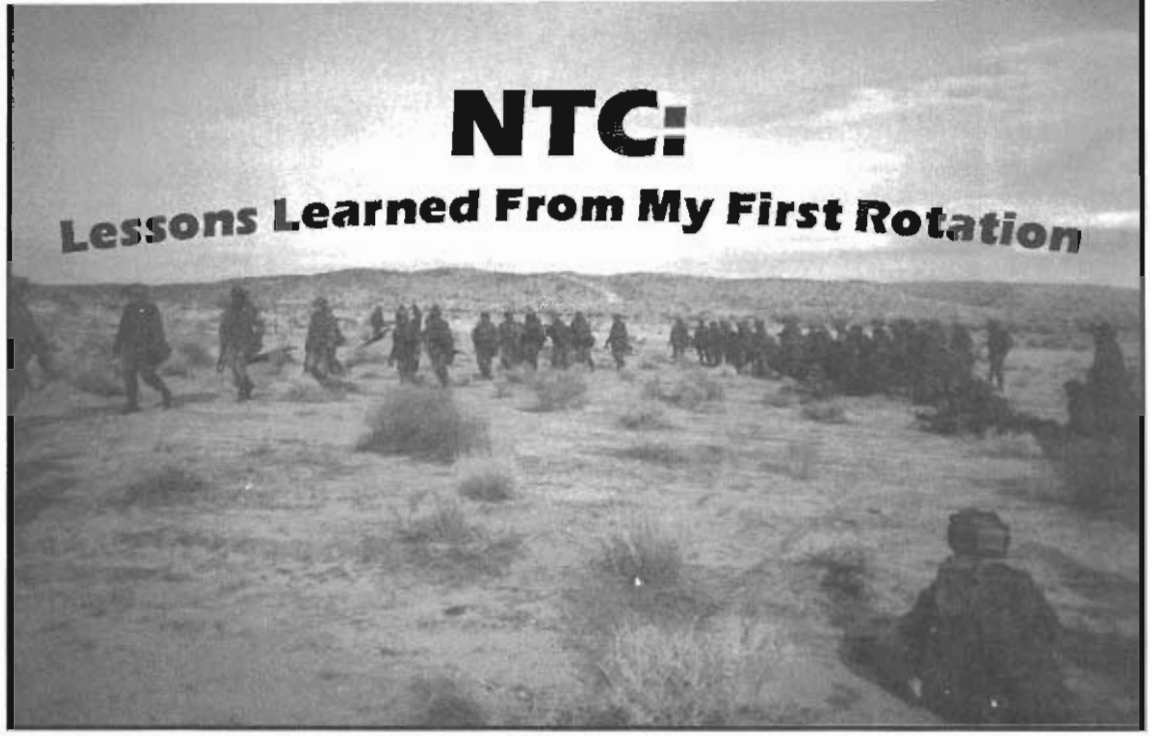
Some may consider it strange to put a command-inspection report or a field exercise after-action report in a "history" file. That is because too many believe that history is what happened 20 or 30 years ago. In fact, yesterday is history; it has happened and cannot be changed. The material placed in the historical file today becomes the historical material for all who serve in the unit in the future. Invariably, the value of that file is driven by the quality of material placed in it.

One of the most important items that could be placed in the file is the commander's review and assessment of activities. Virtually every unit is required to produce some form of annual historical report. Often, these documents are of marginal value, being only copies of last year's input with the names, statistics, and dates changed. However, this report could be invaluable if seen in the context of what was done, why, how, and the lessons learned from the effort. An annual—or even more frequent—summary of what the unit did, what initiatives were taken, and what worked or did not work would be extremely useful to future unit leaders.

In the past, end-of-tour reports were common for many unit commanders and key personnel. Today, we tend to limit that type of report to general officers. However, there is no reason why key officers and NCOs in a command should not write such a report. Not only would it be valuable in the unit history effort, but it would also be useful in providing perspectives and insights gained during service with the unit.

History is valuable to the profession of arms. Many famous leaders have attested to the value of applying the lessons of the past to the challenges of the present. The knowledge and appreciation of a unit's accomplishments are important in building and sustaining esprit de corps. Soldiers are challenged to maintain the traditions and standards of those who came before them. However, the raw materials of a unit history—the reports and papers that document what happened and why—can also be used to help current leaders guide their soldiers through the demands of today. Maintaining a viable unit-history file will serve all those who follow.

