Engineer

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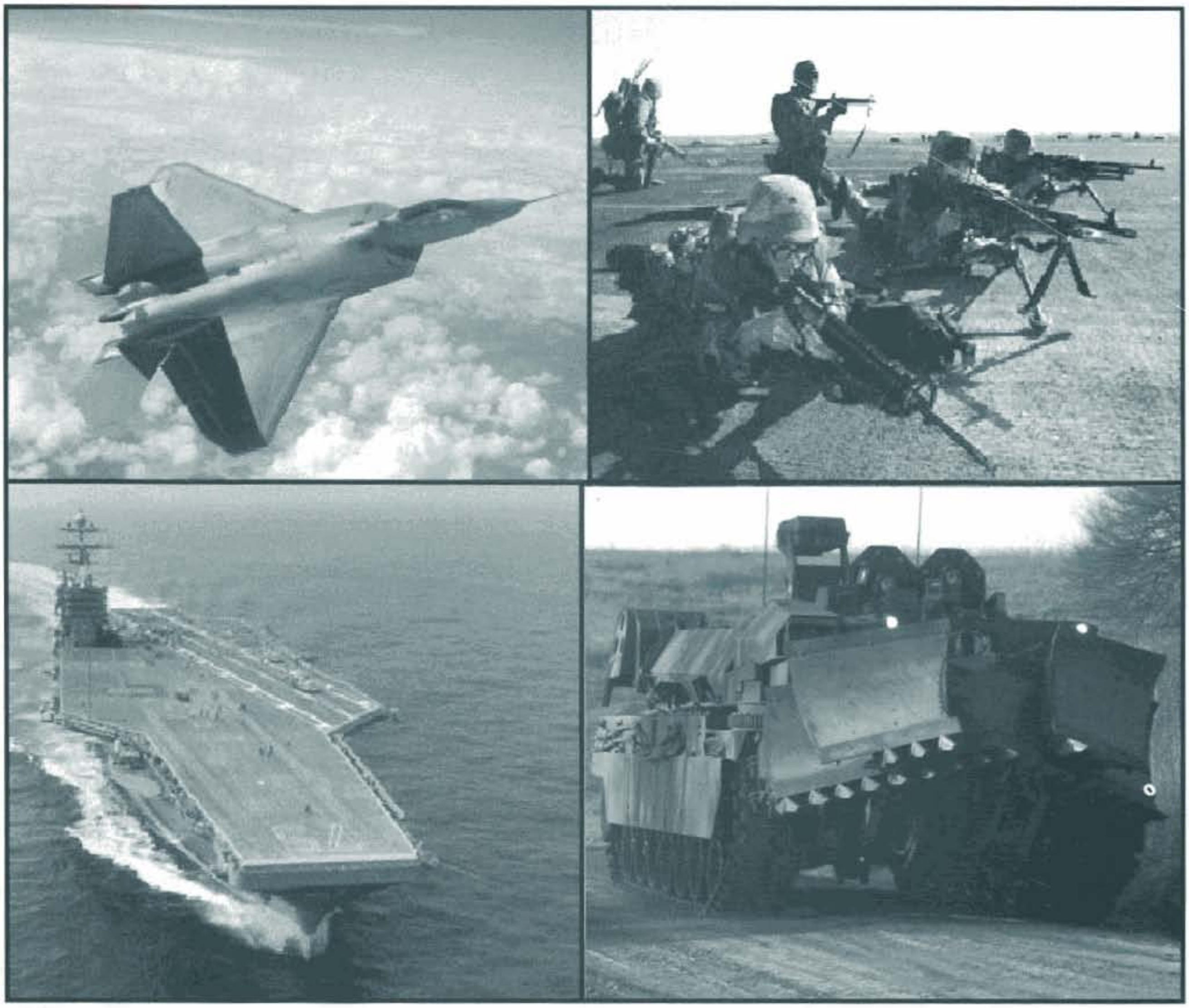

Joint Operations

Headquarters, Department of the Army
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CLEAR THE WAY

By Major General Robert B. Flowers
Commandant, U.S. Army Engineer School

The leader's statement, "How so few can do so much for so many" is a perfect fit for the many accomplishments the U.S. Army Engineer School has managed this past year. Our community has experienced great change, not only in the myriad of tasks required for our seamless transition to the Maneuver Support Center (MANSCEN) but also in what we do best—supporting the engineer community. We will continue to march proudly into the future as we modernize our engineer force structure by synchronizing Force XXI and Army After Next efforts, complete Engineer School reorganization under MANSCEN, and continue to develop current doctrine.

Our Doctrine Division continues to work on "high priority" manuals: FM 90-13-1, *Combined Arms Breaching Operations*, FM 90-7, *Combined Arms Obstacle Integration*, and FM 5-103, *Survivability*. Furthermore, the division continues to work on Force XXI and the joint contingency force requirements. The article "Joint Doctrine Update" appears on page 24 of this magazine.

The theme for this year's ENFORCE Conference is "Joint Engineers: America's Total Engineer Force for the Next Millennium." We believe that this event has all the attributes of an outstanding conference. One of the highlights this year, presented by 1st Engineer Brigade, is a tactical twilight tattoo that outlines the rich history of the Engineer Regiment.

If you have not had an opportunity to visit our installation recently, I extend my personal invitation for you to do so. As soon as you enter the front gate, you will feel an air of vitality and energy. You will see an installation going through its maturation process as the Army's Maneuver Support Center. A $260 million construction effort on this post supports our soldiers' training needs. It leverages and synchronizes the Engineer School with the Chemical and Military Police Schools. This marriage truly passes the "common-sense test" in savings to the nation's taxpayers. The construction also supports the role these proponent schools will play in satisfying future Homeland Defense training and doctrinal requirements.

This spring, Fort Leonard Wood will reorganize to common corps subjects that will be taught by MANSCEN personnel under the Directorate of Common Leader Training. These courses include subjects that are common to all branches—for example, legal and medical courses. This will allow the proponent schools to focus training energies on branch-specific subjects. We have programmed this transition so the impact will be seamless to the engineer community at large.

In March, I had the opportunity to testify to a congressional subcommittee concerning our installation's readiness. I took this occasion to highlight our many accomplishments in 1998. Last year we trained more than 32,000 soldiers in 60 military occupational specialties (MOS) through our Basic and Advanced Individual Training, Basic and Advanced NCO Courses, Drill Sergeant School, Officer Basic and Captain Career Courses, and Precommand Courses for senior leaders. We also trained 4,000 sailors, marines, and airmen via interservice training courses. Furthermore, I extended my personal thanks to Congress for their efforts in improving our soldier's pay and retirement benefits.

Your Engineer School accomplishes all this while training and producing the finest soldiers and leaders throughout the training base. During the past two years, commanders at Fort Leonard Wood have used Army Performance Improvement Criteria principles to document and optimize their training program of instruction. After base-lining their soldiers' performance to that of other TRADOC installations, we found our soldiers set the standard in marksmanship, physical fitness training, and basic soldiers' skills testing.

Keeping my finger on the training pulse of our field units is imperative if we are to fulfill our mission at the Engineer School. I want to personally thank all of the commanders and key leaders who participated in the recent Commandant's VTC. The issues, concerns, and discussions have not fallen on deaf ears. I want you to know that we at the schoolhouse are working your issues with renewed vigor. It is our goal to meet your visions and training objectives so that engineer soldiers and leaders are trained for whatever the future may hold.

Along with all these innovations and changes come new faces and jobs. I would like to announce just a couple: Colonel Bill Van Horn will become the Engineer Assistant Commandant, and Colonel Marsha Killam will become Director of the Directorate of Common Leader Training.

We are living in a fast-paced environment. All of us at the Engineer School are committed to providing you with world-class training support. See you at the conference!

Essayons!

Engineer

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UNITED STATES ARMY ENGINEER CENTER AND FORT LEONARD WOOD

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Front Cover: *Joint operations, represented by (left to right) the U.S. Air Force, Marine Corps, Army, and Navy, ensure strong warfighting capabilities.*

Back Cover: *Historical example of the Army value "Honor."*

FEATURES

DEPARTMENTS

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BOSNIA:
THE SECOND TIME AROUND

By Colonel Thomas P. Bostick

The 1st Armored Division completed its second deployment to Bosnia on 7 October 1998. A number of units in the division, including the Engineer Brigade, served during various periods throughout the one-year rotation. The 16th and 40th Engineer Battalions deployed at different times during the year, and a portion of the Engineer Brigade Headquarters Company deployed for the entire year. Engineers were actively engaged in missions on two major fronts: demining and construction. The successful rotation in Bosnia was a total team effort. Army engineers worked side-by-side with Navy and Air Force personnel, civilians, Brown & Root and other contractors, NATO and non-NATO allies, and many others. This article highlights some of the missions and lessons learned throughout the deployment.

Demining

Much progress was made in moving toward the demining end state identified by the Stabilization Force (SFOR) commander: a national, sustainable demining capability. Several key elements of the campaign plan were vital to achieving this end state: organization, training, equipment, and insurance.

Organization

The organizational structure successfully transitioned from the U.N. Mine Action Center to the Bosnia-Herzegovina Mine Action Center, which includes representatives from both the Federation and Republika Srpska. This center has overall responsibility for the demining program throughout Bosnia-Herzegovina. The SFOR headquarters, through the multinational divisions, met regularly with the Entity (Federation and Serb) Mine Action Centers and the Entity Armed Forces (EAF) to determine future areas of work. Entity Mine Action Center personnel worked with EAF soldiers to determine areas of focus, while SFOR retained veto power over sites selected. SFOR soldiers monitored the EAF demining efforts. *SFOR participation in overseeing the demining process could continue to decrease with additional training for EAF monitors and quality-control observers.*

A significant challenge in achieving all the requirements set by the Dayton Accords is to complete civil implementation tasks. The military continued to provide a secure and stable environment, but the civil implementation tasks were a challenge to plan, coordinate, and execute. Demining provides a model for how civil and military tasks may work together. The U.N. Mine Action Center controlled the tasks and priorities of the civilian demining organizations, while SFOR monitored the military demining effort. Both organizations worked in parallel toward a common goal. Early in the process, the military placed a demining expert liaison officer in the U.N. Mine Action Center to help synchronize civilian and military efforts. Equally important, commanders worked at all levels—including SFOR, Multinational Division-North, and the EAF—to regularly address requirements, training, and ongoing issues. Because of the coordination between the U.N. Mine Action Center and SFOR, the demining mission could more effectively employ the efforts of multiple non-governmental and private volunteer organizations.

Training

Long-term training programs in Bosnia allowed the country to train its own deminers. U.S. Special Operations Forces (SOF) established three training centers for military and civilian deminers. The SOF coordinate many demining operations throughout the world, but combat engineers have a significant role in Bosnia. *It is important that SOF provide a liaison officer to combat engineers early in this type of mission and throughout peacekeeping operations.* Liaison officers are important to ensure a coordinated effort in key areas—such as training, funding, and equipment—so that resources are appropriately distributed among the many demining operations that require military support.

The demining challenge in stability operations requires long-term solutions. Therefore, in-theater schools that help to train the indigenous population must be established early in the campaign. Training both military and civilian deminers in Bosnia reduces the need for SFOR engineers in the training arena. Training for the civilian population in Bosnia-Herzegovina is also important. Many initiatives, including Superman comic books, were used to educate the local populace. Figure 1, page 3, shows the significant progress made in reducing mine strikes in Bosnia.

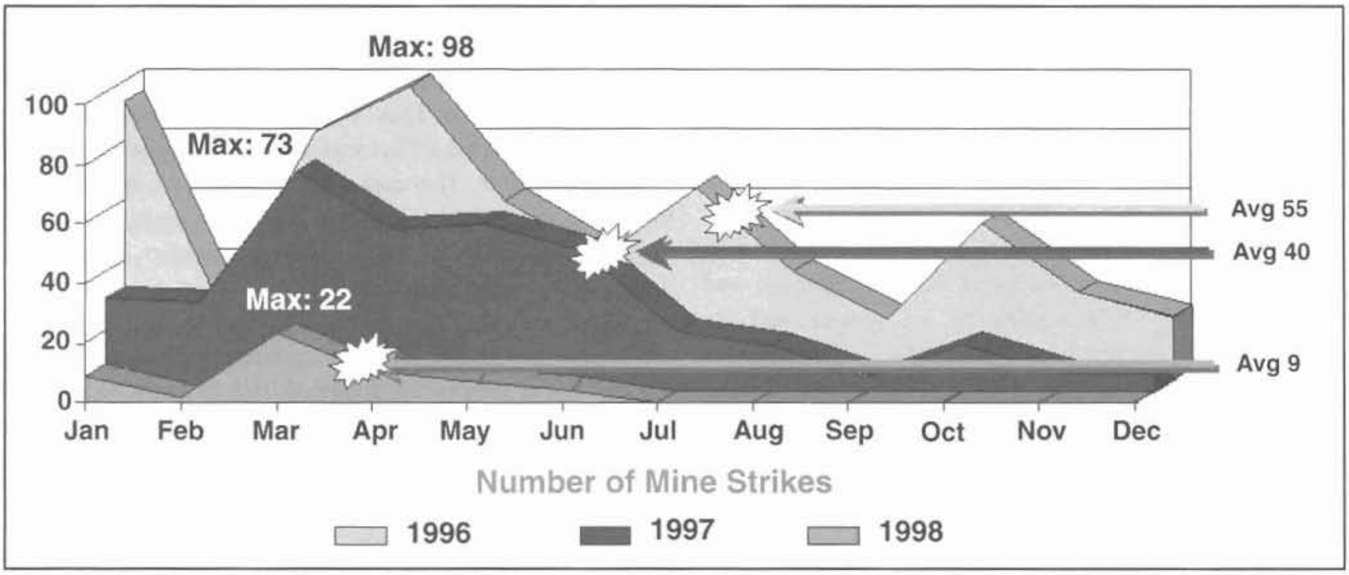


Figure 1

Equipment

SFOR purchased mechanical demining equipment similar to the U.S. miniflail for the EAF demining teams. They also acquired additional personal protective gear and mechanical demining equipment. The EAF used a small number of T55 tanks with rollers, which were particularly effective in relatively flat areas. The EAF teams were much more effective and willing to do dangerous demining work when they were properly equipped. *Providing equipment to the EAF early and establishing a regular accountability and resupply program of essential items would make it possible for their personnel to work more often and more effectively.*

Insurance

The Entity Armed Forces now have health and life insurance, which is a major improvement. Before insurance could be acquired, the EAF had to agree to several stipulations. One stipulation was to convert their mine-clearing operations to humanitarian standards. They had to perform to the same standards and use the same techniques as those used by U.N. civilian deminers. They could not continue to lift mines identified only on minefield records. The EAF successfully made this transition in July 1998, and they now focus on the amount of land cleared rather than total mines lifted. Early in the demining program, it was not uncommon for less than 50 percent of the lifting teams to arrive at work. Their reasons included pay, equipment, and insurance. Several attempts to gain funding for deminers from the international community and various countries were unsuccessful. However, insurance for deminers was very important to the EAF, and the international community supported this initiative for moral reasons. Combined with training and equipment, insurance for deminers made a huge impact on their morale and efforts. Near the end of the 1st Armored Division's year in Bosnia, 100 percent of the demining teams often arrived at work each day.

Training and organizing EAF monitors and quality-assurance officers to assume the role of SFOR monitors is a key element in achieving the end state. With proper training, the EAF can assume this responsibility and report to the Entity Mine Action Center, which will reduce the requirement for SFOR engineer monitors. The overall demining campaign in Bosnia has made significant progress. The lessons learned in organizing, training, equipping, and insuring personnel may be applicable to future operations in countries ravaged by mine challenges.

Construction

During late 1998 and early 1999, Task Force Eagle received the most significant construction mission since U.S. forces arrived in Bosnia. Some of the major projects were airfield repair, hospital construction, SEA-huts (Southeast Asia huts) for most troops, two base camp closures, and asphalt road repair. Many smaller projects were completed or are ongoing. The surge of construction was funded with a supplemental appropriation from Congress of about $34 million. Much of the construction was performed during an intensive period that also included Bosnia-Herzegovina elections and transfer of authority to the 1st Cavalry Division. The construction mission was a joint and combined effort of Army combat heavy and mechanized engineers, Navy Seabees, Air Force personnel, allied engineers, USACE, and Brown & Root contractors.

The 1st Armored Division Engineer Brigade headquarters provided command and control for both the construction and demining missions. The 130th Engineer Brigade deployed members of its construction management section and

B Company, 94th Engineer Battalion. The European District provided civilian inspectors and engineers from Corps of Engineer districts in the United States. The surgeon general's office deployed a facilities planner to assist with hospital design and construction. The Navy deployed additional design and project management engineers, and the Air Force deployed an airfield construction expert. Mechanized combat engineers worked side-by-side with Navy Seabees and Army combat heavy engineers, and USAREUR used tele-engineering to provide off-site assistance with challenging sewage and electrical power design. These teams, as well as others, were key to success. *In Bosnia, engineer teams designed and constructed several significant projects. Future operations must plan for these teams to come together quickly through a cadre of rapidly deployable experts.*

Airfield Repair

The Tuzla Airfield presented several challenges before it was completed. The most significant were funding and the need for airfield construction expertise. Task Force Eagle worked with funding constraints that were difficult to overcome in a peacekeeping mission. *Department of Defense leaders must reassess the standard military new-construction limit of $500,000 and repair limits of $2 million in terms of how they apply to peacekeeping environments.* NATO provided some funding for the airfield and may ultimately fund the entire airfield repair. SFOR, USAREUR, and U.S. Air Force in Europe (USAFE) assisted Task Force Eagle throughout the entire funding process. USAFE provided an airfield construction management expert, who was valuable in working through translators to ensure that local subcontractors met stringent standards. The result is a strategic airfield that allows soldiers to fly, for the first time, directly from the United States into Tuzla (Figure 2).

Figure 2

Hospital Construction

Another significant construction mission for Task Force Eagle was a theater-of-operations hospital, so the medical facility at Guardian Base Camp could move to Eagle Base Camp before the 1st Cavalry Division arrived. The standard theater-of-operations hospital described in the theater construction manual did not meet the strict requirements of the medical community. Therefore, the surgeon general sent a facilities planner to Task Force Eagle to assist with the hospital design. This officer was extremely helpful throughout the entire process. The team effort resulted in a new hospital that was completed on time. *Engineers must include a facilities planner early in the planning process for projects with specific design requirements.*

SEA-huts

The primary goal of this rapid construction effort was to move soldiers out of tents by the winter of 1998. Soldiers, sailors, and civilians worked together to construct SEA-huts. A new design combined five single SEA-huts side-by-side with a latrine/shower unit located between the second and third huts (Figure 3). The new design reduced fire hazards and improved quality of life for soldiers by providing a common roof, covered walkways, and nearby latrine and shower facilities.

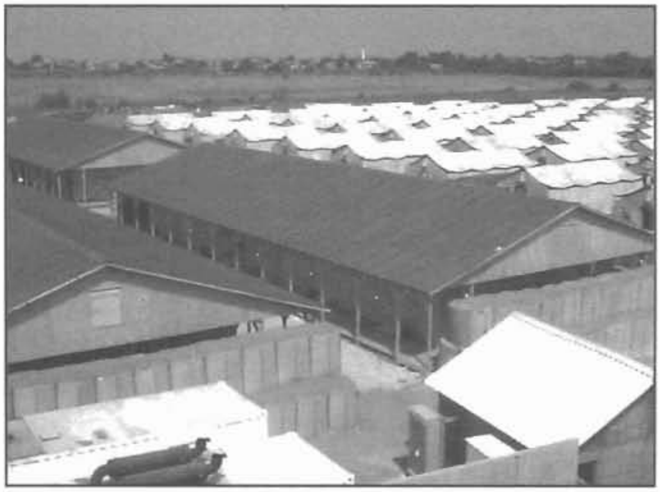


Figure 3

Base Camp Realignment

To improve efficiency, save money, and realign base camps, Task Force Eagle closed the Colt and Guardian Base Camps. These closures required that the entire logistics operations be moved from Guardian to Comanche Base Camp. A massive construction effort was required at Comanche that included living areas, a container storage handling area, a direct support maintenance building, a supply and service area building, 50-ton haul roads, a new dining facility, parking areas, and numerous other projects. Some of this construction had to be completed or be well under way so that the 1st Cavalry Division could move directly into Comanche and Eagle Base Camps.

One lesson learned during the construction mission was the synergistic effect of Navy Seabees, Army combat heavy and combat mechanized engineers, and NATO and other allies working side-by-side with Brown & Root personnel to complete a demanding construction mission.

Mechanized engineers provided much-needed manpower and dozer expertise (cross-trained armored combat earthmover operators). *In future peacekeeping operations, special construction tools not organic to mechanized engineers should be available through pre-positioned stocks.*

Task Force Eagle also benefited from theater engineer support provided by Italian rail engineers, Austrian army dump trucks, and Hungarian rail ramp expertise. These soldiers, their expertise, and their equipment were a significant force multiplier. Brown & Root personnel integrated their work with military construction efforts extraordinarily well. Military and Brown & Root planners, designers, project managers and builders worked together to make complex operations run smoothly and safely (Figure 4).

Figure 4

Other Engineer Missions

Military engineers also completed considerable work on roads and bridges off the base camps. As the SFOR mission extended throughout Bosnia, heavily used roads and bridges required significant repair. Engineers retrieved seven armored vehicle-launched bridges from Multinational Division-North routes and replaced them with timber trestle bridges. Some bridges were simple, but others were more challenging and included piers, multiple spans, steel stringers, and concrete abutments. Federation engineers (Croatians) worked with C Company, 40th Engineer Battalion, to construct the bridge shown in Figure 5.

Figure 5

In some cases, military engineers demolished damaged bridges on major highways so that new bridges could be constructed. B Company, 16th Engineer Battalion, used more than 750 pounds of explosives to destroy the Bosanski Samac bridge (Figure 6).

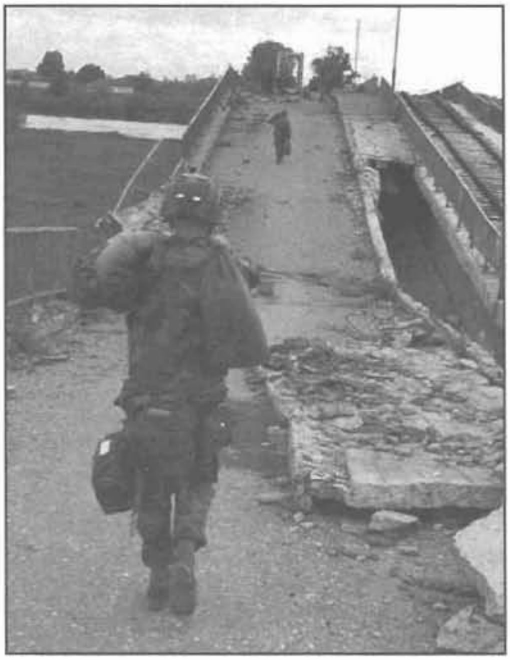


Figure 6

Task Force Eagle encouraged EAF engineers to support the democratization of their military. These engineers could help rebuild their country in areas other than demining. In most democratic countries, the military provides aid following natural disasters, and the EAF could do the same in its war-torn country. Convincing the EAF of the advantages such projects offer was initially challenging, but bridges proved to be a useful vehicle for this effort. *Building bridges benefited the local people and helped the image of the EAF military and Bosnia-Herzegovina politicians.* With the proper recognition and use of media, the joint effort with the EAF in bridge building was quite successful. Russian and American engineers worked closely with Serb engineers to complete the bridge at Priboj (Figure 7).

Figure 7

(Continued on page 18)

Building Bridges Between Nations

By Lieutenant Colonel William H. Haight III, U.S. Army, and Lieutenant Colonel Leonid I. Ysik, Russian Army

The 20th Engineer Battalion is a mechanized combat engineer battalion in the U.S. 1st Cavalry Division stationed at Fort Hood, Texas. The engineer battalion of the Russian Army's Separate Airborne Brigade is stationed in Stavropol, Russia. Both units are well trained, combat ready, professional, and fully prepared to answer the call to fulfill the military needs of their respective nations. Both units received that call early in 1998 to deploy to Bosnia-Herzegovina to support NATO and Operation Joint Forge.

Deployment

While preparing all the necessary logistics for the upcoming deployment, each unit simultaneously completed extensive training plans, complete with country briefings on the Entity Armies in Bosnia, force protection, mine awareness, and studies of information relevant to engineer operations in the theater. The Russians arrived in midsummer 1998 and immediately began operations in support of the Russian Separate Airborne Brigade Sector, one of four brigades in the United States-led Multinational Division-North (MND-N). The MND-N is one of three multinational divisions that make up the NATO Stabilization Force (SFOR). In September 1998, the 20th Engineer Battalion took responsibility for the U.S. brigade sector in MND-N from the 40th Engineer Battalion, 1st Armored Division, and began operations in support of the 1st Brigade Combat Team, 1st Cavalry Division.

Joint Training

The commander of the MND-N and 1st Cavalry Division realized early in the mission the potential for combined projects with all allied nations in SFOR, but he particularly wanted to promote U.S.-Russian training and projects. Very little encouragement was needed. From the first week the 20th Engineer Battalion was on the ground, Russian and American

Russian and American soldiers build a bridge at Priboj.

commanders mutually agreed to make combined U.S.-Russian training a priority.

During the six-month deployment, the two battalions participated in 13 combined training or construction projects and completed planning for several more. They also visited each other's base camps to conduct NCO and officer professional development classes on topics ranging from minefield marking and recording to familiarization with former Soviet engineer equipment. Perhaps the most exciting training was a joint demolition range where soldiers from both countries demonstrated their tactical combat engineering skills. They completed a live-fire minefield breach using a Russian mini-line charge (see photo below). Additionally, both engineer battalion commanders held multiple trilateral meetings with Entity Army (Bosnian) engineers and municipal leaders concerning areas of common interest to the U.S. and Russian brigades.

