ENGINEER

The Professional Bulletin of Army Engineers



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Full-Spectrum Engineers

Force For Change





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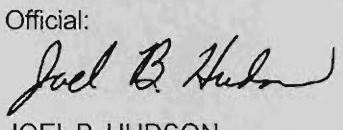
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Clear The Way

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



FULL-SPECTRUM ENGINEERS – FORCE FOR CHANGE! Excitement is in the air as we near ENFORCE 2002. This will be a tremendous event for our Regiment's leaders; we can't wait to see all of our Engineer warriors gather here and engage in camaraderie and healthy exchanges of ideas and resolve tough Regimental issues. We'll roll up our collective sleeves to get some important work done as we continue to transform our Regiment and Army. Our ENFORCE conference theme, Full-Spectrum Engineers—Force for Change, conveys two vital points about where we are and where we must be. The events of 9-11 underscored the role of the Engineers across the spectrum of conflict—from homeland security (HLS) to global war on terrorists to full-scale, high-intensity warfare. The vast breadth, diversity, and power of our branch continue to be demonstrated by you throughout the world. And the Engineers are at the forefront of the Army's Transformation, not just going along with change but driving it. The ENFORCE 2002 theme captures the excitement of our vitality today and the extraordinary road ahead. The conference agenda is loaded with activities and sessions that will instill pride, recognize excellence in our ranks, address key concerns, stimulate new thought, and break old paradigms. The war stories will abound, as always, as we reacquaint with our sapper compatriots returning to the Home of the Engineers from around the world.

We'll start the week off with our Councils of Engineer Sergeants Major and Colonels. We will continue to update our senior leaders on what's going on at the School, review the status of current issues, some of which resulted from the Commandant's VTC at the end of March, and give a lead-in to the ENFORCE breakout sessions. We have six challenging issues set for this year's breakout sessions: 1) Engineer Command and Control (C2) Systems; 2) Assured Mobility and Future Engineer Organizations; 3) Countermine Operations in the Contemporary Operational Environment (COE); 4) Homeland Security—Engineer Support Requirements; 5) Engineer Officer Education Transformation (OES); and 6) Joint and Field-Force Engineering (FFE). We look forward to your personal contribution in at least one of these vital issues.

The Engineer C2 Systems breakout will review the development of such C2 systems as the Maneuver Control System–Engineer (MCS-E), Force XXI Battle Command Brigade and Below (FBCB2), CastleNET, and Digital Topographic Support System (DTSS). The session will provide a detailed review of existing Engineer C2 systems, their capabilities and shortcomings, and the planned way ahead to make them more valuable tools for Engineers and maneuver forces and ensure full integration of Engineer command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) in current and evolving combined-arms operations.

The Objective Force's mobility is absolutely critical to ensuring that it maintains force agility, freedom to operate in the COE, and high-tempo combat operations over the extent of the battlespace. In the Assured Mobility breakout session, we will discuss how we as a Regiment must understand the concept of Assured Mobility and determine how we can make it a reality for the Objective Force Unit of Action (UA).

In the COE, we no longer face enemies who use mines primarily to shape the terrain; turn, fix, block, and disrupt are no longer the intended payoffs of enemy mine warfare. These have been replaced by the threat's use of mines as a terror and casualty producing system—the perfect asymmetric weapon of the Third World. Though employment techniques are different, mines and booby traps are just as lethal and even harder to detect. This dilemma imposes serious challenges to our maneuver forces today and assured mobility for future forces. In the Countermine breakout session, you will see how your Engineer School is attacking this challenge head-on and developing an organization with the expertise to orchestrate an aggressive, combined-arms, joint effort to provide solutions across the DTLOMS spectrum.

As I stated in the February 2002 Engineer Bulletin, "Combat Engineer doctrine, units, systems, training, tactics, techniques and procedures must address a new threat, a new operational environment here and abroad, and new roles that must fill voids in Army planning." Our Homeland Security breakout session will go into detail on the missions, responsibilities, and requirements of Engineers in their critical role in the defense and preservation of our free and secure homeland.

The OES session will update Engineer leaders on TRADOC's Leader Development Campaign Plan and the Engineer School's role in transforming the Engineer OES. We will discuss the timelines for its implementation and its impacts on the field.

In the Field-Force Engineering breakout session, you will see how FFE is our way of putting General Engineering requirements into the plans for contingency operations and ensuring that critical Engineer resources are available at the time and place necessary to execute each contingency operation. As we develop FFE as a concept, it's easy to see the complexities involved with coordinating the efforts of many diverse organizations; but it's also easy to see the power of the combined efforts of these organizations.

Lead The Way

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



Our 14th annual ENFORCE conference is fast approaching, and I would like to echo MG Aadland's remarks regarding the importance of this week to our Regiment. I sincerely hope that you are looking forward to spending this week at Fort Leonard Wood, renewing friendships and resolving issues as we focus on our full-spectrum engineering capability in support of our Army, now and in the Objective Force. I also want to address some issues that will shape the focus of the Council of Command Sergeants Major (CSMs) and generate what I am sure will be lively discussion among our senior leaders.

We will kick off the week with 2 full days of Council of CSMs sessions—the agenda is on the ENFORCE Web site. Among our usual topics will be a career-management-field brief from the Engineer Branch, an update from the Directorate of Combat Developments, an Engineer ANCOC/BNCOC course update, a review of our proponent guidance to the DA centralized boards, an update from the Army Engineer Association, and a brief from former FORSCOM CSM, CSM(R) Jerry Alley, on financial planning. Addresses from the Chief of Engineers, LTG Flowers; MG Aadland, Commandant, U.S. Army Engineer School; and BG Castro, Assistant Commandant, U.S. Army Engineer School, will complement our agenda.

We also have SMA Jack Tilley scheduled for a talk on Tuesday. He will spend 2 days at Fort Leonard Wood, attend our ice-breaker social, and be a featured guest speaker in Lincoln Hall auditorium on Wednesday. This is a great opportunity for us to be in the midst of someone who has such a great impact on us and our soldiers. SMA Tilley will share his thoughts and concerns and, I'm sure, will be available to answer your questions.

The remainder of the ENFORCE schedule mirrors the past—vendor displays, Regimental review, barbeque social, Army Engineer Association luncheon, and unit plaque dedications. Culminating the week will be our Regimental run and the dinner, where we will recognize our 2001 Itschner, Sturgis, and Grizzly winners, along with our gold de Fluery medal recipient.

Please arrange your itinerary so you can register on Sunday, participate in all the Council of CSMs schedule and, if desired, stay through Saturday to play in the ENFORCE golf tournament. As always, please bring your colors so we can display them during our Regimental dinner.

Since the last Lead the Way article, I have traveled to several installations. I truly enjoyed visiting with the soldiers of the Regiment and being immersed in the uniqueness of the many organizations and missions we have in our branch. Say I'm biased, but our soldiers are the greatest in the Army. We are blessed with talented officers and noncommissioned officers who competently lead our soldiers through the varied and complex missions our Army expects us to execute.

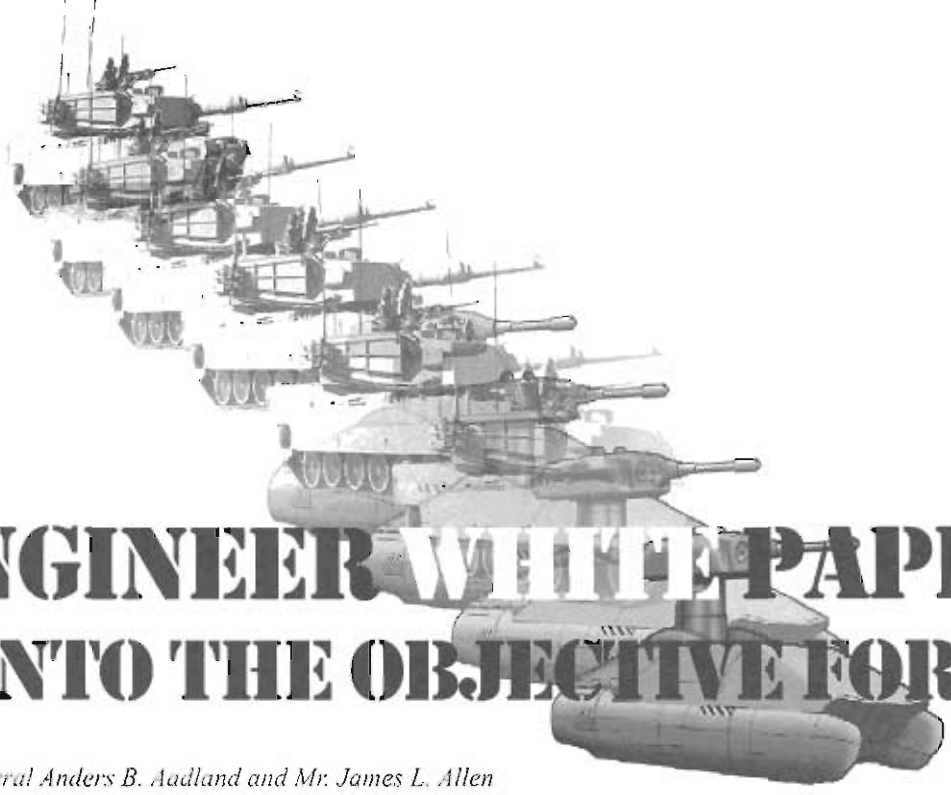
Along with my firsthand observations, I routinely receive e-mails and calls on the great support and effort our soldiers provide to installations and missions all over the world. Several weeks ago, a retired CSM, who works at a chemical munitions arsenal, called me. He told me that shortly after the events of 11 September, soldiers had been deployed to his arsenal to assist in security. He stated that he was so impressed by the professional bearing and discipline of the soldiers that he approached a few of them to find out what unit they were from. He said he was amazed to learn that they were active-duty engineers assigned to a midwest installation. He called me to tell me what a great job they were doing and that I should be proud (as I always am) of our soldiers.

I am extremely proud of all that you and our soldiers represent. We have a common factor that's evident in all of our organizations: we are all extremely busy and feverishly working to accomplish the missions of our Army and nation. From shaping doctrine and design of our organizational mission and structure to supporting the efforts related to Operations Noble Eagle and Enduring Freedom, engineers are completely integrated and involved.

Our Army needs us as much now as it ever did. If there is ever a doubt as to whether the Regiment will be viable as part of the Objective Force, just look to the past and examine how we have transitioned the Regiment as our Army changed over the last 226 years. There is no question that for as long as there is an Army, there will be engineers.

As we move into the remaining months of the year, I will make every effort to visit with you and your units. Being with you and our soldiers gives me an intense sense of pride in all we do for this country, and it makes me grateful for the opportunity to serve as your Regimental CSM.

ESSAYONS—Engineers Lead the Way!



ENGINEER WHITE PAPER – INTO THE OBJECTIVE FORCE

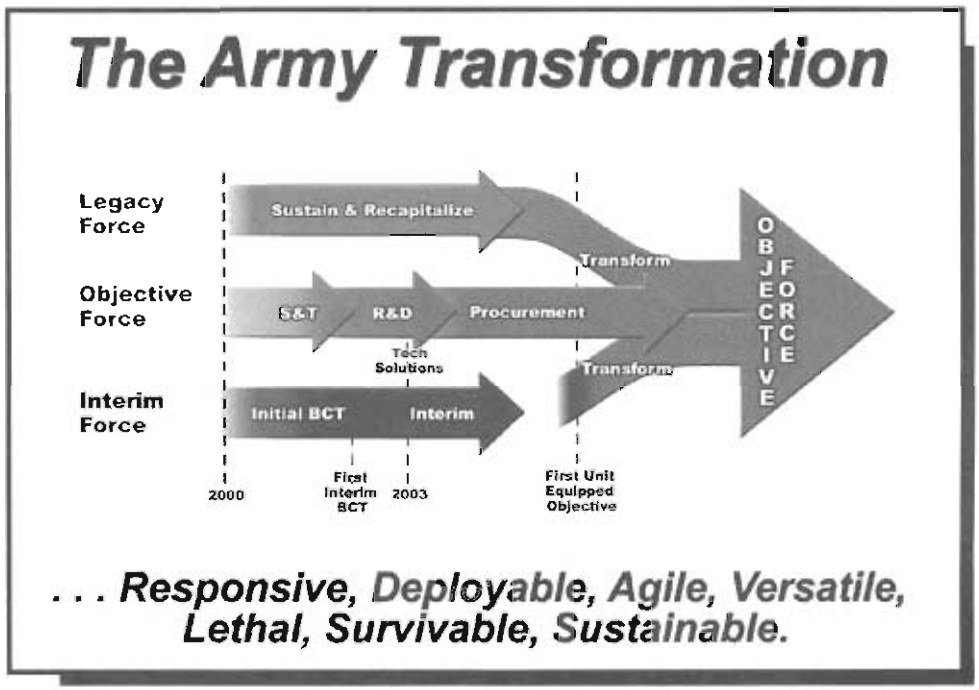
By Major General Anders B. Aadland and Mr. James L. Allen

Engineers are a full-spectrum force for change. During the past year of so, we have all become familiar with the "trident" chart pictured below. It is Chief of Staff of the Army General Eric K. Shinseki's vision of how our Army must transform over the next 30 years. Engineers are fully involved in all three legs of the trident—the Legacy, Interim, and Objective Forces. Our involvement extends from the very tip of the spear all the way back to the sustaining base and includes elements of the soldiers and civilians working in the Active Component, Reserve Component, and Corps of Engineers. No other Regiment has that broad a band of responsibility.

In past White Papers, our priority has been the Legacy and Interim legs of the trident. In this paper, our priority shifts to the third leg, the Objective Force.

The Objective Force

As a quick review, let us recall that the Objective Force is to have the deployability of the Interim Force with the lethality and survivability of today's Legacy Force. Beyond that, it will enable us to fight in a whole new way, using total situational overmatch and precision engagement. Built around the Future Combat System (FCS), the Objective Force will also include the Comanche helicopter and the Crusader field artillery cannon. Units will be structured as "units of action" (UA) and "units of employment" (UE). The Army is using these new designations to get us to think about unit organizations other than the platoons, companies, battalions, brigades, divisions, and corps with which we have all grown comfortable. UAs—roughly analogous to today's battalion and brigade combat teams—are tomorrow's maneuver units. UEs—roughly analogous to today's divisions and/or corps—are tomorrow's planners, synchronizers, and supporters.



The force made up of UAs and UEs will be lighter than today's force and easily deployed anywhere in the world within 96 hours. It will have superior firepower, networked together and capable of engaging any threat from beyond the threat's capability to engage us. Situational awareness and understanding of the entire battlefield is *an integral part of its survivability and lethality*. With this information, we stop reacting to obstacles as we encounter them and start making decisions based on the ability, capability, and intent of the enemy to emplace an obstacle. In this way, we are reacting to information, not just obstacles on the ground.

Envision a typical heavy armored division on today's battlefield, a division equivalent perhaps to one of our divisions in Operation Desert Storm. The commander of that division knows where all of his units are located and knows their capabilities. He wants to know where we are located as well. Now, think of us entering the battlefield in about the same strength as today's maneuver brigade. It doesn't seem a very fair fight, but in the Objective Force, we will not only know where all of our units are located, we will have a complete picture of where all of the Republican Guard units are located as well. And, with our precision strike and other capabilities, we will start blinding the threat before we land, taking down his command and control nodes so he loses touch with his own units. Our brigade-sized unit—the UA—will engage each of the threat's units in turn from standoff distances. Because the threat commander no longer has the ability to keep in touch with his own units—let alone target ours—our smaller, lighter force will quickly roll up the much larger unit. The Republican Guard commander may not even know we have landed until we are knocking at the door to his headquarters. That, in a nutshell, is the theory of the Objective Force.

Where does this unparalleled situational understanding come from? It comes from sensors and databases, all networked together and available to the soldier on the ground or as he flies to the battlefield. The Global Information Grid (GIG), an element of the Objective Force, is an integrated, interoperable digital information infrastructure supporting the strategic, operational, and tactical information and intelligence needs for our warfighters. Whatever information we need will be available to us from the GIG. Future improved versions of our Digital Topographic Support System (DTSS) and the Maneuver Control System (MCS) will feed information into, and receive information from, the GIG. Data from the intelligence community, national intelligence assets, and other military and civilian information providers will also be fed into the GIG, fused at some point and fed back on demand. We may receive digital geospatial information and imagery in the middle of an Asian jungle from a French, Russian, or even a commercial satellite.