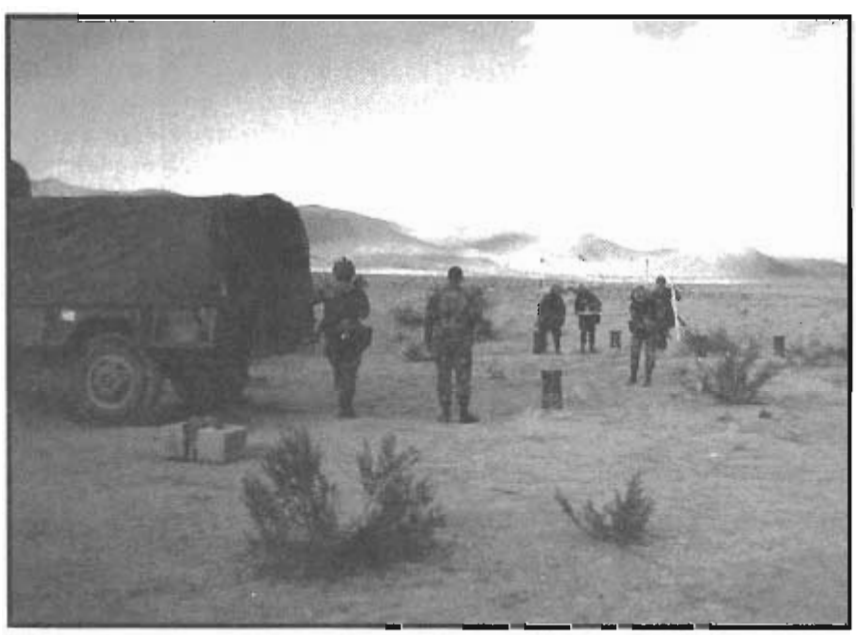
Dr. Roberts is the U.S. Army Engineer School historian at Fort Leonard Wood, Missouri.



NTC:
Lessons Learned From My First Rotation

By Second Lieutenant Steven L. Kreh

Throughout the Engineer Officer Basic Course and other training, I was told to prepare for anything once I arrived at my permanent duty station. Fortunately, I landed in an excellent position to learn how to be a platoon leader. After 3 weeks with my new company, I had the opportunity to go to the National Training Center (NTC) at Fort Irwin, California, where I was a liaison officer to a light engineer attachment. This position gave me time to observe platoon leaders and learn from their mistakes and successes. I learned several lessons from the operations in this training environment that will help me become a better platoon leader: how to develop and execute a well-rehearsed plan, remain flexible at the platoon level, and issue a proper operations order (OPORD) for each mission.



Soldiers train in the National Training Center desert.

Developing and Executing a Plan

A well-rehearsed plan is a key ingredient in conducting a successful operation. The main problem within the light engineer attachment was indecisiveness regarding the location of obstacles and fighting positions. This created several problems for the engineer platoon personnel because they needed to know the general location of an obstacle before any work could begin. If the platoon leader could not site in the obstacle, then the platoon could not begin to work on the obstacle. This pushed back the timeline and made it next to impossible for the engineers to execute all the planned obstacles.

What seemed to work best during the wargaming process was a thorough plan that provided the task-force engineer knowledge of where his soldiers could work as soon as they hit the ground. Planning allowed time for the squad leaders to conduct precombat checks (PCCs) and rehearsals for the upcoming missions. When the company team conducted a proper rehearsal, the unit fought well, and the soldiers all knew their roles. If engineers are given a plan that the task force fully develops and adheres to, they can conduct proper rehearsals and PCCs to ensure that they increase productivity to their highest level.

(continued on page 46)

Space Heater Safety

By Fred Fanning

Each winter, soldiers are injured by improper use of space heaters. The key to preventing these injuries is a unit program that identifies the hazards associated with the specific space heaters the unit uses and the implementation of procedures that will reduce or eliminate the hazards. However, this program is only effective if the procedures are actually implemented.