Bridging Projects

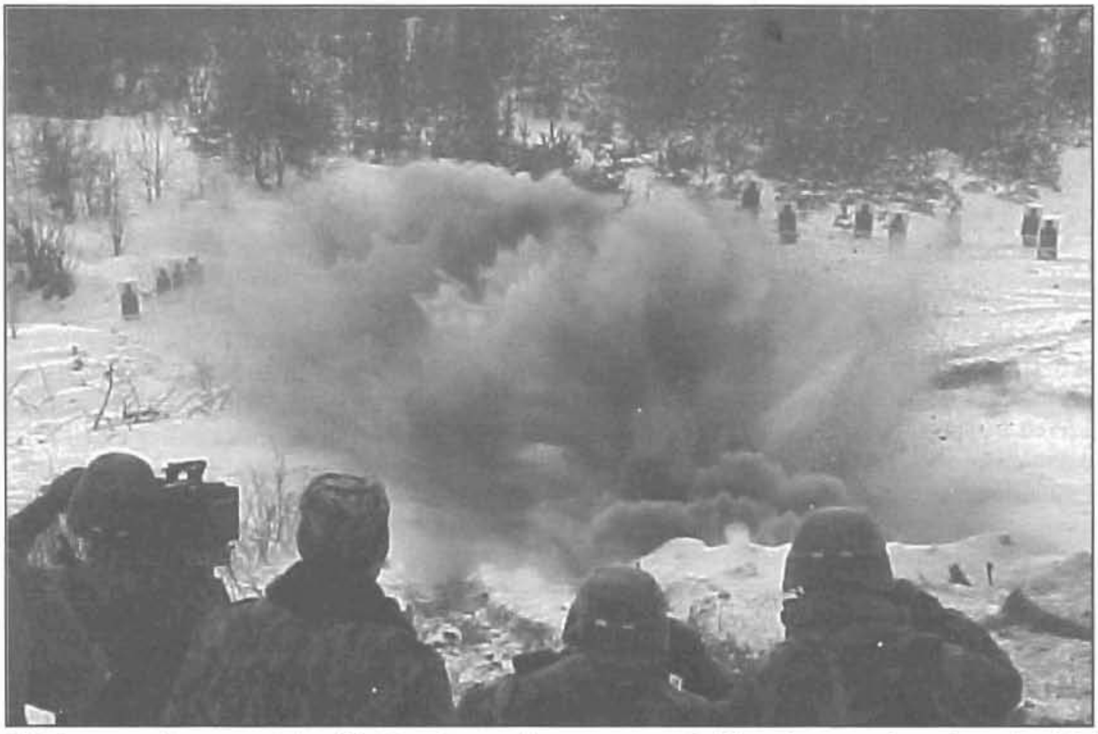
Most of the combined projects, however, involved building bridges. Following up on initial coordination by the 40th Engineer Battalion, 20th Engineer soldiers and their Russian counterparts began a combined bridge-building project on the Janja River soon after arriving in country. The bridge connected Bosnian and Serb communities for the first time since the end of the war. A local village donated materials for the bridge, while SFOR engineers provided equipment support and manual labor. The result was a military load class 30 bridge that spanned a 12-meter gap and saved residents a 40-kilometer detour over very bad roads.

A total of six vehicular bridges were either completely rebuilt or resurfaced by U.S. and Russian engineers working together. The U.S. Civil-Military Commission (CIMIC) Task Force soldiers who supported the Russian Brigade sector deserve credit for helping to identify and coordinate most of these projects. In some cases, the CIMIC teams secured local funding or national assistance for materials or other support, such as welding. The CIMIC teams facilitated our engineer work by ensuring local support and approval for all plans. This was not an easy task, because most of the projects were located in economically depressed parts of Bosnia. The locals had very little to offer in return other than their gratitude.

The bridging projects were completed as military operations. Discussions for planning, design, materials, etc., were in English, which gave the Russian engineer battalion interpreters quite a challenge. Differences in planning and design factors and determining bills of material for projects made for lively planning meetings. While our approaches differed, it was very interesting to see at the end of our planning processes that the results were very similar. That surprised many engineer soldiers from both units and taught us all a lesson about the universal nature of engineer work.

Removing Barriers

Each bridge-repair mission was carefully selected to support several important MND-N objectives and to improve quality of life. While the value of these bridges in supporting freedom of movement and regenerating economic activity is very



U.S. Army engineers watch while Russian engineers use a mini-line charge to breach a minefield.

An American soldier measures a bunker.

Russian soldiers discuss bridging plans.

important, their value in terms of the message they sent is equally as powerful. The image of U.S. and Russian soldiers working together to bridge a physical gap served as a powerful metaphor for bridging other gaps, opening lines of communication, expanding cooperation, and more importantly, developing mutual understanding and trust. All this between military forces of two nations that until recently had few if any bridges between them, much less bridges that they built together. The lack of these cultural bridges contributed to the terrible war that tore Bosnia apart earlier this decade.

Perhaps the U.S. and Russian soldiers did not discuss such symbolic connections while swinging hammers and lifting heavy timbers, but you could see on their faces that they fully understood the historical significance of these events. What made all this even more rewarding was that the projects were real, affected real people, and helped countless displaced persons, refugees, and war victims begin new and better lives.

There is great value in working closely with engineers of another nation in any operation. United States-Russian cooperation was particularly important. For many years both of our armies studied each other from a distance and learned as much as possible about our mutual capabilities and equipment. The spirit of international cooperation that exists in SFOR helped both organizations set aside previously held prejudices and misconceptions.

What proved true was that both groups of engineers were skilled, motivated to complete their tasks, had dedicated competent leaders, and cared for their soldiers' training, welfare, and safety. What proved untrue were the misconceptions that for too many years created distrust and suspicion between our nations.

This experience may have been unique to our two units, but we think not. Engineers had much work to accomplish in Bosnia, and common goals have a way of removing barriers. We sincerely hope that the bridges we built together will long outlast the timber and steel structures we leave behind in the Balkan countryside.

Setting an Example

Both units trained hard for their primary missions, but neither anticipated nor prepared for a very special opportunity to conduct combined United States-Russian engineering missions in Bosnia. These missions, which were enthusiastically embraced by engineer soldiers and commanders, have produced a lifetime of memories for the soldiers of both countries. Significantly, these missions also serve as an example to the former warring factions of Bosnia, and the world, that former adversaries can forget their differences and work together toward common goals and lasting peace.

Lieutenant Colonel Haight commands the 20th Engineer Battalion.

Lieutenant Colonel Ysik is the chief engineer for the Russian Brigade in Bosnia.

ONE REGIMENT, ONE FIGHT

By Lieutenant General Joe N. Ballard

When I was a lieutenant, senior leaders talked about branch unity. Back then I didn't really know what they meant, and frankly I didn't care. All I knew was that every time they started talking about the regiment and unity, I got a little sleepy. And I wasn't the only one. Some of the other lieutenants and captains would also start to nod. Therefore, I decided it wasn't all that important.

But this kind of attitude has led us to where we are today. If engineers don't care about the Engineer Branch, then who does?

Branch unity is not new. It has been around for decades, and it always seems to be the favorite topic of old lieutenant colonels, colonels, and generals. But to junior officers in the trenches, where the important work is done, regimental unity seems about as relevant as a glass of water to a drowning man.

During my lieutenant years, I didn't care what the rest of the Corps did. I kept my eyes on the 50-meter targets and let someone else worry about the 300-meter targets. After all, anybody who knew anything knew who the *real* engineers were. Light engineers knew *they* were the *real* engineers. So did the heavy engineers. The same was true for airborne, construction, Departments of Public Works, U.S. Army Corps of Engineers, topographic, National Guard, and U.S. Army Reserve personnel. All those engineers were in the field, where the rubber hits the road. I thought that leaders interested in regimental unity were out of touch with those who made things happen.

The 50th Engineer Company, 2nd Infantry Division, rafts Bradley fighting vehicles across a river in Korea.

Not only did senior leaders beat the dead horse of regimental unity, they frequently put a negative spin on it. The message I heard was that we needed to analyze why we were falling apart, not getting enough funding, or losing force structure. I thought it was someone else's problem, since my soldiers worked hard and did a great job. I was doing my part, and the soldiers were doing theirs. The failings were at another level. Why should I waste time and energy worrying about something that I didn't see as a problem, that I felt I could not change, and that seemed to be a lost cause. In short, *not my problem.*

Looking back, I ask myself, "What has changed?" Is regimental unity still a senior officer problem? Is it still a problem that has no solution but that everyone still feels obligated to wring their hands over? No! *Regimental unity is every engineer's responsibility.*

Many engineers do not see the value of the Engineer Regiment. They do not understand its benefits. To appreciate the value of the Engineer Regiment, we must first understand regimental unity.

"...engineers are vital to the Army and we will get the job done, but we need the funds and equipment to accomplish the mission."

Regimental unity is older than the Roman legions. Effective unity benefits the individual, the unit, and the regiment. It is the bond formed by soldiers who share a mission, share a perspective, and share hardships. The payoff is a sense of identity, camaraderie, and much greater power than can be obtained by isolated elements. If engineers want to be successful in today's resource-constrained Army, we must have our act together and act together.

Army leaders at every level must hear one coherent message from the Engineer Regiment. This message is that engineers are vital to the Army and we will get the job done, but we need the funds and equipment to accomplish the mission.

There are many steps we can take to change the culture of the Engineer Regiment. And, make no mistake, a cultural change is required. But I can't make this change alone. It takes engineers at every level to see the light and realize that the Engineer Regiment has benefits. Until this happens, senior leaders will continue to push with no true results.

A critical question is, How do we know when we have achieved regimental unity? First, we must define our success criteria. I see regimental unity as affecting three levels of the regiment: the individual, the unit, and the regiment itself.

At the *individual level*, regimental unity changes the way soldiers think of themselves. They feel that they are a U.S. Army soldier first, an engineer second, and a member of their unit third. Soldiers stick up for one another simply because they are engineers. They are brothers and sisters—family. If your engineer brethren need a piece of gear, you support them because you trust them; you know they will be there in your time of need. Soldiers at every level join professional associations that endorse and support the Engineer Regiment. This is how unity appears at the individual level.

At the *unit level*, regimental unity changes the way units interact with each other. Commanders and unit leaders emphasize our engineer heritage. Leaders make it a point to know about other elements of the regiment and teach it to their soldiers. Unit leaders defend or explain the actions of their compatriots when they hear them maligned or misunderstood. Unit leaders support the Engineer Regiment's position on issues. Every engineer looks out for each other and ensures that news—good and bad—gets passed on to someone who can act on it.

At the *regimental level*, we achieve unity when lieutenant colonels, colonels, and general officers band together to present a unified front to help each other—not only when there is a threat but also during day-to-day operations. The Engineer Regiment has never had a problem pulling together as a team during times of crisis. It's during the calm of nonemergency operations when we tend to separate. With regimental unity, senior engineer leaders insist that their units and soldiers be team players. Senior engineers network and politick with senior Army leaders for corporate positions. Soldiers and units then are provided the information and resources they need to fully function as part of the team. Engineer systems and force structure are as well-funded as combat and combat support systems. This is what I see as a unified end state.

The one-voice concept is not an attempt to keep soldiers and leaders from expressing their professional opinions when asked. But there are many sides to any important issue, and engineers should learn the merits of opposing positions. The proposal to use the Bradley as the engineer squad vehicle is a good example. Some engineers advocate using the M113A3 as the engineer vehicle, while others prefer the M2. The Engineer School has determined that the M2s are best; therefore, engineers must support this decision.

All of the above requires a concerted effort. We can't simply say that we are going to be more cohesive and then it happens. Making the regiment a viable and effective organization requires commitment from each member. Can this happen? Many people doubt it. But if Army engineers don't improve the way we do business as a regiment, then we are guaranteed to continue to decrease in effectiveness and prestige.

Okay, so why should we care about any of this? Very simply, it's not only the right thing to do, it's in your best overall interest—personally and professionally.

Most of you who read this article are trained as Army engineers. You could be assigned to an armored or airborne division, U.S. Army Corps of Engineers, Department of Public Works, or some other engineer area. Ultimately, your fate is entwined with that of the regiment. When the regiment prospers or falls, so do you. If not in this assignment, then in the next one.

Corporately, we win on issues when we band together. We lose when we don't. Whether the issue is equipment funding or fielding or force structure, the Army must see a united front from the engineer community. Because of the positions we take, when we win the Army wins.

Personally, I don't think we are doing enough to unify the Engineer Regiment. We must work together within the regiment to realize the efficiencies we gain through a coordinated effort. If the regiment applies its collective

Engineers from Alpha Company, 82nd Engineer Battalion, remove a bridge near the town of Olivo, Bosnia-Herzegovina.

knowledge and power to an issue, the results will be staggering. It only remains for us to work as a team and focus our efforts.

Okay, for argument's sake, let's say you are convinced that it is in *your* best interest and in *our* best interest to support the regiment. So why haven't we been more successful? There are two answers to this question—one easy and one hard.

The easy answer is that we haven't succeeded because we haven't tried hard enough. Everyone is too busy looking out for himself in the near term, and not enough people are paying attention to the long-term health of the entire organization. This is easily understood, because each of us has more than a full plate. We rarely have time for philosophical discussions on subjects such as regimental unity. But we must change this trend, and that will require a collective effort from the entire regiment.

The hard answer to why we haven't been more successful is that too many engineers don't see and understand the criticality of regimental unity, and senior leaders have not provided structure and discipline to the process. But we're beginning to solve this problem. We are now providing some structure through the regimental vision and a follow-on strategic plan.

To improve regimental unity, I propose the following actions:

- I want every engineer to get interested in the process—really interested—and give me some feedback. I'm designating an action officer in my planning group to keep track of regimental issues. E-mail him when there is something to report on your interaction between elements of the regiment *(kevin.porter@inet.hq02.-usace.army.mil)*.
- I am charging the Engineer School commandant to develop a list of engineer issues along with the proponent's recommendation and the rationale. This list of issues and solutions will be posted on the Internet. It will be sent to all commanders at battalion level and above in both the Active and Reserve Components. If you can't support the position proposed by the school, I ask you to e-mail school personnel and let them know why. That will establish critical dialogue that we need.
- I am charging my historian with developing a unified regimental history presentation. It will be available on the Internet so that every engineer has access to it. By teaching the history of our regiment and the history of the units that compose it, we will create an organization that has pride in its past. Once we share a common history, we can look toward to our common future.
- I am tasking my public affairs officer to develop a guide that shows all the major organizations in the regiment and explains their command relationships. The intent of the guide is to present in one concise document the structure of the regiment and how all the pieces fit together. The guide also will be available on the Internet. It will help engineers understand the complex and diverse nature of the Engineer Regiment.

Regimental unity is every engineer's problem. Without a dedicated effort at every level, unity cannot be achieved. Ultimately, the future of the regiment is in your hands. We can continue working in our isolated cells and performing marginally, or we can realize the benefits of applying our collective power to the regiment's problems.

I believe it's time to start moving on regimental unity. I'm ready. Are you?

Lieutenant General Ballard is Chief of Engineers and Commander of the U.S. Army Corps of Engineers. He previously served as Chief of Staff of the U.S. Army Training and Doctrine Command, Fort Monroe, Virginia. LTG Ballard is a registered professional engineer in civil engineering.

Joint Engineer Training: *Top Ten Lessons Learned*

By Lieutenant Colonel Anthony Vesay

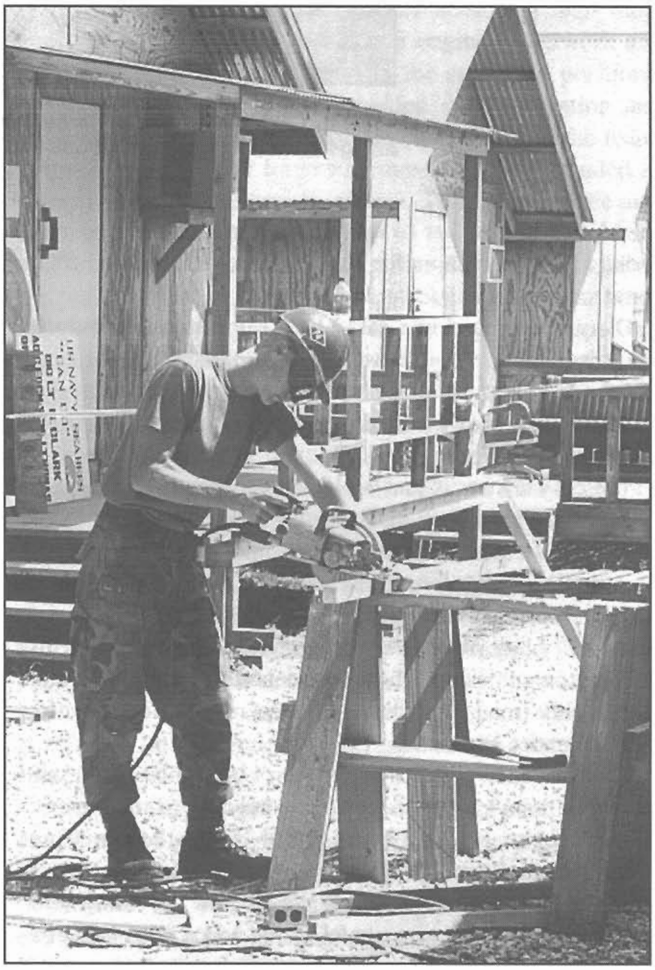
The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow.

Joint Vision 2010

Army and Marine Corps engineers are working together, rehearsing and synchronizing actions on the objective. Navy Seabees and Air Force RED HORSE elements join in since they'll be responsible for force bed down and ports of debarkation upgrades. This scenario is an example of joint training, right? Not necessarily.

To be considered "joint," training must meet two criteria: It must be based on joint doctrine, tactics, techniques, and procedures; and it must support or be sponsored by a joint command. In other words, the training must be in response to operational requirements established by a joint force commander. The above training may be joint. However, if it's based on Service doctrine or does not support a joint force commander's requirements, it is interoperability training. Although interoperability training is a critical part of joint readiness, it is not joint training.

This article discusses the top ten lessons learned from recent joint training exercises and missions. By presenting them here, engineers who conduct joint training or operations in the future may avoid common pitfalls and capitalize on success stories.



A Navy Seabee constructs SEA-huts at Camp Fairwinds, Haiti, 1995.

Hierarchy of Sources

The specific objective is to develop a joint training and exercise program that bolsters combatant commanders' ability to execute the National Military Strategy (NMS) while simultaneously maintaining readiness as a prerequisite to deterring aggression and responding to crises. The desired end state is improved readiness of joint forces, a training and exercise strategy better aligned with the NMS, improved interoperability, and a more stable process for optimizing the application of scarce Service resources.

General John M. Shalikashvili (Retired), Former Chairman, Joint Chiefs of Staff

There is a hierarchy of sources, beginning with the National Security Strategy, that provides requirements to all combatant commanders and geographic commanders in chief (CINCs) (Figure 1, page 13). The end result of this process is joint training that is conducted in support of CINC requirements. In theory, every joint training activity conducted by military forces supports the CINC's operational requirements and is linked to the Joint Strategic Capabilities Plan, which in turn is linked to the National Military Strategy, which is derived from the National Security Strategy.

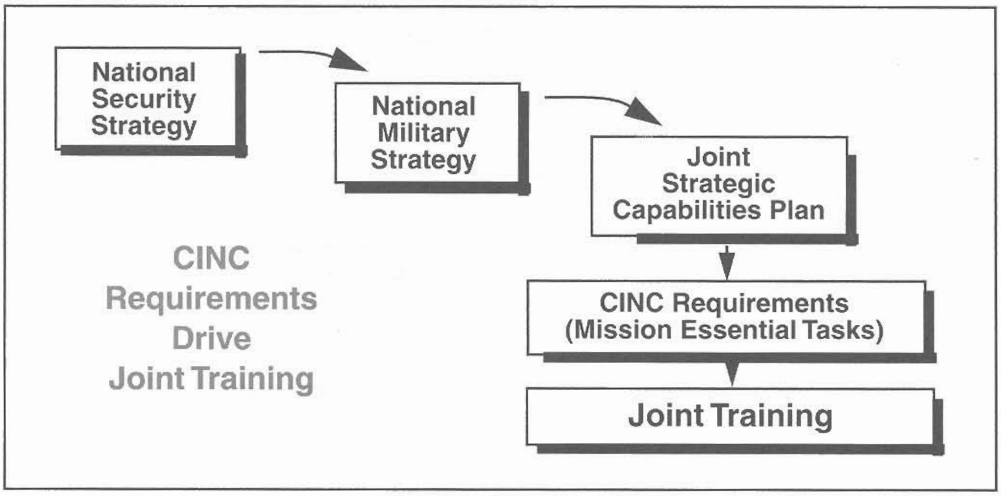


Figure 1

Joint Training, Analysis and Simulation Center

Joint engineer training today is primarily under the direction of the U. S. Atlantic Command (USACOM) (See article, page 19). A unified command headquartered in Norfolk, Virginia, USACOM is one of five combatant commands. Its mission, as specified in the 1993 Unified Command Plan is to—

- **Train** (meet the requirements of the supported combatant commander).
- **Integrate** (blend technology, systems, and doctrine to improve interoperability).
- **Provide** CONUS-based, general-purpose forces in support of worldwide operations (provide joint forces to supported combatant commanders as directed by the National Command Authority).

USACOM also conducts operations in its assigned area of responsibility. With components consisting of the Air Combat Command; Atlantic Fleet; Forces Command; and Marine Forces, Atlantic; it commands and controls approximately 80 percent of all military forces. (Note: According to the 1999 Unified Command Plan, USACOM will become the U.S. Joint Forces Command later this year.)

Training members of all Services to work together as one team is a major thrust of USACOM. The Joint Training, Analysis and Simulation Center (JTASC) supports the increased emphasis on simulation-based joint training. The JTASC serves as a battle laboratory that integrates and rehearses forces for employment around the world and provides a command post for use by joint task forces (JTFs). It also provides a connection to JTF components throughout CONUS. The JTASC's fully functional command center provides the JTF staff with the C4I (command, control, communication, computers, and intelligence) architecture they would use in a real-world crisis.

USACOM recognizes that not all training needs to be joint. Service Title 10 responsibilities mandate that each Service organize, train, and equip their respective forces; hence, the need for interoperability training. USACOM attempts to meld the capabilities of individual Services into a coherent, joint fighting force.

Lessons Learned

In December 1992, the JTF engineer approached the JTF commander of Operation Restore Hope in Somalia to obtain the commander's intent and guidance for facility and road construction. He presented multiple options with varied construction standards. Each option had an associated resource requirement affixed to the level of work and an expected completion date.

Operation Restore Hope after-action report

The following top ten engineer lessons learned are taken from after-action reports and observations from training events at the JTASC and recent operational deployments. Referenced deployments include operations in Central America (Hurricane Mitch), Bosnia (Joint Endeavor), Cuba (Sea Signal), Haiti (Restore Democracy), and Somalia (Provide Hope). The most recent JTASC exercise included 20 engineers from all Services. The Army-led JTF included 12 Army, four Navy, two Air Force, and two Marine engineers. Engineers who deploy in the future—whether to real-world events or exercises—can expect to face similar challenges.

Lesson 1: Engineer End State

How will we know when we're finished? If the JTF engineer has a clear vision of the engineer end state, the means to mission accomplishment will come into focus. Defining the end state and being able to articulate the means to get there will help synchronize the engineer effort. Many seemingly competing priorities will then line up accordingly.

The JTF engineer must first align the engineer end state with the overall mission or operational end state. Secondly, engineers must establish clear transition points between

Engineer Functions

J2	J3	J4	J5
Intelligence - Topography - Site surveys	**Movement and Maneuver** - Lines of communication/ Main supply routes - Intermediate staging bases - Barriers/Obstacles - Mines/Countermines **Protection** - Bunkers/Hardening - Protection **Fires** - Operational Targets	**Support** - Base development - Force bed down - Real estate management - Construction/Infrastructure repair - Facility operation and maintenance - Environmental considerations	**Plans** - Future plans - Branches/Sequels

Overarching command and control of these functions is a key to mission success.

phases, including the ultimate transition—redeployment. During Hurricane Mitch, for example, the end state was to repair or rebuild main supply routes from remote villages to the capital so market trading could continue. In Somalia, the JTF engineer defined the end state in terms of the amount of work to be done *and* the construction standards to be met. These were established early on, in line with the overall mission, which contributed to successful engineer mission accomplishment. A clear end state may not solve problems with mission creep, but it will help identify mission creep and articulate its impacts.

Lesson 2: Mission Standards

Consider force bed down. Are hardened shelters, hardback tents, or temporary shelters the standard? Standards are derived from the end state. They really are the means used to accomplish the end state and the mission. Austere conditions may evolve into initial and then temporary standards for relatively short-duration missions. More permanent standards may be appropriate for long-duration missions. The self-sustaining standards first used in Somalia evolved into temporary standards. The latter included machine-wash laundry facilities, chemical latrines, power generation, air-conditioned computer rooms, and 700 square feet of dayroom space per 100 soldiers.

The staff must establish standards before issuing orders to engineer components. It is also critical to establish consistent standards throughout the JTF; differing standards are counterproductive. Engineer boards (Lesson 6) may be used to establish consistent standards. Establishing standards drives resource requirements and makes it easier to identify the necessary capability—troop labor, contract support, or host nation—and quantities of needed resources (such as Class IV).

Lesson 3: Mission Analysis

To successfully complete mission analysis, it is critical that JTF engineers answer the question "Do the capabilities match the requirements?" The answer to this question, arrived at only through detailed analyses, dictates future actions. Requirements are the missions engineers can expect to execute—such as repairing main supply routes, upgrading port facilities, constructing refugee camps—while capabilities are the assets available. Assets include available military forces, contractors, host-nation support, and force bed-down capabilities (such as Force Provider) or pre-positioned war stocks. Too often a hurried analysis leads to "crisis-action planning," where everything is critical. When that happens, the staff is in a react mode and loses control of the process. The Engineer Estimate, an internal staff product used to justify a recommended course of action, begins during mission analysis. Engineers should plan on a shortage of resources and an overabundance of missions. In other words, requirements usually will exceed capabilities.

One key to success is a clear understanding of the area of responsibility: What resources are available in theater? What capabilities must units bring? Additionally, a clear engineer end state and mission standards (Lessons 1 and 2) will help to prioritize missions and allocate scarce resources. At the end of the analysis process, the engineer cell should clearly understand who (capability) is doing what (requirement). Some form of an execution matrix that depicts mission assignments by phase is recommended.

Lesson 4: Command and Control

How should the JTF engineer organize his staff? Consider two points: First, engineers are somewhat unique in that they are involved in a myriad of functions. The table above shows some potential engineer missions that are spread across several staff directorates. Secondly, how well the JTF

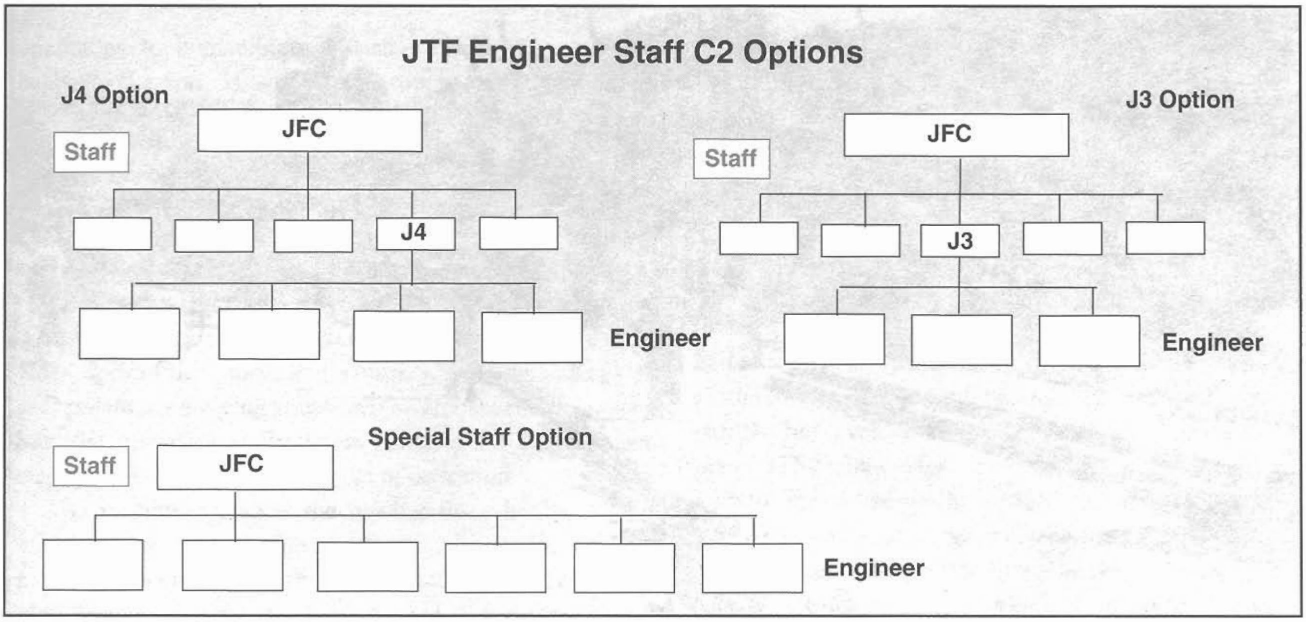


Figure 2

engineer synchronizes the engineer effort among the various staff elements often is a key to mission success. One technique is to place engineers in every directorate. For example, an engineer planner working in the J3 (Operations) directorate must communicate with engineers in the J4 (Logistics) directorate concerning proposed targeting options, since they may directly impact future operations. Likewise, an engineer in the J5 (Plans) directorate must communicate with J4 engineers concerning follow-on phases and/or future operations. And all engineers can benefit from intelligence products produced by engineers in the J2 (Intelligence) directorate.