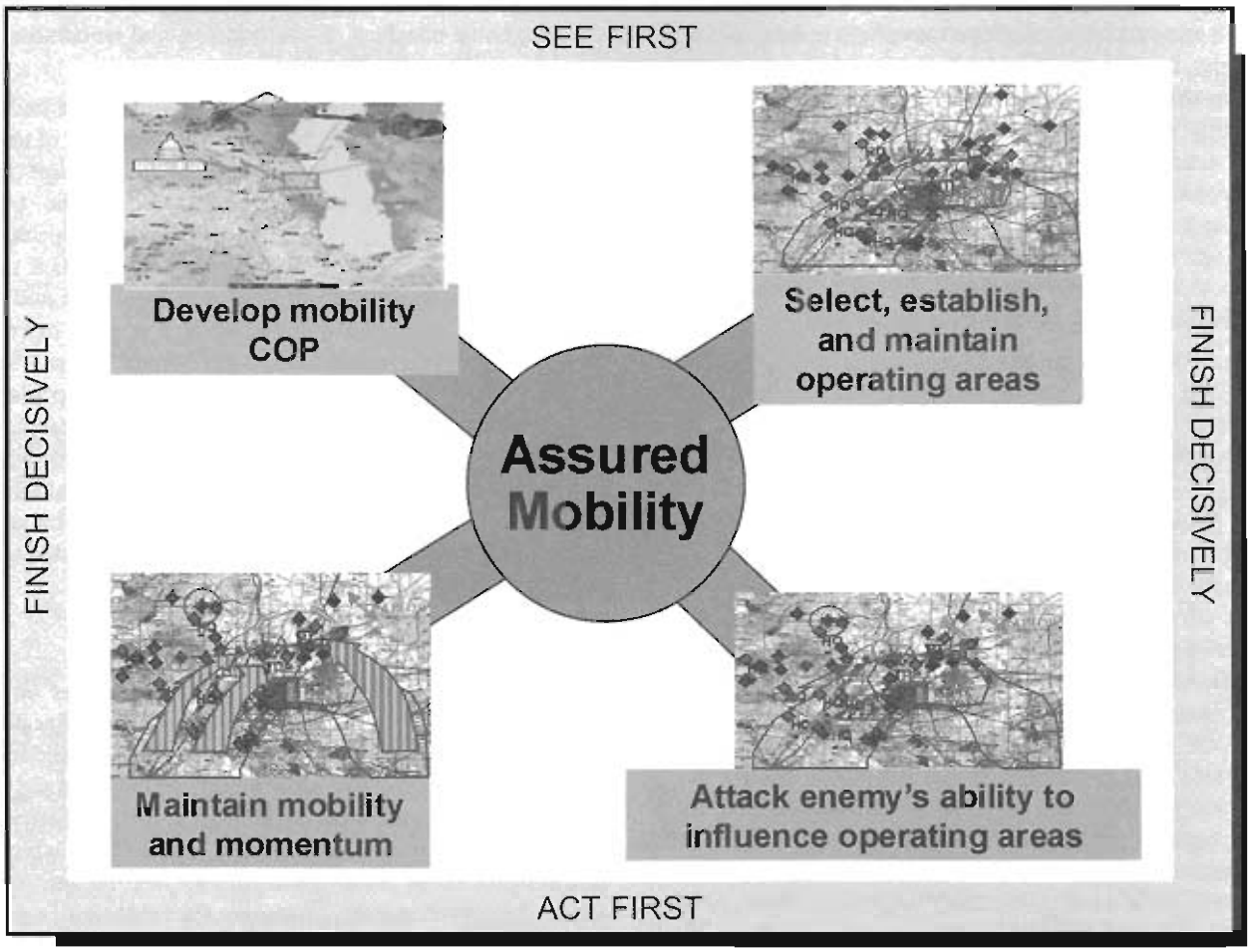
Organizational structures are still being designed, but current UA designs have engineers embedded within the UA itself, as if today's tank battalion had its own organic engineer platoon. Many engineer "capabilities" will be performed by nonengineer personnel or organizations and may be built into equipment designs (for example, blast mitigating hulls on the FCS). There will be extensive use of robotic systems to perform the dangerous missions of countermine and reconnaissance, to name only two.

UE organizations are still being designed. It is our intent for engineer UE organizations to be modular offspring of today's echelon-above-division (EAD) and echelon-above-corps (EAC) battalion-sized organizations, existing within the UE to support the UA. Some of these modules will be specialized teams. These engineers will be supporting not only U.S. forces but also coalition forces and other governmental and nongovernmental organizations and will be needed to restore facilities to the local population and government. Special "urban infrastructure" organizations and technical or specialized augmentation support teams/cells are likely to be needed for such things as power generation and distribution, sanitary sewers, and water- and gas-distribution nets, in addition to execution of environmental baseline surveys and integration actions. Contractors will most likely provide a good deal of this support.

New Objective Force Tasks

Our work with the Objective Force has already introduced a new concept—assured mobility. Today, our forces avoid obstacles when possible and breach them when necessary, but tend to react to minefields and other obstacles as they approach them. Assured mobility is a combined-arms proactive approach to mobility in which we use information to maximize avoidance and prevent enemy actions that inhibit mobility. Computer algorithms are used along with intelligence, geospatial information, and weather data to identify numerous routes to the objective and to predict likely obstacles along each of those routes. The task force then maneuvers along multiple, dispersed, parallel routes to the objective. In this manner, minefields are no longer as prevalent, and we can handle them at standoff without changing our momentum. The slow, methodical breaching of minefields that we must practice today becomes the exception rather than the rule. This is how it works:

- **See First**—We develop the mobility common operating picture (COP) by integrating terrain, imagery, and intelligence to determine potential operating areas.
- **Understand First**—We select, establish, and maintain operating areas by identifying or predicting potential obstacles and booby traps, enemy staging areas, threat avenues of approach and egress, and emplacement methods using standoff detection means. We then "swarm" surveillance assets to cover suspected areas. Sensor nets allow us to detect enemy movements and actions, which cues validation sensors to suspected activity. The sensors then track the enemy and provide a detailed COP to our engagement systems.
- **Act First**—We swarm surveillance assets to attack the enemy's ability to influence our operating areas before he has a chance to place mines into or onto the ground,



and we neutralize any overwatching observation and fires in order to deal with mines or booby traps out of contact.

■ **Finish Decisively**—The cumulative effect of *See First, Understand First*, and *Act First* allows us to mass forces arriving on multiple routes to *Finish Decisively.* Mobility actions such as breaching and bridging are included.

Objective Force 1-n List

1. Mobility Information System
2. Standoff Mine Detection
3. Standoff Mine Neutralization
4. Brilliant Sensor-Munition
5. FCS-Mobility Variant
6. Maneuver Support Bridging Suite
7. Rapidly Deployable Construction Equipment
8. Terrain Shaping Munition
9. Demolition Modernization
10. Infrastructure Construction Equipment

With this shift in emphasis, we have also changed our priority for materiel development. Three tailored lists have replaced the single "1-n" list you have seen in the past, one for each of the three forces.

The Interim Force

We are more familiar with the Interim Force. Like the Objective Force, the CSA's intent is to put a combat-capable brigade anywhere in the world within 96 hours, a full division in 120 hours, and five divisions on the ground within 30 days. The Interim Brigade Combat Team (IBCT) has a 118-man sapper company that supports 80 percent of the mobility tasks[1] required for the IBCT and has specialized engineer equipment, including an engineer variant of the Stryker interim armored vehicle, the Rapidly Emplaced Bridge System (REBS), the Volcano scatterable mine system, the small emplacement excavator (SEE), (which will be replaced by the high-mobility engineer excavator [HMEE]), a downsized version of the Mongoose explosive standoff minefield breacher, the deployable universal combat earthmover (DEUCE), and access to the Digital Topographic Support System (DTSS) which is located at the brigade headquarters. The Engineer Regiment in the Interim Division (IDIV) provides the maneuver commander with engineer command and control, mobility (to include assault

bridging with the REBS), countermobility, survivability, general engineering (both vertical and horizontal construction), and embedded geospatial engineering support. EAD engineer support augments the capabilities of both the IBCT and IDIV engineer organizations.

We have developed a separate 1-n list specifically for this force. There are a number of differences between this list and the one for the Objective Force; these differences reflect the differences in the missions of the two forces and the time frame of their availablility. The IBCT/IDIV engineer equipment and concepts must be proven out for use in the Objective Force.

Interim Force 1-n List

1. DTSS (five variants)
2. Engineer Squad Vehicle
3. Standoff Mine Detection
4. Mongoose
5. REBS
6. Countermine Robotics
7. Raptor/ Advanced Hornet
8. Demolitions Modernization
9. HMEE
10. Light Construction Suite
11. Bridging Suite
12. MCS-E
13. Volcano/APLA

The Legacy Force

The Legacy Force provides our near-term offensive capability. It contains a light "forced-entry" force that includes the 101st Airborne Division (Air Assault), 82d Airborne Division, 10th Mountain Division, 25th Light Infantry Division, and the National Guard's 29th Light Infantry Division. The Legacy Force includes an "early-entry" force (referred to as the containment force in some documents) composed of forward-deployed divisions (1st Infantry Division, 2d Infantry Division, and 1st Armored Division) and active and Army Reserve reinforcing combat units along with seven National Guard divisions and eight National Guard enhanced brigades. These forces will undergo only modest modernization efforts, sustainment, and recapitalized to maintain our offensive power until the Objective Force is fielded. They will be among the first units to move to the Objective Force. The "heavy-punch" component of the Legacy Force is the modernized III Corps, maximized for a counterattack role and composed of 1st Cavalry Division, 4th Infantry Division, 3d Infantry Division, and 3d Armored Cavalry Regiment. The Counterattack Corps is the Army's highest priority for reorganization. With the Army's decision to not procure the Grizzly, our #1 priority system last year, the Legacy 1-n List is changed as follows:

Legacy Force 1-n List

1. Wolverine
2. Standoff Mine Detection (HSTAMIDS, GSTAMIDS, and ASTAMIDS)
3. DTSS
4. MCS-E
5. Hornet/Raptor
6. Bradley Engineer Squad Vehicle
7. Mongoose
8. Bridging Suite (common bridge transporter [CBT], improved ribbon bridge [IRB], dry support bridge, and line-of-communication bridge [LOCB])
9. Countermine Robotics
10. Construction Equipment

Headquarters, Department of the Army has directed only modest modernization in this force, accepting risk here to enable development of the Interim and Objective Forces.

Near-Term Work Effort

EAD and EAC Engineer Battalions

Our quest for change does not ignore the EAD/EAC portion of our Regiment. A review of these organizations can streamline certain components into the more mobile and deployable units we need in the future. This portion of our force structure comprises 72 percent of our Regiment and is a major player in our plans for the Objective Force. What this force brings to the fight is the ability for long-term sustainment of operations. However, we must begin to upgrade our construction equipment fleet, for which we need approximately $150 million per year. We have been working with less than that requirement for years. We must take a hard look at the capabilities we need, eliminate redundancy, and develop alternatives to provide our construction needs. Key missions into the Objective Force will include airfield construction and improvement, lines-of-communication (LOC) development and maintenance, infrastructure development and sustainment, and mine-clearing operations and environmental-integration actions.

Restrictive/Complex Terrain

As the Russians learned in Chechnya, and as we learned in Mogadishu, military operations in urban terrain (MOUT) remain

the great equalizer. We must prepare and equip our soldiers now for these highly likely future scenarios. We must give our platoon and company officers the tools, experience, and tactical acumen to fight and win the MOUT battle. The Infantry School has the lead in development of MOUT doctrine and training strategy, and we will be in "lockstep" with them as we identify the doctrine, training, leader development, organization, materiel, and soldier (DTLOMS) requirements for the combined-arms team at brigade level and below. We see our traditional engineer MOUT missions of rubble, mine, and booby trap clearing; demolitions; force protection—to include environmental considerations, survivability, and infrastructure repair—continuing into the Objective Force.

Beyond MOUT, engineers will continue to add great value to the force when it encounters difficult terrain. Our force-modernization plan is sharply focused on enabling high mobility of the transformed Army and on emplacing dynamic obstacles for countermobility operations. Geospatial engineering promises detailed terrain-feature information about roads, airfields, buildings, bridges, obstacles, subsurface infrastructure (for example, storm sewers and utility conduits), and anything that has a symbol on the map. "Point-and-click" technology will bring up an information table (attributes) about each symbol and provide key information upon which tactical decisions will be based. Predictive terrain modeling for both threat analysis and friendly course-of-action development is required. Key programs in the works are-

- Rapid acquisition and application of fully attributed digital terrain data to support three-dimensional terrain visualization.
- Decision support tools that provide predictive modeling of building composition and strength of materials for precise and proportional weapons effects.
- New explosive and nonexplosive technologies for standoff/remote reduction of walls and other obstacles. We are the obstacle-reduction experts and must be fully knowledgeable of the latest in explosive and nonexplosive technologies. To this end, we are establishing a "master breacher" program similar to the armor and infantry "master gunner" programs.
- Modifications to our training methods that ensure we have the necessary skills to meet the challenges of fighting and winning in complex terrain.
- Employment of robotics to support the full spectrum of MOUT—from robotic followers used as "mules" that can transport equipment and casualties to robots used in reconnaissance and clearing/breaching operations to create lanes through obstacles.
- The need for urban rubble-clearing capabilities to maintain maneuver dominance in complex terrain.
- The need to reinforce, rebuild, or reestablish civilian infrastructure.
- The need for our sappers to move, shoot, communicate, and pave the way for the maneuver force they support. Sappers must have the tools, TTP, and training needed to accomplish their mission for the combined-arms team.

Geospatial Engineering. This is the development, dissemination, and analysis of terrain information that is accurately referenced to precise locations on the earth's surface. Although this is new terminology (replacing topography), the emphasis is still on engineers being the terrain experts for the maneuver commander. Our leaders must be "masters of terrain." Geospatial engineering is keeping pace with other Department of Defense organizations and services as they move from the old topographic line-map mentality into a new geospatial information age. The National Imagery and Mapping Agency (NIMA) has developed the foundation-data concept, a revolutionary approach to provide geospatial information to warfighters. It relies on a readiness and responsiveness strategy that moves away from many standard products and toward an information-management environment. This strategy calls for the establishment of near-global coverage of foundation data, including medium-resolution geospatial information (for example, a joint-operations graphic at 1:250,000 scale). Regardless of location or mission, the foundation data will be available and maintained to provide a consistent, worldwide level of preparedness or readiness. Enhancements to the foundation data will generate mission-specific data sets to satisfy specific mission information needs. The mission-specific data sets are more detailed than foundation data and contain more time-sensitive geospatial content to meet intended uses. Engineer leaders must know how to exploit this information.

Countermine. Currently, at least 72 countries have mines already in the ground, impacting all CINC areas of responsibility. To most Third World countries, mines are a cheap, nasty, and effective means of conducting asymmetric warfare against a First World state and protecting national or tribal interests. Mines remain the "weapon of choice" for many rogue states. The article on page 21 describes how the Engineer School is tackling the countermine requirements for the current and the future force.

Dynamic-Obstacle Emplacement. The offensive and dynamic nature of future operations, coupled with the reduced number of sappers on the ground, forces us to shift from a reliance on conventional obstacles to emplacement of less-manpower-intensive dynamic obstacles with "turn-on/turn-off" and programmable self-destruct capability.

Fratricide from scatterable mines, time and resources required to put up fratricide fences, and implications of short-duration scatterable mines—coupled with problems associated with long-duration release authority—dictate that we look for a turn-on/turn-off capability. We must also look at "self-reporting," "self-marking," and Force XXI Battle Command-Brigade and Below (FBCB2) reporting capabilities to further enhance the task force's situational awareness. We are exploring, with other proponents, possible solutions to emplacing deep dynamic obstacles.

Munitions such as the Hornet, Advanced Hornet, Raptor Intelligent Combat Outpost, and mixed (antitank and antipersonnel) Antipersonnel Landmine Alternatives (APLAs) will provide us with new capabilities incorporating a high-tech ability to seek, identify, and destroy enemy ground vehicular systems. The Advanced Hornet will give us the first remote turn-on/turn-off capability and provide technological insights to add this capability to our current stock of scatterable mines. These intelligent dynamic-obstacle systems seamlessly integrate with our overarching engineer geospatial and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) MCS.

Alternatives to current "dumb" antipersonnel land mines are being developed. Among these alternatives are an artillery-delivered mixed munition; a "self-healing" minefield consisting of antitank mines equipped with sensors, internal communication systems, and injectors that relocate and synchronize the minefield in near real-time; and non-self-destructing alternative (NSDA) munitions that add a soldier to the decision loop before munition activation.

C4ISR Systems. As we look at the Army's Transformation Campaign Plan—our path to the future—we see that knowledge-based battle command is the key to increased lethality and survivability. Comprehensive and reliable C4ISR systems are the cornerstone of the digitized Army. They give us the COP and superior situational awareness and understanding to facilitate precision maneuver and engagement.

One of our most important near-term goals is to define the critical information that must be digitized and how it is to be managed. It is critical that we work with our field commanders to correctly define this requirement. To maintain our relevance on the battlefield, we must develop and field a world-class engineer MCS. The MCS-E is an automated decision support and management element to be embedded in MCSs supporting the maneuver commander and providing the engineer commander rapid answers otherwise requiring time-consuming, manual calculations. The MCS-E is tied to the DTSS and the rest of the Army Battle Command System (ABCS) and is fully integrated throughout the battlespace. It links the commander to Tele-Engineering assets providing access to subject-matter experts from around the world.

Changes in engineer command and control structures in EAD are also being defined. Problems dealing with a mix of digitized and nondigitized units are prevalent. As LOCs become extended and the security of these LOCs decreases, command and control becomes more challenging. A near-term requirement will be defining the roles of engineer brigades and groups and their span of control in the battlespace.

Training, Leader Development, and Soldiers. The explosion of information technology, with its attendant operational and personnel implications, is helping to forge the Engineer Regiment of the 21st century. Even with changes to our structure, equipment, and technologies, our core functions of battlefield engineering and infrastructure support remain central to our mission. The Regiment must acquire the finest equipment and write the doctrine for using it effectively on the battlefield. The Regiment must also develop soldiers and leaders with the right skills, knowledge, and experience to meet unforeseen challenges of the 21st century. In the end, our most important mission and future success lies with the soldiers we train, equip, and deploy in support of the Army and the nation. Army training is in a period of significant transition. What we train, how we train, and the methods used to plan and execute training are all changing.

The article on page 24 describes how the legacy Officer Education System (OES) will transform to meet the Objective Force education needs. These changes are required due to the diversity of the Army's missions, the scarcity of resources, increased weapon lethality, and an anticipated decrease in available training time and space. The purpose of the next few paragraphs is to provide the direction regimental training will take in the near term.

Digitization is the near-term technology for storing and processing information. In the very near future, there will be fewer hard-copy field manuals, soldier training publications, mission training plans, and such. Access to these training and doctrinal materials comes through the Army Doctrine and Training Digital Library on the Internet or through the Standard Army Training System (SATS). Staffing of proposed revisions occurs electronically. Training development is also transitioning to electronic media. There will no longer be paper-based programs of instruction, lesson plans, and job and task analyses. The training-development process will be accomplished in the Automated Systems Approach to Training (ASAT) database. Training developers input information into ASAT, the data are manipulated, and the output is training products that soldiers/units/activities obtain via an electronic medium (Internet, SATS, or data discs).

Classroom XXI takes the classroom to the battlefield and the battlefield to the classroom. It provides worldwide access to digital information, training, and simulation. We currently have 13 classrooms with this capability and will have 27 by 2009. These classrooms provide a multimedia environment with worldwide access to instruction/information. The digital format of training materials/products provides a faster, more economic means of delivery. In the near term, the Engineer School conducts small-group instruction using expert observer-controllers from the combat training centers, assesses student comprehension and performance, and delivers world-class source materials on demand—to include the capability to televise live classroom instruction to students worldwide.