Improper operation of space heaters is normally at the root of the problem. Proper operation begins by identifying a soldier to operate the heater, followed by heater-specific training that results in licensing the soldier. AR 600-55, *The Army Driver and Operator Standardization Program*, provides guidance on selecting, training, and licensing heater operators. Unit personnel use the appropriate technical manual for the heater to develop lesson plans for the training. A hands-on performance evaluation is the best way to determine the skill level before licensing.

Table 1 lists the most common contributing factors to space-heater accidents. In reading through the list, it becomes apparent that if the soldier is properly selected, trained, and licensed, many of these factors can be avoided. Adding proper supervision to the program not only will ensure that the operator is trained and licensed but also will identify and correct hazards with the heaters, their fuel, and their use. Table 2, page 46, provides a list of measures that unit leaders can use to control or eliminate the hazards.

Various types of space heaters are used. The best types are the Army type-classified heaters, with laboratory evaluations and technical manuals to assist units in their use. Space heaters that use fossil fuels should always be vented outside the space being used or potentially being used by personnel. This limits their exposure to carbon monoxide gas, which is colorless and tasteless and normally cannot be detected by personnel. It is key to limit or prevent exposure to this gas.

Risk management should also be a part of the safety program. This process is best implemented by leaders to ensure that control measures are used and that hazard and control-measure information is passed on to soldiers who will be exposed to the hazards of operating space heaters.

Through the proper application of a space-heater safety program, leaders can control and eliminate the hazards faced by their soldiers. This program will enhance a unit's ability to conduct missions by preventing burns or deaths to soldiers and fire damage that often destroys equipment. A winter-weather alert for leader use can be found under the winter-hazard section of the U.S. Army Maneuver Support Center Safety Office home page at *www.wood.army.mil/safety/*.

Mr. Fanning is the Maneuver Support Center safety director.

Table 1. Contributing Factors to Space-Heater Accidents

- Failing to train personnel to operate space heaters.
- Using the wrong type of fuel.
- Placing clothing, tent materials, and other items too close to heaters and stovepipes.
- Storing flammables and ammunition/explosives inside tents.
- Refueling heaters before they have cooled.
- Leaving heaters unattended while operating.
- Maintaining heater units improperly.
- Failing to establish emergency procedures and make available and maintain fire-fighting equipment.

Table 2. Control Measures to Reduce Space-Heater Accidents

- Train personnel to operate space heaters safely and according to AR 600-55.
- Ensure that the proper type of fuel is used. Label the fuel container according to its contents. Refer to the operator or technical manual for recommended fuel.
- Keep clothes (wet or dry) at least 24 inches away from heating sources.
- Place tent stoves on a noncombustible base and surround them by a sandbox no smaller than 36 by 36 by 4 inches when sand and wooden construction materials are available. Install tent stoves at least 4 feet from tent walls. Keep tent flaps and ties near the stove opening away from the stovepipe.
- Place fuel containers at least 5 feet from the outside wall of the tent. Dike the containers to prevent fuel from spreading to space heaters.
- Avoid storing ammunition, combustible and corrosive materials, explosives, pyrotechnics, and simulators in tents with stoves or other heating sources.
- Turn off space heaters and allow them to cool for at least 30 minutes before refueling.
- Use only heaters with a ventilation system that is compatible with shielded tent-vent-stack openings. Extend at least two pipe sections above a tent peak. Keep a 2-inch ventilation space between the exhaust pipe and the tent.
- Designate a fire guard for each tent or a group of tents and brief him on his responsibilities and procedures.
- Check heating units (including fuel lines and connections) daily for leaks and malfunctions. Allow only qualified maintenance personnel to make repairs. Turn in equipment through supply channels when maintenance personnel are unable to repair.
- Develop and implement a field fire-alarm system. Make available a fire extinguisher, shovel, and ax at selected fire points. Provide at least one 10-pound dry chemical and water extinguisher per general-purpose (GP), medium tent and one pressurized water extinguisher for a GP, small tent. Ensure that all fire extinguishers are in operating condition. Ensure that all water fire extinguishers are winterized before using in winter months.

(continued from page 44)

Remaining Flexible

Flexibility gives a leader the opportunity to adjust to the changing environment of a battle. When the task force carefully planned where to put every obstacle in a defense at the NTC, that location would change once the engineer platoon leader conducted his reconnaissance and noticed a better location for the obstacle. For this reason, flexibility became extremely important in every successful mission.