Figure 2 shows several staff engineer organization options. Doctrine suggests that the choice relate directly to the engineer functions previously discussed. For example, if the engineer effort is operationally heavy, engineers should be under the direction of the J3; if logistically heavy, under the J4; and if the overall mission is engineer heavy, under the JTF commander (Special Staff). Remember that this is only part of the equation. The other part is component engineers, who receive and execute mission directives from the staff. Whichever option or technique is selected, the staff must plan and set the components up for success. In the final analysis, engineers should be able to draw the organizational structure. If they can, the structure is probably well understood and should result in effective mission/information flow. If they can't, there is a potential for confusion and mishandling of mission assignments and/or information.

Lesson 5: Operation Plan (OPLAN) Synchronization

In theory, engineers should receive guidance from the supported CINC's engineer staff as well as from the JTF. The former includes overarching planning considerations in the form of a Civil Engineering Support Plan (CESP), while the latter includes JTF planning guidance. With this information, the JTF engineer can issue his guidance, and the planning process—starting with mission analysis—can begin.

JTF engineers are directly responsible for developing several products, primarily a more refined CESP and the Environmental Considerations Annex. Several OPLAN appendices also require engineer input. These include Force Protection; Explosive Ordnance Disposal; Civil Affairs; Air Base Operability; and Mapping, Charting, and Geodesy. These products are described in Chairman of the Joint Chiefs of Staff Manual 3122.03, *Joint Operational Planning and Execution System (JOPES), Volume II.* Although not doctrine, engineer planners should seriously consider developing a combat engineering appendix. The Engineer Estimate process concludes with publishing the engineer products. The engineer components then write their respective plans, which should be rehearsed or "rock drilled" to synchronize the operation.

It is also important that planners clearly understand the other players—such as nongovernmental organizations and private volunteer organizations, coalition forces, contractors, and the host nation—and how they interface with the JTF (see Lesson 4). It is vital that engineer plans account for these capabilities. Failure to do so will result in duplication of effort, wasted resources, and/or mission inefficiency. Synchronization implies that a common thread runs through all plans—CINCs, JTFs, and components.

Lesson 6: Engineer Boards

Boards are temporary organizations established to solve current issues. They are comprised of key players and meet on an as-needed basis. Boards are temporary while centers or bureaus are permanent. For example, the Civil-Military

RED HORSE engineers construct Harry Truman Boulevard in Haiti during Operation Restore Democracy.

Operations Center is permanently manned and has an ongoing mission. The intent of boards is to bring in affected individuals and agency representatives from outside the engineer organization to collectively work a problem.

The JTF engineer chairs three doctrinally established engineer boards. The Joint Civil-Military Engineering Board establishes procedures, priorities, and overall direction for civil-military construction and engineering requirements in the joint operating area. Guidance from the board is used to develop the CESP. Recommended standing members include the JTF Service components, JTF comptroller, JTF staff judge advocate, J3, and J4. Others may include representatives from the embassy, public affairs office, Department of Defense real estate office, Defense Logistics Agency, and U.S. Agency for International Development. In Somalia, a joint board chaired by the JTF engineer established direction for the engineer effort and ensured that it was coordinated among the Service components before being briefed to the JTF commander.

The Joint Facilities Utilization Board evaluates and reconciles Service component requests for real estate, use of existing facilities, interservice support, and construction standards established by the Joint Civil-Military Engineering Board. In Bosnia, facility prioritization was delegated to the Army component, which evolved into the Base Camp Coordinating Agency (BCCA).

The Joint Environmental Management Board establishes policy and priorities for environmental management requirements in the joint operating area. Besides establishing engineer boards, the JTF engineer should be represented on applicable boards, such as the Joint Targeting Board. For example, engineers can offer valuable advice on the effects of a blown bridge or main supply route on future operations.

There is no requirement to establish these boards. However, if they are not established, JTF engineers must ensure that other systems are in place to solve problems. A massive fuel spill in theater, for example, needs quick action by all concerned parties. Convening a board with the key players—Service components, host nation, nongovernmental organizations and private volunteer organizations, the staff judge advocate, public affairs office, etc.—and recommending a solution probably is a better technique than directing an uncoordinated response.

Lesson 7: Future Planning

Future planning for the JTF is the responsibility of the J5, who looks ahead about 96 hours and conducts "what if" analyses. The planning team, having already developed courses of action for base operations, now conducts mission analyses and develops courses of action for anticipated branches or sequels. The planning team is assisted by the Joint Planning Group, which usually includes a core group of experienced planners augmented with individuals from other staff elements, as needed.

Executing current JTF operations is the J3's responsibility. This activity is carried out in the Joint Operations Center—the center of action for ongoing operations.

A common pitfall is that engineers often are excluded from future J5 planning and/or current J3 operations efforts. One solution is to have engineers in both staff elements. Engineers must track current operations with an eye toward future missions, particularly when significant changes in the type of mission are anticipated. Transitioning from combat operations to humanitarian assistance requires additional analysis (Lesson 3) so that appropriate capabilities are allocated to the new requirement. Too often engineers remain engrossed in the current fight and lose track of upcoming operations. When that happens, unsynchronized follow-on missions are assigned to component engineers.

Lesson 8: Resource Tracking

Engineers must track resources for military engineers and construction and barrier materials. They must be aware of all other capabilities, including contractor support. Keys to success are maintaining situational awareness (to understand how the operating environment impacts the mission) and clearly understanding the concept of operation.

The maneuver plan is the driving force behind all the other support systems. The J1 (Personnel) maintains a joint manning document that tracks individuals assigned to the JTF. The J5 manages the Time-Phased, Force-Deployment Data (TPFDD), which includes engineer unit deployment, location, and materiel shipment data. Assets may deploy by several transportation modes—air, rail, and/or ship. Engineers must maintain visibility on both the manning and TPFDD documents to ensure that the needed assets arrive when required. Engineers should arrive early if force bed-down facilities are needed at an intermediate staging base or if significant ports of debarkation upgrades are required. Engineers must understand that rapid force closure is an issue near and dear to the JTF commander. Ideally, the needed capability—people, equipment, and supplies—as determined from the mission analysis process, will arrive on time and at the right location.

Once in theater, engineers must track resources and establish information management systems. Determining specific information the joint engineer cell should track is more art than science. Component engineers usually do a fine job tracking the status of their respective operating systems and resources. *A recommendation is for joint engineer planners to track any critical theater resource common to two or more Services.* This includes Class IV and Class V scatterable mines, which are critical, high-visibility resources that usually are in short supply. Failure to centrally manage Class IV materials usually results in a "first come, first served" approach. Scatterable mines must be tracked because they are not well understood and are a continuing point of discussion (Lesson 9). Tracking the current condition of main supply routes and ports of debarkation is necessary as is tracking critical pieces of equipment, such as bridging, and contract construction information. The JTF engineer's understanding and "feel" for the operation (his situational awareness)—force protection requirements, local customs/laws, funding availability, infrastructure conditions, JTF commander priorities, etc.—ultimately determine what is tracked and reported.

Lesson 9: Rules of Engagement (ROE)

Commanders determine the rules of engagement. Legal experts obviously are involved, but commanders establish operating criteria that support their assigned mission. When developing the ROE, the JTF commander will include U.S. standing ROE (SROE) as well as applicable CINC or supplemental SROE.

Engineer involvement in ROE development centers primarily on the use of scatterable mines. Many engineers believe that to maintain flexibility, release authority for scatterable mines should be quickly pushed to the lowest permissible level. This is understandable, but the CINC and many JTF commanders have a different perspective. They want to move the operation back to the "peace" side of the peace-war continuum. Early delegation of release authority to a lower level could be interpreted as an action that moves the operation toward conflict. Although not directly related, the current policy on banning nonself-destructing antipersonnel land mines may also come into play. Usually a compromise is reached. Component engineers can usually plan for scatterable mines but should understand that they probably won't be released for execution until conflict seems inevitable. Keys to success include an understanding of the referenced debate regarding release authority, knowledge of scatterable-mine considerations—types, release authority, and general information, such as the percentage of nonself-destructing mines. Engineers typically work the ROE process with the JTF legal representative and must educate him on the proper use of scatterable mines so he can properly advise the commander.

Force protection is another operational and ROE issue that engineers must consider. Force protection is everyone's responsibility and must be embedded in mission assignments. Engineers must understand that force-protection requirements have the potential to exponentially increase theater engineer requirements and to significantly increase mission duration.

Lesson 10: Forming the Joint Team

When all is said and done, it is people—not doctrine or joint exercises—that form the essence of "jointness." There are specific criteria for joint training. The criteria are the science part; the art is formed by individuals from different Services who work together to accomplish the mission.

By definition, JTFs are ad hoc. They form for a specific mission and disband upon completion. JTFs operate primarily at the operational level of war. Their solutions are less defined than those developed at the tactical level, which is where the majority of JTF engineers are most comfortable.

Operations at the task force level are crisis action rather than deliberate, and engineers must possess three skills to succeed. The first is a thorough understanding of the engineer capabilities in one's own Service. Service doctrine and operational experiences are the key. Secondly, engineers need a working knowledge of joint doctrine. Unfortunately, Service schools already have packed curriculums and shortened course lengths and devote little time to joint training. Distance learning is one alternative for acquiring joint training. Distance learning offers engineers an opportunity to become versed in joint operations before they deploy or attend a joint exercise.

Service engineer chiefs recently approved more than 100 joint engineer core competencies. The list includes a myriad of general and engineer-specific topics, including the Goldwater-Nichols Act, Joint Civil-Military Engineer Boards, Logistics Civilian Augmentation Program capabilities, and Service engineer capabilities. The goal is to establish a joint staff web site and post briefings related to the competencies. A web site should be operational by this summer. Additionally, USACOM has posted functional area handbooks that discuss joint engineering on its home page.

The third skill is much harder to teach: the ability to be flexible and open minded, yet decisive, as a joint team member in a crisis-action environment. Recommending another Service for a mission based on an understanding of the respective capabilities is tough. Yet it is indicative of a joint team member who understands the situation.

Summary

Joint task force operations are "high adventure." The JTF engineer and his staff are presented with numerous challenges. Determining the engineer end state and mission standards, conducting proper mission analyses, choosing the appropriate command and control structure, and synchronizing the engineer effort during the planning and execution phases are just a few of the challenges they face. Engineers do all this in a crisis-action environment—very likely in a foreign country without needed resources and with team members who probably are meeting each other for the first time.

The lessons presented here will help the engineer staff learn from others' experiences. And hopefully, they will not have to be **re**-learned.

Lieutenant Colonel Vesay is an Army engineer assigned to U.S. Atlantic Command. He is the senior engineer observer/trainer, responsible for training engineer forces to operate within a joint task force. He is scheduled to command the 249th Engineer Battalion this summer.

(Continued from page 5)

Task Force Eagle engineers worked with the U.S. Agency of International Development (USAID) as well as politicians from the United States and Bosnia-Herzegovina to accomplish engineer tasks that supported the overall campaign plan. The joint efforts of Ambassador Farrand (supervisor of Brcko), MG Ellis (Task Force Eagle commander), and USAID leaders to construct a water well for a village near Brcko demonstrated the type of missions that engineers can assist with during stability operations. Army engineers—working with the ambassador's office, USAID, and the two mayors (Federation and Serb) of the town of Stari Rasadnik—helped push through the design, approval, and groundbreaking of the well, which provided much-needed water for the people (Figure 8). *Military engineers in peacekeeping operations must understand how key organizations such as USAID can assist in the overall campaign plan.*

Figure 8

Teamwork

Engineers in Bosnia-Herzegovina often worked side-by-side with engineers from many other countries. Each country adds value in various areas that help the overall mission. *To form a strong and effective team, U.S. engineer planners must clearly understand the capabilities of our allies.*

Bosnia provides another great opportunity for military engineers from around the world to serve their respective countries. MG Ellis' vision, appreciation, and support of engineers fueled an enormous effort. The 1st Armored Division Engineer Brigade was honored with the opportunity to serve in Bosnia. In November 1998, we handed off the torch to a well-prepared 1st Cavalry Division Engineer Brigade. They are continuing a great tradition of engineers serving our nation whenever and wherever they are needed.

Colonel Bostick is the 1st Armored Division Engineer Brigade commander. Previous assignments include engineer battalion/brigade S3, 1st Armored Division; and commander, 1st Engineer Battalion, Fort Riley, Kansas.

The USACOM Joint Warfighting Center

By Major General Martin R. Berndt and Colonel John A. Clauer

The Goldwater-Nichols Act of 1986 highlighted the importance of joint operations to national security and the critical need for joint training for our armed forces. The joint operations envisioned by drafters of this legislation now are becoming a reality. At the heart of this improved joint capability is the U.S. Atlantic Command (USACOM) Joint Warfighting Center (JWFC)—an organization dedicated to comprehensive and integrated joint training.

As commander of the Joint Warfighting Center, it is my privilege to lead a team of nearly 200 dedicated military and civilian personnel and more than 400 supporting contractors employed in training, modeling and simulation, doctrinal and information distribution, and data-collection duties. How well the center accomplishes these tasks depends on the military community's understanding of the center's mission, knowing what services it offers, and knowing how to request those services. This article describes the Joint Warfighting Center and its capabilities to support joint engineer training.

History

The new USACOM Joint Warfighting Center was established on 1 October 1998, by combining the old JWFC at Fort Monroe, Virginia, with the USACOM J7 and its Joint Training, Analysis and Simulation Center (JTASC) in Suffolk, Virginia. The new organization integrates training and learning to support both CONUS and OCONUS joint forces. The USACOM JWFC retains its central role in conceptualizing, developing, and assessing joint doctrine. It also harnesses modeling and simulation tools and evolving information technology to provide comprehensive training support to commanders in chief (CINCs), Services, agencies, and organizations throughout the joint community. The center's mission is to—

- Support joint and multinational training and exercises for commanders, staffs, and component forces.
- Help the Chairman, Joint Chiefs of Staff (CJCS); CINCs; and Service chiefs prepare for joint and combined operations.
- Assist the CJCS in the conceptualization, development, and assessment of joint doctrine.

Joint Training

Before the USACOM JWFC was formed, the USACOM J7 at JTASC conducted three or four large distributed exercises each year. These exercises had 550-3,000 participants, lasted 17-24 days, and focused primarily on operational warfighting training at the joint task force level. The old JWFC at Fort Monroe supported about 12 deployed "full package" exercises each year that had 150-1,000 participants and lasted 17-24 days. These exercises were conducted primarily in theater for regional CINCs and focused on preparing for likely contingencies.

The new USACOM JWFC supports or conducts 15 "enhanced" major exercises annually. However, the focus is not on how many exercises we churn out but on the effectiveness of that training.

Fuertes Defensas 98-99

A recently completed exercise called *Fuertes Defensas 98-99* demonstrates the combined capabilities of the new JWFC. This multiechelon exercise combined a CINC (U.S. Southern Command) battle staff exercise with a joint task force (XVIII Airborne Corps) event. It incorporated the educational portion of the Army Battle Command Training Program from Fort Leavenworth, Kansas, with an Army Warfighter evaluation of the XVIII Airborne Corps' Army element. Combining various elements of Service and joint community training programs is referred to as "nesting" exercises.

The capstone element of Fuertes Defensas 98-99 was JWFC exercise program support deployed to the CINCSOUTH headquarters in Miami, Florida. Personnel in Miami helped to design, plan, execute, and assess this joint training event, which focused on a scenario from the U.S. Southern Command theater. They helped the CINC select a joint mission essential task list to support training objectives, identified the training audience, assisted with the scenario and exercise planning, provided the joint exercise control group, controlled exercise execution, and facilitated after-action review. In Fuertes Defensas 98-99, this capability was

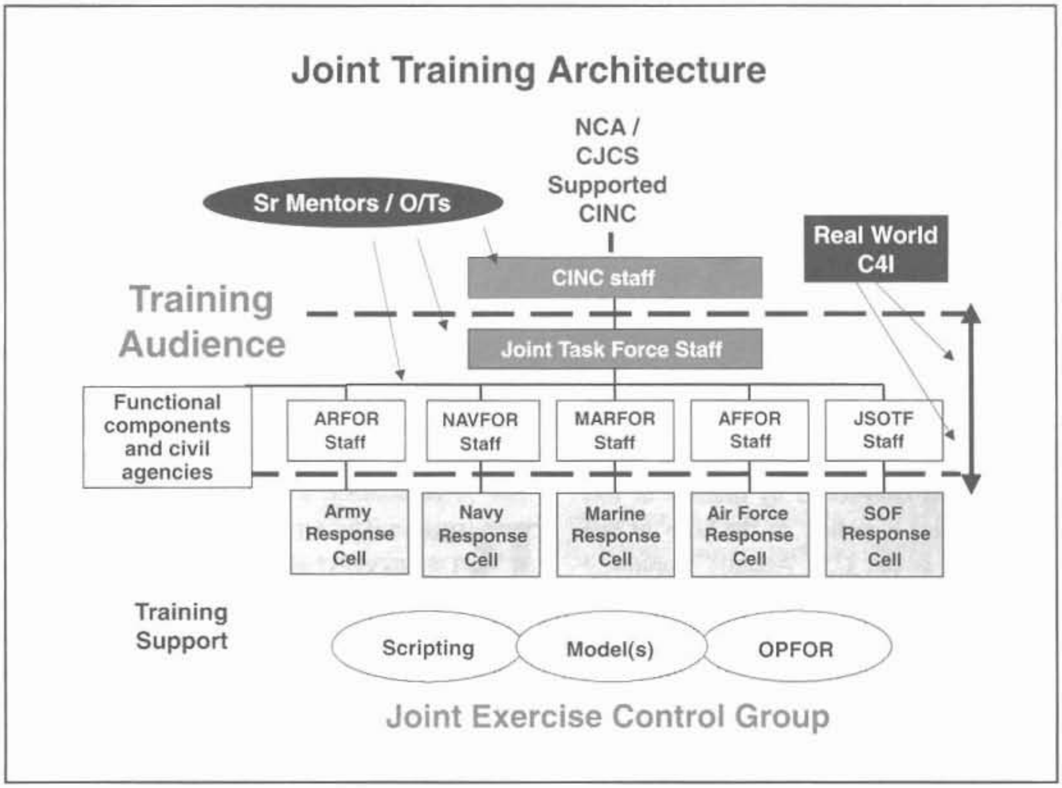


Figure 1

linked, through modeling and simulation, with schoolhouse training provided for the XVIII Airborne Corps at the JTASC. The JTASC used the following four-phase training cycle:

- Academic training
- Planning and development of the operation order
- Execution of the Joint Training Confederation (JTC) computer simulation model
- After-action review

Figure 1 shows generic joint training architecture.

During Fuertes Defensas 98-99, the Suffolk, Virginia, and Miami, Florida, training sites were augmented by elements at component headquarters and other sites across the eastern half of the United States and at Davis Monthan Air Force Base in Tucson, Arizona (Figure 2, page 21). These elements were linked by traditional military C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) systems. While planning and executing the exercise, commanders and staffs were linked by video teleconferencing as well as liaison officers. The Joint Center for Lessons Learned (JCLL), another element of the JWFC toolbox, helped evaluate the exercise and prepare the after-action report.

Merging capabilities to develop a multiechelon exercise typifies the training we hope to conduct. Merging capabilities will enhance the effectiveness of training and help reduce operational tempo. We will provide improved academic support, improved and streamlined computer simulation models, more effective lessons learned, and emphasize the distribution of systems via deployed exercise support.

The following elements of the new enhanced training program also deserve mentioning:

Worldwide Scheduling

A new JWFC mission is to coordinate, deconflict, and rationalize the scheduling of exercises and training events. One way to improve training efficiency is to "nest" exercises. Another method is to combine similar or duplicated CINC and Service training and exercise programs. The JWFC uses computer-assisted scheduling tools to identify inefficiencies in the scheduling process.

Joint Training System Support

JWFC teams train the CINC staffs on the Joint Training System and help develop documents required by the system, including joint mission essential task lists and training plans. The teams also review and update the universal joint task list, which is the basis for developing the CINC task lists and is a reference used to create training plans. Mobile training teams provide classroom instruction on the Joint Operation Planning and Execution System and joint doctrine required for deliberate or crisis-action planning for major exercises. They also assist with short-notice planning and operations during real-world contingencies.

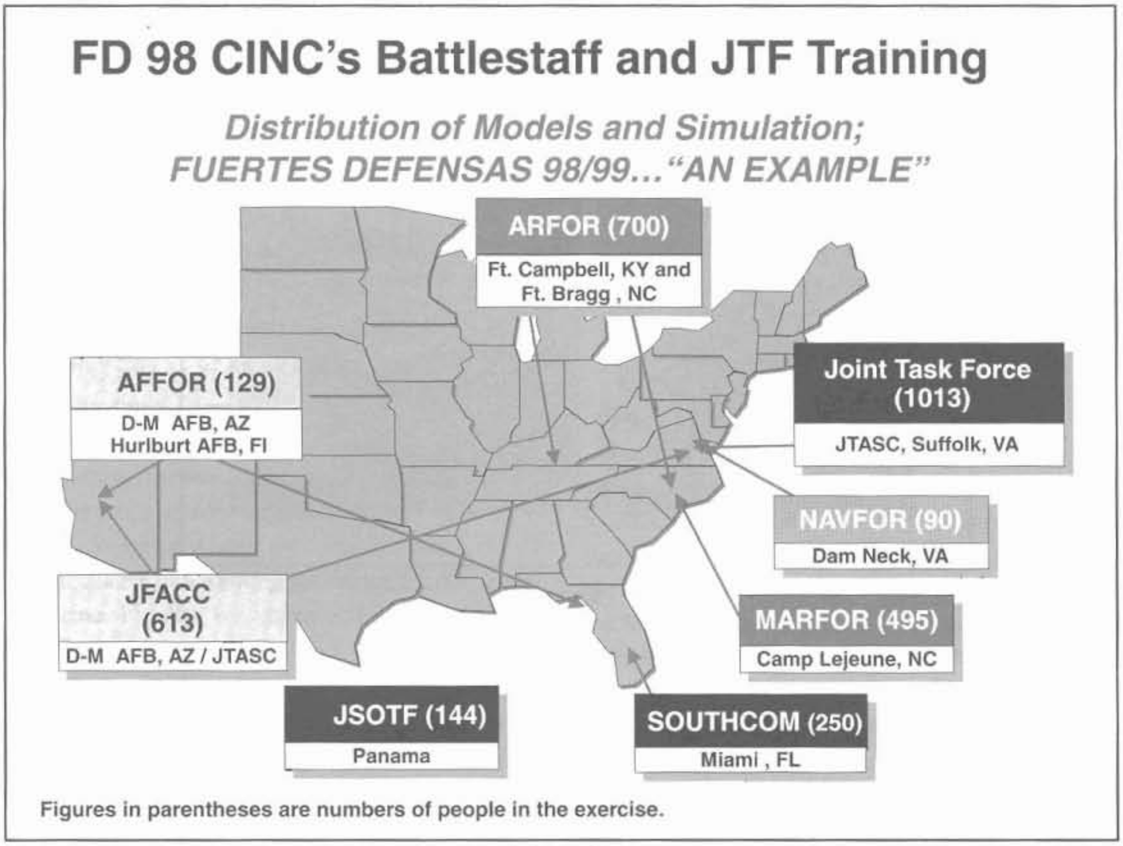


Figure 2

Joint Center for Lessons Learned

The JWFC has refined the JCLL database of more than 8,000 entries to about 1,800 relevant lessons learned. They also provide a database search engine and analyst support. The JCLL works with the Center for Army Lessons Learned Collection and Observation Management System to develop collection tool software, which is scheduled for fielding in FY99. Using JCLL analysts as collection agents significantly improves the after-action products we provide. JCLL is a Secret Internet Protocol Router Network (SIPRNET)-based web tool available to all agencies with registered SIPRNET access. JCLL may be accessed at *jcll.jwfc.acom.smil.mil.*

Joint Distributed Learning Center

This web-based tool is available to Unclassified-but-Sensitive Internet Protocol Router Network (NIPRNET) military address users. It contains programs taught at the JWFC, links to related doctrinal and reference material, the Joint Task Force Commander's Handbook, and other handbooks on joint topics. It can be accessed from the JWFC home page at *http://www.jtasc.acom.mil*. If denied access, call the JWFC at DSN 668-7266 for a password.

Modeling and Simulation Support

As the military moves into the 21st century, two problems will affect training: personnel tempo and the high cost of manpower- and resource-intensive exercises. Large exercises such as Ocean Venture or Solid Shield have traditionally cost upwards of 800,000 man-days and $40 million. By using innovative modeling and simulation tools, we can provide the same level of training for commanders and other leaders for about 80,000 man-days and $3.5 million—a 90 percent reduction in cost and personnel tempo (Figure 3, page 22). This method of training allows Service forces and unit commanders to focus on tactics, techniques, and procedures rather than function as a training tool for the joint force commander, component commander, and staffs. The key to JWFC's successful training programs is effective use of the following modeling and simulations systems:

Joint Theater-Level Simulation (JTLS)

The JTLS model facilitates training in simulation-supported events at strategic theater and operational levels of war. The simulation is a single model that can display forces in an aggregate format. It is widely used to support multidimensional conventional warfare, military operations other than war, and coalition warfare. Several fully qualified JTLS database builders, technical operators, and instructor/controllers provide training on the simulation and oversee simulation operations.

Joint Training Confederation (JTC)

This model combines several Service models that interact and operate within the Aggregate-Level Simulation Protocol System. It supports CINC and joint task force simulation-

Joint Training Man-Day Comparison

Field Training Exercises	Computer-Assisted Exercises
Ocean Venture-- 840,000 man-days	Unified Endeavor-- 80,256 man-days
Solid Shield-- 390,620 man-days	Agile Lion-- 10,934 man-days
Cost ~ $ 37M	Cost ~ $ 3.4M

Figure 3

supported training, primarily at operational levels of warfare. While well-planned exercises using the JTC can be effective, they usually require numerous support personnel, role players, and event scriptors, as well as large control groups. However, the JTC displays forces at the smallest unit level and provides simulation support for detailed training objectives by functional and Service components of a joint task force. The JTC is used by the JWFC in CINC and joint task force training from the Joint Training, Analysis and Simulation Center.