Distance learning is a concept for delivering training to soldiers when and where it is needed without having to bring the soldiers to the schoolhouse. It is the engine making Classroom XXI achievable; it incorporates a number of emerging technologies to accomplish "distributed learning." CD-ROM and computer-based (Web-based) multimedia programs are two technologies used by the Engineer School. Some training-support packages and portions of some courses

are available via these media. The Engineer Focused Battle Command/Staff Training (EFBCST) System is an Engineer School initiative consisting of three progressive training tools for commanders and staffs: the Engineer Battle Staff Training System (EBSTS), Engineer Staff–Conduct-of-Fire Trainer (ES-COFT), and Engineer Collective Command and Staff Trainer (ECCST). The EBSTS is an Internet-based series of courses designed to train commanders and staffs on critical individual tasks. Eight individual position lessons have been developed or are under development. We are continuing to pursue funding for the remaining parts of this training system. Distance learning will be applied in many ways to achieve TRADOC's goal to have soldiers/students spend less time in resident instruction at the school; major portions of courses will be accomplished via distance learning.

Simulators and simulations (Sim2) are in great demand for accomplishing training. Increases in operating tempo and ammunition costs are coupled with a decline in maneuver areas and ranges. Currently, the Engineer School uses constructive simulations (Janus and Brigade/Battalion Battle Simulation [BBS]) to conduct training exercises for leader courses (officer and senior noncommissioned officer). In the next few years, Janus and BBS will be replaced with One-Semiautomated Forces (One-SAF), providing more realistic training possibilities. The training strategy for the Wolverine relies heavily on Sim2 for both institutional and collective/sustainment training. We are working hard to become an active player in the virtual training world. The Engineer School is working with TRADOC on the justification and requirements to include engineer equipment and systems in the close combat tactical trainer/virtual training arena. Our edition of this effort is called the Engineer Combined Arms Tactical Trainer (ENCATT). Pending funding, we project having this capability for the engineer force by the 2005 time frame. Simulations continue to become increasingly realistic and eventually will include simulations of individual soldiers connected via fiber-optic/distributed interactive simulation lines all over the world.

Tactics, techniques, and procedures and new doctrine will be developed for engineer soldiers and leaders with new equipment and concepts to support the Interim and Objective Forces.

Conclusion

Development of new engineer capabilities is not solely the job of the schoolhouse. Good solutions require the help of the entire Engineer Regiment. I challenge the combat developments community, school, labs, and engineer commanders in the field to focus on the issues presented throughout this paper. By focusing our efforts on these top issues, we will be able to achieve our goal—*to remain the best-trained, -prepared, and -equipped engineer force in the world.*

Major General Aadland is the Commandant of the U.S. Army Engineer School and Commander of the Maneuver Support Center, Fort Leonard Wood, Missouri.

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Endnote:

[1]The company's limited countermobility and survivability capabilities, and no general engineering capability, make it dependent on other engineer units for this support.

("Clear The Way," continued from page 2)

We have spanned the Army in our search for ENFORCE guest speakers who are relevant to the Army's change and operationally centered to give you the straight facts, insights, and vision that you need to hear and challenge. These speakers agreed to come because they understand the importance of Engineers to our Army now and in the Objective Force. If you have an important message to convey to the conference from your neck of the woods, let me know and we'll help get your story out.

With much help from Engineers in the field and our SOF, Infantry, Armor, MI, and Ordnance brothers-in-arms, the Engineer School continues to make progress developing solutions to counter our current and future mine and booby-trap problems. Since briefing the Vice Chief of Staff of the Army (VCSA) and the Army Requirements Oversight Council (AROC) last December, we have continued to move forward in efforts to get our deployed forces in Operation Enduring Freedom (OEF) what they need now to detect and neutralize mine threats. In conjunction with HQ TRADOC, we established a Countermine Integrated Concepts Team (ICT), that launched a Countermine Council of Colonels (CoC), which met in March, and a Countermine General Officer Steering Committee (GOSC), which met in April. These fora had great participation from the DA staff, other branch proponents, our sister services, national agencies and labs, and the intelligence community. This continues a full-court press effort to solve current and future countermine challenges and ensure that the countermine priority is not just another "flash in the pan." We are planning future CoC and GOSC meetings, will seek your participation, and will keep this program at the forefront of Army priorities.

The pace of change in our Army and our Regiment are unprecedented. As our CSA, Gen Shinseki, said, "If you dislike change, you're going to dislike irrelevance even more." As a branch, we are committed not only to leading change but also to making sure these changes strengthen the Army's war-fighting capability and increase the vitality of our Regiment as a combat arm. With your help, the Engineers will continue to be a force driving change; be sure to keep your head in that game. Enjoy this ENFORCE conference and come ready to participate. Through it you will gain important insights as to where our Regiment can go armed with the commitment, brilliance, and innovation of our current leaders and those bright young sapper leaders who will follow. These are exciting times and we have much work to do!

ESSAYONS!

Assured Mobility
The Path to the Future

By Mr. Mike Fowler and Lieutenant Colonel Gary Johnston

During the past decade, the U.S. Army has been engaged in a deliberate and sweeping effort to adapt its organizations, soldiers, equipment, and methods of operation to the requirements of a rapidly changing strategic and technological landscape. The Army Vision describes the characteristics of the Objective Force, and emerging technologies promise a clear path to that future. The power of advanced technologies, especially information technology, enables the Army to achieve situational dominance and decision-making momentum to create a new construct for the application of force.

The hallmark of the Objective Force described in this article is its reliance on small, lethal, tactical units. At the heart of these units are soldiers and leaders—warriors—who know and live Army values; are disciplined, physically tough, and mentally conditioned for combat; have perseverance; are technically and tactically competent; and possess an unbreakable will to win. These tough, resilient, resourceful, versatile professionals—equipped with the best technologies our nation can provide and led by the most competent leadership we can grow—will remain persuasive in peace and invincible in war, the ultimate guarantors of America's interests around the world.

Operational Concept

The Objective Force is a full-spectrum force—organized, manned, equipped, and trained to be more strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the entire spectrum of military operations. Objective Force units contribute to decisive joint operations by conducting simultaneous, distributed, continuous, combined-arms air-ground operations—day or night—in any terrain throughout the battlespace.

Objective Force units are designed to operate at a tempo that affords the enemy no rest or relief and no means of responding effectively. These units develop situations out of contact, maneuver to positions of advantage, engage enemy forces beyond the range of their weapons, and destroy them with precision fires and, when necessary, by tactical assault at times and places of our choosing. Objective Force units will employ the full range of national and joint capabilities to *see first, understand first, act first,* and *finish decisively* at the strategic, operational, and tactical levels.

See First

Objective Force units see first by detecting, identifying, and tracking the individual components of enemy units. Advanced technologies that lead to unprecedented intelligence, surveillance, and reconnaissance capabilities—coupled with other ground, air, and space sensors networked into a common integrated operational picture—enable us to see the enemy, both in whole and in part, as a complex, adaptive organization. The enablers for seeing first include, as a minimum—

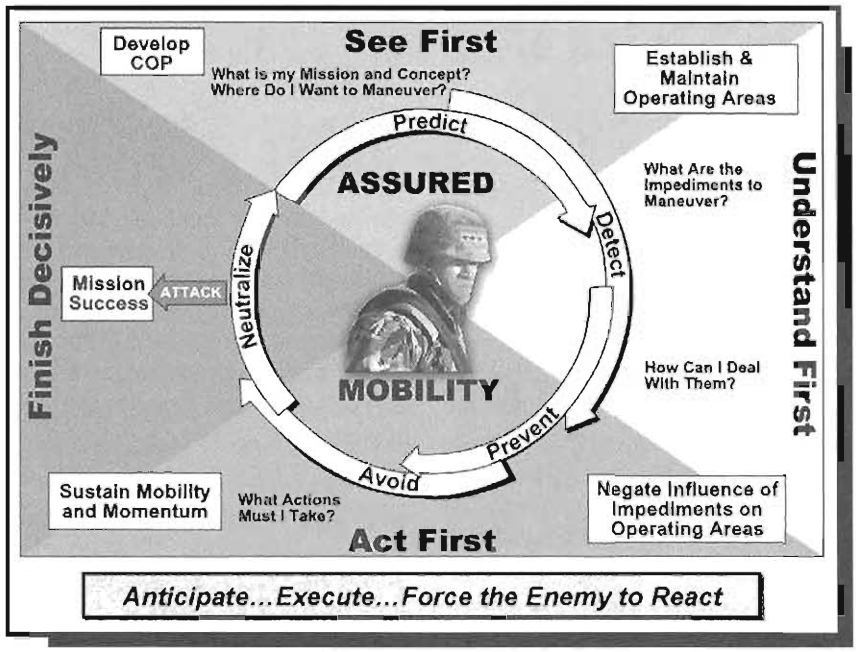
- Combat identification systems.
- Organic sensors that are robotic, multispectral, and disposable.
- Unmanned aerial vehicles (UAVs).
- Embedded command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR).
- Special-operations forces.
- Long-range surveillance detachments.
- Air and ground reconnaissance operations.

Data-fusion systems, global-information grids, and leader training will enable decision makers to have a synthesized, common picture of the battlefield—the common operational picture (COP). Blinding the enemy through the use of obscurants, jamming, signature reduction, deception, and pattern-avoidance techniques will further enhance the Objective Force's ability to see first.

Understand First

Objective Force units understand first through exploitation of a COP of the battlespace that allows soldiers and leaders to understand what the enemy is doing and better anticipate his intentions. As leaders at all levels observe this common picture, they simultaneously analyze and share assessments through their Web-based command and control systems. Objective Force commanders can leverage the intellect, experience, and tactical intuition of leaders at multiple levels to identify enemy centers of gravity and conceptualize solutions, thus creating a collective genius through accelerated collaborative planning within Objective Force units. As commanders decide on a course of action, they instantaneously disseminate their intent to all levels, affording maximum time for subordinate levels to conduct requisite troop-leading procedures. The time gained through effective use of these information technologies enables Objective Force units to seize and retain the initiative and build momentum for decisive outcomes. The key enablers for understanding first include—

- A knowledge-based battle-command system.
- Mentally agile, intuitive, and adaptive leaders at all levels.
- An execution-centric command and control system.



Leaders must be educated for rapid synthesis of information, intuitive assessments of situations, and rapid conceptualization of friendly courses of action. They must be able to clearly define their information requirements and, most importantly, develop and effectively communicate their intent. Units must be highly trained and disciplined in the use of these information technologies to efficiently manage the volumes of information they will provide. This will require disciplined use of information protocols, leader education, and new training and leader-development concepts in both live and constructive environments.

Act First

Objective Force units act first by virtue of the superior situational awareness that permits them to engage the enemy at times and places of our choosing. Wide dissemination of the commander's intent, coupled with broad access to the COP, will provide unprecedented opportunities for subordinate initiative to exploit enemy vulnerabilities as opportunities present themselves. Furthermore, this information will allow our commanders to integrate the elements of combat power into a dominant whole when applying decisive force, both lethal and nonlethal. To act first, Objective Force leaders, platforms, and units must—

- Have information dominance.
- Be capable of moving, shooting, and reengaging faster than the enemy.

Target-acquisition systems will see farther than the enemy in all conditions and environments. Units will be able to rapidly assess options, act first by understanding when and where they must transition between actions, and maintain fully synchronous fires throughout the violence of execution. The design is to deny the enemy any respite or initiative while Objective Forces operate at high operational tempo. Objective Force units will be enabled by systems that link and clear line-of-sight and beyond-line-of-sight fires through advanced weapons control systems and man-in-the-loop decision making.

Finish Decisively

Objective Force units finish decisively by destroying the enemy's ability to continue the fight and achieving moral dominance over him. The units will do this by building momentum and rapidly transitioning to assault and exploitation operations without allowing the enemy time or opportunity to regroup and continue the fight. Units will maneuver by both ground and air to assume tactical and operational positions of advantage through which they will continue to dominate the enemy and pursue subsequent campaign objectives. Objective Force units will continue to exploit the initiative until they have broken the enemy morally and/or physically, thus achieving decisive victory.

Assured Mobility

The mobility of the Objective Force is critical to maintain the high tempo and operate over the extended distances dictated by this concept. Assured mobility is one of several key maneuver support enablers of the Objective Force and must be developed to its full potential. Assured mobility extends the concept of air corridor suppression of enemy air defense (SEAD) to ground mobility routes, corridors, or operating areas. Today, troops on the ground must continue to develop the current situation, develop the mobility plan after deployment, and remember that situational understanding is time-sensitive.

In the Objective Force, space, air, and ground imaging sensors will maintain current, real-time situational understanding, and sensor-effects links will preclude the enemy from modifying the current situation. The selected course of action will be encompassed by a blanket of sensor coverage allowing assured mobility with sensors and effects similar to the SEAD effects

today. The current operational pictures will be fed continuously to commanders, and area-denial systems will prevent enemy alteration. Future requirements for the intelligence, surveillance, and reconnaissance system include sensors that can distinguish among friendly, enemy, and civilian activities; predict and verify enemy intent with assured route mobility sensors (a mobility decision aid); and deny enemy forces the opportunity to apply countermobility measures.

At present, engineers are task-organized to handle a myriad of tasks in a worst-case mission scenario. Current doctrine requires 150 percent redundancy of engineer systems to ensure mission accomplishment. In the Objective Force, engineers will task-organize only with necessary mission-specific equipment. Mobility support will be provided by planned/focused engineer effort, thereby reducing the necessity of redundancy required today, supported by Future Combat System (FCS) mobility mission modules with prepackaged equipment for specific missions. Future mine-detection and -neutralization capabilities, both standoff and organic, will allow the preparation of the battlefield with an assurance and safety factor not imaginable today. Future requirements include the FCS mobility package, robotic standoff mine-detection and breaching capabilities, and a standoff marking system. Standoff detection and breaching can be accomplished by systems such as the conceptual route access and proofing system, which will have robotic vehicles move down a desired route—identifying and electronically marking mines along the way—with standoff mine killers such as the UAV or vehicle-mounted rockets homing in on the electronic signal to destroy the threat.

There are four main tasks for assured mobility. Those tasks are not necessarily sequential.

Develop the Mobility COP

This is the collection and integration of geospatial, cultural, and enemy information—aided by automated mobility planning tools—to establish the mobility COP for the operating area. This information allows us to quickly develop our initial modified combined-obstacle overlay (MCOO) and enables the maneuver commander to select the mobility course of action. Knowledge of the existing obstacles and monitoring of existing traffic patterns are two examples that allow us to see the battlefield in near-real time. This information allows the maneuver commander to determine where he wants to maneuver, what resources will be required to get there, and how the enemy can attempt to influence this maneuver plan. The mobility COP identifies the operating areas and the mobility issues within those areas for the maneuver plan.

Select, Establish, and Maintain Operating Areas

With the aide of automated tools, critical mobility choke points and operating areas will be identified and a shaping plan developed. This plan includes prediction of enemy actions and intents and required sensor coverage to fill any information voids within the operating area. Sensors will be employed, or focused from other assets, on the critical areas to fill the voids or improve our situational understanding and maintain our mobility COP. To solidify the mobility COP, sensor-effects packages will be employed at critical areas to protect them from enemy influence. In coordination with these sensor-effects packages, conducting standoff attacks on selected enemy capabilities to perform countermine activities—or deceiving the enemy to focus his attention on other areas—will fix the current mobility situational understanding. An active protective system will be emplaced at choke points, such as bridges, to counter enemy attempts to disrupt us at such points. Being able to control and monitor critical mobility areas is key to coordinating a mobility plan in conjunction with the scheme of maneuver. Simply put, "sensor staring" will enable the Objective Force to "own" the operating area.

Attack the Enemy's Ability to Influence Operating Areas

Employing standoff-detection and obstacle-neutralization systems to maintain mobility within operating areas will ensure freedom of maneuver. This will be accomplished with a combination of *unit-of-employment* (UE) and *unit-of-action* (UA) resources. Battlespace terrain reasoning and awareness (BTRA) will allow us to template potential obstacles and locations of where the enemy might place obstacles. Standoff detection of obstacles and standoff neutralization (where necessary) or attacking of these obstacles in coordination with the maneuver plan are critical to reserve UA resources. This is a proactive attack of the enemy's ability to employ obstacles. Attacking the enemy's ability to shape the battle-space is also a key enabler for the UA's mobility. Sensor systems such as the Raptor and the antipersonnel land mine alternative (APLA) will protect the flanks of our units and deny the enemy the freedom of action within our operating area.

Maintain Mobility and Momentum

This allows the UA the freedom of maneuver to seize his objective without delay. Detecting obstacles (including side-attack and wide-area mines) and neutralizing their effects without affecting the maneuver plan or momentum are critical to accomplish the speed and agility required for the Objective Force. As a last resort, an in-stride breaching capability must exist to overcome enemy obstacles that may be encountered when it is necessary for the force to cross. Marking systems that provide visual, virtual, and active identification of obstacles and cleared or safe areas are required. In addition to supporting the assaulting force, maintaining mobility and momentum has a role to ensure that the force can be supported. This includes maintaining and opening routes for pulse logistics as well as forward landing areas for air resupply. We must be able to neutralize the effects of obstacles without disruption of our maneuver momentum in one of four ways: detect and avoid, detect and destroy from standoff, detect and breach, or withstand the effects.

Organizations

To implement the Objective Force concepts, all Army organizations will be analyzed as to their need and relevance. This is especially true for the Engineer Regiment with the wide range of capabilities it brings to the Army. Most Army tasks that are conducted today will remain

valid; however, the method used to accomplish those tasks may drastically change. This leads to a complete review of how our units are organized.

There are several considerations that must be applied in developing the future engineer organization. Basic options that must be reviewed are—

- Modularity.
- Tailorability.
- Combined arms to the lowest levels.
- Task organizing on the move.
- Force pooling of engineer capabilities.
- The way we equip and deploy.

Before the engineer units can be developed, the Objective Force organization concept must first be understood. The Objective Force must fulfill a variety of strategic, operational, and tactical purposes, while interacting with various political and military actors within the U.S. interagency process and the international community. Thus, the Army must maintain some mix of functional competencies at all levels. Early analysis indicates that eliminating echelons and flattening hierarchies will not be as easy as commonly perceived. Many factors must be addressed, including the challenges of span of control, the increasing complexity of operations at each level of effort, the expanding battlespace geometry, the differences in tasks and purposes that occur at each echelon, and the human capabilities (and limitations) of future leaders and staffs. Echelonment also reconciles the inherent organizational tension between size and agility. Finally, echelonment reflects the reality that it is neither economical nor efficient to furnish every functional capability to every formation. Rather, the more varied and complex military activities become, the more necessary to delegate functional responsibilities among more than one level of organization.