Another example of flexibility being key was the location and utilization of obstacle-construction materials, referred to as Class IV. The task force never properly planned or executed a Class IV point, which meant that the engineers could not rely on the materials being where they were needed. The platoon leader had to remain flexible and adjust his plan so his soldiers could transport the materials to where he needed them. A mission will never go exactly as planned, no matter how much preparation is put into it, but this does not mean that a unit should disregard planning altogether. When the task force develops a thorough plan, the unit can react quickly when things do not go according to the plan. As long as platoon leaders remain flexible, they can adjust to ensure that they meet their commander's intent.

Issuing OPORDs

The commander's intent defines what a successful mission entails, and it comes from an OPORD. Although it takes some time to prepare, an OPORD provides all the information needed to conduct a mission. Without this knowledge, a platoon leader cannot expect his subordinate leaders to understand a mission thoroughly. Too often, soldiers—to include the squad leaders—are not informed regarding mission specifics because they have not received a proper OPORD. If a platoon leader does not properly give an OPORD to his platoon, they must work without any knowledge of why they are performing that mission.

Conclusion

A well-rehearsed plan, flexibility, and a proper OPORD are essential to the success of a platoon. Without these key elements, a platoon cannot execute all of its missions efficiently. These elements are critical to a platoon's functioning despite operating in the confusing and constantly changing environment of war. The NTC allows soldiers to train under conditions that resemble war without actually being in a war. The NTC is a great environment in which to train as a soldier, but a platoon will only get out of the experience what it puts into it. The best advice is to understand that the NTC is a training environment and that everyone will make mistakes. The important thing is that the soldiers learn from those mistakes and use their experiences when deploying to a hostile nation.

Second Lieutenant Kreh is assigned to C Company, 4th Engineer Battalion, Fort Carson, Colorado. He was previously a platoon leader in A Company, 4th Engineer Battalion.

ENGINEER UPDATE

Commercial numbers are (573) 563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

Engineer School

USAES Web Site. To access the U.S. Army Engineer School Web site, go to *http://www.wood.army.mil/eschool/.*

POC is LTC Billy Tollison, (573) 596-0131, ext. 3-7166; DSN -7166; or e-mail tollisob@wood.army.mil.

Lineage and Honors Updates. This office recently acquired the "current" Lineage and Honors statements of active, Reserve, and National Guard engineer units. In many instances, these statements are more than 20 years old. The Center of Military History (CMH), which maintains the Lineage and Honors of units, updates the statements only when it receives a formal request from a unit for an update. We recommend that you look at your Lineage and Honors and, if necessary, request an update from the CMH. The address is:

U.S. Army Center of Military History
ATTN: DAMH-FPO
103 Third Avenue
Fort McNair, D.C. 20319-5058

POC is Dr. Larry Roberts, Historian, -6109; DSN -6109; or e-mail *robertsl@wood.army.mil.*

Directorate of Training (DOT)

Engineer Bradley Fighting Vehicle (EBFV) Military Occupational Classification Structure (MOCS) Proposal. DA PERSCOM has approved this proposal, which authorizes engineers to use additional skill identifiers (ASIs) for the Engineer Bradley Operator Course, the Master Gunner Course, and the Bradley Leaders Course (BLC). The EBFV approval calls for the use of three existing skill identifiers/ASIs and the creation of one new ASI as follows:

- 3X for engineer officers who attend the BLC at Fort Benning, Georgia.
- D3 for engineer NCOs who attend the BLC at Fort Benning.
- J3 for battalion and brigade NCOs who attend the Bradley Fighting Vehicle (BFV) Master Gunner Course at Fort Benning.
- D5 for Skill Level 10 engineer soldiers is a new ASI. It will be awarded to one-station unit training (OSUT) graduates who also complete the Combat Engineer BFV Course at Fort Leonard Wood, Missouri. (The first course is tentatively scheduled for FY05.)

POC is Ms. Victoria Anthony, -6137, DSN -6137, or e-mail *anthonyv@wood.army.mil.*

Engineer Lessons Learned. To help build our lessons-learned database, we request that field units send us their significant engineer-related lessons learned. A recent addition to the database is task-force and higher after-action reports from Bosnia. In addition to lessons learned, we want to develop a digital archive of tactical unit SOPs to help units develop and maintain their SOPs. Please send copies of your SOPs to help get this started.