Other Modeling and Simulation Programs

The USACOM JWFC also supports the following emerging modeling and simulation programs:

Joint Simulation System (JSIMS). This system eventually will replace the JTLS and JTC. It will support joint and Service training requirements from strategic national through tactical levels, across the full spectrum of warfare operations. JSIMS is a joint, Service, and inter-agency cooperative development effort.

When JSIMS reaches its initial operational capability in April 2001, it will replace the Joint Training Confederation. It will have a strategic theater and operational focus. By full operational capability, anticipated in December 2003, JSIMS will replace all joint legacy simulation models. It will support the full range of universal joint and Service tasks.

Joint Conflict and Tactical Simulation (JCATS). This is a multisided, interactive, high-resolution, entity-level simulation for training, analysis, mission planning, and rehearsals. It displays simulations down to individual combatants in single buildings or combat vehicles. It supports military operations other than war, military operations in urban terrain, special operations, conventional ground combat operations, and mission rehearsals. JCATS, Version 1.1, fielded 30 October 1998 by Lawrence Livermore National Laboratories, has robust joint and urban features that no other simulation possesses. JCATS, Version 1.2, released in December 1998, has even greater resolution and fidelity. JCATS is evolving as the common simulation for joint experimentation applications in Service Battle Laboratories.

Joint Integrated Database Preparation System (JIDPS). This system reduces the time and manpower required to build databases and conduct database tests for simulation-supported exercises.

Joint Doctrine

An essential piece of any training program is the doctrine used for force employment. The CJCS Joint Doctrine Program helps the Services and joint community conceptualize, analyze, develop, disseminate, assess, and revise current and future joint doctrine, tactics, techniques, and procedures. By having the CJCS's day-to-day manager of the Joint Doctrine Program collocated with the joint training processes, we have established a cycle of input and output of doctrinal ideas from all training and exercise events.

The JWFC provides worldwide support to all CINCs, Services, and Joint Staff as the "honest broker" in joint doctrine. Our role, as described in Joint Publication 1-01, *Joint Doctrine Publication System*, has three primary responsibilities:

- Write joint doctrine.
- Coordinate with other activities that are tasked to write joint doctrine.
- Disseminate and integrate doctrine into the training and exercise program.

Whether writing joint doctrine or supporting others who write it, the JWFC accomplishes the same key tasks during doctrine development. These include:

- Analyzing new doctrine proposals.
- Developing directives that outline the structure of new publications.
- Hosting working groups to discuss publications.
- Coordinating and commenting on publication drafts.
- Assessing all approved publications.
- Revising these publications when necessary.

A critical JWFC role in the doctrine process is to assess current joint publications. Blessed with officers from all four Services who possess a broad range of military skills, we identify and address shortcomings in joint publications, inconsistencies between similar documents, and voids in the doctrinal library. We also assess the overall readability of publications and ensure that training processes are consistent with joint doctrine. Finally, we observe the application of doctrine during training events.

JWFC personnel help the Joint Staff J7, Joint Education and Training Division, to certify and accredit joint professional military educational institutions.

The USACOM JWFC Joint Doctrine Division and its electronic library may be accessed on the NIPRNET at *http://www.dtic.mil\doctrine*. This site allows access to all approved joint doctrine tools and sites.

Emerging Systems

The following emerging systems will support joint training:

Distributed Joint Training Initiative

A new initiative within the Joint Warfighting Center is our involvement in distributed joint training. As the Chairman of the Joint Chiefs of Staff expressed in Joint Vision 2010:

"Simulations must be interconnected globally—creating a near real-time interactive simulation superhighway between our forces in every theater. Each CINC must be able to tap into this global network and connect forces worldwide that would be available for theater operations. This network will allow selected units in CONUS to train with forces located in an overseas theater without actually deploying there."

The vision of this program is to establish global distributed architecture that integrates and shapes related Department of Defense initiatives, programs, and operational requirements. It will link Service and joint programs and provide the capability for worldwide warfighter participation in joint training on demand. This program will become the means for distributing training, as envisioned in Joint Vision 2010.

A single program that provides rigorous, high-fidelity training and training support

Joint Exercise Management Package

Joint Exercise Management Package (JEMP) III will provide automated support for the joint training system. When complete, the JEMP III will have four modules, one to support each phase of the system. The Mission Requirements Module and the Mission Planning Module are in place, and the Mission Execution and Mission Assessment Modules are being developed. The Mission Requirements Module identifies CINC mission requirements and helps develop the CINC's joint mission essential task list. The Mission Planning Module automates development of all required tabs of the CINC's Joint Training Plan. When the four modules are complete, the system will provide a range of database information to manage the CINCs' training programs.

The Road Ahead

The JWFC is a growing organization that is involved in almost every aspect of joint training. It is more than a conglomerate of programs and systems. The JWFC is a dynamic organization that enhances the U.S. military's ability to conduct coherent joint operations through the synergistic effect of training support, modeling and simulations, doctrinal services, and distributed learning and training technologies. Our role in these programs and our innovative use of emerging information technologies places us on the cutting edge of joint training. I encourage you to contact us on our NIPRNET and SIPRNET web sites and to use the services and products that we provide.

Major General Berndt is commander of the Joint Warfighting Center, Fort Monroe, Virginia, and the director for joint training (J7), USACOM, Norfolk, Virginia. He previously served as deputy commander, U.S. Marine Corps Forces, Atlantic; and with the Office of the Joint Chiefs of Staff and Headquarters, U.S. European Command.

Colonel Clauer is the deputy director of the Joint Training, Analysis and Simulation Center of the Joint Warfighting Center, Suffolk, Virginia. He previously served as head of the Concepts Division at JWFC, responsible for concept development and implementation of Joint Vision 2010.

Joint Doctrine Update

By Major Scott Spellmon

Several engineer-focused joint publications (JP) are in the doctrine development, revision, and approval process. They are JP 3-34, *Engineer Doctrine for Joint Operations*; JP 4-04, *Joint Doctrine for Civil Engineering Support*; and JP 3-15, *Joint Doctrine for Barriers, Obstacles, and Mine Warfare*. These publications, among several others, present doctrinal discussion for the engineer battlespace functions outlined in JP 3-34 (general engineering, topographic engineering, and combat engineering) as depicted in Figure 1.

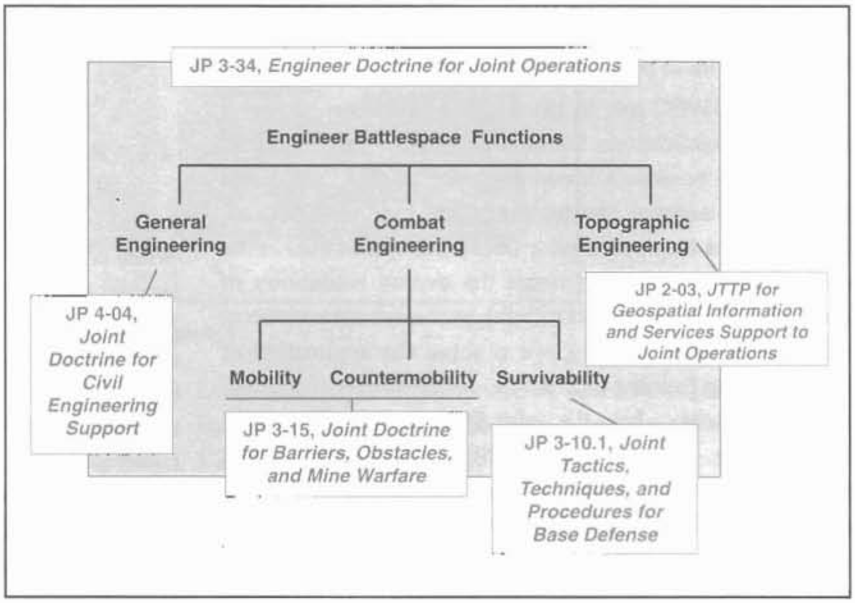


Figure 1. Engineer battlespace functions

This article provides an update on where these publications are in the development process. It discusses significant content revisions that have been drafted as a result of lessons learned from recent operations and presents the method by which the Army and joint publications hierarchy will be linked in the near future.

JP 3-34

A new publication, JP 3-34, *Engineer Doctrine for Joint Operations*, will serve as the capstone manual for joint engineering. It will provide joint force commanders and their staffs with guidance, principles, and procedures to plan, coordinate, and conduct timely and tailored joint engineer support across the full range of military operations. This publication will fill a void in today's joint doctrine library, since there is no manual that ties together the engineer battlespace functions or describes how they shape the battlespace in which joint forces will operate. In comparison to U.S. Army doctrine, JP 3-34 is the "FM 5-100, *Engineer Operations*" of the joint community.

Highlights of the publication include considerations for two of the most debated issues within the joint engineering community: placement of the engineer staff within the joint staff structure and command and control options for the joint engineer force. JP 5-00.2, *Joint Task Force Planning Guidance and Procedures*, states that "The commander, joint task force (CJTF) may organize his staff as he considers necessary to carry out his duties and responsibilities...." Given this capability, Chapter II of JP 3-34, "Command and Control," presents several staff placement options for the CJTF to consider when organizing his engineer staff for a particular operation (Figure 2, page 25). Since many engineer staffs within today's joint commands are subordinate to the J4, the intent of this discussion is to present the considerations and benefits for locating the engineer staff outside of the logistics function. JP 3-34 describes advantages of placing the engineer as a special staff officer (with staff links to the J3, J4, and J5) or as a cell under the J3, depending on the nature of the operation. In many operations, these options offer the engineer staff more opportunities to optimize their functions and facilitate planning and coordination issues related to operational maneuver, force protection, or other engineer-intensive mission requirements.

Command and control options for the engineer force traditionally have been established along Service lines as a Service component command (top portion of Figure 3, page 25). While this technique remains an option, JP 3-34 presents other command and control courses of action for the joint force commander to consider when organizing the joint force for an operation. In light of recent operations, a functional component command may be more efficient to leverage the unique engineering capabilities within each Service (bottom portion of Figure 3). For example, in some operations the joint force commander may best optimize Marine and Army

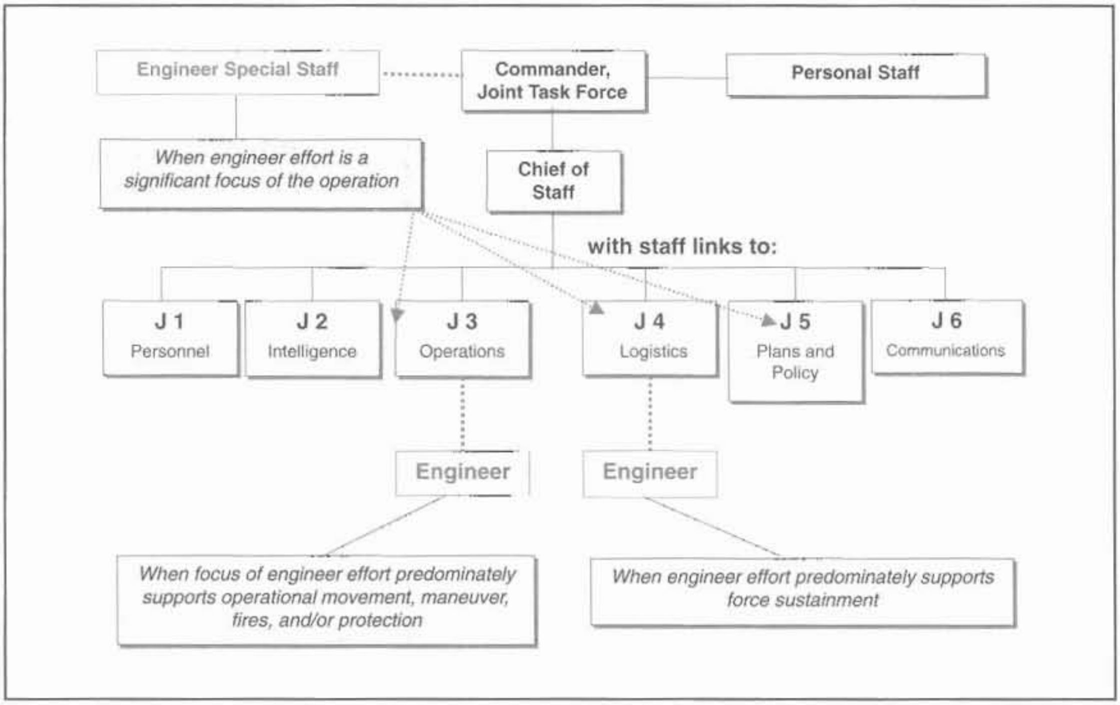


Figure 2. Sample JTF HQ staff organization with engineer staff placement options.

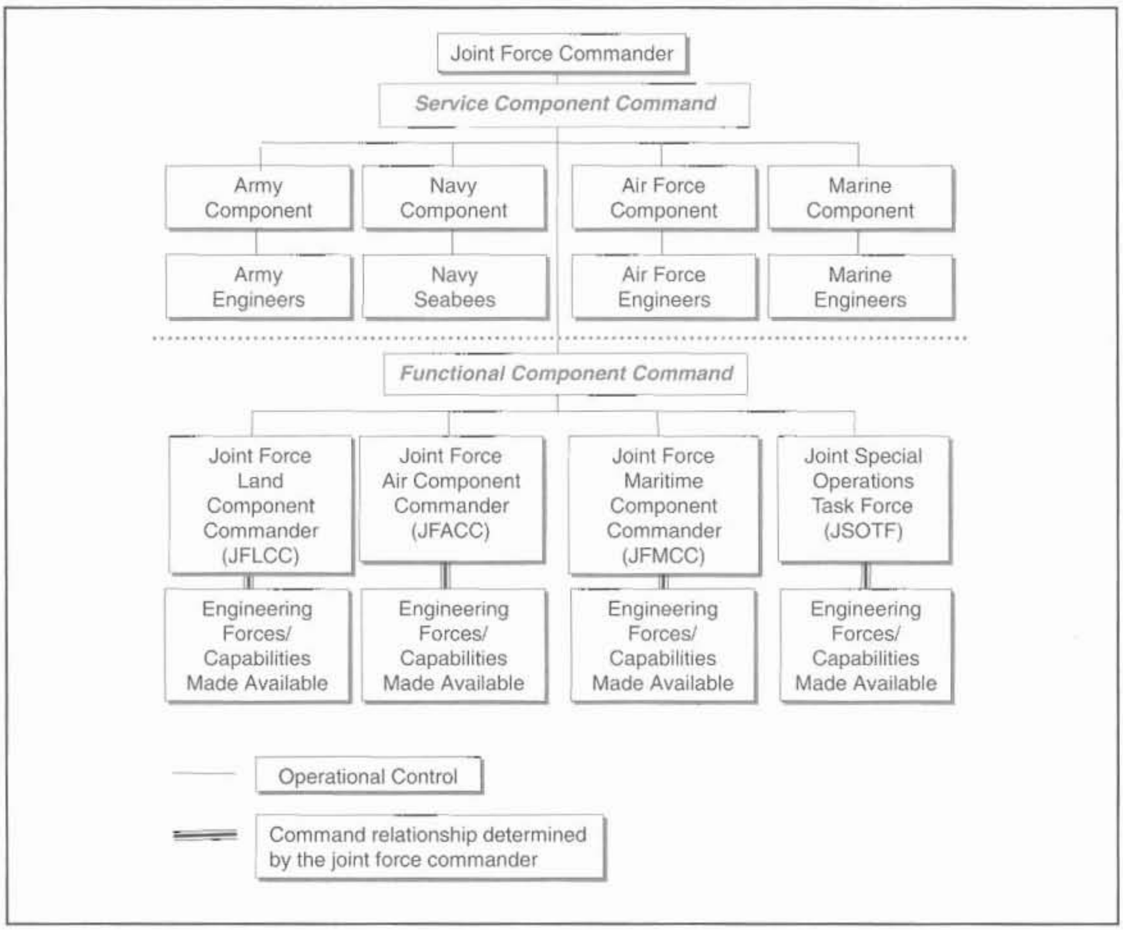


Figure 3. Service and functional component commands

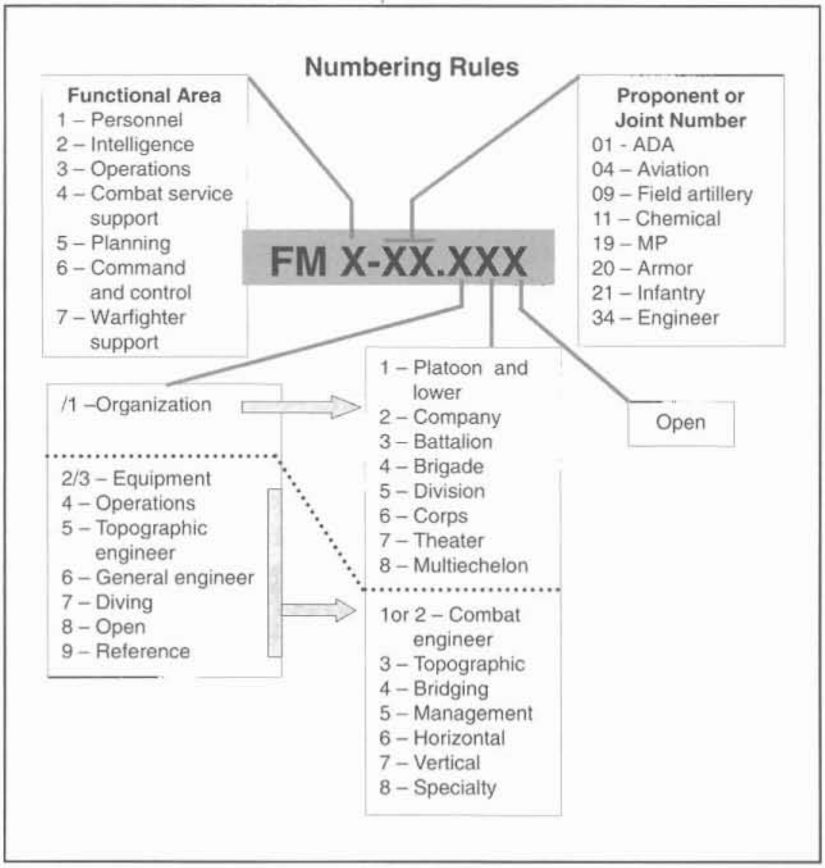


Figure 4. Numbering rules

engineers by making them subordinate to the joint force land component commander, leaving Air Force engineers subordinate to the joint force air component commander and Navy Seabees subordinate to the joint force maritime component commander. This is one example; JP 3-34 presents numerous options that are available when engineers are organized under a functional component command. The publication also presents considerations the staff should address when preparing task organizations and command or support relationships for a given joint operation.

U.S. Army Engineer School personnel participated in recent working groups to develop JP 3-34. As lead agent, the U.S. Army Training and Doctrine Command (TRADOC) will distribute this publication to the commanders in chief and Services for final review in May 1999.

JP 4-04

The key "4-series" joint engineer publication is JP 4-04, *Joint Doctrine for Civil Engineering Support*. It provides joint engineer planners with detailed, logistically focused planning and operational requirements for shaping the joint force battlespace from a facilities and infrastructure perspective. The current revision improves on the September 1995 version by presenting operational and strategic considerations for planning, coordinating, and executing civil engineering operations. As requested by the field, JP 4-04 also fully describes the military civil engineering capabilities within the Services, contract construction agents, and contractors.

U.S. Army Engineer School personnel actively participated in the revision of this publication. As lead agent, the Navy (Naval Facilities Engineer Command) is currently staffing JP 4-04 with the commanders in chief and Services. The first draft is available in the joint electronic library at h*ttp://www.dtic.mil/doctrine/jel*.

JP 3-15

JP 3-15, *Joint Doctrine for Barriers, Obstacles, and Mine Warfare*, outlines how mobility and countermobility operations can enhance the terrain and shape the battlespace to support the commander's operational and strategic objectives. In comparison to U.S. Army doctrine, the publication serves as the operational compilation of principles discussed in FM 90-13-1, *Combined Arms Breaching Operations*, FM 20-32, *Mine/Countermine Operations*, and FM 90-7, *Combined Arms Obstacle Integration*. Unlike these field manuals, however, JP 3-15 presents the land, air, and maritime components of mine/countermine warfare.

JP 3-15 completed the doctrine development cycle on 24 February 1999. It is available at *http://www.adtdl.army.mil* (Joint Publications).

Linking Joint and Army Doctrine

Unlike the joint doctrine library, the Army's numbering system for doctrinal publications follows no discernable set of rules. Some engineer manuals, such as the 5-71 series, align engineer doctrine with its associated maneuver doctrine, but in most cases the numerical designation gives no indication of its hierarchial position or subject.

In August 1997, TRADOC initiated a program to revise the Army doctrine hierarchy to link it by number and function to the joint publications system. The purpose of this initiative is to—

- Enable the Army to move in concert with an established, systematic joint doctrine system with the other Services.

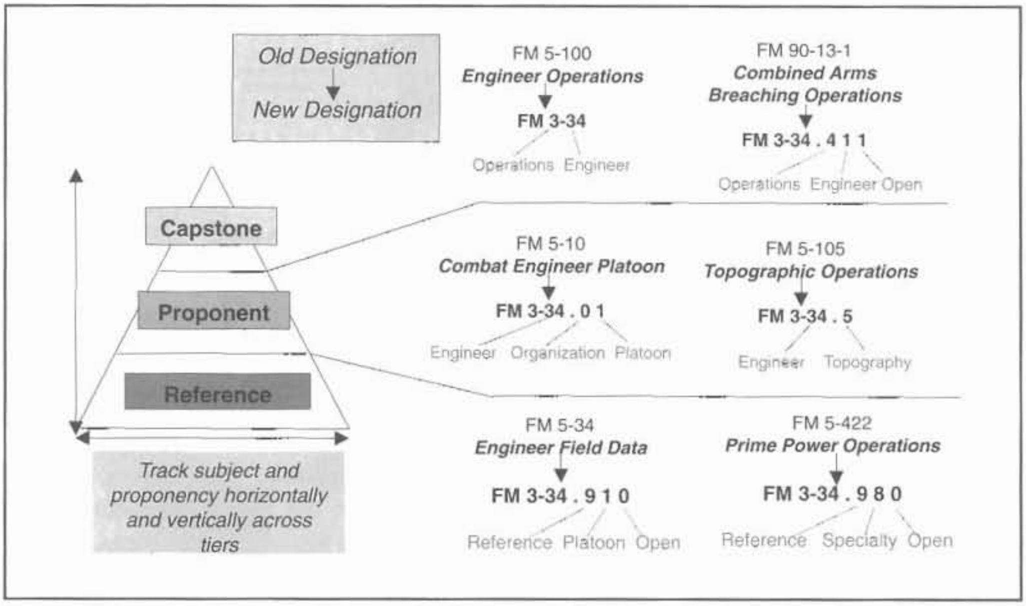


Figure 5. Linking joint and Army doctrine

- Groom young officers for the increasingly joint, interagency, and multinational nature of future military operations.
- Facilitate planning, preparation, and conduct of joint operations by Army headquarters.

The joint doctrine numbering system follows a fixed set of rules, as depicted in Figure 4, page 26. The first digit corresponds to the staff functional area for the content of the publication (1-Personnel, 2-Intelligence, 3-Operations, etc.). The second and third digits correspond to an existing joint publication or the Service proponent for the publication (20-Armor, 21-Infantry, 34-Engineer, etc). The fourth digit describes the content of the publication: organization, equipment, reference, and for engineer publications, the type of engineering covered (topographic, general, diving, etc.). Subsequent digits in the numbering system serve as further descriptors to the manual's content.

The end product of this hierarchial method is a three-tier system that allows field personnel to track proponency and functional areas horizontally and vertically across tiers (Figure 5). The upper tier delineates Army or capstone doctrine and aligns those manuals with their corresponding joint publications. The following examples show how current capstone Army field manuals will be renumbered:

- FM 100-5, *Operations,* will become FM 3-0, *Operations,* which aligns with JP 3-0, *Doctrine for Joint Operations.*
- FM 5-100 *Engineer Operations,* will become FM 3-34, *Engineer Operations,* which aligns with JP 3-34, *Engineer Doctrine for Joint Operations.*

The second tier consists of proponent and branch-specific doctrine and publications on tactics, techniques, and procedures. The lowest tier consists of reference-related doctrinal publications that contain tabular data, general reference, or common equipment. Examples of field manuals in each tier and their future designations are shown in Figure 5.

The revised doctrinal numbering system has been approved at all levels throughout the Army. Implementation of the system is expected to begin with the new version of FM 100-5 (FM 3-0), *Operations,* when it is published. Subsequent renumbering of existing field manuals will occur during the normal review or reprinting process.

Conclusion

U.S. Army Engineer School personnel continue to participate in the doctrine development process for joint publications. In an effort to improve field operations, considerable strides have been made over the past several months to ensure that lessons learned from recent operations have been captured in our joint engineer doctrinal publications.

For more information, call MAJ Spellmon at DSN 676-7537 or commercial (573) 563-4106.

Major Spellmon is chief of the Doctrine Development Division at the U.S. Army Engineer School. Previous assignments include observer/controller at the Combat Maneuver Training Center; company commander, 82nd Engineer Battalion; and platoon leader, 8th Engineer Battalion. MAJ Spellmon is a graduate of the U.S. Military Academy and the U.S. Army Command and General Staff College and holds a master's degree in civil engineering from the University of Illinois.

Military Support Detachment (RAID): The Tip of the Military Spear

By Colonel Kenneth Gonzales

A new unit is standing up at Fort Leonard Wood—the 7th Military Support Detachment (MSD) Rapid Assessment and Initial Detection (RAID). Like its nine counterparts—one in each Federal Emergency Management Agency (FEMA) region—it has a mandate. Authorized and funded in the FY99 defense bill, it must be manned, equipped, trained, certified, and validated fully mission capable no later than 5 January 2000. Ambitious as this may seem, its fielding is very much in progress.

Because the RAID detachments are so new and their concept-to-fielding process transcends standard procedures for introducing new force structure, they are already the subject of much misinformation. This article explains some of the background that led to their establishment, how the RAID detachments are manned and equipped, and what they are designed to do. I also briefly describe the 7th MSD (RAID) relationships with the Maneuver Support Center (MANSCEN) and the Total Army Center of Excellence for Homeland Defense initiatives at Fort Leonard Wood.

Background

Our nation's awareness of the threat from terrorist acts and incidents involving weapons of mass destruction (WMD) has been mounting throughout the 1990s. Events such as the bombings at the New York City World Trade Center, the Tokyo subway, and the Murrah Federal Building in Oklahoma City accelerated the need to take action. In June 1995, President Clinton issued Presidential Decision Directive 39. It provides guidance for distinguishing between "consequence management" and "crisis management" and establishes specific objectives and accountability for federal agencies. The directive's objectives include deterring, defeating, and responding to all terrorist attacks on our territory and managing the consequences of such attacks.

Nunn-Lugar-Domenici legislation contained in the FY97 defense bill directed the Secretary of Defense to more fully engage the military in measures to protect our nation from terrorist attacks involving WMD. Accordingly, the Department of Defense is providing for training, expert advice and assistance, loan of equipment, rapid response capability, and the use of the National Guard and other elements of the Reserve Components.

