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.

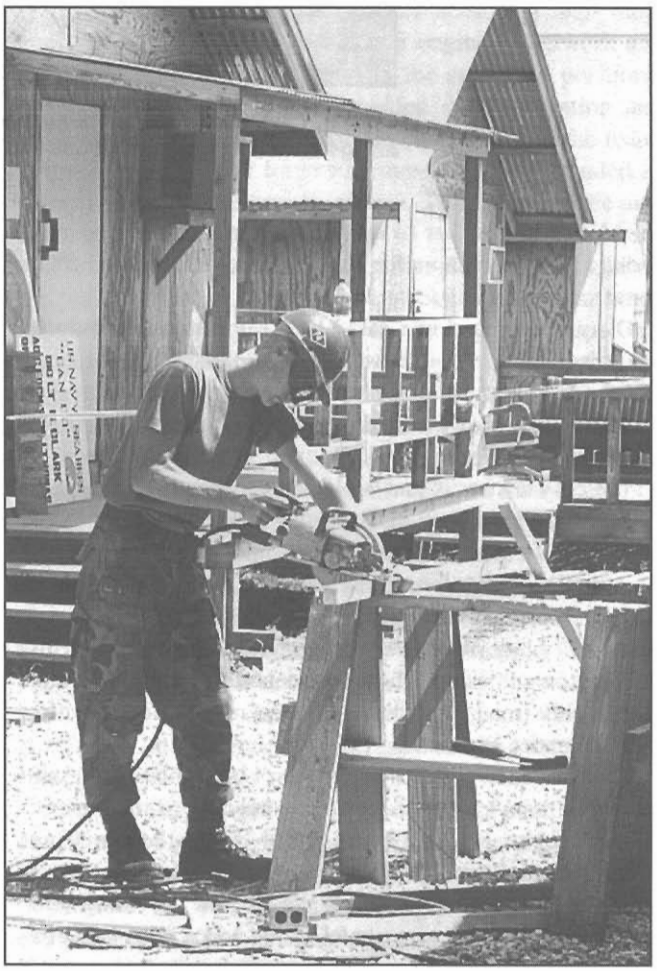
To be considered "joint," training must meet two criteria: It must be based on joint doctrine, tactics, techniques, and procedures; and it must support or be sponsored by a joint command. In other words, the training must be in response to operational requirements established by a joint force commander. 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.

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



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

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.

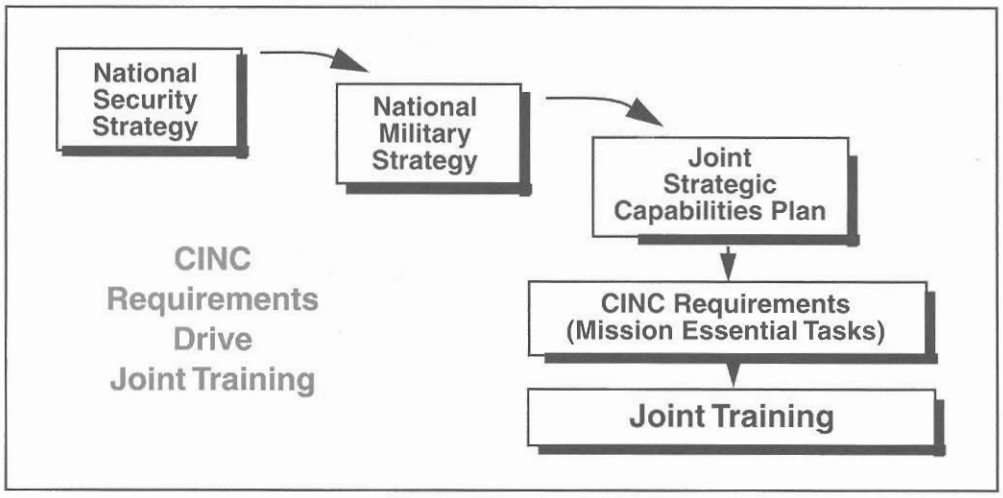


Figure 1

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

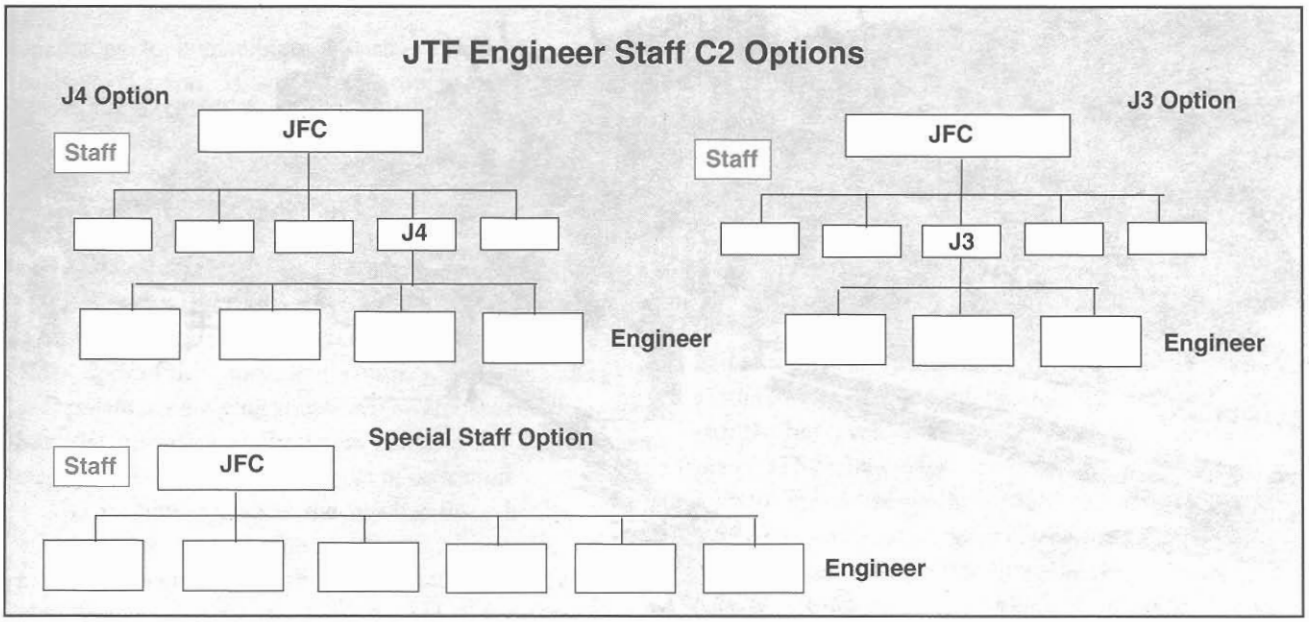


Figure 2

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.