POC is Mr. Reggie Snodgrass, (573) 596-0131, ext. 3-7762; DSN -7762; or e-mail *snodgrar@wood.army.mil.*

Engineer Officer Advanced Course (EOAC) Training. In this course, we are emphasizing military operations in urban terrain (MOUT) as it applies to the Engineer Branch; stability and support operational scenarios; and engineer support to light forces. Current training materials are available at *http://www.wood.army.mil/OTD/EOAC%20Homepage.htm.*

POC is MAJ Steve Cross, Royal Australian Engineers, -4128; DSN -4128; or e-mail *crosss@wood.army.mil.*

Terrain Visualization II CD-ROM. We are in the final stages of completing the Terrain Visualization II CD- ROM and forwarding it to TRADOC for approval. We expect this TerraBase II product to be available by the end of second quarter FY01.

POC is CPT Chris Kramer or Mr. Ed Zielonka, (573) 596-0131, ext. 3-7060/7061, or DSN -7060/7061.

Countermine Training Support Center/Humanitarian Demining Training Center Web Site. Visit our revised Web site at *http://www.wood.army.mil/ctsc*.

POC is Dr. Steve Grzyb, -6199; DSN -6199; or e-mail *grzybst@wood.army.mil*.

Mobile Training Teams (MTTs). We have two mine-awareness MTT programs of instruction—one is for all arms and the other is engineer-specific. Contact us early in your preparation for deployment if you need an MTT so that we can put you on the calendar. We normally try to schedule the actual training within 3 months of deployment. Units are required to pay associated costs.

POC is Dr. Steve Grzyb, -6199; DSN -6199; or e-mail *grzybst@wood.army.mil*.

Unit Environmental Compliance Officer (UECO) Course. Development of our Web-based UECO course is progressing well, and we are now in the final reviewing stages. This course, which is designed to supplement current UECO courses as required by AR 200-1, *Environmental Protection and Enhancement*, will be provided to installations.

POC is MAJ John Whitfield, (573) 596-0131 ext. 3-5647; DSN-5647; or e-mail *whitfiej@wood.army.mil*.

Environmental Websites. The homepage for the Office of the Director of Environmental Programs at *www.hqda.army.mil/acsimweb/env* is an excellent site for "communication and information between major Army commands." The site also serves as an unclassified information source for all parties interested in the Army's compliance program. Another excellent site for critical information pertaining to environmental compliance is the U.S. Army Environmental Center (USAEC) homepage at *http://www.aec.army.mil*. The USAEC provides technical services to HQDA, major commands, and commanders and also integrates, coordinates, and oversees implementation of the Army's environmental programs for the Army Staff, HQDA.

POC is MAJ John Whitfield, (573) 596-0131 ext. 3-5647; DSN-5647; or e-mail *whitfiej@wood.army.mil*.

Directorate of Training Development (DOTD)

Field Manual Update. The following field manuals have recently been sent to ATSC to be printed and distributed. They are available for viewing and downloading from the MANSCEN Publications Page at *http://www.wood.army.mil/PUBS/newpubs/htm*.

- FM 3-34.331, *Topographic Surveying*. This manual, which combines FM 5-232 and TMs 5-232 and 5-237, is a guide for military occupational specialty 82D (topographic surveyor). It provides techniques not found in any commercial text concerning the precise determination of position, azimuth, or elevation of a point. Additionally, this publication describes and standardizes procedures for performing recons, preparing station descriptions, and reporting and briefing survey projects.
- FM 5-472, Change 1, *Materials Testing*. This change corrects some formulas given in the basic publication.
- FM 5-125, Change 1, *Rigging*. This change addresses safety considerations related to determining when wire rope is beyond the recommended serviceability.

The following publications will be sent for printing and distribution within the next 60 days:

- FM 20-32, Change 1, *Mine/Countermine Operations*.
- FM 5-250, Change 2, *Explosives and Demolitions*.

POC is Sandra Gibson, -4100.