In May 1997, the National Security Council released *The National Security Strategy for a New Century.* Our nation's security planners recognized that "...because of our dominance in the conventional military arena, adversaries who challenge the United States are likely to do so using asymmetrical means such as weapons of mass destruction, information operations, or terrorism." A few months later, the Secretary of Defense released an updated *National Military Strategy* (October 1997). It provided additional insight into an acknowledged vulnerability: "...terrorism, the use or threatened use of WMD... have the potential to threaten the U.S. homeland and population directly and to deny us access to critical overseas infrastructure."

Other reports since then from the Defense Science Board, Foss-Downing Commission (CB 2010), and Quadrennial Defense Review also acknowledged the terrorist threat. Among the conclusions reached by these separate studies was one common recommendation: greater use of the National Guard and other elements of the Reserve Components.

In response to these findings and recommendations, the Department of Defense established a special committee to investigate how to better integrate National Guard/Reserve Component WMD capabilities to enhance military response to civil authorities. Designated the 'Tiger Team," its charter was straightforward: construct a complete model for integrating the Reserve Components into a consequence-management response for domestic terrorist incidents involving WMD.

Establishment

Among recommendations posed by the Tiger Team's early 1998 report was the establishment of a rapid assessment and initial detection capability in the National Guard. The original recommendation called for 54 teams (one for each state, territory, and Washington, D.C.).

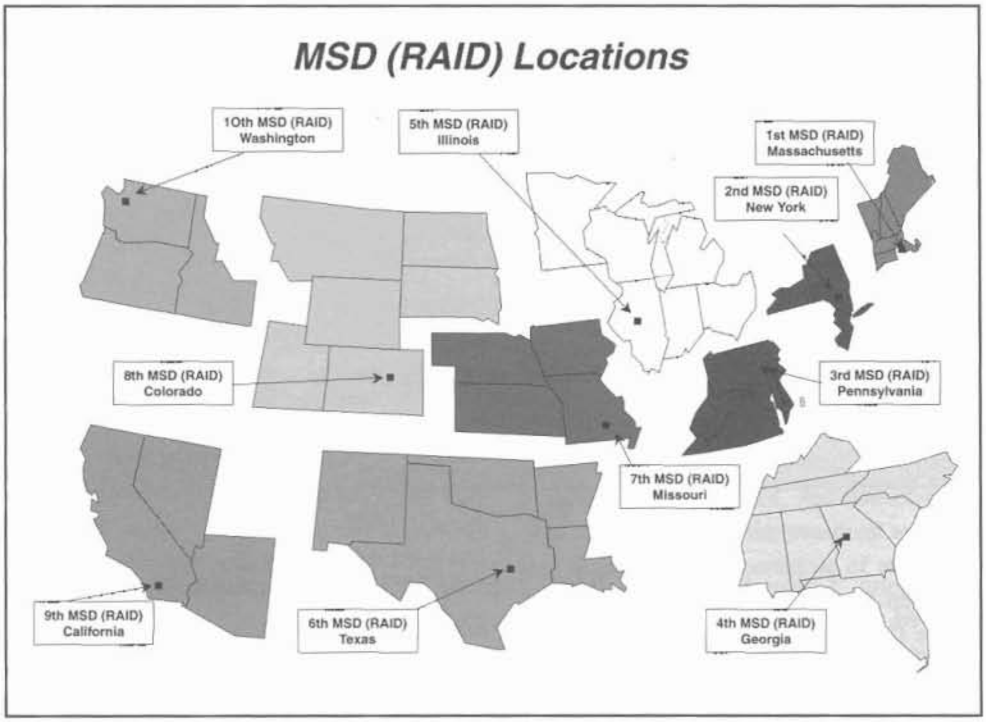


Figure 1

The manning document provided for 44 personnel: 22 full-time (Active Guard/Reserve) and 22 part-time (traditional or mobilization-day guardsmen). These teams were to be trained and equipped to standards compatible with the civilian "first responders" (fire, police, emergency medical, and hazardous materials) they were designed to support.

Despite time, budgetary, and legislative obstacles, the Tiger Team's recommendation became a reality when the 1999 defense bill was signed. Final legislation, however, reduced the number of National Guard teams from 54 to 10 (one for each of the 10 FEMA regions) and provided for only 22 full-time Active Guard/Reserve personnel (no traditional guardsmen). Figure 1 shows the 10 FEMA regions and the MSD (RAID) states.

Mission

The purpose of MSD (RAID) is multifaceted. From the time of notification, units are designed to deploy within 4 hours to the site of a suspected terrorist incident within the FEMA region they support. The RAID detachments operate in direct support of civilian first responders. The local agency head that has authority over the incident response is referred to as the incident commander. In terrorist incidents characterized by explosive devices, fires, hazardous materials, etc., the incident commander is normally the local civilian fire chief. The RAID detachments, in direct support of incident commanders, help first responders identify and assess the nature of an attack and determine the presence and type of nuclear, chemical, biological and/or radiological (NBCR) contamination. The detachments are trained and equipped to provide on-scene medical and technical advice to incident commanders and have the knowledge and capability to reach back for follow-on state, federal, and military assets. Figure 2 shows the MSD (RAID) mission statement.

The MSD (RAID) 22-man table of distribution and allowances provides for six subteams: command and control, operations, communications, administration/logistics,

MSD (RAID) Mission

The MSD (RAID) deploys to an incident site in support of the local incident commander to:

- **ASSESS a suspected nuclear, chemical, biological or radiological event.**
- **ADVISE civilian responders regarding appropriate actions.**
- **FACILITATE requests for assistance to expedite the arrival of additional state or federal assets to help save lives, prevent human suffering, and mitigate great property damage.**

Figure 2

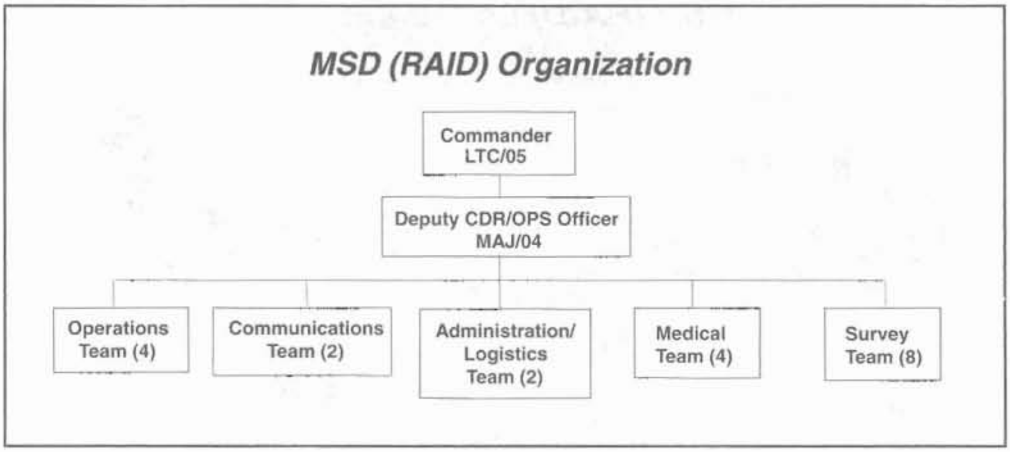


Figure 3

medical, and survey. Figure 3 depicts how the RAID detachments are structured. All positions may be filled by either Army or Air National Guard personnel.

Command and Control Team

The command and control team oversees the MSD (RAID), advises the incident commander on appropriate responses to WMD incidents, and facilitates follow-on support. The team also coordinates all public affairs issues for the MSD (RAID).

Operations Team

The operations team conducts planning, hazard modeling, and interagency coordination and schedules individual and collective training for MSD (RAID) personnel. The team helps plan and conduct interagency exercises, conducts force protection and liaison functions, and coordinates MSD (RAID) sustainment training.

Communications Team

The communications team supports the technical needs of the MSD (RAID). It provides day-to-day communications (internal and external voice and data networks) while the RAID detachment is at home station. Once mobilized, it supports team communications en route to an incident site. Upon arrival at the incident site, the communications team keeps the MSD (RAID) commander in touch with the incident commander and other reach-back support as needed.

Because of the civil-military implications of this team, MSD (RAID) communications equipment appears more civilian than military. Civilian fire, police, and emergency medical service departments frequently employ 800/900 MHz two-way radio communications systems. HF/UHF/VHF systems frequently are used to link military and federal agencies. Pagers, cellular telephones, and tactical satellite voice and data telecommunications systems supplement the radio-based systems that provide communications power to the MSD (RAID) commander and the supported incident commander.

Administration/Logistics Team

The administration/logistics team procures, stores, accounts for and maintains all MSD (RAID) equipment. It also provides traditional administrative and personnel functions common to all units. The challenges of its support are magnified by the unique requirements of the unit. The communications systems described above are representative of the unusual and nonstandard military character of the MSD (RAID). Transportation and protective gear are other examples of the unique nature of this unit. Its vehicles are nonstandard—General Services Administration vans and sport utility models. While all team members are issued personal protective equipment and carry M40 masks, the survey team is trained to operate in Level A suits (spacesuit-type outer garments with self-contained breathing apparatus).

Medical Team

The medical team advises the incident commander of health and medical implications for personnel in areas affected by a WMD incident. Team members are trained and resourced to coordinate with local, state, and federal health-care officials and agencies for follow-on support as needed. The medical team provides basic medical care for MSD (RAID) members and conducts physical assessments before and after survey team members enter potentially contaminated WMD incident sites.

Survey Team

The survey team conducts nuclear, biological, chemical and radiological (NBCR) surveys at a WMD incident site, as directed by the MSD (RAID) commander. Survey team members are at the heart of the MSD (RAID) weapons-of-mass-destruction incident response. They are trained and equipped to enter the "hot zone," obtain samples of possible NBCR contaminants, and monitor local contamination levels.

They are equipped with the latest technology for detecting and assessing possible contaminants. In addition to familiar military detection and monitoring equipment, the survey team brings sophisticated diagnostic tools like the gas chromatograph and mass spectrometer to the incident commander. Having these devices available is critical to the unique mission of the MSD (RAID) and its support to civilian authorities.

Command and Control

Operationally, the MSD (RAID) falls under the command and control of the adjutant general of the state to which it is assigned. As a Title 32 National Guard asset, its deployment to support civilian authorities during a WMD incident is similar to other state disaster deployments in which the National Guard has been involved for many years.

Recognition of the long-standing relationship between the National Guard and civilian authorities was an influencing factor in deciding where to place the MSD (RAID) capability. Deployment of the detachments to other states is coordinated through FEMA. In those circumstances, the MSD (RAID) falls under the command and control of the receiving adjutant general, while remaining in direct support of the local incident commander. Many other doctrinal, training, equipment, evaluation, and deployment considerations for MSD (RAID) are still being developed.

Stationing the 7th MSD (RAID) at Fort Leonard Wood offers it some advantages that the other detachments won't enjoy. During FY99, the Army's Chemical and Military Police Schools will join the engineers as co-tenants of Fort Leonard Wood. While the dynamics of this union may take years to fully realize, the 7th MSD (RAID) will reap some immediate benefits. Subject matter expertise available in the three schools will enable the 7th MSD (RAID) to lead in doctrine, training, leader development, organization, materiel, and soldiers (DTLOMS) issues affecting its mission.

The advantage works both ways. Discussions with senior members of the school staffs reveal that they already see benefits for their students, battle lab experiments, facilities employment, leader development, and training by having a RAID detachment in their own backyard. Designated the Maneuver Support Center and established to leverage the synergistic impact of all three schools, Fort Leonard Wood is a showcase for TRADOC's reorganization initiative around battlefield functions. (See *Engineer,* April 1998). Through its stationing at the MANSCEN, the 7th MSD (RAID) benefits from this consolidation. No other installation brings together the subject matter experts, training opportunities, and battle lab facilities as well as Fort Leonard Wood.

Threat Response

In homeland defense and Department of Defense initiatives to provide for the defense of our nation, the MSD (RAID) is the tip of the military spear in responding to incidents involving WMD. In fact, while our leaders determine how to bring all strategic assets into coordinated alignment (information operations, national missile defense, special operations forces, etc.), the MSD (RAID) stands out as the military's newest and most visible capability for responding to the threat of domestic terrorism.

The designation of MANSCEN as the Total Army Center of Excellence for Homeland Defense training, experimentation, and force integration is a given. At MANSCEN, troops will train to detect, defend against, and decontaminate NBCR weapons. Soldiers will manage the treatment and evacuation of casualties and assist with the quarantine of affected areas and personnel. Proponent responsibilities of the Chemical, Military Police and Engineer Schools (the MANSCEN) are to respond to NBCR contamination, counter the threat of terrorism, protect the force, secure projection platforms, and ensure continuity of critical infrastructure. The physical and intellectual capital invested in Fort Leonard Wood today will contribute to the Total Army's success in executing homeland defense missions. Stationing the 7th MSD (RAID) at Fort Leonard Wood is part of that investment.

Conclusion

The requirement for a rapid assessment and initial detection capability was documented by numerous studies and technical working groups. Hence, the establishment of the Military Support Detachment (RAID). Stationed in the 10 FEMA regions of the United States, these National Guard detachments will be designed, trained, and equipped to detect and assess NBCR contamination resulting from terrorist acts involving weapons of mass destruction. The MSD (RAID) will augment civilian authorities with technical capabilities beyond those normally found among first responders.

If called on to respond to a WMD incident, an MSD (RAID) deploys to support civilian authorities as the initial military response element on the scene. For the Department of Defense, the National Guard's MSD (RAID) capability is the tip of the military spear. For Fort Leonard Wood, the Maneuver Support Center, and the Total Army Center of Excellence for Homeland Defense, the 7th MSD (RAID) is a unique tenant activity and a viable partner for the future.

Colonel Gonzales is director of plans, operations, and training for the Missouri National Guard. He commanded the 175th Military Police Battalion and has served at the National Guard Bureau in Washington, D.C. COL Gonzales holds a master's degree in education and is a graduate of the Army War College.

The First DEUCEs are "On the Ground"

By Jeffrey Klein

On 29 January 1999, the U.S. Army Engineer School received the first two production deployable universal combat earthmovers (DEUCEs). This highly anticipated earthmover, which will soon be in the Army construction equipment inventory, will provide light infantry and airborne combat engineers with an unprecedented self-deploy capability. The Engineer School's two DEUCEs will supplement the school's training mission by providing advanced technologies and will help define future mission doctrine.

In addition to receiving the equipment, Engineer School instructors, maintainers, and operators received instructor and key personnel training. These critical personnel will train future Army soldiers in the correct operation and maintenance of the tractors. They are at the top of a teaching pyramid that will rapidly multiply the number of properly trained engineer soldiers.

In the earthmoving mode, the DUECE's blade can be tilted in six different positions with a joystick.

Description

The DEUCE is the result of an ongoing partnership between the Tank-Automotive and Armaments Command (TACOM), in Warren, Michigan, and the contractor, Caterpillar Inc., Defense and Federal Products Department. A contract awarded to Caterpillar in 1995 is managed by TACOM's project manager for Tank-Automotive Weapon Systems (PM TAWS) and the product manager for Construction Equipment/Material Handling Equipment (PM CE/MHE). Representatives from both TACOM and Caterpillar attended the DEUCE hand-off at Fort Leonard Wood.

The DEUCE's engine, transmission, and suspension configuration combine to allow it to travel in the self-deploy mode at speeds up to 30 mph. It has an automatic 6-speed transmission and a fully suspended undercarriage. The rubber track is lighter and less damaging to road surfaces than a traditional steel-track design. This configuration allows for a safe and comfortable ride and eliminates the need for additional hauling assets between job sites.

The flip of a switch engages the earthmoving mode. The DEUCE operates with a standard power-shift transmission, a locked-out suspension for a rigid dozing platform, and a dozing capability comparable to the D5 dozer currently authorized to some 18th Airborne engineer units. The DEUCE is designed for driving on and off C-130, C-141, C-5, and C-17 aircraft and is undergoing certification testing for C-130 airdrops.

The DEUCE will be used primarily to prepare airstrips, roads, and protective positions. To increase its effectiveness, the operator may communicate from within the DEUCE with the single-channel, ground-to-air radio system (SINCGARS) and precise light-weight GPS (global positioning system) receivers (PLGR). The DEUCE uses a six-way hydraulic power-angle-tilt blade and a rear-mounted 22,000-pound hydraulic winch. The Caterpillar 3126 Hydraulic Electronic Unit Injector engine has dual power settings, which produce 185 hp in the earthmoving mode and 265 hp in the self-deploy mode. The DEUCE is equipped with an enclosed, climate-controlled cab that allows optimal performance from a less-fatigued operator. The engine, as well as 75 percent of about 3,000 serviceable DEUCE components, has proven its durability through Caterpillar's extensive commercial experience.

In the self-deply mode, the DUECE can travel up to 30 mph on asphalt roads without causing damage.

Testing

Initial testing indicated that the undercarriage design, although adequate for commercial applications, was not sufficient for rigorous military operations. After consulting with all appropriate commands, including U.S. Army Forces Command and the Engineer School, the PM CE/MHE initiated a nine-month testing and redesign period with the goal of improving the future readiness of the machines. The result is a much improved undercarriage design.

According to the assistant product manager for the DEUCE, the rubber track technology has been proven over the years on Caterpillar's Challenger series of agricultural tractor. The entire undercarriage, including the steel-reinforced solid rubber track, has undergone extensive testing across the country. Testing conditions included knee-deep mud and clay at Aberdeen Proving Grounds; frozen soil (sand, gravel, and clay) at Caterpillar's Minneapolis facility; desert rock and sand at Caterpillar's Arizona Proving Grounds; and a Midwest mix of clay, sand, gravel, and mud at Caterpillar's proving grounds in Peoria, Illinois. All of this data was incorporated in the final undercarriage design that soldiers will receive. Sharp volcanic rock in Hawaii and Fort Lewis, Washington, will undoubtedly increase the grouser wear rate, similar to the experiences of rubber-tired vehicles, but the transportability advantages of this type of track are necessary to meet the quick-strike capabilities of light and airborne engineers.

Fielding

Before delivering these machines, unit personnel will receive three days of operator training and five days of maintenance training. The advanced design of the operator's compartment, along with the ergonomically designed operator controls, allow for these minimal operator-training requirements. For example, the automotive-type steering wheel, accelerator pedal, and brake pedal typically are not associated with tracked construction equipment.

The 10th Mountain Division (Light) at Fort Drum, New York, is scheduled to receive the first DEUCE in May 1999. The 82nd Airborne Division at Fort Bragg, North Carolina, will be outfitted with the DEUCE in June, followed by the 20th Engineer Brigade at Fort Bragg. Fielding the acquisition objective of 160 DEUCEs will continue through 2002.

The coming months will be busy as product managers from both TACOM and Caterpillar's Defense and Federal Products Department prepare for the initial fieldings. At that time, TACOM and all of the DEUCE team members will have achieved their goal of fielding a capable, reliable, and supportable piece of equipment to the soldiers of the 21st century.

Mr. Klein is the DEUCE project engineer and works on the Construction Equipment Team at TARDEC. He holds a bachelor's degree in mechanical engineering from Virginia Tech and a master's degree in mechanical engineering from Catholic University, Washington, D.C.

Army Experimentation Campaign Plan:

Total Army and Joint Teamwork Toward a Full-Spectrum Land Force

By Vern Lowrey

General Reimer, Chief of Staff, United States Army, recently approved a new path to the future that is described as the *Army Experimentation Campaign Plan* (AECP). The AECP is a result of the Army's successful experimentation since 1993 with new ideas, technologies, equipment, and organizations as part of the Force XXI process. Results from experimentation with mechanized forces and digital technologies at Fort Hood, Texas, and the National Training Center (NTC), Fort Irwin, California, led General Reimer and Army leaders to expand experimentation efforts into other areas. These areas include light contingency forces, Strike Forces, and future Army After Next (AAN) forces. The AAN forces include Battle Forces, campaign forces, homeland defense forces, and special operations forces (SOF).

The AECP path to the future shown in Figure 1 takes the Army from the current Army of Excellence (AOE) organization through a spiral development process. Beginning with research and study, science and technology, and experimentation, the process spirals through the newly designed Army XXI Division toward AAN and its various franchise study groups. Fort Leonard Wood will lead Army homeland defense doctrine, training, leader development, organization, materiel, and soldier (DTLOMS) developmental efforts (See article on page 38).

The three AECP experimentation axes shown in Figure 2, page 35, will guide the Army over the next 10-25 years. Mechanized and light force axes will lead to fully digitized mechanized and light corps by 2010. Current Strike Force experimentation efforts will create a deployable headquarters that can quickly assimilate Army warfighting capabilities to meet strategic and operational requirements in a theater of operations. The Army is teaming with its joint partners in the U.S. Navy, Marine Corps, and Air Force through a series of joint experiments over the next several years to develop mutually supporting technologies and organizations. Army engineers will continue to be key players in all AECP experimentation efforts. The following potential issues and initiatives will be addressed in future AECP experimentation efforts.

Mechanized Contingency Forces. An article beginning on page 40 describes lessons learned from early experimentation with mechanized forces. Experimentation continues with the 4th Infantry Division at Fort Hood, Texas

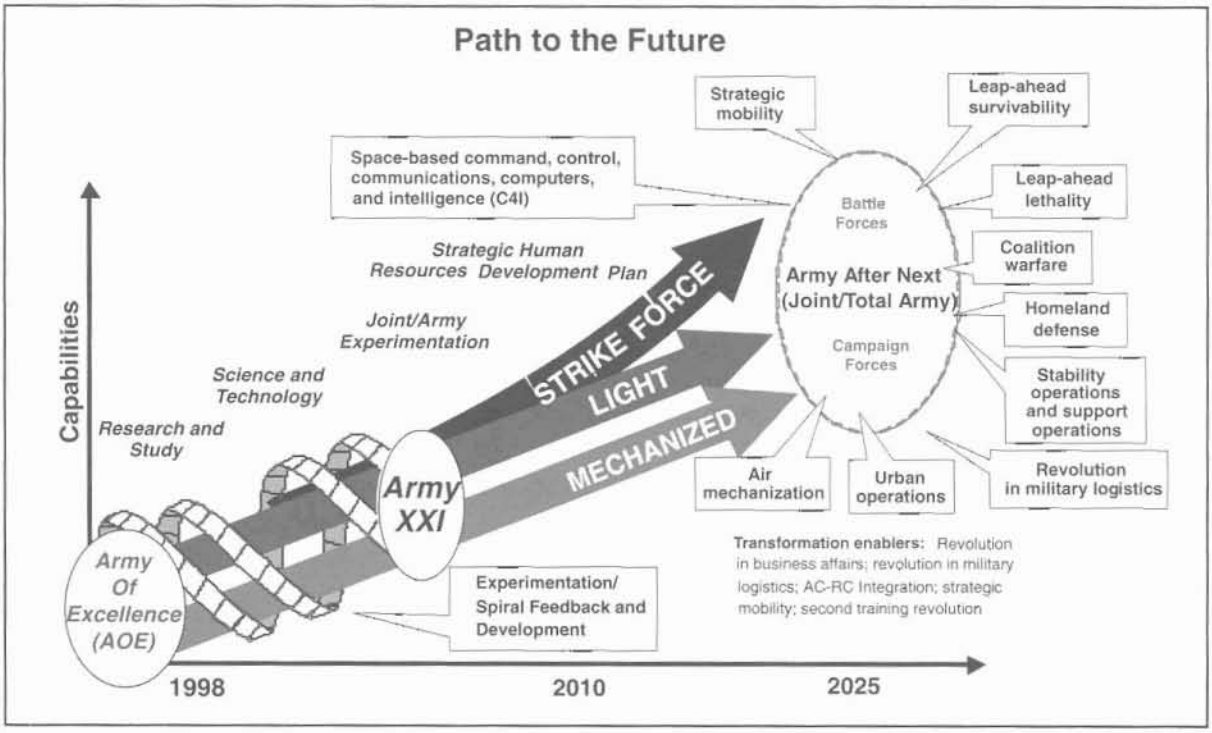


Figure 1

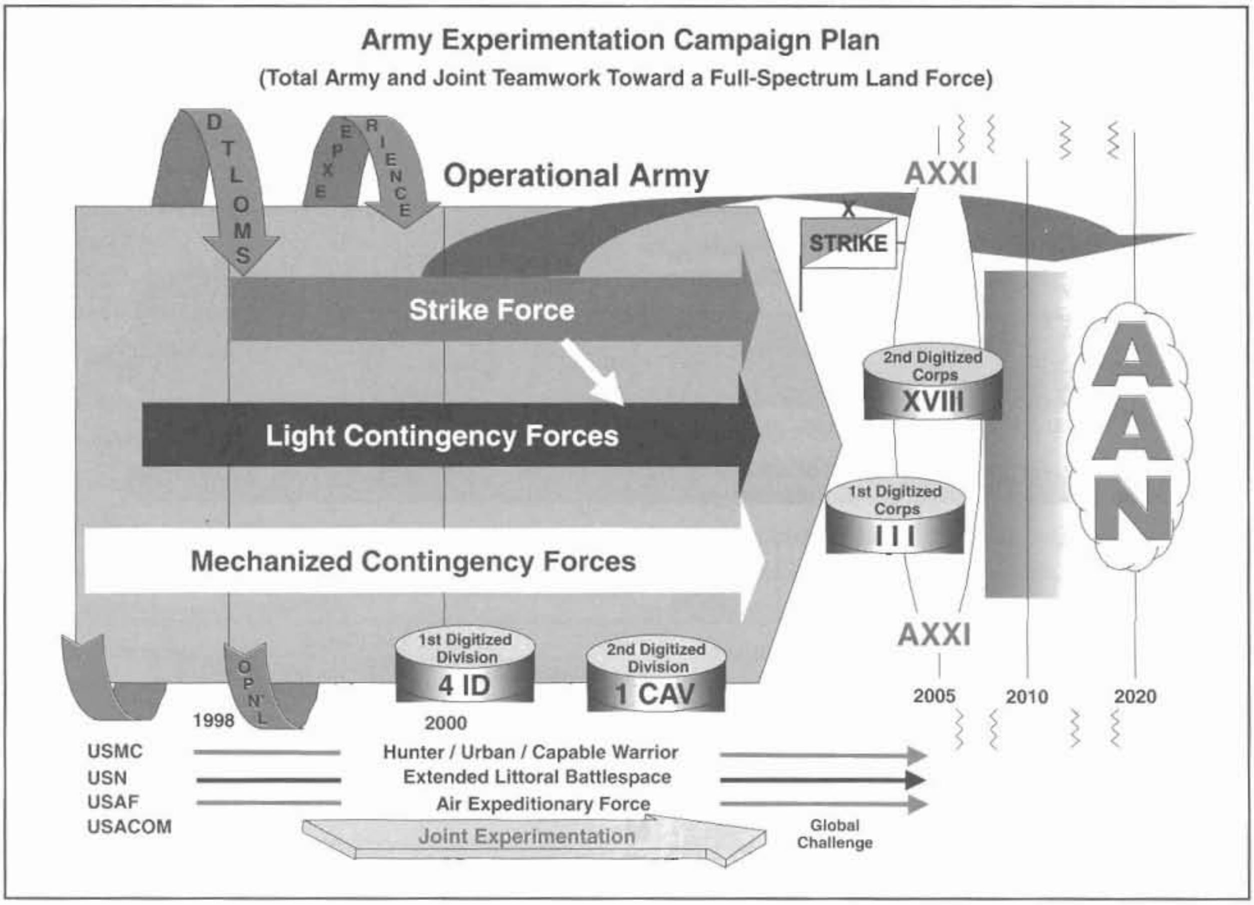


Figure 2

(Figure 3, page 36). The Army will validate the first digital division design in FY01 during division capstone exercises (DCX) at both Fort Hood and NTC. Following the DCX, the 1st Cavalry Division at Fort Hood will start digitizing its command and control capability. Ongoing hardware integration and software upgrades within the Army Battle Command System, including the Force XXI Battle Command Brigade and Below (FBCB2) platform computer system, will continue through the DCX. Training and Doctrine Command (TRADOC) is developing a Corps XXI design that will focus on the new battlefield framework of shaping, decisive, and sustainment operations. This design will replace the current Air–Land Battle framework of deep, close, and rear operations. The new Corps XXI design will be validated during a Corps advanced warfighting experiment (AWE) that will examine both heavy and light corps operations. The following are some of the engineer issues to be addressed in the mechanized contingency force experimentation axis:

- Army XXI division engineer command and control structure.
- Corps XXI engineer command and control structure.
- Joint combat engineer command and control tools.
- Army XXI division consolidated combat service support structure for engineers.
- Digital terrain data acquisition, management, dissemination, and storage.
- Engineer Bradley fighting vehicle.
- Route minefield clearance.
- Maneuver control system-engineer (MCS-E) software.