Generally, when fewer consecutive echelons are required, translating intention into action is more rapid and less vulnerable to friction. There are limits to that equation, however. Beyond a certain point, flattening organizations so enlarges their span of control and increases the burdens on subordinate units that organizational sluggishness and operational risk actually increase. Moreover, the way in which successive echelons are constituted is as important as their number. Formations designed with a high level of organic self-sufficiency are—by that very quality—less easy to reconfigure, whereas formations with little organic structure require augmentation for robustness and durability but also can be retailored more rapidly and easily.

Objective Force organization reflects these considerations in relation to the operational conditions and methods described earlier. It—

- Locates self-sufficiency and tailorability at the echelons where they are most essential.
- Capitalizes on new information technologies to streamline decision making and coordination without overloading commanders and staffs.
- Provides for the routine cycling of combat and support units into and out of action.
- Reflects an expectation that future military operations typically will require the employment of joint enablers at much lower organizational levels than in the past.

Units of Purpose

In the context of today's echelons, we must account for the functions, tasks, and purposes of corps and divisions to establish the requirements for Objective Force echelonment. We use the UE to account for these tasks in our design work. It is imperative to place the UE in the context of operations in order to validate this assessment. The UA accounts for the functions, tasks, and purposes of the brigade and below. These units conduct combined-arms operations, employing fire and maneuver and tactical assault while maintaining freedom of action in tactical engagements. While the ultimate designations of Objective Force units of purpose remain to be determined, for the sake of discussion, today's designations can be used to discuss the functions they must be able to perform.

Echelonment in the Objective Force is a complex question that demands extensive analysis and experimentation. TRADOC has not yet defined all levels of command resident within the Objective Force. To discuss echelonment, Objective Force concepts employ a functional framework in which UEs perform tasks assigned today to divisions and higher-service headquarters. UEs—

- Link ground and joint forces and orchestrate ground operations that decide joint campaigns.
- Have the capacity to assume command of joint task forces.
- Provide the basis for combined-arms air-ground task forces.
- Resource and execute combat operations.
- Designate objectives.
- Coordinate with multiservice, interagency, multinational, and nongovernmental activities.
- Employ long-range fires, aviation, and sustainment.
- Provide C4ISR and tactical direction to UAs.

UAs are the tactical warfighting echelons of the Objective Force. For analytic purposes, UAs comprise brigade and below echelons. Maneuver UAs are the smallest combined-arms units that can be committed independently. Their function is to finish decisively by closing with and destroying enemy forces through integrated fire and maneuver and tactical assault. For continued developmental purposes, the core of the UA brigade is the combined-arms combat battalion that commands a number of organic small tactical units that fight as teams of fighting teams. The span of control of the UA brigade is four to six battalions. Maneuver UAs require the qualities of durability, endurance, and stamina. Brigades are expected to employ most combat battalions in dispersed yet integrated engagements while

periodically cycling individual units into and out of contact to sustain operational momentum. Combat battalions must dominate the unexpected contact and be able to transition through several engagements in sequence.

Engineer Organizations

Developing organizational designs for engineers has begun by defining the capabilities that are required and those that can be embedded into the UA. We will use the term "modules" to identify a capability that is required to accomplish a low-level Army task. Each task will be broken down into squad-level detail with mission-essential equipment. These modules will be grouped together to form units that are consistent with the Objective Force design (such as brigades, battalions, and companies).

Engineer modules are now being developed; these modules will lead to grouping capabilities to accomplish vital engineer functions in support of Army missions. For example, engineer missions are described using FM 7-15, *The Army Universal Task List*. Under the Battlefield Operating System of mobility/countermobility/survivability, the combined-arms tactical maneuver element is required to conduct mobility operations. A part of mobility operations is overcoming barriers, obstacles, and mines, which leads to subtasks of conducting breaching operations. Even under the concept of assured mobility these tasks will have to be performed when standoff neutralization or avoidance methods have failed.

Using the subtask "conduct breaching operations," we develop a list of modular capabilities that are required within engineer units to support this combined-arms operation. After reviewing all the tasks, we developed 10 groups of module tasks:

- Mobility (enhance mobility options by enabling bypass, clearing obstacles [out of contact], and breaching, when required).
- Search (detect and neutralize mines, unexploded ordnance, improvised explosive devices, and other offensive enemy use of obstacles at standoff).
- Reconnaissance (identify mobility opportunities and assess mobility restrictions).
- Shaping (proactively deny the enemy's ability to affect friendly mobility, while positively affecting enemy and gray mobility).
- Force protection (enhance friendly and neutral force survivability through employment of terrain and infrastructure reinforcement).
- Construction (through joint, organic, host-nation, and contract assets, provide infrastructure and services to meet mission requirements, including airfield/APOD repair/emplacement, LOC construction/maintennace, etc).
- Geospatial (provide terrain situational awareness to enable home-field advantage and quickly develop and continuously update mission-specific data sets).
- Force support (provide noncontiguous route support, area clearance, deception, and environmental support).
- Special-purpose (provide unique specialized capabilities in support of operations).
- Command and control (plan, integrate, and synchronize engineer capabilities required for mission success; command and control combined-arms and engineer UAs as assigned; control defile operations, which includes the ability to reach for assistance through information or modular capability outside of the organization).

As the modules are grouped together, modularity, tailorability, and deployability are key characteristics that are considered. Each modular design has three components:

- Personnel with key unique equipment.
- Army TOE equipment required for major-theater war environment.
- Available commercial equipment that could be used in lieu of deploying the units' equipment.

This organizational concept opens up new deployment options. Some units may rapidly deploy a portion of their unit initially without all their fielded equipment and then lease commercial equipment at a forward location to begin operations while the rest of the unit, or other engineer units, deploy by conventional means. This gives us options to provide CONUS-based units with forward-deployed capabilities.

Conclusion

This is just the beginning of the total review that must be done to support the Army's Transformation Plan. It will take the involvement of the entire Engineer Corps to ensure that—

- The maneuver commander receives assured mobility.
- Current engineer capabilities are embedded in the Objective Force (may or may not reside in engineer organizations or equipment).
- Engineer units are operationally responsive and agile (ready, tailorable, and deployable).
- Requisite Objective Force capabilities that the engineers must provide (embedded, combined areas, or modular) are properly addressed and designed in accordance with the concept of assured mobiltiy.

The Engineer School and MANSCEN DCD engineer staff invite support and input from each member of the Engineer Regiment to help address these complex issues.

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Engineer Digital Command and Control

By Major Eugene Snyman and Mr. Kenneth Bergman

The Engineer Regiment has been working to develop digital command and control (C2) systems that facilitate maneuver support to the combined-arms commander. This work has been fully integrated with other efforts across the Army to automate battlefield functions. Although most of the work has focused on legacy systems, the intent is to posture C2 systems to support the operational concepts being developed for the Interim and Objective Forces. The current Army Battle Command System (ABCS) will move forward and transform as well.

This article addresses the chronology of the Engineer Regiment's efforts to complement Armywide efforts in development and transformation of command, control, communications, and computers (C4). The central requirement is that the future system will serve the needs of the combined-arms commander. Requirements that are more oriented to the engineer staff's needs should be considered as distinct from maneuver requirements. Digital C2 systems will enable the future vision of support to maneuver forces by defining actions necessary to ensure the mobility of the force: *see first, understand first, act first,* and *finish decisively.*

Background

With the proliferation, sophistication, and availability of digital technology in the late eighties came the natural impulse to apply digital solutions to battlefield functions. The introduction of systems such as the Standard Army Training System, the Unit-Level Logistics System, and e-mail facilitated broad steps toward unit automation. Engineers sought the same digital efficiency. In the early 1990s, USACE sponsored a Science and Technology Objective (STO) for the Engineer Obstacle Planning System (EOPS), which was a forerunner of the Maneuver Control System-Engineer (MCS-E). TerraBase provided staff officers the capability to quickly analyze terrain and distribute useful terrain-visualization products. SapperNET, developed by the 3d Infantry Division in early 1999, was the first use of the Tactical Local Area Network to post engineer reports to a Web server to share commonly used data. From this legacy, the 18th Airborne Corps developed CastleNET as a Web-based reporting system that could be adapted by any engineer unit. The Engineer School developed the Digital Topographic Support System (DTSS) to provide engineer terrain teams at the brigade, division, corps, and echelon-above-corps levels with automated assistance performing terrain analysis and creating topographic products.

Proponents of other Battlefield Operating Systems (BOSs) were simultaneously developing automated tools to assist in collecting, analyzing, and disseminating information relevant to their unique requirements. These included the MCS, Advanced Field Artillery Tactical Data System, and All-Source Analysis System. By the late 1980s, this confederation of BOS C2 systems became the Army Tactical Command and Control System (ATCCS). These systems funneled data directly from source to intended recipients, bypassing the wider community of staffs working to satisfy battlefield demands. This "stove-piping" of data was not originally a problem since it was understood that the staffs would distribute the relevant information. ATCCS had five systems. Since then, additional systems were added as the need for even greater BOS functionality became apparent. The ATCCS evolved into the current ABCS, which now has 11 systems.

The Division Capstone Exercise (DCX), conducted in two phases at the National Training Center, Fort Irwin, California (DCX I), and at Fort Hood, Texas (DCX II), better refined command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) requirements (see "Assessing Engineer Priorities in the Division Capstone Exercise," *Engineer*, February 2002). Commanders demonstrated how ABCS provided a common operational picture

(COP) and situational awareness that improved efficiency and lethality. While automation has transformed battlefield dynamics, the systems themselves have significant shortcomings.

During the DCX II after-action review/commandant's video teleconference on 5 November, TRADOC Commander, General John N. Abrams, addressed some of the broad issues confronting ABCS viability. Foremost was the observation that all systems lacked integration and were too oriented to meeting individual BOS requirements. He directed the Combined Arms Center Commander, Lieutenant General James C. Riley, to lead an effort to reassess the ABCS and make recommendations to TRADOC on whether to continue program funding, modify the system requirements, or discontinue the program. The following quote from Lieutenant General Riley addressed ABCS way-ahead efforts: "...overarching driver for final recommendations will be the degree to which each system integrates into the combined-arms fight in order to support situational understanding and decision making by combined-arms commanders."

Current Situation

There are distinct aspects of the commander's situational awareness that engineers historically manage. The Engineer Regiment is always cognizant of our fundamental purpose to support the combined-arms commander in the prosecution of the warfight. It is challenging to sort through the myriad of tasks and assign priorities from the maneuver perspective. In one sense, all our activities are oriented to the combined-arms fight, but the question really deals with the specific information the commander needs for decision making. These include preparation for combat, correlation and control of forces, knowledge of the enemy, and the effects of combat action. Many of the current capabilities in MCS are designed to meet the requirements of the battle captain. The commander probably does not need to see an engineer overlay dotted with little green marks; instead, he needs a visual analysis of enemy activity, considering obstacle effort grouped according to probable enemy intent. Similarly, the commander may not understand the significance of electronically highlighted routes and bridges until he sees how they fit with other aspects of terrain and with the scheme of maneuver.

The current thought is that considering the offensive focus of current doctrine and the emerging emphasis in the Interim and Objective Forces on assured mobility, obstacle situational awareness is one of the most important command requirements. Equally important is the ability of the commander to see the terrain and understand its effects on maneuver. Topographic engineers can provide a variety of digital tactical decision aids and terrain-visualization tools for maneuver support. Other important tasks must be automated as well. Legacy Force doctrine still accounts for defensive operations making survivability and countermobility tracking important in automation efforts. At this stage in ABCS development, various systems give us only pieces of the data sets required to create relevant command decision-making tools.

Maneuver Control System

The aptly named MCS does not adequately support the engineer's ability to package information for the commander. Although the initial requirements documents addressed the need to record and report obstacle information, developers focused efforts on other maneuver priorities and on system stability. Not until operational testing at the DCX did the extent of the deficiencies become clear. Currently, the MCS has no means by which engineers can track obstacles, much less perform mobility analyses. Very little of the obstacle data generated at ground level can be automatically sent to the MCS and, even then, there are no tools to manage and synthesize data into information.

As this system evolves, it must allow the soldier to accurately record friendly and enemy obstacles according to doctrine, post these immediately to the COP, and be able to update obstacle information in real time. Staffs must be able to receive, store, update, collate, analyze, and disseminate obstacle information and graphics up and down the chain in real time. Technically, this requires a database—fully compatible with other hardware and software—empowered with user-defined query capability and "fuzzy-logic" decision aids.

Force XXI Battle Command Brigade and Below

Development of the Force XXI Battle Command Brigade and Below (FBCB2) System, the fighting-platform-level reporting and situational-awareness system, accommodated engineer needs to a much greater extent than did the MCS. At the platform level, obstacle situational awareness is achieved. Obstacles discovered are reported in real time and populate the entire lower tactical internet. The systems in vehicles that are approaching recorded obstacles even give the drivers audible warning. However, during the DCX in early 2001, minefield fratricide became a primary point of command attention.



FBCB2 System

"It is envisioned that future versions of the FBCB2 System will simplify the obstacle reporting into one comprehensive report for both enemy and friendly obstacles."

The FBCB2 System provides three primary message formats that engineers typically use: the obstacle report, the minefield-laying report, and the overlay message. The obstacle report, intended originally as a means of reporting enemy obstacles, automatically displays the reported minefield on all FBCB2 screens. The minefield report and overlay message are intended for friendly minefields and graphic dissemination of engineer planning. While most of the relevant information is captured in these three reports, a complex combination of work arounds and tactics, techniques, and procedures involving all three reports is needed to push information to the intended recipients. It does not automatically make information digitally accessible to the higher echelons.

MCS-Engineer

To date, the MCS-E program has suffered from a lack of definition and focus within the ABCS construct. Although there has been work since the inception of the MCS to create a stand-alone C2 system, called MCS-E, for the mobility/survivability BOS, those efforts have fallen significantly short of the mark. There is also valid concern in the Regiment that another stovepipe box in ABCS would be a mistake. As a result, the Engineer School decided that MCS-E should be integrated directly into MCS. MCS-E is an effort to assist the TRADOC System Manager-MCS in meeting engineer requirements. It will provide engineers with a seamless, integrated set of tools in one easy-to-use software package. Capabilities will include countermobility, survivabilty, mobility, and sustainment tools. MCS-E will be integrated into the MCS-Light System. It will incorporate all of the functionality that currently exists in CastleNET and will have the added benefit of being totally integrated into the ABCS architecture.

It is intended that these tasks identified as most important to the combined-arms decision-making process be addressed by the MCS, while all additional, more staff-oriented tasks be incorporated into MCS-E. Integration of this effort is expected to coincide with MCS, Version 7.0, which is scheduled for release in FY04.

Digital Topographic Support System

The DTSS software is largely successful at the technical level and can be enhanced through software upgrades and doctrine, training, leader development, organization, materiel, and soldiers (DTLOMS) adjustments. Since it is able to leverage commercial software, the DTSS is a fully integrated member of the ABCS family and is a stable, reliable system in the field. Unique government applications provide added functionality to process digital terrain data. System upgrades are delivered to the field as software advances are achieved. Many products can be prepared using the DTSS, including tactical decision aids, slope analyses, intervisibility plots, and 3-D terrain fly-throughs. A map server was added at DCX II to provide a readily accessible archive for larger terrain-data files in the tactical operations center. The units performed well at the DCX, but mission performance standards (mission training plans [MTPs]) must be identified to better focus the soldiers on keeping their technical skills razor-sharp.

Joint Mapping Toolkit

The Joint Mapping Toolkit (JMTK) was designed to serve as a common system for terrain-data displays and some embedded-data analysis tools throughout ABCS. Problems with the initial release of the JMTK led to the variety of display software as each system sought its own display tool. There are presently seven different terrain-data-display software packages in use within the ABCS. This leads to a lack of commonality in terrain-data representation and functionality. The current version of the JMTK used at DCX II is more stable and capable than previous versions. External interfaces with DTSS and other ABCS members will increase the effectiveness of planning, execution, and reporting by engineer units.

Near-Term Prognosis

Using the DCX after-action review and consultation with the field, MCS deficiencies have been captured, articulated, and passed on to the TRADOC System Manager-MCS. The MCS-E will give us an opportunity to insert engineer functions into the MCS in its FY04 release and subsequent versions.

The FBCB2 System will release Version 4.0 in FY04 as well. The Maneuver Support Center's (MANSCEN's) Director of Combat Developments is working to refine the message format in the FBCB2 System to fix reporting shortcomings and facilitate database management of obstacles, but it is not yet clear whether these significant message format changes will be reflected in FBCB2, Version 4.0. There are varying degrees of difficulty in effecting changes with proponent, contract/cost, priority, and time considerations involved. A short-term solution involves changes to the existing message formats. The minefield symbol that autopopulates all other FBCB2 screens can be changed to capture the obstacle number; the drop-down menus in the obstacle report can be changed to better reflect obstacle status options; and the ability to edit

existing obstacles can be added to circumvent the requirement to send additional messages about the same obstacle when the status changes. The task is further complicated because changes to the messages and Military Standard 2525B (Field Manual 101-5-1, *Operational Terms and Graphics*) must be approved by an interservice board.

CastleNET is essentially two subsystems (CastleNET-Reports and CastleNET-Visual) that currently require a manual interface. CastleNET-Reports (previously SapperNET) is a Web-based (SIPRNET) system at the task-force level into which reports from lower echelons (mobile subscriber equipment, FM radios, and e-mail) are entered. Standard reports include enemy and friendly obstacles, engineer missions, main supply routes, bridges, and logistics. Once entered, the data is saved to a relational database that self-replicates the data to databases at higher echelons, essentially creating several identical sets of data available for use at each echelon through corps.

CastleNET-Visual is an overlay-producing program used to create situational awareness and update the various commanders' COPs. As mentioned, the transfer of data from the reports database to a current overlay requires a multistep transfer of data on a Global Command and Control System box. Once the transfer takes place (one contractor or trained soldier is required full-time), several other manual data-transfer steps must take place to view the update on the corps COP and MCS-Light (personal computer/Windows-based). At this point, despite the manual processing steps involved (elapsed time 5-60 minutes), obstacle situational awareness is available for the commander's decision-making process.

CastleNET was successfully used during the 18th Airborne Corps Warfighter Exercise in early February 2002. It has received developmental Joint Forces Command funding through the Joint Area Clearance Advanced Concepts Technology Demonstration to determine the military utility of the system. With further funding, CastleNET could serve as an interim solution until MCS, Version 7.0, is released. Incidentally, the MCS-E is using much of the functionality of CastleNET to accelerate its developmental efforts.