2001 Engineer Unit Directory. The directory, which is updated periodically, is available at *http://www.wood.army.mil/PUBS/dsd/dsd.htm*. Units may submit changes/corrections at any time via e-mail to Jennifer Morgan at *morganj@wood.army.mil*.

POC is Jennifer Morgan, (573) 596-0131, ext. 3-7644, or DSN –7644.

Engineer Assistant Commandant Promoted

By Specialist Peter Fitzgerald



BG Johnson addresses the crowd at his promotion ceremony.

(This article is reprinted with permission from *The Guidon*.)

The morning star seen on Friday, 5 January, belonged to Fort Leonard Wood's newest general officer, BG Ronald Johnson.

Johnson, assistant commandant of the U.S. Army Engineer School, was promoted to the rank of brigadier general in a Friday morning ceremony at Davidson Fitness Center.

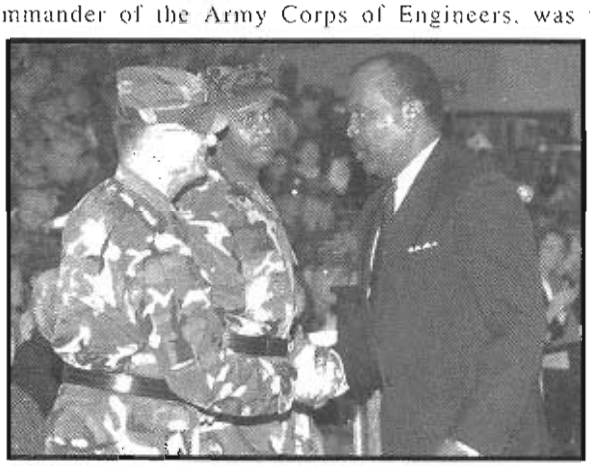
"It is with great humility and healthy perspective that I accept this promotion today," said Johnson.

Service members, community leaders, Johnson family members, and friends all gathered to pay tribute to the Chicago native. The ceremony included a static parade formed by representatives from all the units on post. The 399th Army Band was also there to add an air of stateliness to the occasion.

MG Anders Aadland, post commanding general, opened the ceremony, describing Johnson as "a strong leader, outstanding role model for our troops, combat ready Sapper warrior, thoughtful mentor, father, and husband."

"He's had a huge role in the training of our Engineer soldiers and leaders," Aadland added.

Retired LTG Joe Ballard, 49th Chief of Engineers and former commander of the Army Corps of Engineers, was the ceremony's guest speaker. Ballard, a former Fort Leonard Wood commanding general, said the promotion was "a cause for celebration."



BG Johnson stands beside MG Aadland as he greets retired LTG Ballard.

"He is just the kind of general officer our Army needs," Ballard said. "He's an excellent leader. He takes care of his people, and he's conscientious and dedicated."

Ballard, along with Clyde Redmon, Johnson's father-in-law, helped pin on the general's new stars. Family members and colleagues cheered as Johnson strapped on the distinctive general officer's belt for the first time.

"It's a great feeling," said Rita Lambert, Johnson's sister-in-law. "We're very proud of Ron and his accomplishments. It's a lovely ceremony, and we're glad to be a part of it."

Taking the stand, Johnson thanked his family for their support. He also thanked his colleagues, mentors, and fellow soldiers by saying, "This really isn't about me. This is about those of you who have contributed to my success."

In closing, Johnson said, "This is a great day to be a soldier. It is a greater day to be a general officer."

Johnson was commissioned in the Corps of Engineers after receiving a bachelor of science degree from the U.S. Military Academy at West Point, New York, in 1976. Johnson assumed duties as assistant commandant of the Engineer School in August 1999. He has previously served as executive officer to the Secretary of the Army and senior aide de camp to the Secretary of the Army.

Johnson has also commanded the 130th Engineer Brigade in Hanau, Germany, and the 14th Engineer Battalion at Fort Ord, California, and Fort Lewis, Washington.

Johnson has a master's in operations research and systems analysis from the Georgia Institute of Technology in Atlanta. He has also been a mathematics professor at West Point and a 1995 U. S. Army War College Fellow at the Joint Center for Political and Economic Studies.

Johnson is married to the former Iris Redmon of Pensacola, Florida. The Johnsons have an 11-year-old son, Ian.



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