Light Contingency Forces. The Army has conducted very few experiments with light contingency forces over the past several years. That situation is changing because we will be involved with the Joint Contingency Force (JCF) AWE, which will be conducted at the Joint Readiness Training Center, Fort Polk, Louisiana, in the fall of 2000. As shown in Figure 4, page 36, the JCF AWE will showcase new warfighting technologies and digital command and control linkages, which were developed during the Rapid Force Projection Initiative's (RFPI) advanced concepts technology demonstration (ACTD) and the ongoing Military Operations in Urbanized Terrain (MOUT) ACTD at Fort Benning, Georgia. The 10th Mountain Division from Fort Drum, New York, will be the JCF AWE experimental force. The XVIII Airborne Corps headquarters, Fort Bragg, North Carolina, will serve as the joint task force headquarters for the AWE. The United States Atlantic Command (USACOM) will serve as the overall joint experimentation headquarters for the AWE. The Marine Corps will participate through ongoing Urban Warrior experimentation that will continue through the JCF

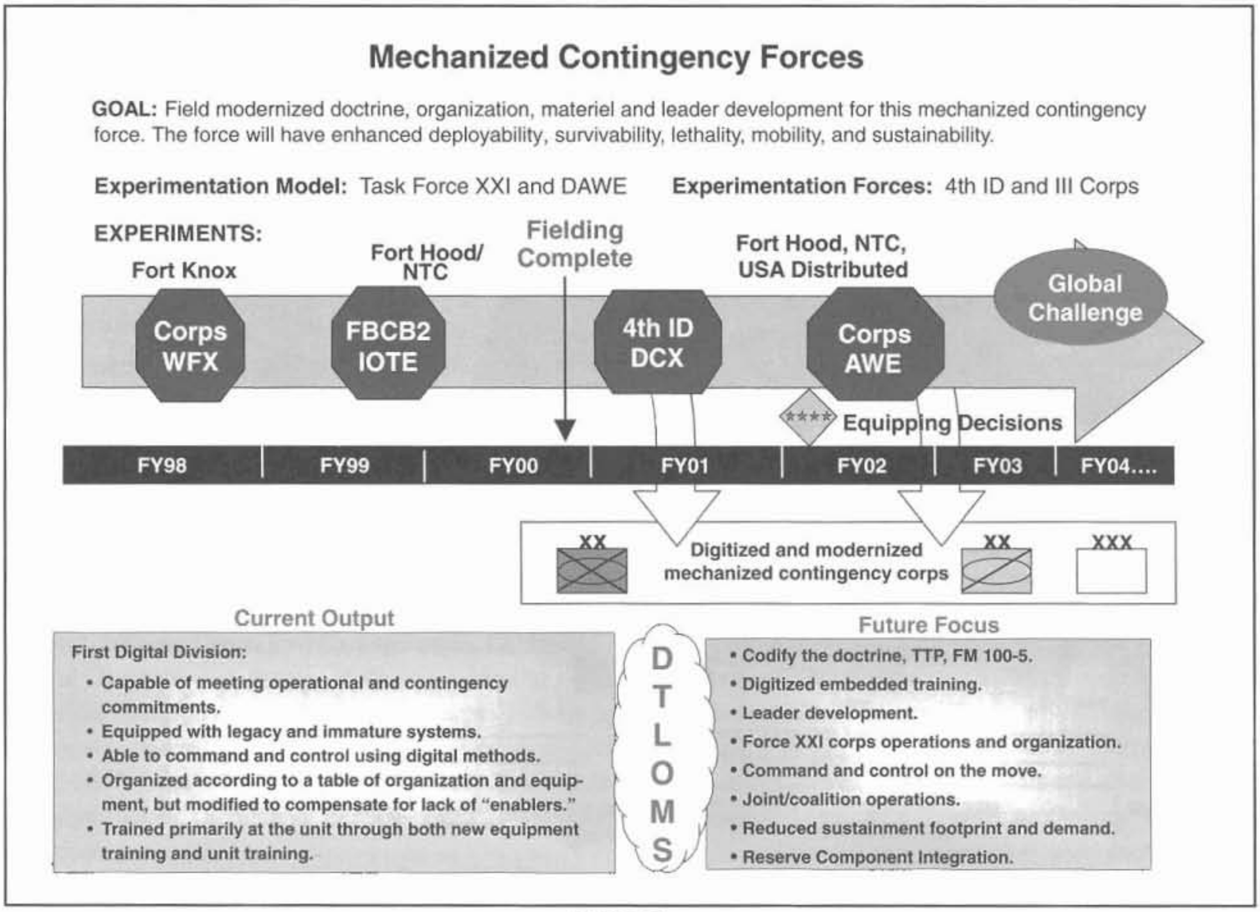


Figure 3

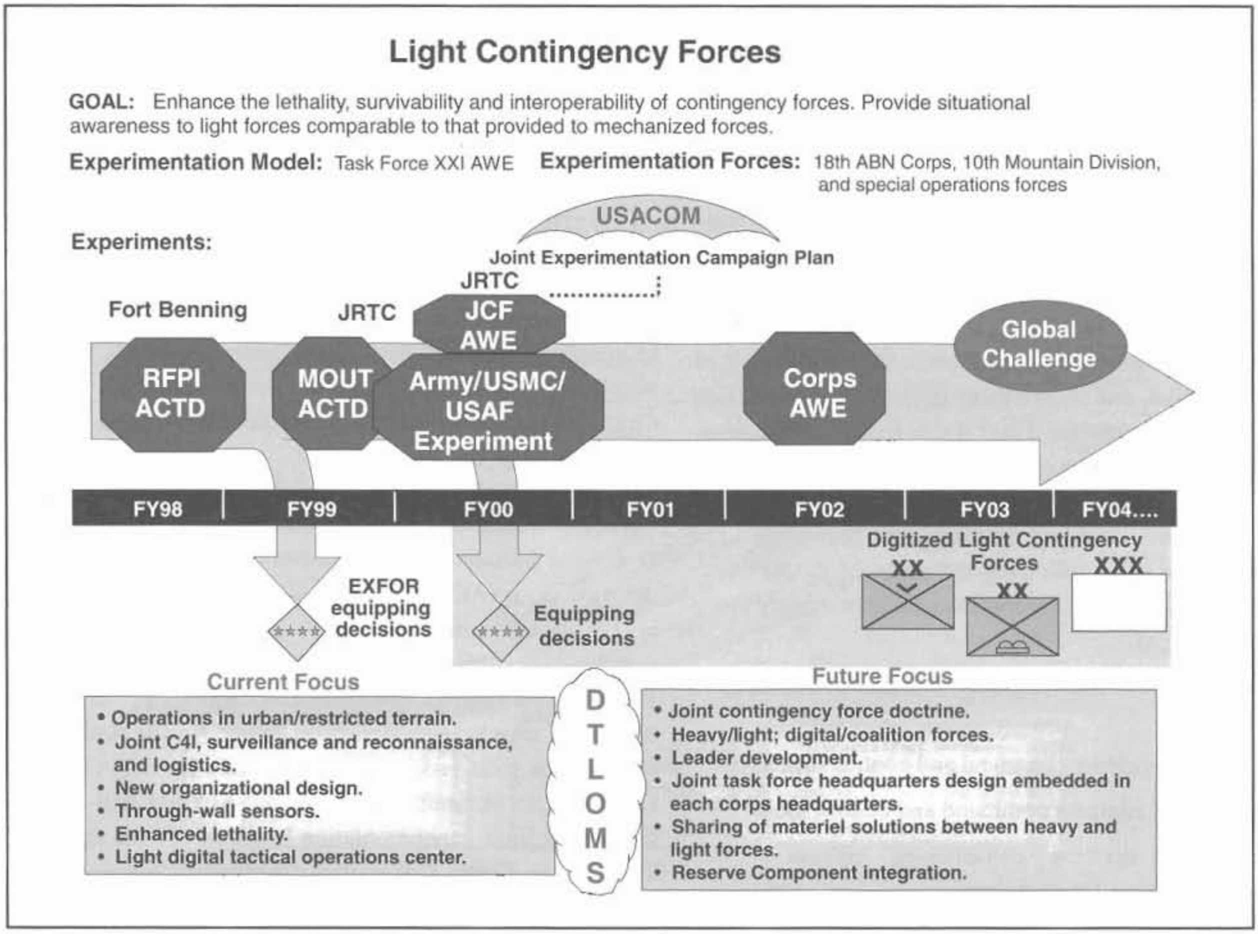


Figure 4

AWE. The Air Force also will participate as part of their Air Expeditionary Force experimentation process. A newly formed Strike Force headquarters will be evaluated during the JCF AWE. Results from the JCF AWE will be used to assess needed changes in light contingency forces and to identify issues for the follow-on Corps AWE. The following are some of the Army engineer issues to be addressed in the experimentation axis for light contingency forces:

- Rapid airfield construction.
- Digital terrain data acquisition, management, dissemination, and storage, especially in urban environments.
- Urban obstacle and rubble removal.
- Subterranean robotic reconnaissance.
- Advanced technologies for the demolition of buildings and walls.
- Digital command and control of engineers.
- Tactics, techniques, and procedures for the acquisition and operation of contingency engineer equipment.

Strike Forces. Strike Forces are part of the AECP to prepare combat and combat support organizations for future multifunctional operations. They will be part of a rapidly deployable, flexible, and adaptive early-entry force (Figure 5). The evolving Strike Force structure is intended to complement current light and heavy force capabilities. Strike Forces will serve as a bridge between the physical agility of Army XXI and the mental agility inherent in the Army After Next. Initial experimentation efforts will focus on the design and operations of the Strike Force headquarters being developed at Fort Polk, Louisiana. The following are some of the engineer issues to be addressed as part of Strike Force experimentation efforts:

- Engineer command and control requirements associated with the combat support node of the Strike Force headquarters.
- Digital terrain data acquisition, management, dissemination, and storage for Strike Forces.
- Requirements for a high-speed engineer vehicle as a possible complement or replacement for the small emplacement excavator (SEE).
- Engineer robotic applications.
- Capability of the deployable universal combat earthmover (DEUCE) to support more than light forces (see article, page 32).
- Lightweight bridging.

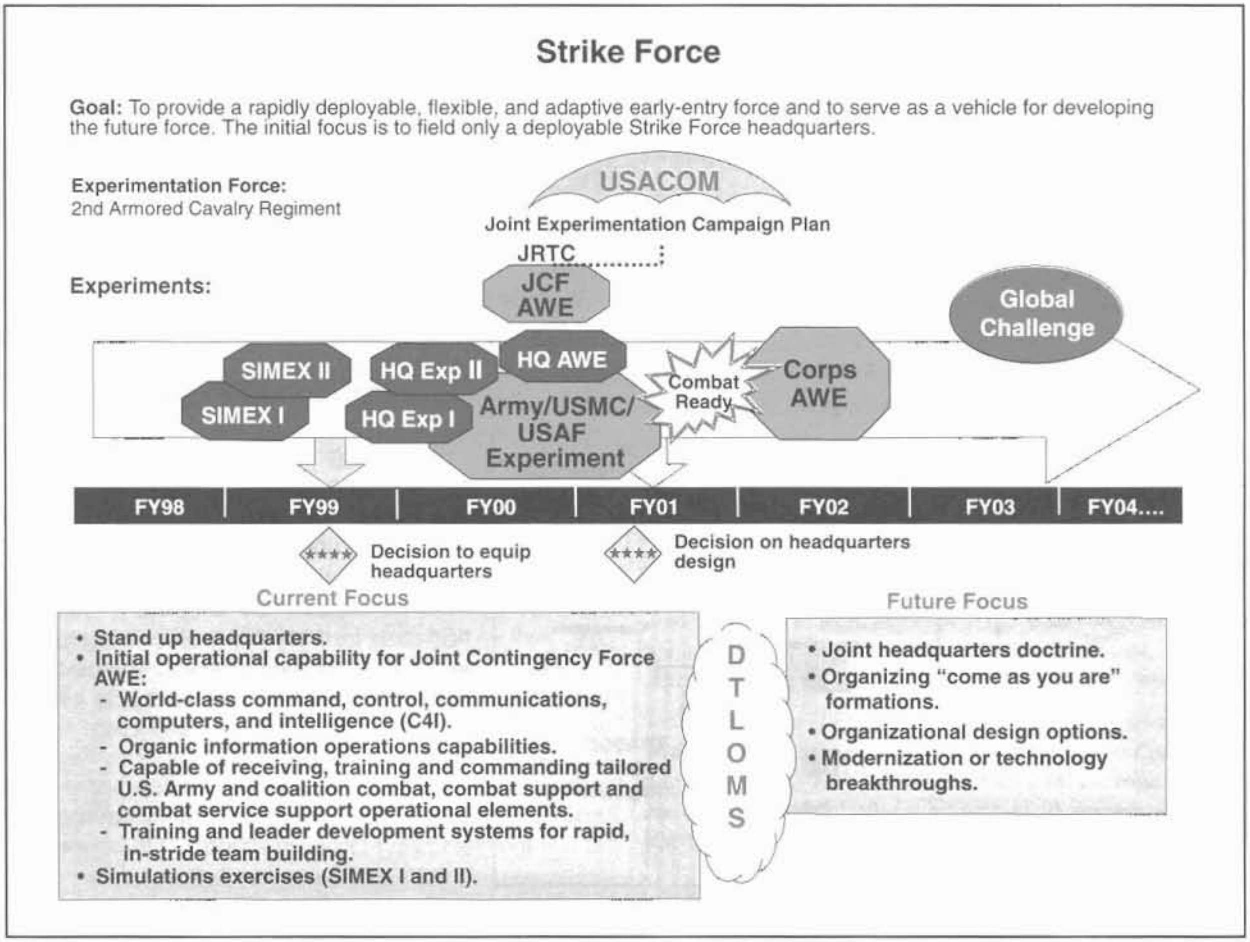


Figure 5

Homeland Defense. Army leaders are defining this new mission area. Homeland defense encompasses many areas, including disaster relief, protecting the nation's infrastructure against weapons of mass destruction and terrorism, and vulnerability assessment tools. Fort Leonard Wood will become the Army's Center of Excellence for Homeland Defense on 1 October 1999, when the Maneuver Support Center officially stands up. The Maneuver Support Battle Lab has several ongoing engineer-related experiments that may become part of the homeland defense mission:

- Mine detection using chemical signature technologies.
- Evaluation of joint vulnerability assessment tools.
- Evaluation of an antiterrorism planning tool for blast effects.
- Force protection of logistics bases.

The Maneuver Support Battle Lab is charged with integrating all engineer experimentation activities associated with AECP. We continually seek new thoughts and ideas from field personnel related to AECP and homeland defense missions. For additional information or to pass on ideas, please call Colonel Greg Bean or Vern Lowrey at DSN 676-4082 or commercial (573) 563-4082. Our fax number is (573) 563-4083. *E-mail addresses are beang@wood.army.mil or lowreyv@wood.army.mil.*

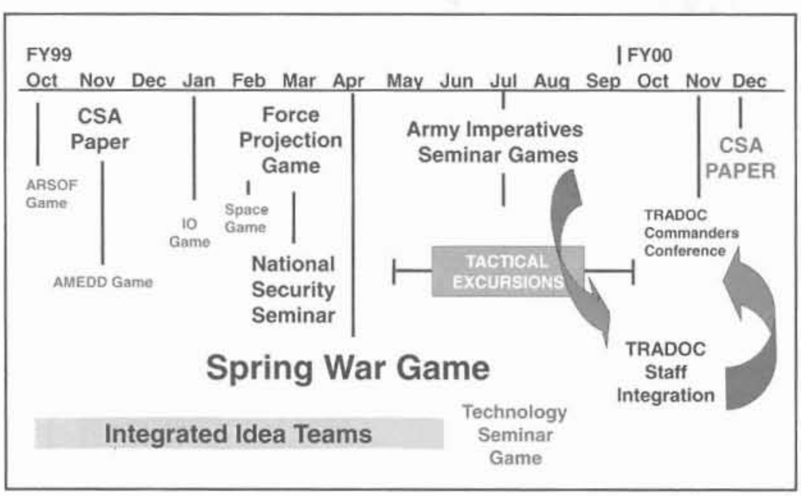
Mr. Lowrey is the technical director of the Maneuver Support Battle Lab at Fort Leonard Wood.

Engineer Contributions to Army After Next

By Lieutenant Colonel James Vosler

Knowledge, speed, and power are broad capabilities that will form the foundation of the Army After Next (AAN) in 2025. The Chief of Staff, United States Army, established the AAN project in February 1996 "...to assist our leadership in developing a vision of future Army requirements." The project's mission is to conduct broad studies of warfare out to the year 2025. These studies will frame issues vital to the development of the U.S. Army after 2010 and identify alternatives for senior Army leaders to integrate into TRADOC's combat development programs (see figure).

U.S. Army Engineer School personnel are actively engaged in the AAN project and participate in TRADOC-sponsored war games, technology seminars, and integrated idea teams that occur throughout the year. This year's AAN project will culminate with TRADOC's third annual report to the Chief of Staff of the Army in December 1999.



The AAN project's main effort each year concentrates on a spring war game at Carlisle Barracks, Pennsylvania. The game this year will examine asymmetric threats by opposing forces, which include weapons of mass destruction, information warfare, and operations within complex and urban terrain. Other war games planned for this year will examine implications resulting from the spring war game across the Army DTLOMS (doctrine, training, leader development, organization, materiel, and soldiers) imperatives. During the last week in April, the Engineer School will provide personnel to support both the blue and red commanders in chief at Carlisle Barracks to specifically address engineer issues.

Integrated idea teams bring together technical and military art experts to examine, refine, and provide insight into AAN FY99 concepts, capabilities, notional systems, and enabling technologies. This year Engineer School personnel participated in urban, hybrid, and C4I (command, control, communications, computers, and intelligence) integrated idea teams. Engineers are making significant contributions regarding the development of future force mixes and materiel requirements by participating in these events.

Although the year 2025 is far beyond most of our horizons, the Engineer School's participation in the AAN project will ensure that engineers remain relevant into the next century. Our efforts today will play a large role in shaping the Army of tomorrow.

Lieutenant Colonel Vosler is the strategic planner for the U.S. Army Engineer School and Fort Leonard Wood.

Book Review

The Bear Went Over the Mountain: Soviet Combat Tactics in Afghanistan, by Lester W. Grau, Frank Cass Publishers (Portland, Oregon), 1998, 220 pages. The ISBN is 0-7146-4857-4 for a hard-back copy and 0-7146-4413-7 for a paper-back copy.

Lester W. Grau's *The Bear Went Over the Mountain* provides an outstanding look at and commentary on Soviet tactics against the mujahideen fighters from 1979 to 1989. The author uses a series of vignettes that were originally published by the Soviet's Frunze Combined Arms Staff College. The intent was to pass on both positive and negative lessons learned from that conflict to Soviet forces. Given the college's original effort and Grau's translation, editing, commentary, and incisive conclusion, this unique work enlightens Western readers about the Afghan war. Grau's work is a tool that allows leaders to learn from the Soviets' efforts and possibly use this hard-won knowledge to keep their soldiers alive on future battlefields.

The introduction sets an attention-getting stage for the vignettes. A Soviet airborne division began to land in Kabul on December 24, 1979. By December 27, airborne and Spetsnaz forces had overthrown the Afghan government and killed the president while heavy divisions executed a cross-border invasion. A pro-Soviet president was installed on December 28. The last Soviet combat units withdrew from the country on February 15, 1989. In the intervening decade, 620,000 Soviets served in Afghanistan; 13,833 of them were killed and another 469,685 were sick or wounded. The Soviets left 118 jets, 333 helicopters, 147 tanks, 1,314 armored personnel carriers, 433 artillery pieces and mortars, 1,138 radio sets and command vehicles, 510 engineer vehicles and 11,369 trucks destroyed across Afghanistan's mountain-desert terrain.

After setting the stage, the author presents 47 vignettes that were written by junior officers based on their firsthand combat experiences against the mujahideen. The vignettes typically have four parts: the plan, a brief summary of mission preparation, the outcome, and both Frunze and Grau commentaries. A map showing key terrain features and Russian graphic-control measures accompanies each vignette. The author uses Russian map symbols because they clearly illustrate time-phased execution of the action. While the officers often developed the maps from memory and some have errors in location and terrain, the maps add significantly to the readers' understanding of the plan and its execution. Each vignette is an outstanding after-action review complete with graphics and commentary that capture key lessons learned.

Many of the vignettes discuss Soviet and mujahideen engineer operations. Mobility operations focus on route clearance, obstacle reduction, and creating "mouse-hole" entrances to buildings. While none of the vignettes discuss combined arms breaching in detail, breaching operations were part of several missions. The purpose of many missions was to find supply and arms caches and to destroy them using explosives. Soviet static positions and security outposts typically featured extensive protective obstacle systems. Both sides used mines and other obstacles to support ambushes. They blocked avenues of approach, fixed the enemy in the kill zone, and disrupted counterattacks against the ambushing unit's flanks. The mujahideen apparently were very adept at war-gaming likely reactions of Soviet vehicle drivers during ambushes and then mining those locations. The Soviets used BM-22-delivered scatterable mines as situational obstacles to disrupt withdrawing enemy forces. The combined effect of mujahideen mines on armor avenues of approach and the restricted terrain contributed to the ineffectiveness of Soviet tanks in the Soviet-Afghan war. Road mining by the mujahideen disrupted the movement of Soviet units and supplies. Although not specifically discussed, Soviet engineers apparently provided extensive survivability support to their base camps and sometimes dug in combat vehicles that occupied static blocking positions.

Lessons learned range from the basics of light and litter discipline to the correct use of indirect fires and the synchronization of mounted and dismounted elements. The value the noncommissioned officer corps provides to the U.S. Army is evident in almost every mission. In addition to the lessons in commentaries at the end of each vignette, Grau's concluding chapter addresses tactics, equipment, force structure, morale, and the effects of Soviet operations on the Afghan population. Interestingly, he states that engineers were always in demand. The book brings home the following key points concerning engineer operations:

- Effective terrain analysis is imperative.
- Obstacles must be integrated with fires to achieve their intended effect.
- Event triggers and an appropriate observation plan are essential to effectively employ situational obstacles.
- Engineers with mobility assets must be located near the front of every combat formation.

The Bear Went Over the Mountain is a valuable learning tool, especially for leaders at the battalion level and below. The vignettes are ideally suited to support a series of leader-development classes. The lessons learned are not unique to the Soviet army or to a specific geographic location. Whether the reader is trying to learn more about the Soviet-Afghan war or to prepare himself and his soldiers for future combat, this book will not disappoint.

Major Mike Rose is Chief, Engineer Division of the Warfighter Department, at the Maneuver Support Center, Fort Leonard Wood. He previously served as a doctrine writer at the Engineer School after a tour as an observer/controller at the National Training Center, Fort Irwin, California.

Engineers in Task Force XXI

By Lieutenant Colonel Kevin Weddle, Lieutenant Colonel Cliff Farquhar, and Major Steve Gay

The 1st Brigade Combat Team, 4th Infantry Division, is conducting a predawn hasty attack on a dug-in enemy motorized rifle battalion. Late in the reconnaissance fight, the enemy commander unexpectedly changes his course of action. At 0200, with low illumination, the brigade commander decides on a high-risk, high-payoff night movement of the entire brigade to attack positions. He elects to move over some of the toughest terrain at the National Training Center (NTC). The attack kicks off at the right time, and the commander commands and controls the movement and attack despite total darkness and enemy-spoiling attacks. The brigade's main effort hits enemy defenses at the right location. Engineers breach multiple lanes in enemy complex obstacles in a matter of minutes. The mission is a success. On to the next challenge!

This scenario may sound like fiction, but in reality it was the next-to-last mission at the Task Force XXI Advanced Warfighting Experiment (AWE), which took place in March 1997. The night attack and its coordinated movements were made possible by the Appliqué system. The All-Source Analysis System and the Digital Topographic Support System (DTSS) provided terrain and enemy threat analyses, which allowed the main effort to hit the opposing force at its most vulnerable spot. The Grizzly (a visually modified M113)—along with some hard-working, well-trained, dismounted combat engineers—produced multiple breaches. This night attack illustrates the potential of the future digitized force. Engineers have been an integral part of this force from the beginning.

The Beginning

The Task Force XXI AWE process was an 18-month effort that will stand as the model for all future AWEs. It began in January 1995, when the Chief of Staff, United States Army, designated the 4th Infantry Division, Fort Hood, Texas, as the *Experimental Force* (EXFOR). The division designated the 1st Brigade Combat Team as *Task Force XXI*, which included the 299th Engineer Battalion. Early that spring, work began on a modified table of organization and equipment and task organization for a brigade combat team. An initial training plan was prepared with hundreds of milestones that would bring the brigade to the culmination of the AWE at the March 1997 NTC rotation. The brigade organization was finalized only weeks before our deployment to NTC. Brigade units included a light infantry task force, a mechanized infantry task force, an armored task force, an aviation task force, two field artillery battalions (direct and general support), an engineer battalion, a forward support battalion, an aviation support battalion, a brigade reconnaissance troop, and other combat support and combat service support units. The 4th Infantry Division Engineer Brigade, the 299th Engineer Battalion, and the U.S. Army Engineer Center began a parallel effort to develop tactics, techniques, and procedures for a digital engineer force.