The next software release of DTSS in the fall of 2002 will include a capability called battlespace terrain reasoning and awareness (BTRA). This new tool will enhance the capability of DTSS users to provide terrain-analysis products that can be rapidly modified as the battlefield situation develops. Meanwhile, understanding the use of digital topographic products will be enhanced through the development of a new Training Circular 5-230, *Topographic Smart Book*. This will increase awareness of potential DTSS products in the field and at the TRADOC schools for battle staff officers. There has always been a close relationship between the topographic engineer community and the intelligence community, especially in the use of imagery products. Engineer units in recent years have provided more oversight of topographic functions. This has increased the focus of the topographic units on both the friendly and enemy terrain regions, but some units seldom use imagery products from the intelligence community. The Engineer School is refining concepts with the Intelligence School through the Imagery and Geospatial Information Integrated Concept Team. Conclusions from this analysis will help refine the synergistic relationship between the topographic and intelligence functional areas.

Visualization of terrain data throughout the ABCS will be impacted by a congressional mandate for commercialization of the JMTK. The new commercial JMTK (C/JMTK) contract award should take place in FY02, with initial software release in FY03. Portions of JMTK software can potentially be incorporated into the C/JMTK. The Engineer School will participate in the development of the C/JMTK to manage capabilities and costs associated with software licenses, since thousands of computers will use this system.

Engineer C2 Roadmap

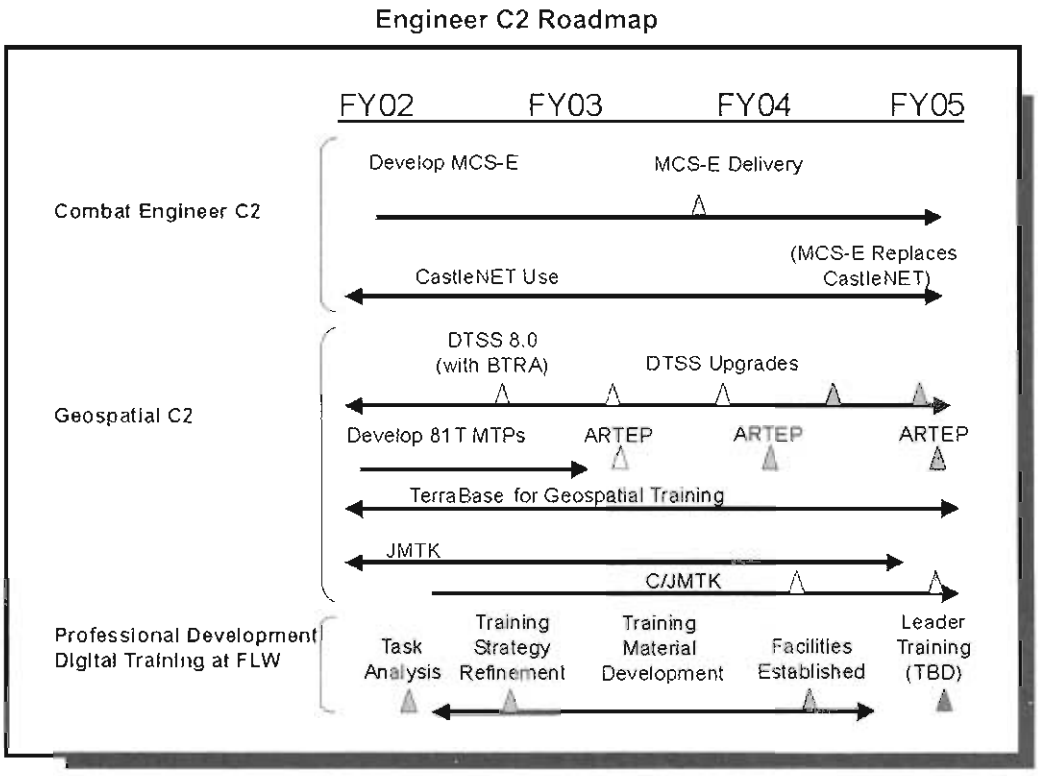
The figure on page 20 shows notional timelines for combat engineer and geospatial C2 developments and a concept for digital systems training at Fort Leonard Wood. The figure shows CastleNET providing current capabilities to support combat engineer tasks; CastleNET will be retired after the MCS-E is delivered. The DTSS will incorporate BTRA in the fall 2002 delivery, with continued software upgrades as commercial industry and government labs build added functionality. The Engineer School will accommodate digital systems training with the advent of these automated systems so that engineer students will see digital systems being used effectively before departing Fort Leonard Wood. MANSCEN assets will be used to show students how the MCS-E, DTSS, and other digital systems are employed.

The Way Ahead

As previously mentioned, the ABCS way ahead was a series of conferences to review, update, and determine courses of action oriented to a final decision brief to General Abrams in early February 2002 to facilitate Program Objective Memorandum 04-09 input. The action officer conference methodology was used to conduct a mission analysis to develop a common understanding of ABCS capabilities, gain consensus from all stakeholders, and present the recommended courses of action to the TRADOC commander. All viable courses of action address actions to be taken after ABCS, Version 7.0 (MCS 7.0/FBCB2 4.0), to accompany the transformation of the Legacy and Interim Forces. A separate Future Combat System (FCS) C2 capability will be developed for the Objective Force.

The Objective Force concept is still in development. TRADOC is conducting a series of seminar war games to focus senior leaders on fleshing out operational and organizational issues. Other efforts are ongoing:

- A unit-of-action (UA) task force was stood up at Fort Knox during the fall of 2001.
- A full-time working group is exploring the nature and requirements of the FCS.



- Five concept experimentation programs (CEPs) are underway, all oriented on transformation with full engineer participation.

In addition, the Engineer School has done an enormous amount of work exploring countermine requirements and solutions for the Objective Force Assured Mobility Concept.

Assured mobility involves actions that guarantee the force commander the ability to maneuver where and when he desires without interruption or delay to achieve his intent. It presupposes situational awareness through superior battlefield vision and understanding. The commander is able to develop a thorough mobility COP with geospatial products to help assess the environment and see the enemy's intent. With extensive support of sensor webs, he is able to select, establish, and maintain operating areas, from which he sets the conditions to fix and destroy enemy forces and move according to operational requirements. From an operational position of advantage, he can then attack at will, using stand-off detection/neutralization of obstacles. Finally, with the aid of embedded systems, he can breach residual obstacles and maintain mobility and momentum.

When the Objective Force operational and organizational concepts are approved, the current C4ISR requirements will be revisited with the intent of developing an integrated system structured around the needs of the commander. Taking advantage of current and future technologies, the Objective Force commander will have at his disposal tactical decision-making aids, collaborative and interactive planning tools, real-time access to reach-back expertise and resources, and the ability to conduct mission rehearsals on the move. It is clearly vital that MANSCEN and the Engineer School embrace a forward-focused posture to ensure that these systems serve the combined-arms commander with relevant information from the maneuver support community. These capabilities will be facilitated by enhanced engineer C2 systems which will give us information superiority to *see first, understand first, act first,* and *finish decisively!*

Major Snyman is chief of the Heavy Forces Division, Maneuver Support Battle Lab, Fort Leonard Wood, Missouri. Previous assignments include command of the 535th Engineer Company (CSE), 130th Engineer Brigade, Hanau, Germany, as well as executive officer and platoon leader in the 1st Engineer Battalion, 1st Infantry Division, Fort Riley, Kansas. MAJ Snyman is a graduate of the Engineer Officer Advanced Course and Command and General Staff College and holds a bachelor's degree in English from the University of Kansas and a master's degree in military science from the Command and General Staff College.

Mr. Bergman is the Deputy, TRADOC Program Integration Office for Terrain Data, Fort Leonard Wood, Missouri, through July 2002. Previous experience at the Engineer Research and Development Center-Topographic Engineering Center, includes the Rapid Terrain Visualization ACTD, Army Space Technology Office, and terrain database generation. Mr. Bergman is a graduate of the Naval Academy and holds a master's degree in systems engineering from George Mason University. A lieutenant colonel in the Marine Corps Reserves, his experience includes deployments to Beirut and Grenada.

Countermine Operations in the Contemporary Operational Environment

By Colonel Jeffrey P. LaMoe and Captain Ted Read

The events of 11 September initiated Operation Enduring Freedom and thrust engineers into a new operational environment. Legacy-equipped and -trained Forces are currently deployed in Afghanistan as part of Operation Enduring Freedom, operating in a nonlegacy environment. The challenge in Afghanistan is part legacy environment with a conventional force and part asymmetric, with the added complexity of terrorist organizations. The contemporary operational environment (COE) is a complex composite of all three of those elements. The Legacy Force in the COE causes multiple dilemmas; mines and booby traps are perhaps the most vexing. Engineers will spearhead a comprehensive combined-arms dialogue involving all the Battlefield Operating Systems to tackle the mine and booby-trap challenge of the COE.

The countermine dilemma in Afghanistan is daunting. The United Nations estimates that 6-10 million mines have accumulated since the 1979 Soviet invasion. Additional sources estimate up to 30 million mines (Training and Doctrine Command [TRADOC] Countermine Task Force Recommendations, 19 December 2001). Because the contemporary operating environment combines conventional, asymmetric, and terrorist environments, Afghanistan is a near-perfect surrogate to test systems and develop future solutions on a world scale.

A chilling aspect of the countermine challenge in the COE is that mines, booby traps, and improvised explosive devices (IEDs) are pervasive and converge as increasingly sophisticated and individually targeted devices that the enemy uses specifically to inflict casualties upon our soldiers. This is very different from our traditional perception of how the enemy uses mines to shape the battlefield or for area denial in conventional confrontations. Moreover, technology and globalization enable terrorist organizations (and unfriendly nations) to share successful and ominous tactics, techniques, and procedures (TTP) in a quick, efficient manner. This means that U.S. forces may well see devices and TTP that terrorists used successfully in Indonesia, Chechnya, Lebanon, or any other current conflict in the world. The ability to understand our adversaries' options and anticipate their actions in the COE is paramount to our near-term success and requires additional analysis of the enemies and the environment in which they operate.

We have traditionally regarded our enemies in the context of a peer competitor that is Cold War-organized to use mines to shape the battlefield. However, the COE, is "terror-centric" (see Figure 1) and uses mines, booby traps, and IEDs primarily as offensive weapons or for protection. The contemporary threat will most likely progress from a regional conflict to an asymmetrical conflict when U.S. forces arrive in theater. Regional

Paradigm Shift

- The operational environment changes how the Army operates.
- Reconcile and close the gap between the Legacy Force that is trained and equipped to face a doctrine-based, echeloned enemy and a force needed to to operate in a contemporary operational environment, faced with mines and technologically sophisticated booby-trap threats.

	Then	Now
Threat	■ Fight to win. ■ Peer competition. ■ Echeloned enemy using doctrinal row minefields to shape the battlefield. ■ Soviet "bear claw" complex obstacles against armored formations.	■ Fight not to lose. ■ Asymmetric, "terror-centric" threat. ■ Mining to inflict casualties and terror. ■ Emplace mines for protection and to fortify positions. ■ Legacy minefields from previous conflicts. ■ Discrete use of sophisticated command-detonated mines on individual targets.
Focus	■ Mine-centric to turn, fix, block, disrupt. ■ IPB—confirm or deny templated enemy, adjust plan, attack, find mines, conduct deliberate breaching operations.	■ Find mobility where traffic, people, and animals are moving. ■ IPB—predict the enemy's mine-emplacement plan and prevent emplacement.
Systems	■ Mine detectors, rollers, plows, line charges, and scouts.	■ Sensors, sensor cueing, change detection, and standoff mine detection and neutralization.
Operational Concept	■ Deal with mines encountered; in contact. ■ Use supress, obscure, secure, reduce (SOSR) fundamentals to set conditions and execute. ■ Task-organize support, breach, and assault.	■ Attack mining activity and ambush preparation; deter mine emplacement. ■ Set conditions to deal with mines and booby traps out of contact.
Enemy Risk	■ Mining is low risk and high payoff.	■ Mining is low risk and high payoff; we must turn this around and make enemy mining high risk and low payoff.

Figure 1

warlords know they cannot compete with U.S. forces in a direct confrontation, so the enemy's path is to win by not losing. The threat's offensive strategy of a "death by a thousand cuts" will continue until he can garner the military support or weaponry needed to win a decisive operation. The enemy may attempt to erode our national will and resolve by using mines and booby traps to terrorize field forces, inflict unacceptably high casualty rates, and degrade soldier confidence and morale—leaving them to feel defenseless, frustrated, and unprotected against an unseen menace. A full-spectrum analysis, incorporating a complex asymmetric and terrorist threat analysis, is needed to define the mobility and survivability tasks supporting freedom of maneuver in the COE.

Rethinking the threat requires that we also rethink ourselves. While the legacy paradigm assumed our enemies to be conventional peer competitors who fought to win (see Figure 1, page 21), our current enemy in Operation Enduring Freedom is more asymmetrical. The legacy paradigm also assumed that it was not feasible to prevent our enemy from emplacing a large number of mines. Given that prevention was not an option, the Engineer Regiment was "mine-centric" and expected to locate the mines, find a bypass, or if necessary reduce the mines through redundant means. The changes in the COE, combined with increased information dominance, gives us new capabilities and options in which to develop a countermine model. We can focus on deterring mine emplacement instead of reacting to mines that are already on or in the ground. The Engineer Regiment has a mandate and an opportunity, through a comprehensive combined-arms dialogue, to redefine how we will meet the COE countermine challenge and make the threat's emplacement of mines a high-risk, low-payoff operation.

To focus the Army's countermine effort, General John N. Abrams, TRADOC Commander, directed the Engineer School Commander to convene a combined-arms Countermine Task Force to recommend near- and long-term doctrine, training, leader-development, organization, materiel, and soldier (DTLOMS) solutions to enhance ground operations during Operation Enduring Freedom and develop an agressive countermine operational and organizational plan for the Objective Force. The task force used a combined-arms process to war-game potential missions in Operation Enduring Freedom to identify required countermine and counter-booby-trap capabilities. It focused on how to improve friendly countermine operations in Afghanistan by leveraging technology to—

- See the battlefield by developing a common operating picture (COP).
- Understand the threat and develop a comprehensive surveillance plan.
- Maximize sensor arrays to ensure early warning.
- Act decisively to neutralize adversaries before mine emplacement.

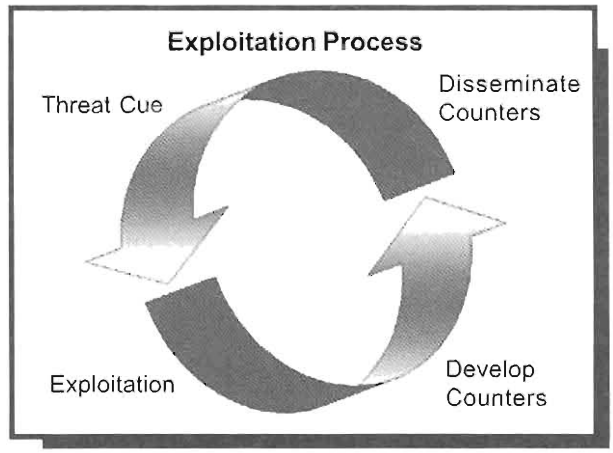


Figure 2

The Countermine Task Force's deliberate course of action analysis on all the missions yielded core requirements that will touch the full spectrum of engineering:

- "See and detect" both the enemy and mines.
- "Neutralize" mines outside their blast radius.
- "Clear" mines to maintain maneuver tempo.
- "Protect the force" from mine hazards.

In a briefing to the Army Requirements and Oversight Council (AROC) on 19 December 2001, the Countermine Task Force recommended selected near-term, commercial-off-the-shelf and government-off-the-shelf solutions for immediate acquisition to enhance ground operations in Afghanistan. Some of the solutions fulfill current operational requirements. The recommended solutions included: limited number of Minelab F1A4s—handheld mine detectors that are effective in high-ferrous soil; Antipersonnel Obstacle Breaching Systems (APOBS)—portable, rocket-propelled line charges; Improved Body Armor Sets, Individual Countermine (IBASIC); miniflails; mine-marking foam; small robots; and coalition/contract mine-detection dogs. These systems will help bridge the gap for units in Operation Enduring Freedom until better systems, such as the Handheld Standoff Mine-Detection System (HSTAMIDS) are ready for fielding under an accelerated time line.

General Abrams is fully committed to solving this combined-arms challenge. His guidance included the following:

- Employ the best minds available to develop materiel, operational, and training solutions to the countermine problem.
- Acquire and then reverse engineer the threat mine, booby-trap, and command-detonation architecture.
- Conduct a worldwide assessment to find innovative solutions in both training and materiel.
- Develop a Countermine/Counter-Booby-Trap Center (CCBTC) that will bring synergy to DTLOMS efforts and solutions.
- Set the dialogue, report progress, and identify resource shortfalls.

"In keeping with General Abrams's guidance, the Maneuver Support Center (MANSCEN) began efforts to establish a CCBTC at Fort Leonard Wood, Missouri, to bring combined-arms, joint, and allied efforts together on one team."

He made it clear that TRADOC's energy and resources will be committed to solving the countermine problem.

In keeping with General Abrams's guidance, the Maneuver Support Center (MANSCEN) began efforts to establish a CCBTC at Fort Leonard Wood, Missouri, to bring combined-arms, joint, and allied efforts together on one team. The center provides in-depth, worldwide assessments of current and emerging mine and booby-trap capabilities in order to actively fill information gaps and proactively seek out emerging capabilities, trends, and employment techniques. The center will focus and synchronize aggressive technical exploitation and science and technology (S&T) efforts, in addition to developing integrated DTLOMS solutions to protect forces and assure operational momentum against enemy employment of mines and booby traps.

Through a worldwide in-depth assessment of current and emerging technologies and employment TTP, the center discovers a "threat cue"—either a new way an enemy employs old mines, or the development of new mines (see Figure 2). The threat cue triggers exploitation of the threat architecture using our technology to quickly reverse engineer the threat cue and develop DTLOMS solutions from both internal resources and capitalization of worldwide countermine neutralization techniques and/or equipment (see Figure 2). The CCBTC will be a one-stop shopping mall for countermine solutions across the DTLOMS spectrum.We will build it into the world benchmark in countermine and counter-booby-trap training and technology. Our center will be a joint organization that will monitor mine incidents around the world, then tie new mine incidents into a collaborative fix between materiel solutions provided by the S&T from both the military and industrial communities and training solutions from the mine warfare training department. The center can be viewed as a hub for a continually moving wheel that searches the world for new enemy devices and TTP and DTLOMS countermine solutions and assists in the implementation of materiel and training solutions to the field.