The many engineer initiatives originally envisioned were pared to 12 systems or ideas tested by the 299th:

- Engineer organization
- Grizzly
- Appliqué

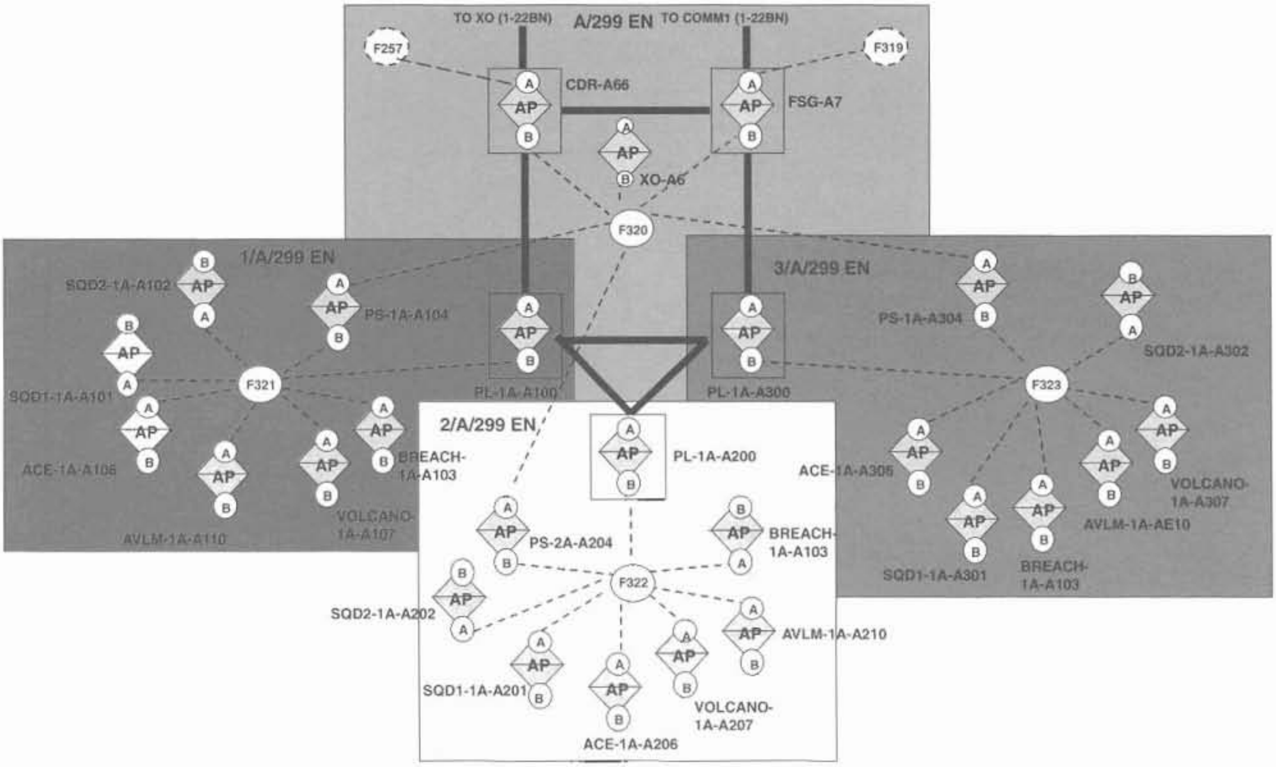


Figure 1. A Company, 299th Engineer Battalion, tactical internet

- Digital Topographic Support System
- Engineer Tactical Operations Center
- Maneuver Control System–Enhanced (MCS-E)
- Enhanced Position Locating and Recording System (EPLRS)
- Single-Channel, Ground-to-Air Radio System-Systems Improvement Program (SINCGARS-SIP)
- Battlefield Combat Identification System (BCIS)
- Hornet wide-area munitions

In addition to the new systems, the battalion also fielded the Volcano and 12 armored combat earthmovers (ACEs) to provide a permanent ACE/dozer mix of 12 and six, respectively.

Training

The training phase of the Task Force XXI AWE began in January 1996 with individual training for all brigade soldiers on the Appliqué, SINCGARS-SIP, and EPLRS systems. The brigade and the division set up a "digital university" (now called the *Computer Training Support Facility*), which was operated mainly by soldiers with significant support from contractors. The 40-hour courses operated 24 hours a day for a five-month period and reached virtually every soldier in the brigade. Concurrent with individual training, the brigade established an installation yard where soldiers began to install Appliqué, SINCGARS-SIP, global positioning system (GPS) receivers, and EPLRS into thousands of the brigade's vehicles. Literally thousands of man-hours were expended in individual training and the installation process. Normal battalion business continued throughout the AWE process—including exercise evaluations, a Battle Command Training Program exercise, and fire fighting.

After the Appliqué system was installed and basic Appliqué training was provided to soldiers, the brigade combat team "plugged in " the system to see if it worked. Through a series of connectivity exercises conducted during the summer of 1996, the brigade tested the tactical internet to see if it operated as planned. The tactical internet was the communications and positioning network (using SINCGARS-SIP and EPLRS as the communications "pipes" over which the digital and voice traffic passed) that provided the brigade's situational awareness. Figure 1 shows one company's tactical internet architecture. The brigade's soldiers and contractors achieved higher than a 95-percent success rate for Appliqué-equipped vehicles. To achieve situational awareness without constant contractor assistance, the brigade established exacting tactics, techniques, and procedures (TTPs).

After the brigade was connected, we conducted collective training with the new organization. During this training, the brigade incorporated tactical and digital TTPs that were written and developed over the previous 18 months, trained on

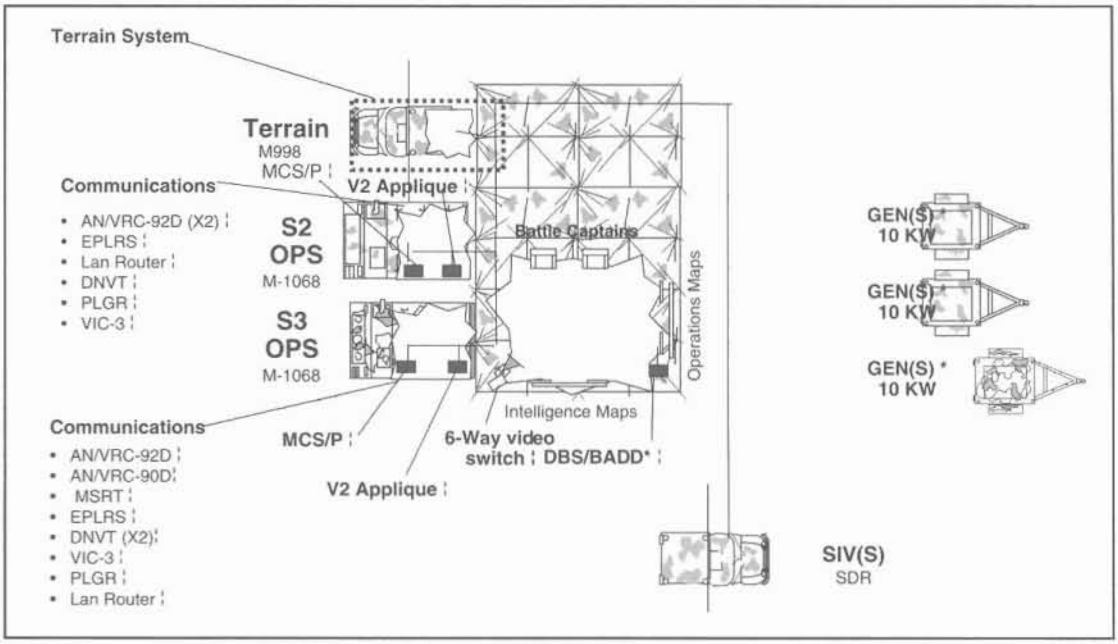


Figure 2. The 299th Engineer Battalion's tactical operations center

and evaluated more than 100 initiatives, and conducted normal NTC train-up missions.

Our rotation was unique in several ways. We deployed most of the brigade's vehicles, had many VIPs and press in attendance, and conducted no live-fire. We conducted several standard NTC movements to contact, hasty attacks, and defenses in sector during the first five days of the rotation. After that, the brigade moved into a continuous operations phase, where we operated continuously in both time and space. We received missions every day without the usual "prep day" and operated over the entire NTC maneuver area. During two defenses, the brigade defensive sector stretched from the northern to the southern boundaries of NTC. This action was an attempt to stress the tactical internet and to determine if the brigade was capable of increased tempo, lethality, and survivability through the magic of digitization. While the brigade did not win every battle, the beauty of almost perfect friendly situational awareness paid off time after time.

Lessons Learned

After returning to home station, we conducted a series of lessons-learned sessions and internal after-action reviews. Here are a few of the things we found:

Appliqué: The Appliqué system worked well for friendly situational awareness. We are not aware of a single instance where an Appliqué-equipped unit got lost, missed a movement or link-up, or experienced any of the other mishaps that occur when soldiers operate and train. Much of this system's success is attributed to the noncommissioned officers (NCOs), who helped develop the plan and kept it on track. Red (enemy) situational awareness was less user friendly and less useful. The messaging component of the Appliqué system never worked very well. Overlays and long messages were too large to move digitally over the tactical internet, which was often clogged with messages. The tactical internet was too rigid and could not be tailored to changing task organizations. Positioning and digital message data moving over the Appliqué system often interfered with FM voices, degrading the range and quality. Fortunately, many of these problems have been solved or are being solved with the system that replaced Appliqué, the Force XXI Battle Command Brigade and Below System. Although its full fielding to the 4th Infantry Division has been delayed, limited user tests show great promise. The future tactical internet will have separate voice and data nets and will allow task organization changes "on the fly."

Hornet: The Hornet wide-area munitions have great potential for engineers. Throughout the AWE, the Hornet affected the enemy commander's psychology, provided early warning, reinforced conventional obstacles, disrupted enemy forces, and was a lethal killer. We found that all engineer and maneuver scouts can emplace Hornets in the counter-reconnaissance fight. The Raptor, which combines improved Hornets with sensors and communications gateways, was successfully tested in simulation during the Division AWE.

Digital Topographic Support System (DTSS): The HMMWV-mounted DTSS supported the entire brigade from the engineer battalion tactical operations center (Figure 2). This system was manned by soldiers from the 29th Engineer Battalion (Topo), Hawaii, who provided outstanding topographic support to every brigade unit. Since DTSS did not have full digital connection to units throughout the brigade, we hand-delivered hard copies of topographic

This Grizzly is ready to conduct a breach.

products. These products were better than anything the task force and team commanders had previously experienced. To better support brigade units, we developed a "push-pull" system of support. Units could always request specific topographic products from the engineer terrain team, which worked well when commanders knew what they needed. We also developed a standard package of topographic products for delivery to each unit depending on the mission. The combination of these two methods worked well. Brigade commanders probably became the most "topo-knowledgeable" commanders in the Army because of the direct and responsive support they received. Even without a digital connection, DTSS proved itself throughout the AWE process. Due largely to the success of DTSS at the task force and division AWEs, the Army has provided funds for full connectivity with other Army Battle Command Systems and to field the DTSS down to brigade level.

Revolutionary Warfare

Many have judged the Task Force XXI experiment based solely on the outcome of NTC rotation battles. Unfortunately, this misconception negates the almost unbelievable performance of the soldiers in the 1st Brigade Combat Team. The AWE was a two-year effort with unprecedented personnel tempo. The brigade fielded literally hundreds of new equipment items, wrote and tested TTPs for digital equipment no one had ever seen, sustained itself, trained hard, and changed schedules daily. Individual soldier sacrifices were immeasurable. With the possible exception of the airmobile experiments of the early 1960s, no peacetime Army unit has accomplished so much in so little time as Task Force XXI. The AWE process allowed accelerated procurement of key systems and development of new and dynamic doctrine.

The AWE process is here to stay! If engineers are to remain an essential member of the combat arms, we must remain fully engaged. The 4th Infantry Division (EXFOR) continues to refine and improve the groundwork laid by Task Force XXI and the Division AWE. Thanks to the EXFOR, the Army will experience a revolution in warfare, not merely a predictable evolution in tactics.

Lieutenant Colonel Weddle is attending the Army War College at Carlisle Barracks, Pennsylvania. Previous assignments include commander, 299th Engineer Battalion; S3, 555th Engineer Group; S1, 7th Engineer Brigade; the Army Staff; and Assistant Professor of Military History at the U.S. Military Academy. LTC Weddle is a graduate of the U.S. Military Academy and holds a master's degree in civil engineering from the University of Minnesota.

Lieutenant Colonel Farquhar was executive officer of the 299th Engineer Battalion during the AWE. He previously served as a staff officer for USFK in Korea; led platoons in the 237th Engineer Battalion in Germany; and commanded D Company, 15th Engineers at Fort Lewis, Washington. LTC Farquhar was killed in an accident in December 1998. He will be greatly missed by all who served with him.

Major Gay is an engineer staff officer on the Central Command staff. Previous assignments include S3, 299th Engineer Battalion; platoon leader and company executive officer, 326th Engineer Battalion (Assault); A Company and Headquarters Company commander, 65th Engineer Battalion (Light); and assistant division engineer, 4th Infantry Division (Mech). MAJ Gay served as the battalion's executive officer during the Division Advanced Warfighting Experiment.

Bridge to the Future:

Tele-Engineering and the Bubiyan Bridge Assessment

By Dr. Paul F. Mlakar Sr., James C. Ray, and Captain Todd C.

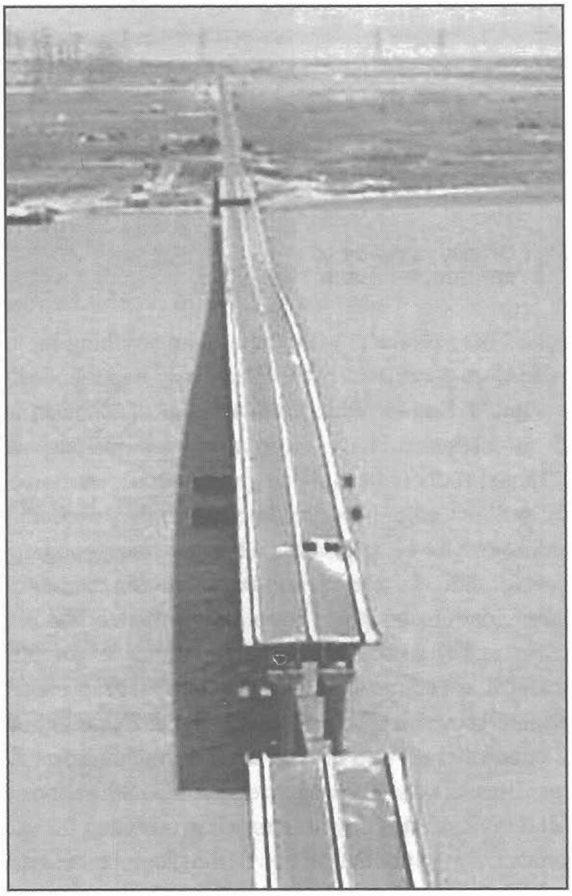
Tele-engineering is an emerging concept that uses state-of-the-art telecommunications to supplement theater of operations engineering personnel in remote locations with advice from Army subject matter experts. It serves engineering as telemedicine serves medicine.

A recent mission to plan the expedient restoration of the war-damaged Bubiyan Island Bridge in Kuwait clearly illustrates the capabilities of tele-engineering. Using this concept, engineers provided a fast, detailed technical assessment of a war-damaged bridge halfway around the globe. Future developments will expand the use of tele-engineering to significantly enhance and multiply the capabilities of our engineer forces worldwide.

The Concept

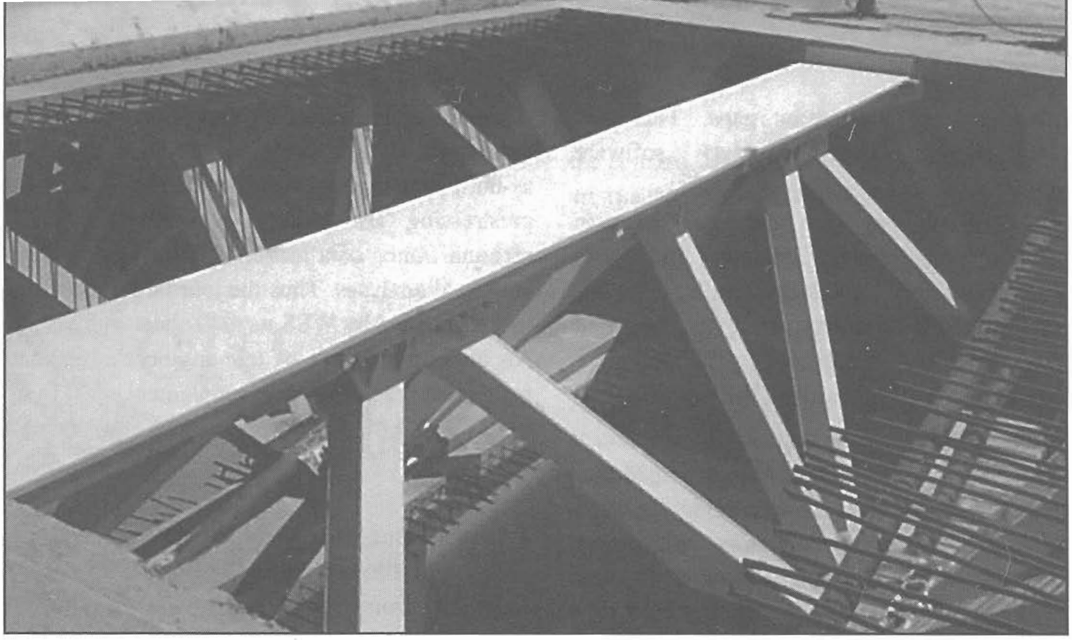
While tele-engineering is a new term, it is self-explanatory. It means "remote engineering," where a user in the field links with a subject matter expert at another location to solve an engineering problem. The need for such a capability has expanded as the complexity and technical requirements of military engineering have increased. There will be many instances where detailed engineer expertise and technical advice will be required for successful mission accomplishment. However, as the Army continues to downsize and reliance on a CONUS-based force increases, a complete engineer team of experts will not always be available. Tele-engineering solves this problem by establishing an engineering telepresence that allows engineers on the ground easy access to CONUS or OCONUS expertise.

If an engineer unit faces a technical challenge that is beyond the expertise of people on-site or beyond the scope of available engineer assets, solutions are "just a phone call away." Telecommunication links allow engineer units in the field to connect with appropriate engineer subject matter experts who can visualize a problem, engage in dialogue with individuals performing the work, and provide viable solutions. Solutions will draw on and exploit state-of-the-art technologies from the Army research and development (R&D) community, Department of Defense high-performance computing assets, the expertise of U.S. Army Corps of Engineers districts and divisions, the collective experience of the private sector construction industry, and the knowledge base of academia.



Aerial view of the Bubiyan bridge from Bubiyan Island, showing the 80-meter gaps at each end.

CONUS-based tele-engineering support from the Corps of Engineers R&D community will be available in the future from a central tele-engineering operations center. The current demonstration is being centrally facilitated by an interim operations center located at the U.S. Army Research and Development Center's Waterways Experiment Station (WES) in Vicksburg, Mississippi. This operations center will receive requests for assistance from the engineer force, activate standby subject matter expert teams or generate ad-hoc teams, track the teams' responsiveness, catalogue



Substantial damage was identified to segments of the bridge between the two 80-meter gaps. The assessment team recommended over-bridging this 40-meter span with panel bridging.

responses to the requestors, and provide communications links between subject matter experts and requestors. The Tele-Engineering Operations Center will only respond to requests for support that are beyond the scope of the engineer assets available to the operation (including Corps of Engineers districts supporting the deployed engineers).

Bubiyan Island Bridge

In the spring of 1998, the Kuwaiti Ministry of Defence requested assistance from the U. S. Office of Military Cooperation-Kuwait to plan an expedient restoration of the Bubiyan Island Bridge that would accommodate light military traffic. The U.S. office asked personnel from the U.S. Army Engineer School for help, and they in turn called the Waterways Experiment Station. This project ultimately involved the Third Army Engineer Staff and the Corps of Engineers Transatlantic Programs Center as well. Execution of this mission demonstrates the outstanding capabilities and support available through tele-engineering.

The Kuwaiti Island of Bubiyan is strategically located in the northern Arabian Gulf adjacent to Iraq. Its only connection with land is a 2.4-kilometer bridge from the mainland of Kuwait across the Subiya Channel. The bridge is a precast, posttensioned, segmental concrete structure that was completed in 1983. It is unique in the three-dimensional frame of its segments. During the Gulf War, an 80-meter gap was created when an intermediate pier near the mainland was destroyed. Hostilities left a similar opening near the navigation pass at the island end of the bridge.

Assessment and Restoration

The WES staff began this assignment by searching for information on the bridge. Their search produced a technical journal article on its design and construction written by U. S. Federal Highway Administration engineers who had advised the Kuwaiti Ministry of Public Works. The article explained that the bridge had 11 viaducts, which were continuously posttensioned over five or six spans of 40 meters between piers. Each of these spans was formed from eight precast segments, which are space frames. The WES staff also contacted the designer-builder, who provided a documentary video and other valuable information.

An assessment team consisting of one person from WES and one from the Engineer School then visited Kuwait. They first met with the U.S. Office of Military Cooperation to establish specific requirements for bridge restoration and criteria to evaluate alternative concepts. The information acquired was confirmed in meetings with the Kuwaiti Ministry of Defence, who contributed valuable information about extensive damage to the bridge in addition to the two major gaps. This damage had been stabilized but not fully repaired after the Gulf War.

The next phase included a two-day reconnaissance of the bridge. The team accessed the remaining portion at the mainland directly, the part between the major gaps by helicopter, and the piece at the island by naval vessel. The team checked the as-built structure against the information previously acquired. They also inspected for damage affecting the capacity of the remaining spans. Their inspection revealed significant distortion of the bottom flange of the span adjacent to the major gap near the mainland. It also revealed substantial damage to segments of the bridge between the two major 80-meter gaps.

The information gathered in Kuwait was transmitted daily to WES by phone, fax, and e-mail. There, a subject matter expert team evaluated the capacity of the damaged structure to carry vehicular traffic. The team also assessed the ability of this structure to bear the additional loading of alternatives for the expedient bridging of the major gaps. This was accomplished with finite element analysis software developed by the WES.

Results of the WES analysis were sent to the team in Kuwait. The results indicated that the remaining bridge was capable of single-lane, military load class 40 traffic if the 40-meter span (between the two 80-meter gaps) that contained damaged segments was over-bridged with panel bridging. Three alternatives were evaluated to close the two 80-meter gaps:

- Expediently elevate a single intermediate damaged pier in each gap to the elevation of the remaining deck and construct four double-truss, single-story M2 Bailey spans of 40 meters each in the gaps.
- Raise the intermediate piers and erect four 40-meter spans of single-truss, single-story Mabey & Johnson Compact 200 bridging across the gaps.
- Leave the intermediate piers as they are and bridge the two 80-meter gaps with double-truss, double-story Mabey & Johnson Universal bridging.

The engineering staff of Mabey & Johnson in the United Kingdom provided valuable assistance in this evaluation through telecommunication links.

The assessment team briefed these results to the U.S. Office of Military Cooperation and then the Kuwaiti Ministry of Defence. Thanks to tele-engineering support, a detailed structural analysis and review of alternatives were accomplished within five days of the assessment team's arrival in Kuwait. The Kuwaiti Ministry of Defence took the results under advisement, and action to restore the bridge awaits their decision.

Data Collection

While tele-engineering was not the main objective of the Bubiyan Bridge project, it provides an excellent example of the concept's potential. This project reinforced the fact that data collection and transmission are key parts of tele-engineering. Without high-resolution data, a reliable off-site assessment of a problem is extremely difficult, if not impossible, to achieve.

From the onset of the Bubiyan project, lack of detailed data was a problem. Digital photographs of the bridge and the damaged spans were all that were initially supplied. While the photos were of high quality and provided a good overview of the problem, the research staff misinterpreted them. The photos made the structure appear to be a conventional steel deck truss with reinforced concrete deck, which was far from the truth. Also, the photographers concentrated mostly on the gaps and took few shots of the remaining spans, which were critical to the problem.

Detailed information was required for an in-depth assessment of this complex structure. Structural design or as-built drawings were not available. Since reinforcing and prestressing are hidden in concrete structures, on-site reconnaissance data lacked sufficient detail for the required structural analyses. Thus the journal article and documentary video obtained by WES were the best sources of information. An important aspect of tele-engineering is that the subject matter expert often must supplement data from the remote site using his own sources, contacts, and expertise.

The Benefits

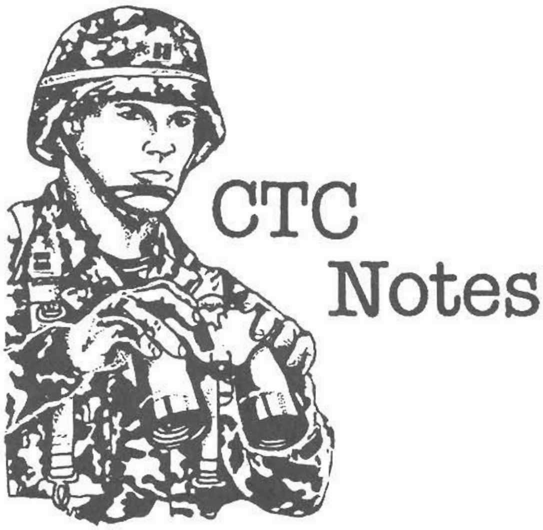
The Bubiyan Island Bridge project shows the great benefits and unlimited potential of tele-engineering. It promises to be a versatile tool for deployed engineer units in combat support, peacekeeping, and humanitarian operations where immediate technical expertise is required for unique problems. Equally important, the Bubiyan project brought out shortcomings and some needed improvements for tele-engineering. Successful tele-engineering operations depend on detailed data provided to off-site subject matter experts so they clearly understand the problem. Their "eyes" to the problem are those of the on-site engineer, who must carefully and fully describe the problem to them. This level of data transfer requires fast, reliable, and high-capacity communication capabilities, including phone, fax, Internet, and e-mail. This level of communications is probably the foremost challenge, because military operations usually occur in remote areas and Third World countries where communication links are minimal. High-capacity communication was a problem even in the well-developed country of Kuwait. Although links existed, there were too few of them, and they were used for higher-priority purposes.

With the assistance of tele-engineering, a two-man field reconnaissance team at Bubiyan Bridge was able to provide an accurate, expert assessment of the damaged bridge in only a few days, saving thousands of dollars in travel and engineering expertise. In wartime operations or operations other than war, tele-engineering will help soldiers in the field solve a wide spectrum of problems by tapping engineering expertise from sources thousands of miles away. Such tele-engineering mission solutions will save time and money as well as the lives of our soldiers, allies, and civilians.

Dr. Mlakar is chief of the Concrete and Materials Division at the Waterways Experiment Station.

Mr. Ray leads the bridge research and development program at the Waterways Experiment Station.

Captain Liebig commands D Company, 35th Engineer Battalion at the U. S. Army Engineer Center.



NATIONAL TRAINING CENTER

National Training Center (NTC)

Integration of Obstacle Design and Fires

By Major Frederick J. Erst

Both maneuver and engineer units have difficulty achieving obstacle integration during engagement area development at the National Training Center (NTC). Most obstacle groups lack sufficient density and are not integrated with effective direct and indirect fires. As a result, they are rapidly bypassed or reduced by enemy engineers. However, when maneuver and engineer units understand the task and purpose of fires for each obstacle group design, they can achieve the intended obstacle effect of *disrupt, fix, turn,* or *block* on the enemy's formation.

Design

Tactical obstacle design is based on the formation of the attacking enemy and the intended obstacle effect. During task force defensive planning, the assistant task force engineer should design and array each obstacle group based on the commander's intended obstacle effect, the resource factor (RF), and the total width of the avenue of approach (AA). Use the obstacle group design calculation in FM 90-7, *Combined Arms Obstacle Integration*, to determine the total quantity of standard minefields required to achieve the intended effect (Figure 1).

Antivehicular obstacles, such as antitank ditches or 11-row concertina roadblocks, may be substituted for as much as 20 percent of the standard minefields in a group. Plan to use scatterable mines such as Volcano, MOPMS, and ADAM-RAAM or special purpose munitions such as Hornet as part of the minefield groups. These mines and munitions also can reinforce an avenue of approach to counteract an expected enemy penetration. The key is to array the obstacle groups with sufficient depth and density so they will manipulate the enemy's maneuver in the desired direction.

During the defense, the engineer battlefield assessment (EBA) often focuses on friendly engineer capabilities and does not address the impacts of terrain or the enemy engineers' breaching capability. Engineer platoons can use the EBA to design obstacles that will defeat enemy breaching assets. Or platoons can use a combination of "more visible" and "unseen" obstacles in each obstacle group to manipulate enemy maneuver in the desired direction. They can use the countermobility time line to emplace specific obstacles during the day (or at night) based on expected enemy reconnaissance in sector.

Obstacle Integration

Effective obstacle integration begins with the commander's intended effect of the obstacle on the enemy's maneuver. This effect should include the enemy target, the specific obstacle effect, and the relative location of the

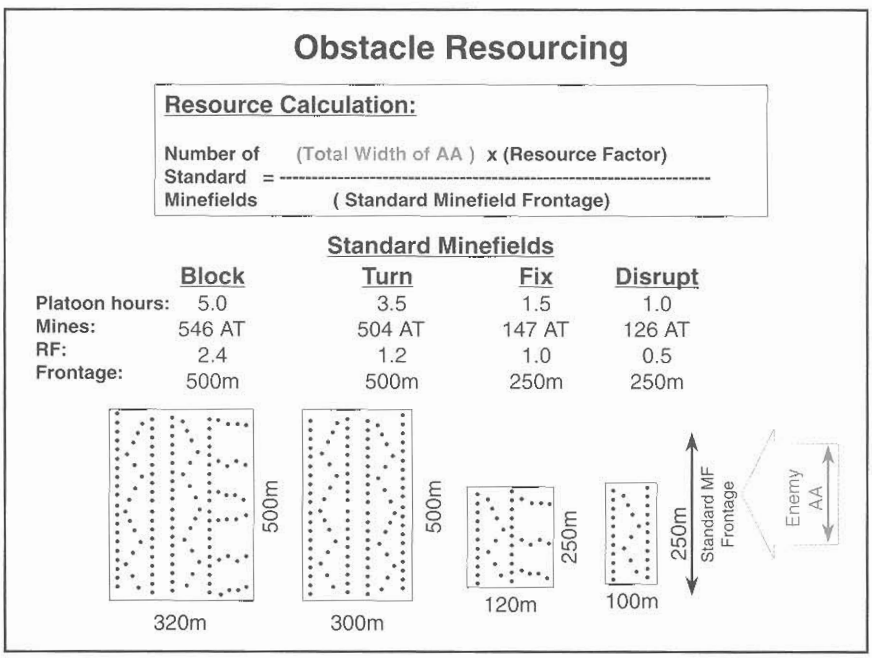


Figure 1

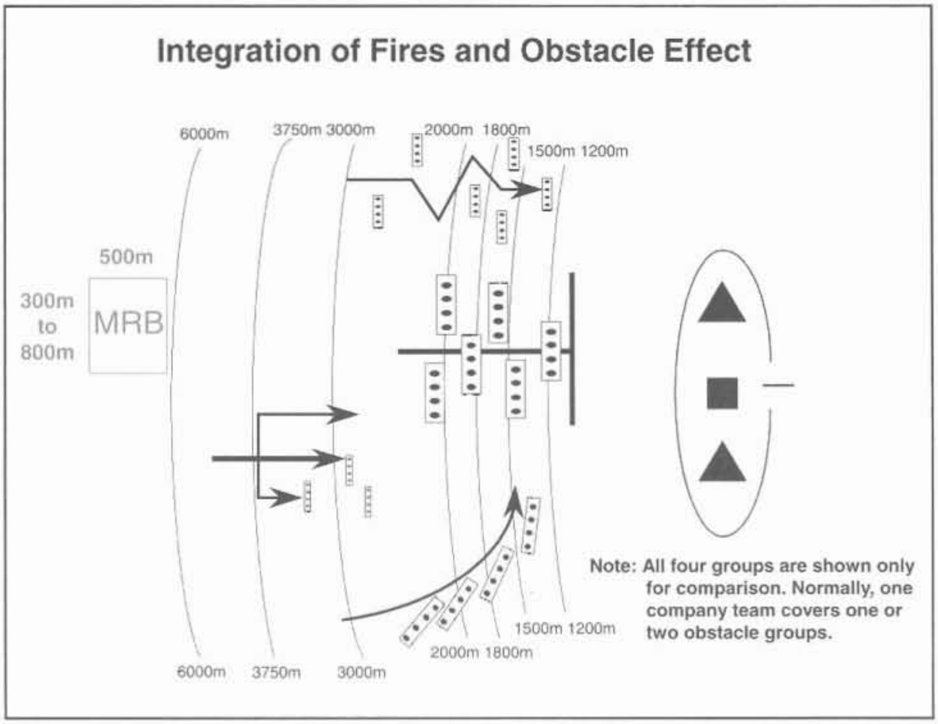


Figure 2

obstacle. The method to achieve this effect is to integrate obstacles with direct and indirect fires and manipulate enemy maneuver in the desired direction. The end state is for each company team to kill at least one enemy battalion while remaining combat effective. The maneuver commander's intent must specify locations *where* he wants to affect the enemy's maneuver. The engineer must ask the commander four questions during engagement area development:

- Where does the enemy want to go?
- Where should the enemy go?
- Where should the enemy not go?
- Where do you want to kill the enemy?

At the task force level, the maneuver commander uses obstacle groups to graphically portray the obstacle effect. Figure 2 depicts weapon ranges from a company-team battle position to each type of obstacle group. The four groups are shown for comparison only. Normally, one company team covers one or two obstacle groups with direct fires.

Integrating Obstacle Groups and Direct Fires

Effective units emphasize the use of the following three techniques to successfully integrate obstacle group design with direct and indirect fires:

- Obstacle siting.
- Obstacle ownership.
- Fire-control plan (direct and indirect fires).

Obstacle Siting

Obstacle integration begins during obstacle siting. The maneuver company team that overwatches a particular obstacle group must understand the intended obstacle effect and the type of direct and indirect fires required to achieve that effect. The company team and the engineer platoon must work together to position each obstacle in the group using the direct fire plan and the initial obstacle group design. Based on the terrain, the company team commander, the fire-support officer, and the engineer platoon leader adjust obstacle locations to ensure that the group is covered by direct and indirect fires and that the group design is consistent with the task force commander's intent. Use the obstacle siting procedure described in FM 90-7.

Obstacle Ownership

"Ownership" of the obstacle group by the company team begins with obstacle siting and continues through obstacle turnover. While the obstacle group is emplaced by an engineer platoon, the actual "owner" is the company team overwatching the obstacles. The company team should provide security and manpower for fratricide fence construction or mine-dump operations for their own obstacle group. This technique allows the engineer platoon to focus on its primary mission of emplacing minefields. It also allows the company team leadership to account for, equip, transport, and supervise its own personnel. The company team is then better prepared for obstacle turnover and land closure during the battle and for obstacle recovery after the fight. Ownership ensures that the company team remains integrated throughout the entire process; it results in better integration of the obstacle group with fires.

Fire-Control Plan

Engineers must know weapons' ranges and capabilities; they must also understand and use the same fire-control terminology as their maneuver counterparts. When engineer platoon leaders are asked, "How far should an obstacle be positioned from the overwatching unit?" most will answer, "Two-thirds of the maximum effective weapons range." However, their response should also include the task and purpose of direct and indirect fires for the obstacle group design needed to achieve the obstacle effect. An engineer platoon leader who can confidently talk about direct fire-

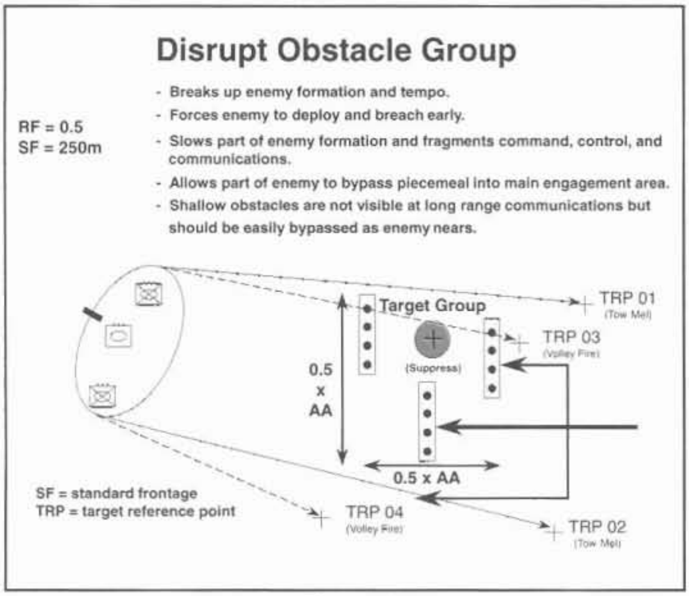


Figure 3

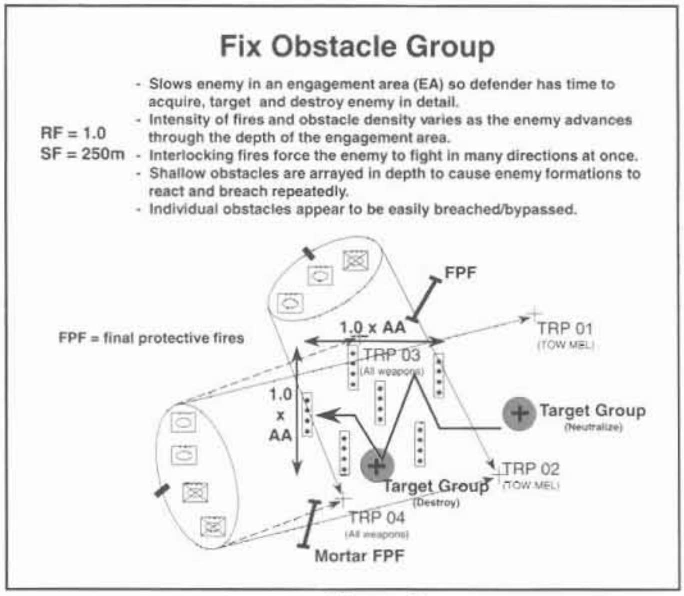


Figure 4

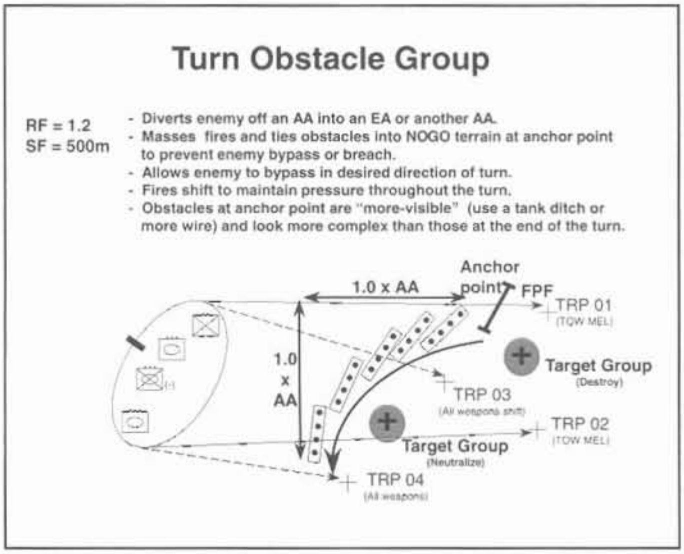


Figure 5

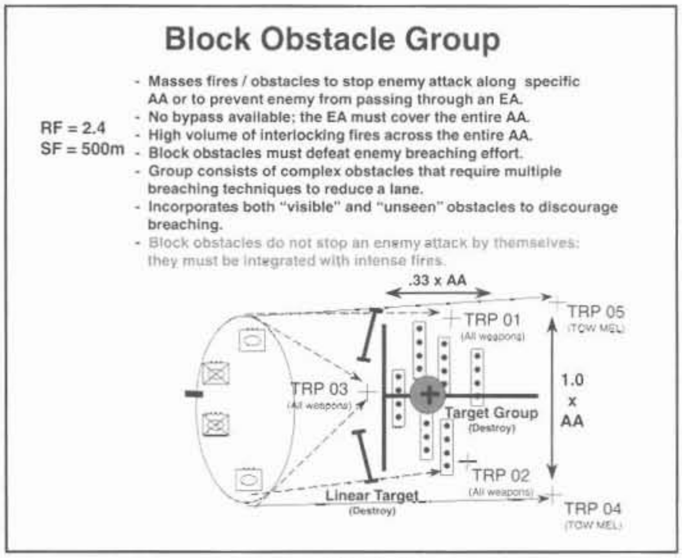


Figure 6

control measures (such as maximum engagement lines) or discuss the type of indirect fires on an obstacle group, can effectively assist the company team commander when he develops his fire-control plan.

The four types of obstacle effects (disrupt, fix, turn, and block) require a different combination of direct and indirect fires to achieve the commander's intent. The engineer platoon and the company team must understand where fires must be massed, distributed, and shifted within the obstacle group. Both must understand how the obstacle group is designed to manipulate the enemy's maneuver in the desired direction. Figures 3 through 6 combine engineer considerations for obstacle group design with the specific direct fire-control measures needed for each obstacle effect, as shown in FM 90-7.

Summary

To ensure mission success, units must ensure that obstacle integration is an integral part of engagement area development. The engineer must understand fire-control planning, and the maneuver commander must understand obstacle-group design. Both the engineer and the maneuver unit must work closely together throughout the engagement area development process. By improving their understanding of the task and purpose of fires for each type of obstacle group design, commanders can achieve the intended obstacle effect of disrupt, fix, turn, or block on the enemy's formation.

Major Erst is the assistant brigade engineer trainer at the National Training Center, Fort Irwin, California. He previously served as a company commander in the 3rd Engineer Battalion and 10th Engineer Battalion and as a platoon leader/company XO in the 4th Engineer Battalion. He is a graduate of the University of Central Florida.

Training for the Field: Squad Drill Certification

By Captain Keith W. Ensley

As usual the squad simulation training exercise (STX) was wedged tightly among several equally demanding events, and we had two new squad leaders. It was reminiscent of my first squad STX, which had gotten off to a shaky start about nine months before. Then, looking hard at the short-range calendar, we had carved out two days to train and rehearse squad drills. Our train-up had been simple, well-planned, and predictably painful to execute. Performed on Wednesday and Thursday, we had left Friday for precombat checks and inspections.

When we rolled to the field on Monday, I fully expected this STX to be a repeat of the previous one. But one difference was immediately apparent: rehearsals. In the previous STX, we had to pressure the squads to rehearse. This time they sprang into their rehearsal sequence with a purpose. Maybe they anticipated getting hammered by the evaluators the next day.

The slaughter never came. The squads conducted the lanes like practiced veterans—all of them. What was different?

The Secret

There was no secret—for the second STX, we adhered to time-tested doctrine. As FM 25-101, *Battle-Focused Training,* puts it, "Train the trainer to train his soldiers." Step two of the eight-step training model addresses the training and certification process. Our drill certification went even further by finishing with a fully evaluated rehearsal. The eight training steps are—

1. **Plan the training**
2. **Train and certify leaders**
3. **Reconnoiter the site**
4. **Issue the plan**
5. **Rehearse**
6. **Execute**
7. **Conduct an after-action review (AAR)**
8. **Retrain**

The Groundwork

The certification planning process begins by identifying the tasks to be trained. This is significantly easier if the company or battalion has a standard drill book. We isolated the following drill book tasks to evaluate in our squad STX:

- ❒ Conduct Squad-Level Troop-Leading Procedures (TLPs)
- ❒ Place a Row in a Hasty Row Minefield
- ❒ Construct a Standard Antivehicular Wire Obstacle
- ❒ Create a Hasty Road Crater
- ❒ Deploy a Modular Pack Mine System (MOPMS) with Remote-Control Unit (RCU)
- ❒ Perform Target Turnover Using STANAG (DA1355R)
- ❒ Perform a Minefield Strip Feeder Report
- ❒ Breach a Minefield Using Hand-Emplaced Explosives
- ❒ Breach a Wire Obstacle With a Bangalore Torpedo
- ❒ Mark a Cleared Lane in a Minefield
- ❒ Conduct an Enemy Obstacle Reconnaissance
- ❒ React to Contact

We then clumped these tasks into four mission scenarios. With only a few qualified evaluators, we limited ourselves to four stations. "Conduct Troop-Leading Procedures" was trained at all stations, and we grouped the other tasks as follows:

Station One

- ❒ Place a Row in a Hasty Row Minefield
- ❒ Perform a Minefield Strip Feeder Report
- ❒ Perform Target Turnover Using STANAG (DA1355R)

Station Two

- ❒ Construct a Standard Antivehicular Wire Obstacle
- ❒ React to Contact (Seven Forms of Contact)

Station Three

- ❒ Create a Hasty Road Crater
- ❒ Deploy a Modular Pack Mine System (MOPMS) with Remote-Control Unit (RCU)

Station Four

- ❒ Conduct an Enemy Obstacle Reconnaissance
- ❒ Breach a Minefield Using Hand-Emplaced Explosives
- ❒ Breach a Wire Obstacle With a Bangalore Torpedo
- ❒ Mark a Cleared Lane in a Minefield

The Plan

The figure on page 51 shows a two-day squad certification plan. The squad leader's brief to the commander and first sergeant on Day 1 are essential for successful certification. After squad leaders complete this session, they are ready to lead their squads with confidence. At the end of Day 1, participants understand the unit standard.

Two-Day Squad Certification Plan

Day 1 (Wednesday)

0400 Squad leaders brief drills to chain of command
0800 Squad leaders brief drills to their squads
1400 Squads gather training aides

Day 2 (Thursday)

0800 Set up training sites
0930 Execute graded drills (rotation)

A sand table is the perfect tool for drill briefings. Our first sergeant oversaw construction of an excellent sand table in our common area. After squad leaders are certified, they should sand-table-brief their squads as well. When soldiers visualize a task, they perform it much better the first time.

The schedule on Day 2 is designed to allow about 2.5 hours per rotation. This is ample time to conduct good TLPs and a quality AAR. Day 2 is a long one. Plan logistics to support a day filled with retraining and reevaluation. It is important to evaluate tasks to standard and allow time for AARs, so that squads clearly recognize their shortcomings when they leave.

The Exercise

Our squad leaders' briefing event began at 0400 hours around the company sand table, with squad leaders and above attending. Every squad leader briefed every drill. The repetition built confidence and reinforced comprehension. There was time for discussion, argument, synchronization, and compromise. Squad leaders left the sand table knowing the battalion drill and company standard.

Next, squad leaders walked their squads through all of the drills on a sand table. Squad leaders coordinated use of the company and battalion sand tables. Soldiers thrive on this special attention; it's an effective, professional touch that they respect.

Squads were assigned testing stations to set up. After coordinating with that station's evaluator, they used Day 1 to gather and load resources for their station.

Day 2 began with constructing the testing stations. Our post has several nearby training areas for unscheduled, small-unit training. These sites afford excellent opportunities to save mileage, maximize daylight, and respond to flexible training needs.

After stations were constructed, squads rotated through them according to a schedule. Each evaluator issued a scenario and mission fragmentary order. Squads conducted standard lane training complete with TLPs, to-standard execution, AARs, and retraining. Evaluators had the latitude to repeat an event at any point if the squad's execution was off the mark.

We prepared soldiers to spend a long day and served chow in the training area. It was important for them to complete all tasks to standard. They appreciated the company's dedication to uncompromising training.

Suggestions

The following suggestions will help ensure a successful squad certification:

- Schedule squad certification quarterly.
- Schedule this event as closely as possible to another evaluated event (squad STX, platoon STX, training center rotation, etc).
- Assign the company first sergeant as the master trainer for this event.
- During training quarters without another exercise, concentrate on tasks from the mission-essential task list that often are neglected during bigger events.
- Deploy a company tactical command post or tactical operations center to control rotations, filter distracters, and diffuse potential problems.
- Set up stations to support separate sections (dig teams, Class IV/V teams, etc.).

The Aftermath

Squad certification is not designed to be an end in itself; it serves as a refresher course and prepares soldiers for larger events. A key point is to capture the lessons of Day 2 before the day ends. Once the troops are gone, gather the squad leaders in the commander's or first sergeant's office and discuss the exercise. Use this time to direct squad rehearsals and make changes to the squad certification plan. When you observe squad rehearsals later, check to see if the group's advice was incorporated. Without a doubt, you'll see an improvement in the rehearsals!

Captain Ensley is serving in the Headquarters, Combat Maneuver Training Center in Germany. He previously commanded in the 1st Engineer Battalion at Fort Riley, Kansas.

References:

1. FM 25-101, *Battle-Focused Training* (Chapter 4, Drills/Lane Training).

2. ARTEP 5-145-*Drill Lane Training Methodology and Example Drills*.

3. TC 5-150, *Engineer Qualification Tables* (Tasks and Battle Drills).

ENGINEER UPDATE

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

Directorate of Training Development (DOTD)

Engineer Unit Directory. The Engineer Unit Directory has been updated and is available at http://www.wood.army.mil/DDD/ddd.htm. Revisions or corrections to the directory may be sent to bakern@wood.army.mil. POC is Sandy Gibson, -4100.

Engineer Museum

Museum Guide. Visitors to Fort Leonard Wood are cordially invited to visit the Engineer Museum, which was established here in 1989 when the Engineer School moved from Fort Belvoir, Virginia. The museum includes an encyclopedic gallery, a chronological gallery, and a World War II historic community.

The encyclopedic gallery displays pieces of the material culture of American engineers. Five aspects of the Army engineer mission are highlighted: topographic engineering, land-mine warfare, tactical bridging, demolitions and explosives, and arms and armaments.

In the chronological gallery we interpret the history of Army engineers throughout America's history. We concentrate on the Battle of Yorktown during the American Revolution, westward expansion and the Mexican-American War, the Civil War, World Wars I and II, the Korean Conflict, and Vietnam War.

The World War II historic community interprets the history of Fort Leonard Wood. It includes 13 World War II-era temporary mobilization buildings, such as barracks, a mess hall, day rooms, and a historic chapel.

You may also visit our web page at: www.wood.army.mil/museum. POC is Kim Combs, 6-0780.

News and Notes

Obstacle Control Points. During a recent Warfighter exercise, the 3rd Infantry Division, Fort Stewart, Georgia, learned that obstacle coordination points are critical to the synchronization of Corps obstacle plans. The doctrinal foundation for an obstacle coordination point is in FM 101-5-1, *Operational Terms and Graphics*. The 18th Airborne Corps engineer section has written a document that explains the engineer interpretation of a coordination point as a place where leaders co-ordinate their obstacle effort across division and corps boundaries. An article describing their interpretation will appear in a future issue of *Engineer*. POC is CPT Kevin Pettet, (910) 396-5717.

Director of Public Works (DPW) Apprenticeship Program. Ten soldiers from the 864th Engineer Battalion, Fort Lewis, Washington, recently completed a one-month apprenticeship with the post's DPW. Each participant (electricians, plumbers, and equipment operators) was attached to a three-person crew that responded to service calls throughout the post. In addition to receiving valuable training in their MOS, the soldiers saved the DPW about 300 man-hours of labor and executed more than $20,000 worth of work. The 864th and DPW plan to provide additional soldiers with this unique training opportunity in the near future. POC is CSM William McDaniel, (253) 967-4483.

MANSCEN and Engineer School Directory

Fort Leonard Wood is making organizational changes to accommodate the arrival of the Chemical and Military Police Schools and to prepare for the Maneuver Support Center (MANSCEN), which will stand up on 1 October 1999. The following interim directory is a partial list of key offices at Fort Leonard Wood. Commercial numbers are (573) 563-xxxx and Defense System Network (DSN) numbers are 676-xxxx unless otherwise noted.

MANSCEN Commander and Engineer School Commandant
MG Robert B. Flowers
563-6158

MANSCEN and Engineer Center Command Sergeant Major
CSM Robert M. Dils
563-6149

MANSCEN and Engineer School Chief of Staff
COL Robert L. Davis
563-6118

Maneuver Support Center

Garrison Commander
COL Tim Daniels
563-4005

Directorate of MANSCEN Combat Developments
COL Leonard Izzo, Director
563-4009

Engineer Division
COL David Kingston, Chief
563-4076

Directorate of Training Development
COL Rex Forney Jr., Director
563-4111

Department of Common Leader Training
COL Marsha Killam, Director
563-4123

Maneuver Support Battle Laboratory
COL Gregory Bean, Deputy Director
563-4082

TRADOC Program Integration Office, Terrain Data
COL William Pierce, Director
563-4086

Terrain Visualization Center
LTC Earl Hooper, Chief
563-4077

MANSCEN Safety Office
Fred Fanning, Director
596-0116, DSN 581-0116

Engineer School

Assistant Commandant
COL M. Stephen Rhoades
563-6159

Deputy Assistant Commandant, Army Reserve
COL Michael Adams
563-4033

Deputy Assistant Commandant, Army National Guard
COL Harry Bryan
563-4034

1st Engineer Brigade
COL Thomas Luebker, Commander
596-0224, DSN 581-0224

Liaison Officers
Australian Army, LTC Phil Vandermoezel
563-6132

British Army, COL Phil Lilleyman
563-4018

Canadian Army, MAJ Paul Fleet
563-4017

French Army, COL Yves LeCouster
563-4027

German Army, LTC Helmut Bach
563-4029

Directorate of Training
COL William A. Van Horn, *Director*
563-4093

Engineer Personnel Proponency Office
Victoria Anthony, Chief
563-4087

Department of Instruction
LTC Michael Conrad, Chief
563-4119

Total Army School System Division
MAJ Victor Stephenson, Chief
563-4106

Doctrine Development Division
MAJ Scott Spellmon, Chief
563-4106

Countermine Training Support Center
David Dunstedter, Chief
563-4123

ARMY VALUES

Honor

"A military, or naval man, cannot go very far astray, who abides by the point of honor."
Admiral Raphael Semmes

Robert E. Lee

U.S. Army Corps of Engineers, 1829-1855
General, Confederate Army, 1861-1865

He was a foe without hate, a friend without treachery, a soldier without cruelty, and a victim without murmuring. He was a public officer without vices, a private citizen without wrong, a neighbor without reproach, a Christian without hypocrisy, and a man without guilt. He was Caesar without his ambition, Frederick without his tyranny, Napoleon without his selfishness, and Washington without his reward.

Benjamin H. Hill - 1832-1882 - Tribute to R.E. Lee

History Office, U.S. Army Engineer School

PIN: 077051-000