Unfortunately, the Army has made little progress in developing technology to detect and neutralize mines over the past 60 years. Mine detectors (that detect metal), mine probes (to manually determine whether metal in the ground is a mine or a scrap), plows and rollers (brute force), and bangalores and mine-clearing line charges (explosives) are "state of the art" for mine detection and neutralization even today. Limited investment in standoff detection and neutralization programs is attributable partly to the technical complexity of getting beyond manual, brute-force systems that supported a legacy paradigm whose countermine solutions were limited to bypassing or breaching existing minefields.

This resurgent effort orchestrated by the Army's new CCBTC will lead the charge to reverse this 60-year trend by focusing on the COE to synchronize DTLOMS integration and concentrate research and development efforts. The effort also depends on maintaining a close collaboration with the combined-arms team and developing close partnerships with intelligence, special operations, infantry, armor, explosive ordnance (EOD), and chemical proponents to develop collective combined-arms training strategies to meet agile and adaptive adversaries.

The Engineer School is leading the TRADOC effort by forming a Countermine Integrated Concept Team (ICT) to accelerate implementation of DTLOMS solutions that meet the countermine challenge in the COE now and ensure mobility of the Objective Force. This ICT encompasses a Countermine Council of Colonels and a Countermine General Officer Steering Committee which will ensure that the countermine effort has sustained, top priority investment and commitment from the Army. In short, the countermine challenge is a combined-arms challenge that requires a full-spectrum analysis of the contemporary operating environment to ensure that we maintain the freedom to maneuver and increase force protection in any environment now and in the foreseeable future.

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Captain Read is a geospatial-engineering instructor in the Tactics Department, U.S. Army Engineer School, Fort Leonard Wood, Missouri. He was previously an engineer observer/controller at the Combat Maneuver Training Center in Hohenfels, Germany, and commanded C Company, 9th Engineer Battalion, 1st Infantry Division in Schweinfurt, Germany. He has deployed to operations in Somalia, Haiti, and the Balkans.

Engineer Officer Education Transformation

By Lieutenant Colonel Jeffrey Bedey and Major Dallan Scherer

The United States Army Engineer School has been a key participant in every facet of transforming the officer education system (OES). The latest initiatives and changes to the way we will train our engineer officers in the very near future are captured in this article.

The Chief of Staff of the Army, General Eric K. Shinseki's, vision for Army Transformation as it applies to TRADOC is "...training and developing the force for 'strategic dominance across the entire spectrum of operations'...we will do it better, faster, and more affordably." TRADOC is not only the architect for change in the design of the Army's warfighting forces, it also has the key role to transform the institutional Army. In support of the Chief's vision, TRADOC Commander, General John N. Abrams, developed his vision for the future of leadership development for the Army. He has energized the force to—

- Identify the knowledge, skills, and attributes for leaders to be able to cope with the task of warfighting and war winning across the full spectrum of warfare as it relates to the world we live and operate in as reflected by the contemporary operational environment.
- Advance curriculums with experiential leader-development experiences relevant to the positions they assume upon graduation from TRADOC schools.
- Return to the core foundations of teaching tactics and learning tactics at the company-grade level; emphasize small-unit leadership development for lieutenants as well as tactical and technical competence.
- Advance the learning for combined-arms training for captains, and increase joint and combined operations knowledge and skills at the senior tactical level and operational level for military education level (MEL)-4 experience.
- Rekindle the passion and competence for training and for our training doctrine across the force, and put its application in the context of today's readiness equation.
- Focus on learning the traditions of Army service and its heritage.
- Reinvigorate the study of history as a medium for scholarship development as a lifelong enabler for learning and growing.

The end state is to develop competency-based learning requirements for officers, noncommissioned officers, warrant officers, and civilians at each level in support of Army Transformation. This will be accomplished by designing and executing transformation of command to align with Objective Force goals and by implementing institutional transformation strategies for training and leader-development systems.

To meet General Shinseki's intent, TRADOC implemented a Leader Development Campaign Plan (LDCP) to transform our current resident facility-focused system into one that is a more efficient model, focused on an officer's next assignment. The figure depicts how the Legacy Force OES, by course and duration from initial-entry training through the Command and General Staff Officer Course (CGSOC), will transform to meet the Objective Force education needs.

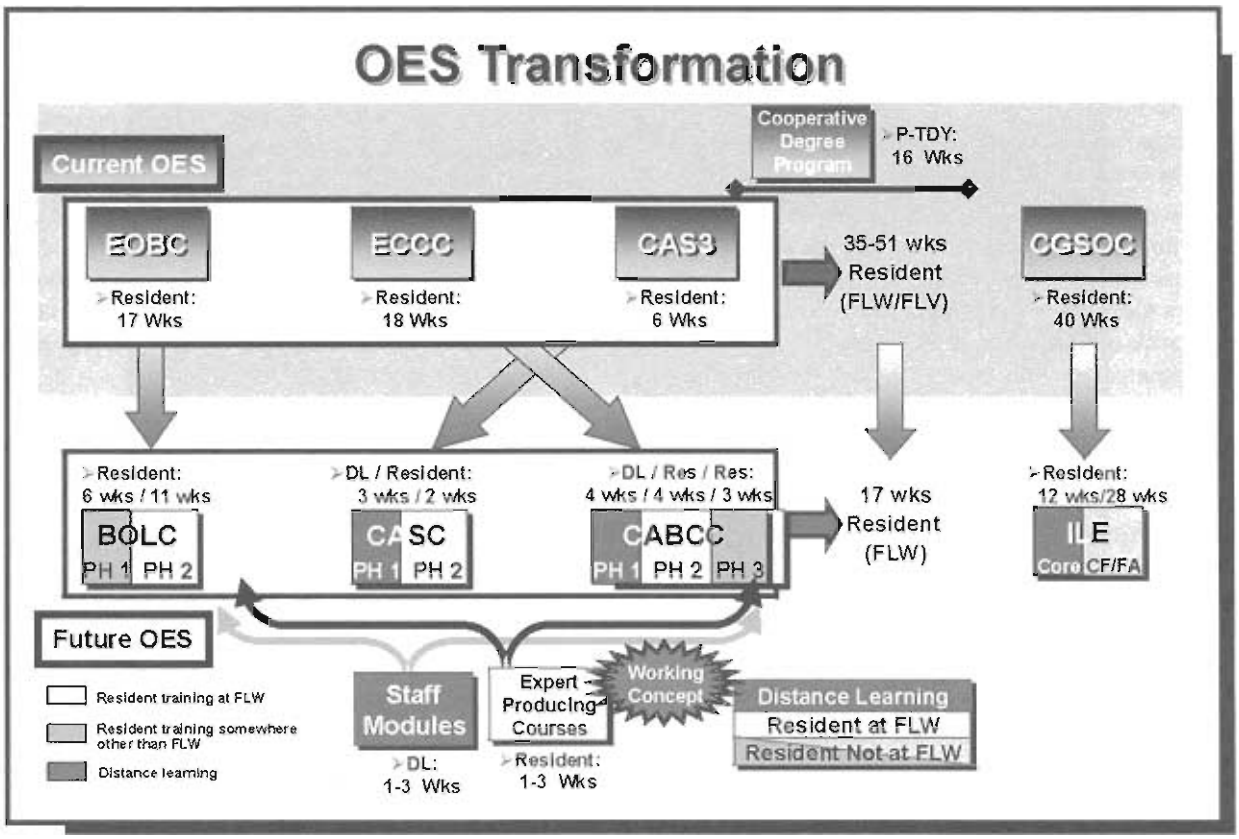
Looking at the current OES model, our junior-grade officers currently spend between 35 and 51 weeks training at Fort Leonard Wood, Missouri, or Fort Leavenworth, Kansas. The higher end takes into account the participation in the Cooperative Degree Program (University of Missouri-Rolla / University of Missouri-St. Louis Webster University). As for our field grade officers, only 50 percent of a given year group are selected to attend CGSOC in residency for 40 weeks at Fort Leavenworth. Those who are not selected must complete their training by correspondence while still working full time in the field Army.

The **Basic Officer Leader Course (BOLC)**, which replaces the Engineer Officer Basic Course, will be conducted in two phases:

- **BOLC Phase I** will be trained at one or two consolidated locations (for example, pilots are currently being conducted at Fort Benning, Georgia). This 6-week course will develop leaders of all Army branches with character and confidence who are self-aware and adaptable and achieve excellence.
- **BOLC Phase II** will be trained at the Engineer School. This 11-week course will focus on engineer platoon leading and task force engineer skills, with an increase in tactics instruction (in particular, training on scatterable mines, geospatial engineering, and force-protection construction). In March 2002, we conducted our first BOLC Phase II pilot. Full BOLC implementation is targeted for FY03/04.

The **Combined Arms Staff Course (CASC)** will replace the Combined Arms Services Staff School (CAS3) (notice that the timing has changed to precede advanced officer training). This training will also be conducted in two phases:

- **CASC Phase I** will consist of approximately 120 hours of distance learning, to be conducted at the unit on both common-core and engineer-specific tasks focused on staff



officer skills and knowledge. The window for accessing this distance-learning courseware opens upon successful completion of BOLC Phase II and must be completed before attending CASC Phase II.

- **CASC Phase II** is a 2-week resident course at the Engineer School that maximizes constructive, virtual, and/or live training with a focus on staff functions. This training will revolve around combined-arms staff officers training with engineer-specific training embedded. Portions of this training are also envisioned to be Web-based combined-arms multiechelon collaborative simulation exercises. The first CASC pilot is scheduled for FY03/04. Full implementation is targeted for FY04/05.

The **Combined Arms Battle Command Course (CABCC)**, which will replace the Engineer Captain's Career Course (ECCC), will be very similar in execution as CASC, but will be conducted in three phases:

- **CABCC Phase I** will consist of approximately 160 hours of distance learning, which will be conducted at the unit and will include both common-core and engineer-specific tasks that are focused on company command skills and knowledge. The window for accessing this distance-learning courseware opens upon successful completion of CASC Phase II and must be completed before attending CABCC Phase II. Officers must be identified for company command to attend CABCC Phase II.
- **CABCC Phase II** will be a 4-week resident course at Fort Leonard Wood, with the focus on maximizing constructive, virtual, and/or live training with a focus on command functions. This training will also revolve around combined-arms training with engineer-specific training embedded. Similarly, portions of this training are also envisioned to be Web-based combined-arms multiechelon collaborative simulation exercises.
- **CABCC Phase III** will be a combat training center (CTC)-like experience with officers spending 3 weeks at the CTC that is most associated with their command. This training will focus on unit training and the after-action review (AAR) process—the intent being to develop "master trainers." The first CABCC pilot is scheduled for FY03/04. Full implementation is targeted for FY04/05.

Intermediate Level Education (ILE), a resident course conducted in two phases, will replace the CGSOC:

- **ILE Phase I** will be a 12 weeks long and will focus on common-core field grade training. All field grade officers will attend Phase I in residency; however, this training may be conducted at more than one location. Successful completion of this training will give an officer his MEL-4 rating.
- **ILE Phase II** will likely be resident; however, officers will attend training at different locations based on their career field and/or functional area. The first ILE pilot is scheduled for FY03. Full implementation is targeted for FY03/04.

Expert-Producing Courses is an Engineer School concept whereby an officer can receive highly specialized training. The

vision is to develop a series of 1- to 3-week resident functional courses to produce experts in engineering-related tasks. One example is a Countermine Counter-Booby-Trap Course being developed now to provide expert training on the latest countermine and counter-booby-trap technologies and techniques to counter these hazards.

Notice the significant decrease in institutional resident training (from 35-51 weeks to 17 weeks). To offset this decrease, we must take advantage of existing and emerging technologies to create a means to package and export training to the field. One initiative of LDCP is to create a database for knowledge management and e-learning that can provide the right knowledge, training, and education on demand. This system, termed the "Warrior Knowledge Network (WKN)," will allow all Army personnel to access interactive courseware designed to be delivered anywhere, anytime, to meet the educational needs of the Army via distance or distributed learning (DL), on demand. This courseware will focus on preparing personnel for accelerated advanced learning and/or application of skills in a resident educational course.

Some of this training will be directed (CASC Phase I and CABCC Phase I) while other training will be self-development. Some of the self-development courses, termed **Staff Modules**, can be taken at any time following BOLC. For example, once an officer is identified to serve as a battalion S1, he could access the WKN and take the Adjutant Course Module, giving him the necessary skills and knowledge to perform in that position. The key is that through DL, anyone can learn the fundamentals needed to succeed immediately or "just-in-time" before assuming a new position. Other training that will be offered includes the Supply Officer Course (S4) and the Battalion Maintenance Officer (BMO) Course.

The common theme throughout the LDCP is to leverage DL to reduce an officer's time away from troops and shift focus during the resident training phase from learning skills to applying those skills. The benefit is twofold: the officer learns a skill when he needs the skill most, and he spends more time with troops and less time in the institutional environment.

You may have heard the terms "gauntlet training" and "crucible training." These terms are often used interchangeably; however, gauntlet training focuses on leadership training in a multiechelon, multigrade, synthetic/virtual-training environment, while crucible training refers to the same experience in a field environment. One of the goals of the OES transformation is to use this performance-oriented training to the maximum extent possible.

We are working to integrate this type of training at the Engineer School. The Department of Instruction and Department of Common Leader Training, in collaboration with the Armor School, are working to pilot a constructive simulation exercise via the Web for a gauntlet-type exercise. To further enhance this type of training, we are spearheading the integration of a suite of Force XXI Battlefield Command-Brigade and Below (FBCB2) Systems into a digital tactical operations center. These systems will support training requirements for the entire Maneuver Support Center (MANSCEN).

MANSCEN and the Engineer School are leading the TRADOC transformation and will very soon present a concept to ensure that the cooperative graduate degree programs are not lost. We are exploring multiple courses of action with several learning institutions to actually expand the ability for all engineers to obtain associate, bachelor's, or graduate degrees. The bottom line is that the Engineer School understands the importance of higher education and is determined to continue to provide a means to deliver higher civilian education opportunities.

Today's military missions and operational and strategic policies dictate that we produce skilled, self-confident, adaptive leaders who can win on any battlefield across the full spectrum of conflict. Focused, tailored training is key, whether it is preresident, resident, or postresident training. Providing expertly packaged, more frequent training for shorter periods allows the mind to better absorb and understand concepts and—overall—increase retention. This can be accomplished best by providing the right combination of distributive learning multimedia technology and capitalizing on combat training center and unit training. Our challenge is to wisely use the limited resources we have to develop the most effective and innovative training feasible. To successfully transform our educational system, it is essential that we continue to explore the use of existing and emerging technologies to enhance the delivery and design of future resident and nonresident training. We must ensure that we maintain the most realistic and challenging training and education possible.

Lieutenant Colonel Bedey is chief of the Directorate of Instruction, U.S. Army Engineer School, Fort Leonard Wood, Missouri. Previous assignments include commander of the 299th Engineer Battalion, 1st Brigade, 4th Infantry Division, Fort Hood, Texas, and S3 and company commander, 15th Engineer Battalion, 9th Infantry Division (Motorized). LTC Bedey is a graduate of the Command and General Staff College and holds a bachelor's degree in construction engineering from Montana State University and a master's degree in construction management from Colorado State University.

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Developing an Engineer Strategy for Homeland Security

By Lieutenant Colonel Robert Hudnall, Lieutenant Colonel Monroe Nickell, and First Lieutenant Rachel Walkenbach

The threats of the 21st century demand a new approach to homeland security (HLS). The events of 11 September have caused us to focus more clearly on the connection between terrorists and other enemies of this country; the weapons of mass destruction they seek to use against us; and the social, economic, and political tensions across the world. President Bush has proposed an HLS budget that increased from $19.5 billion in the FY02 budget to $37.7 billion for FY03. The budget proposal nearly doubles funding for a sustained strategy of HLS focused on four key areas: bio-terrorism, emergency response, airport and border security, and improved intelligence. National sovereignty and HLS are top presidential priorities.

Our country is at war. Security of our homeland is a national priority. The present terrorism threat toward Americans requires a different perspective of what the constitutional requirement "to provide for the common defense and general welfare of the United States" means. In the near future, the President is expected to sign the Unified Command Plan, creating a new combatant command—U.S. Northern Command (USNORTHCOM)—responsible for HLS. The Implementation Plan will lay out DoD's requirements and guidelines for response planning tasks, command and control architecture, and training standards.

Department of Defense Job #1

"The primary mission of the U.S. military is first and foremost to fight and win our nation's wars. Service members are trained and ready to defend our nation from attack. Our military forces have previously worked and partnered effectively with civil authorities during times of natural disaster and will continue to do so."

-Secretary of Defense message 26 2330Z Oct 01

Engineer Roles, Responsibilities, and Missions

The Engineer Regiment must adapt its structure for HLS missions, roles, and responsibilities. Engineer leaders must discuss force structure changes that will be needed to prepare for, prevent, defend against, and respond to threats and aggression directed toward U.S. territory, sovereignty, domestic population, and infrastructure. We must look at the capabilities the Regiment brings to the table to accomplish these missions, roles, and responsibilities. Developing an HLS strategy should be on every engineer commander's agenda.

Although U.S. Army engineers have been a part of the HLS mission since its inception, it is now formally spelled out by the Secretary of Defense as a priority mission area. There will be two primary mission considerations for engineers as the Army develops its Objective Force structure capabilities—fighting and winning our nation's wars and defending the homeland.

Many engineer capabilities required to support civil authorities will be the same as those required to support military forces and installations in the prosecution of the global war on

The Department of Defense on HLS

HLS is not a new mission for the American military...we have been performing the mission for the past 226 years.

"Many of our commanders feel comfortable in their ability to respond to requests by civilian agencies for support in dealing with natural or man-made disasters. There is a long history of exemplary service to our nation by all components of our Regiment. But the events of 11 September have greatly increased the stake we, as Engineers, have across the spectrum of our National Defense Strategy."

-MG Anders B. Aadland

terrorism. There is a need to reassess today's engineer capabilities in order to support the full spectrum of Army requirements in the 21st century. There is a necessity to rethink how we are going to prepare our units to prevent or respond to attacks. Most CONUS response plans focus on natural disasters or isolated examples of man-made disasters. They are not geared toward responding to the asymmetrical terrorist threats now facing our nation. Future HLS responses by DoD will almost certainly be joint and multicomponent whereas, historically, the Army National Guard has been the traditional military component involved in civil-military training exercises and military assistance to civil authorities. The Total Army Analysis process is now considering the assignment of engineer units to this mission exclusively. Estimates are that as many as a dozen or more engineer units—to include groups, battalions, companies, and detachments involving thousands of engineer soldiers, primarily from the Reserve Components—will be assigned geographical responsibility to support HLS.

The Way Ahead

The Secretary of the Army's principal tasks for HLS:

- Consolidate responsibility for HLS—and the myriad of issues, functions, and responsibilities that touch the DoD staff—into a single organization.
- Complete a review of the operational planning for HLS through the Chairman, Joint Staff, and unified commands, to ensure that arrangements for HLS between various unified commands are optimal.
- Ensure interagency coordination with Governor Ridge's office and all the activities that he is undertaking.

"The good news is that there are many federal agencies working on all of these issues. The bad news is that there are many federal agencies working on all of these issues."

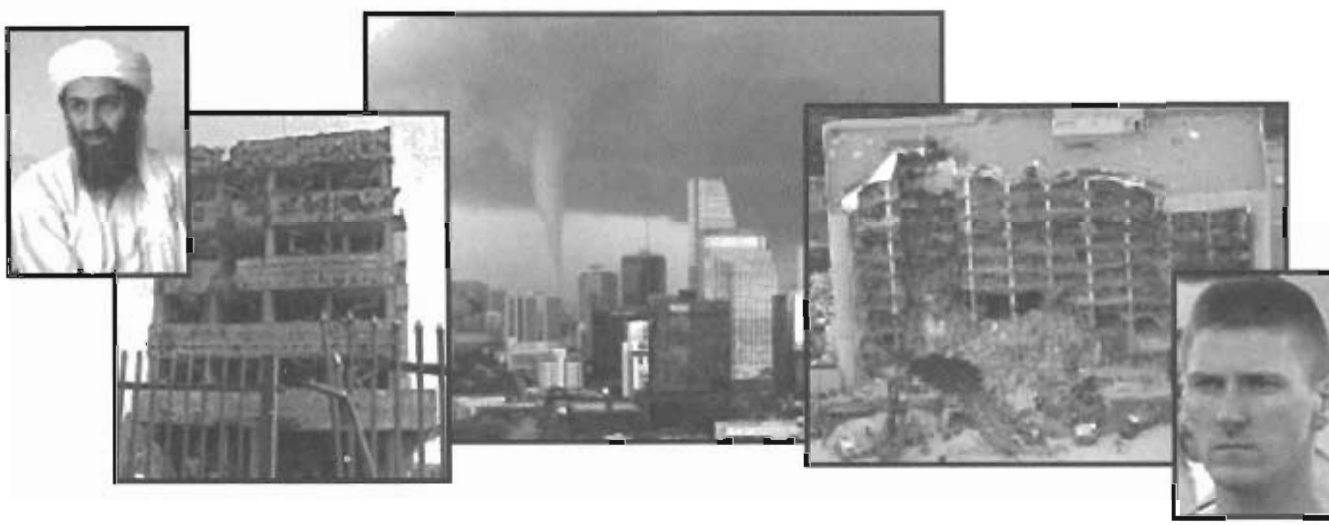
-Senator Fred Thompson

Engineers are a critical and dynamic part of the HLS mission area. HLS—by definition—WILL be a mission area for the Objective Force. The threat to our homeland will not diminish as we move into the future. In fact, it may increase as technology and financial capabilities of those hostile to our way of life grow. Leaders must think "out of the box" to develop new ways that Army engineers can contribute to the HLS mission. Engineers must be prepared to respond with well-trained and well-equipped units that can operate effectively.

Basic engineer missions of today have not changed as a result of the HLS requirements. But future HLS mission requirements may lead to a need for new technology and equipment. Terrain visualization, field-force engineering, and integration of environmental impacts associated with events involving weapons of mass destruction or natural disasters are areas where the Engineer Regiment has great potential to enhance our nation's HLS posture.

The HLS Challenge

A major challenge of the future involves building and improving civil-military relationships. Commanders can help initiate their piece of the HLS strategy by



Civil Support Missions

- Enemy attacks
- Insurrections
- Civil disturbances
- Earthquakes
- Fires
- Floods
- Tsunamis/tidal waves
- Meteor impacts
- Tornados
- Space debris impacts
- Animal diseases
- Mass immigrations
- Hurricanes/typhoons
- Volcanic eruptions
- Landslides
- Biological incidents
- Explosions
- Radiological incidents
- Snowstorms
- Droughts
- Oil spills
- Chemical incidents
- Epidemics
- Postal work stoppages
- Military support to civil authorities
- Military support for civil law enforcement
- Military support for civil disturbances
- Counterdrug operations
- Critical infrastructure protection
- Continuity of operations
- Counterterrorism
- State funerals

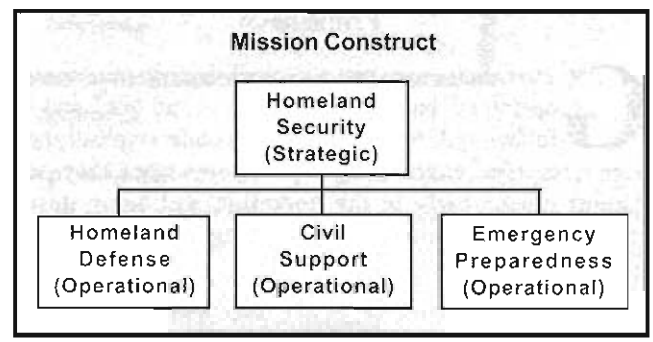
completing a unit HLS mission assessment. Leaders must consider these types of questions when creating their assessment:

- What kind of mission might your unit be tasked with, and what are the requirements of agencies your unit may be supporting?
- Are local civilian or other military support assets available in your area?
- How does your current warfighting mission differ from an HLS mission?
- Are there different materiel or training support requirements?

This process will help identify missions your unit can or cannot accomplish. Local, state, and federal agencies can consider your capabilities in their emergency-response planning process.

Community Involvement

Emergency-response community involvement may be the most important area for integration, coordination, and synchronization of emergency-response tactics, techniques, and procedures. Engineer units will not be as effective initially in a disaster-response call-up if they do not communicate, plan, and train with local, state, and federal agencies that may request engineer support. The importance of getting involved in civil-military training exercises cannot be overemphasized. No one knows when the next terrorist incident will be, but we can help protect the future of our nation by getting involved now. Guidelines for conducting HLS training exercises will change as new doctrine is developed. For now, leaders must continue to plan, prepare, and rehearse roles as often as possible using current doctrine.



Conclusion

HLS is not changing basic engineer missions or roles. It simply establishes a new emergency-response construct to deal with the challenges created because of terrorist threats and attacks. Engineers have successfully responded to disasters throughout our nation's history. Engineers of the 21st century will continue to be tasked to respond to natural and man-made disasters, except that now these missions may be in response to terrorist threats and attacks. Responding to the increased demands of HLS will be a challenge. HLS has been an important part of our Regiment contribution to the security and prosperity of our nation. From defending the homeland to winning our nation's wars, engineers will continue to move into the future as a full-spectrum force.

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Field-Force Engineering – A Regimental Approach

By Representatives of the 412th and 416th Engineer Commands and the U.S. Army Corps of Engineers

The Army is transforming to improve responsiveness to operations across the full spectrum of conflict. Army engineers have been a force multiplier and force enabler in every military operation since the end of the Cold War. This article outlines an ongoing initiative by the U.S. Army Corps of Engineers (USACE), the 412th and 416th Engineer Commands (ENCOMs), and the U.S. Army Engineer School to define how the Army Engineer Regiment must transform to meet the challenge of providing timely general-engineering support throughout the spectrum of conflict.

Problem

General-engineering response during contingency operations has been described as "ad hoc" and not following Army doctrine. Commanders typically have large unsatisfied engineering requirements when they need support most—early in the operation and again during posthostility operations. The challenge is to satisfy the requirements curve (see Figure 1).

Solution

Field-force engineering (FFE) links all the components of the Army Engineer Regiment into a seamless field-force engineer capability to provide timely general engineering to the warfighter throughout the spectrum of conflict. FFE specifically targets improving general-engineering support to contingency operations where friendly forces fluctuate quickly as the situation develops but are kept at a minimum end strength (see Figure 2, page 31).

Regimental Capabilities

The Engineer Regiment has enormous capabilities to apply across the spectrum of conflict. USACE, the ENCOMs, the Engineer School, the Directorates of Public Works, and contractors work together under FFE to provide seamless general-engineering support to the warfighter. Additionally, USACE, the Facility Engineer Group (FEG), and the ENCOMs can task-organize and send modular teams to meet diverse general-engineering requirements.

The ENCOMs have the following capabilities:

- Command and control.
- Augmentation of Army Service Component Command (ASCC) engineering.
- Theater planning.
- Facilities engineering.
- Troop construction.
- Geospatial engineering.

USACE has the following capabilities:

- Contract construction.
- Technical engineering.
- Real estate support.

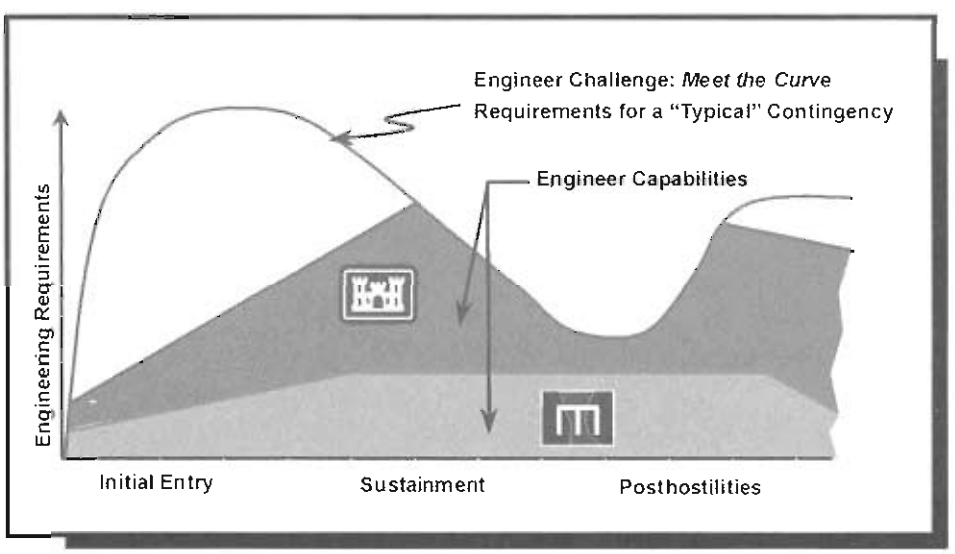


Figure 1. Engineer Support Shortfall

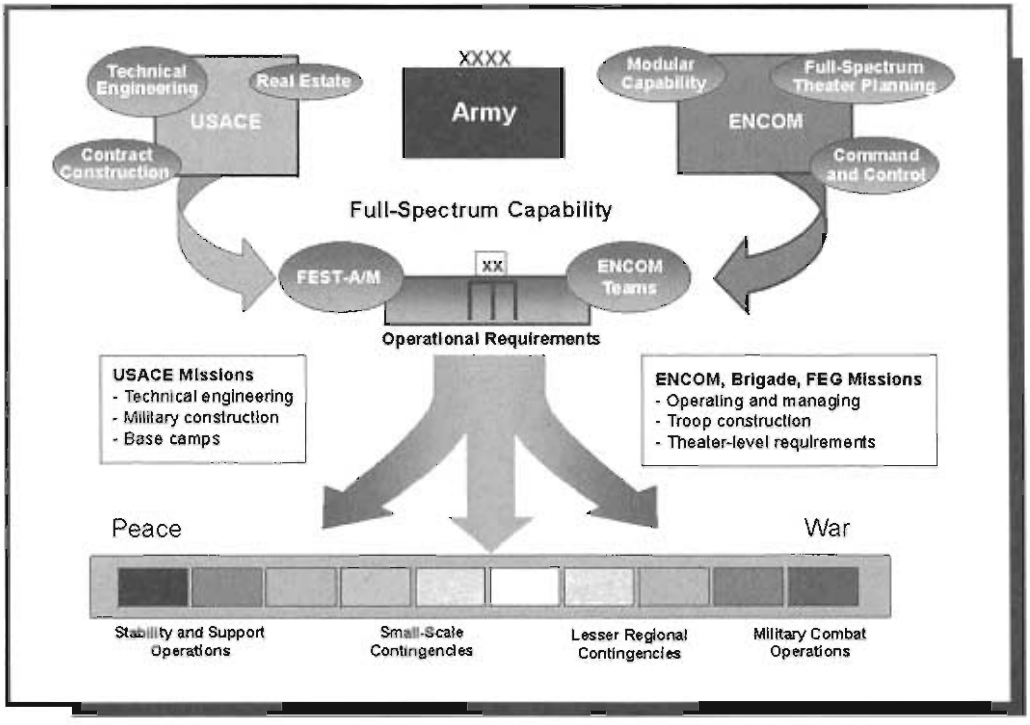


Figure 2. Regimental Approach

FFE Planning Structure

The structure provides an integrated Army engineer planning capability. Regimental ENCOM/USACE teams work for the joint task force commanders and/or the ASCC engineer to provide timely technical assistance. The ENCOMs have permanent forward-planning cells with all the ASCCs except U.S. Army South. USACE can deploy planning augmentation teams as required to support planning (see Figure 3 and the table on page 32).

Engineer Commands

The ENCOMs support each commander in chief (CINC) through the ASCC. The ENCOMs plan for flexible modular entry into the theater via early-entry modules, which range from several soldiers to a functional ENCOM command and control element. A one-size module does not fit all contingencies, so one or two early-entry modules are developed for early insertion into an operation as the situation develops. At some point, the "early operation" ends and further augmentation is the result of deliberate planning and specific capability requests through Forces Command.

The ENCOMs have multiple capabilities to put their soldiers in theater within days of mobilization by utilizing—

- Active Component and Title 10 active National Guard/Reserve soldiers.
- Hasty mobilization (a new process endorsed by the Chief, Army Reserves).
- Temporary tours of active duty and active duty for special work.

Corps of Engineers

For contingencies, USACE personnel are organized as forward engineer support teams (FESTs). The FEST planning cell provides direct augmentation to the CINC/ASCC staff engineer or the ENCOM. The FEST execution team provides command and control for execution of USACE missions:

- **Forward Engineer Support Team–Main (FEST-M).** A deployable USACE organization that executes USACE missions in the area of operation. It is usually subordinate to the senior engineer commander.
- **Forward Engineer Support Team – Augmentation (FEST-A).** A deployable planning-augmentation cell that augments the engineer staff of other organizations (for example, CINC, ASCC, and ENCOM). If a FEST-M deploys, the FEST-A comes under the command of the FEST-M commander.
- **Contingency Real Estate Support Team (CREST).** A deployable five- to six-person real estate team and a component of a FEST. The team can quickly execute leases at forward locations.
- **Environmental Support Team (ENVST).** A deployable four-person environmental team and a component of a FEST. The team provides baseline and other environmental studies at forward locations.
- **Base Development Team (BDT).** A nondeployable team that can quickly provide base-development engineering and planning and facilities design for staging bases, base camps, forward-operating bases, and displaced-persons camps.
- **Infrastructure Assessment Team (IAT).** A nondeployable team that provides engineering infrastructure assessments

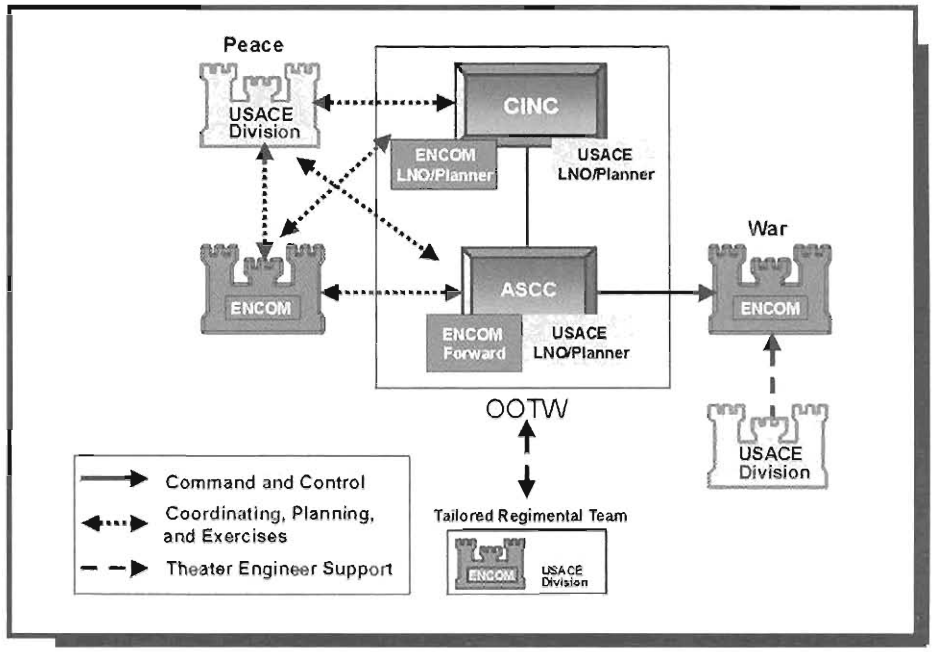


Figure 3. Field-Force Engineering Planning Structure

for military deployments and civil-military operations in forward areas. Focus areas for the IATs are the infrastructures related to USACE missions and aspects of the area of operation impacting contract construction, such as roads, utilities, water resources, and host-nation support.

Facility Engineer Group

The FEG is a 405-person table of distribution and allowances (TDA) and table of organization and equipment (TOE) group responsible for design and technical-engineering support as well as facility and environmental management, base operations, and force protection. The 416th ENCOM has peacetime command and control of the FEG, but during wartime, it is split between the ENCOMs based on the mission, enemy, terrain, troops, and time available. The FEG is comprised of six 15-person TOE facility engineer detachments (FEDs) and thirty 7-person TDA facility engineer teams (FETs) that are aligned under geographic Facility Engineer Centers, which provide command and control and administrative support. Each organizational element of the FEG is assigned a unique unit identification code for rapid and efficient deployment.

Facility Engineer Detachments

Three FEDs are war-traced to each major contingency operation ENCOM and aligned one per area support group. During peacetime, the detachments provide environmental and facility assessments, engineer design, and support to the Army Reserve engineer (50 percent), in addition to exercise participation, engineering planning, and design review (50 percent).

Facility Engineer Teams

The FETs deploy during wartime to conduct Directorate of Public Works, base operations, and environmental and facility

Field-Force Engineering Alignment

Commander in Chief	Supporting ASCC	Supporting ENCOM	Supporting USACE Division
U.S. Southern Command	U.S. Army South	416th ENCOM	South Atlantic Division
U.S. Central Command	U.S. Army Central	416th ENCOM	Southwestern Division
U.S. European Command	U.S. Army Europe	412th ENCOM	North Atlantic Division
U.S. Pacific Command	U.S. Forces Korea/ U.S. Army Pacific	412th ENCOM	Pacific Ocean Division
U.S. Joint Forces Command	U.S. Forces Command	N/A	North Atlantic Division**

** The North Atlantic Division supports the Joint Forces Command in its OCONUS area of responsibility. All USACE divisions support the Joint Forces Command in CONUS.

assessment missions. The FETs are under the command and control of the senior engineer in theatre. During peacetime, FETs provide environmental and facility assessments, engineer design, and support to the Army Reserve engineer.

Leveraging Technology

Reachback and TeleEngineering operations are terms used to describe the ability to conduct engineering analysis utilizing expertise that is beyond in-theater capabilities. The source of the expertise is linked real time via information technology to the mission site. The keys to this are the professional engineers, scientists, and technicians—combined with established procedures in the USACE, ENCOMs, and FEG. This allows real-time linkages of expertise to the operator via secure voice and video. The results are faster response times, a greater level of expertise in examining and solving problems/providing options, reduced deployment footprint and support requirements, and reduced costs.

Summary

This article focuses mainly on the functions, responsibilities, and capabilities of the engineer operational-level organizations formerly known as echelons above corps. It addresses the dynamic nature of the theater strategic and operational requirements across the spectrum of conflict. Field-force engineering is a means to get general engineers involved early in the planning of theater operations and to provide tailored support during execution. A breakout session at ENFORCE 2002 will provide further discussion of FFE.

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The Engineer Writer's Guide

Engineer is a professional-development bulletin designed to provide a forum for exchanging information and ideas within the Army engineer community. We include articles by and about officers, enlisted soldiers, warrant officers, Department of the Army civilian employees, and others. Writers may discuss training, current operations and exercises, doctrine, equipment, history, personal viewpoints, or other areas of general interest to engineers. Articles may share good ideas and lessons learned or explore better ways of doing things.

Articles should be concise, straightforward, and in the active voice. If they contain attributable information or quotations not referenced in the text, provide appropriate endnotes. Text length should not exceed 2,000 words (about eight double-spaced pages). Shorter after-action-type articles and reviews of books on engineer topics are also welcome.

Include photos (with captions) and/or line diagrams that illustrate information in the article. Please do not include illustrations or photos in the text; instead, send each of them as a separate file. Do not embed photos in PowerPoint. If illustrations are in PowerPoint, avoid excessive use of color and shading. Save digital images at a resolution no lower than 200 dpi. Images copied from a Web site must be accompanied by copyright permission.

Provide a short paragraph that summarizes the content of the article. Also include a short biography, including your full name, rank, current unit, and job title; a list of your past assignments, experience, and education; your mailing address; and a fax number and commercial daytime telephone number.

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The Multicomponent Initiative:

Lessons Learned and Challenges Ahead

By Lieutenant Colonel Thomas E. O'Donovan

The multicomponent concept was implemented in the 52d Engineer Battalion, Fort Carson, Colorado, in October 1999, and the 52d became the first tricomponent battalion in the Army. Having passed our 2-year anniversary as a multicomponent unit, it is important that both our successes and challenges are presented to the engineer community. Because of our significant Reserve Component (RC) responsibilities, and the fact that an increasing number of engineer units are becoming multicomponent, we must ensure that the lessons learned as part of this important effort get to the engineers who need them.

Background

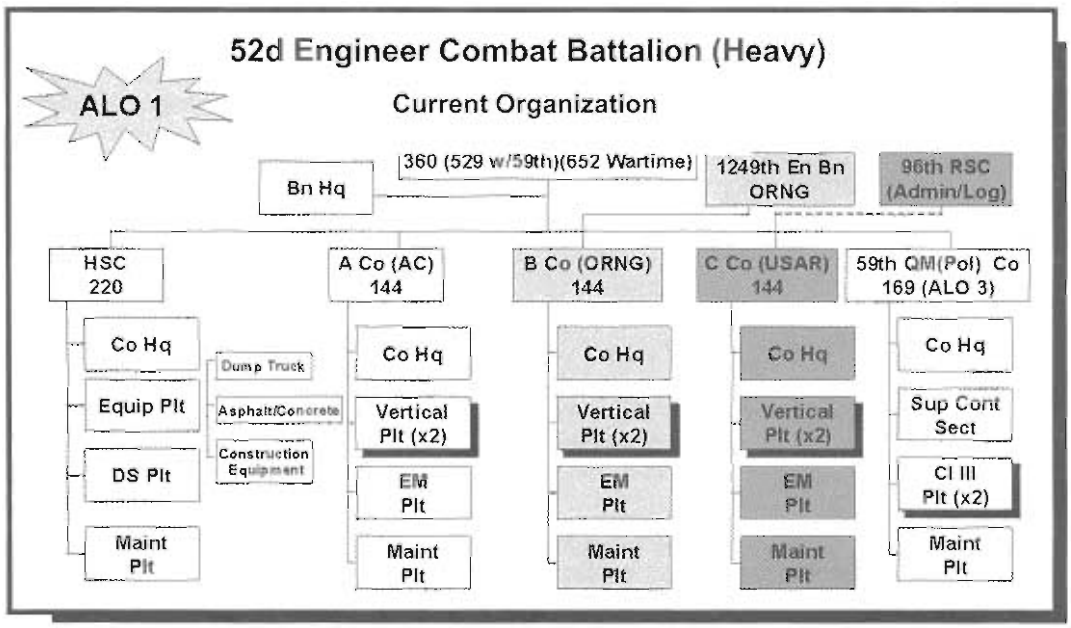
The multicomponent initiative is an Active Component (AC)/RC integration effort that is defined as being one or more organizations from different components organized in a single authorization document (modified table of organization and equipment [MTOE]). More importantly, the initiative makes one commander directly responsible for the readiness of one unit, organized from different components.

The 52d Engineer Battalion is an authorized level of organization (ALO) 1 tricomponent unit with an AC headquarters and support company ([HSC], 220 soldiers authorized), one AC line company (A Company, 144 authorized), one Army National Guard (ARNG) line company (B Company, Albany and Camp Rilea, Oregon), and one U.S. Army Reserve (USAR) line company (C Company, Santa Fe, New Mexico, and Fort Carson). This makes 44 percent of the battalion RC. Each RC company is stationed in two detachments to broaden the recruiting area. Training support for each RC company is provided by the geographically supporting Training Support Battalion (TSBn) from the 91st Division. The 1/364 TSBn, Fort Lewis, Washington, supports B Company and 1/361 TSBn, Denver, Colorado, supports C Company.

The overall mission of the battalion is that on order it deploys to any theater of operations, conducts general-engineering missions in support of U.S./Joint/Combined forces, and provides countermobility and survivability engineer support as required. Upon reorganization, the battalion adopted the multicomponent mission of reaching the very highest possible readiness of all components, using the individual strengths of each.

Training Events

Since the 52d's reorganization, three major training events have been completed. In the summer of 2000, about 120 soldiers from the AC portion of the battalion deployed to Oregon for annual training with B Company. The AC element provided command and control, construction support, and limited maintenance support for Operation Oregon Forest, a tactical construction exercise in the Deschutes National Forest. Later in the summer, the battalion went



downrange at Fort Carson with C Company for an exercise dubbed Coyote Castle, which involved tactical construction of projects for Fort Carson.

In 2001, the entire battalion deployed to South Dakota to participate in Exercise Golden Thunder. This 3,500-soldier exercise included ARNG and USAR units from across the United States in a Bosnia-based scenario. Again, the battalion executed tactical construction. All three of these training exercises involved training assessment modules (TAMs) of RC elements by our TSBns, opposing forces (OPFOR), and deployment operations by many different modes.

Smaller, battalion-supported training events have included range qualification, field training exercises (FTXs), and equipment operator training. At weapons ranges, AC soldiers supported qualifying RC soldiers, which al-lowed maximum use of critical RC training time. Integrated FTXs at Fort Carson allowed C Company to fall in on a battalion footprint that provided mess and medical support, a partially established perimeter, command and control, and maintenance support. This integrates the RC company and maximizes training time.



AC and ARNG soldiers of the 52d Engineer Battalion complete NBC training during Exercise Oregon Forest.

Successes

Wartrace. Commanders of B and C Companies can say with assurance that they understand who their wartime commander is. This has significant positive impact in terms of stating a unit wartime mission, developing a mission-essential task list (METL), and determining critical supporting battle tasks. These, in turn, can result in better (for example, more focused) training.

Integration With the Battalion. Through the execution of Oregon Forest, Coyote Castle, and Golden Thunder, we have made significant strides in integrating the company leadership into battalion operations. Coordination such as video teleconferences and telephone conference calls, e-mailing operations orders (OPORDs) and fragmentary orders (FRAGOs), backbriefs, and rehearsals were completed during the planning and preparation phases of the exercises. This allowed company and battalion leadership and staff to work together to identify and solve problems, coordinate training, and report accurate information. In an actual deployment mission, these foundations would prove invaluable to deployment success. Our efforts in integrating junior leaders included participation of company-level leadership of all components for ceremonies of many types, quarterly training briefs, participation in company training meetings, social events, visits to training, and a METL development and review conference.

Equipment Turnover. When the 52d became a multicomponent unit, we deactivated the active B Company at Fort Carson. We were able to send a large amount of equipment to the new B Company, which significantly modernized that unit. This could not have happened under Oregon's previous Department of the Army (DA) priority for equipment fielding. For an engineer unit, this is particularly notable because it allows Oregon to use that equipment in a wide variety of roles—from training to statewide assistance projects to providing support for disaster response and humanitarian relief.

Equipment Fielding. Designating the 52d as multicomponent brought all three components to one priority for equipment fielding. Previously, C Company's priority was very high due to its alignment with the XVIII Airborne Corps, while the AC portion of the battalion was somewhat lower, and the units that came to make up B Company were even lower. Therefore, C Company had a wide variety of equipment that had not yet been fielded to the rest of the battalion. This gave the AC companies an opportunity to use equipment, such as night-vision devices, that had not yet been fielded to them.

Although there have been challenges with the paint scheme (AC is tan and RC is three-pattern, but equipment is fielded in only one color), new equipment is now fielded to all three components simultaneously. This ensures that both operators and maintainers from all components have the opportunity to train at the same time or for the AC portion to receive training and then give the RC portion during drill or annual training. That commonality of equipment and training will significantly improve the battalion's capabilities for any mission.

Battalion Support. The structure of combat heavy battalions is particularly well suited to company-level multicomponent organization because much of the critical support required by the companies is organized at the battalion level. For example, the battalion aid station; the dump truck section within HSC that supports haul missions for the companies; the soils, survey, and drafting section within the S3 that provides those services



AC and USAR soldiers of the 52d Engineer Battalion build a bridge during Exercise Coyote Castle.

for the companies; the communications section; and the battalion direct-support maintenance shop are all at battalion level. Each of these has given support to our RC companies that might be difficult under other organizational structures. Examples range from weapons ranges to flu shots, to Single-Channel Ground-to-Air Radio System (SINCGARS) training, to survey support on projects, to maintenance assistance in preparation for annual training or readiness inspections. Further, for C Company, the advantages of having its next higher headquarters readily available has helped improve administrative processing of personnel actions, particularly for those where the AC battalion commander is the approving authority.

Interaction With the TSBn. A significant issue that was resolved early was which TSBns would provide coverage for our RC companies. The final decision of the 91st Division was to use the geographical footprints. This allows the battalion to focus on command and control and support of the companies, while the TSBns provide the observer-controllers for TAM evaluations, lane training exercises, tactical operations center exercises, and other training events. This approach is working well and continues to improve with time and focus.

Construction Support. The integration of C Company had added impact by allowing the battalion to develop construction projects on Fort Carson that supported C Company's training and Fort Carson's construction needs. This involved construction planning and technical support to C Company construction at a minimal cost to Fort Carson.

Funding. A challenging area, one success has been the transfer of USAR (Title 11) funds to Fort Carson to allow C Company immediate access to money for Class IX requisitions, temporary duty, and other important items. Additionally, the battalion has undergone an audit by the Army Audit Agency, which was seeking to find instances of mixing congressionally titled funds. Since the battalion had been very careful to ensure that there was no significant mixing, no significant findings resulted.

Staffing. To ensure better support and integration with the RC companies, the battalion sought to capture AC/RC expertise within the battalion headquarters. Selecting a command sergeant major with AC/RC (TSBn) experience proved invaluable. During the 3 years of preparing for and executing the multicomponent concept, the battalion experienced a 50 percent success rate of having field grade officers with previous AC/RC experience. These leaders' experience was important in coordinating with the 96th Regional Support Command and the supporting TSBns and in understanding the RC companies' issues. The battalion is scheduled to get authorization for a battalion-level administrator in FY03.

Partnership. The interaction of the 52d and the supporting unit for B Company, the Oregon National Guard's (ORNG's) 1249th Engineer Battalion (Mechanized), has had many positive aspects ranging from a better understanding of ARNG issues to support for each organization. This has been a real success story and an important part of ensuring consistent and effective guidance and support for B Company.

Future Challenges

Mobilization/Deployment Planning. Without getting too specific—due to classification requirements—one of our Wartrace deployment plans for the 52d now includes our RC; the other plan still does

not. For the first one, our AC and RC units deploy together—with Fort Carson as their power projection platform—in a timeline that can be met based on current readiness. We have not had as much success with the other Wartrace deployment plan. Currently, only the AC portion of the battalion is listed, and this is counted as fulfilling the regional commander in chief's (CINC's) requirement for an entire battalion. Planners are aware of this but are having difficulty correcting the problem. If they adjust our arrival dates to reflect required training and deployment times that allow the battalion to deploy together, they will not have enough combat heavy battalions to meet the CINC's requirements.

Guidance. The multicomponent concept is still being developed. A 27 July 2001 DA policy letter improved guidance in many areas but did not focus on how to make the concept work. The three critical portions of the guidance—that units be of like modernization, be geographically proximate, and be given funding in all three components—are important guidance that is not fully implemented. Further, DA included time-phased force-development-list planning guidance that multicomponent units deploy together, which is also not fully implemented. Forces Command (FORSCOM) Regulation 350-2, *Reserve Component Training*, briefly discusses multicomponent units. Other forms of policy, regulations, and guidance at all other levels are still under development. Coordinated integration of the concept into guidance would impact positively on almost every challenge discussed here.

Impact on Soldiers. There are significant aspects to the multicomponent implementation that impact directly on soldier perceptions. Some RC soldiers have concerns that becoming part of a multicomponent unit increases the likelihood of deployment. One young soldier said, "If I had wanted to be AC, I would have stayed AC." Other soldiers look for immediate improvements in many aspects of their unit (such as equipment, funding, and training), improvements that in fact take time. Some soldiers fear an increase in operating tempo (OPTEMPO) that they are not willing to commit to. While these soldiers are clearly in the minority, each of these perceptions has an impact on the most important issue to RC units—personnel strength—and so must be addressed by both AC and RC leaders.

Impacts on the Readiness of AC Units. The time and resources invested in the multicomponent concept by the AC comes at a cost that includes impacts on the leadership, budget, and soldiers of the battalion and overall readiness of the AC side. A recent General Accounting Office report briefly referred to this impact in terms of OPTEMPO on leadership. This is particularly true in the 52d, where two RC companies with two detachments each means that a unit is drilling every weekend. While that situation is the norm for many RC battalions, it is challenging to sustain focus from the AC side. Also, the challenges of learning the procedures in three such disparate planning, resourcing, and administrative systems takes a significant toll on young staff officers—particularly, given that in AC battalions today, well over half the staff officers are senior first lieutenants waiting to attend the career course. These young officers are still learning the complexities of the AC system, not to mention the RC world.

Memorandum of Agreement (MOA). DA specified that an MOA among FORSCOM, the National Guard Bureau (NGB), and the U.S. Army Reserve Command (USARC) would ensure effective coordination between the three components for running a multicomponent unit. The MOA process for the 52d began in early 1999 with a series of conferences that concluded in early 2000. A final version of the MOA began circulation for signature at that time and still had not been signed as of this writing.

This is only one of several problems with the MOA process. Other issues include the difficulties inherent in establishing procedures for running a battalion at the FORSCOM/NGB/USARC levels. For example, the positive impact that completing and resourcing the MOA could have is the issue and accountability of items such as sleeping bags, cold-weather boots, mittens, and field packs for the Fort Carson detachment of C Company. The MOA specifies that Fort Carson will provide this support to those soldiers. This would allow the supply sergeant of C Company to eliminate all the items he currently controls (a significant workload) and the soldiers would draw from Fort Carson's Central Issue Facility. Then the soldiers would have the same equipment as the AC, and the supply sergeant would be able to focus on other areas. Funding shortages currently prevent resolution. This is just one example of the MOA challenge, but it illustrates the issue.

Conclusion

This is just a brief review of the actions of the 52d Engineer Battalion and a brief introduction to the multicomponent concept. With many other units already multicomponent—like the 14th, the 46th, and the 249th Engineer Battalions—we need to deepen the discussions to help this concept work for every multicomponent unit. The successes show how powerful the concept can be in improving the readiness of the Army. The challenges show just how hard it is. Even if you aren't in a multicomponent unit now, you probably will be someday. Or perhaps another way to look at it is that with 76 percent of the Corps of Engineers in the RC, you already are in a multicomponent unit—the Engineer Regiment!

Lieutenant Colonel O'Donovan relinquished command of the 52d Engineer Battalion in July 2001 and is currently a student at the United States Army War College. Previous assignments include assistant corps engineer, V Corps; S3, 40th Engineer Battalion, Germany; assistant professor, United States Military Academy, West Point; and commander, B Company, 62d Engineer Battalion, Fort Hood, Texas.

Self-Reliant, Resourceful, and Adaptable:

America's Engineers in the 21st Century

By Major Erik L. Stor

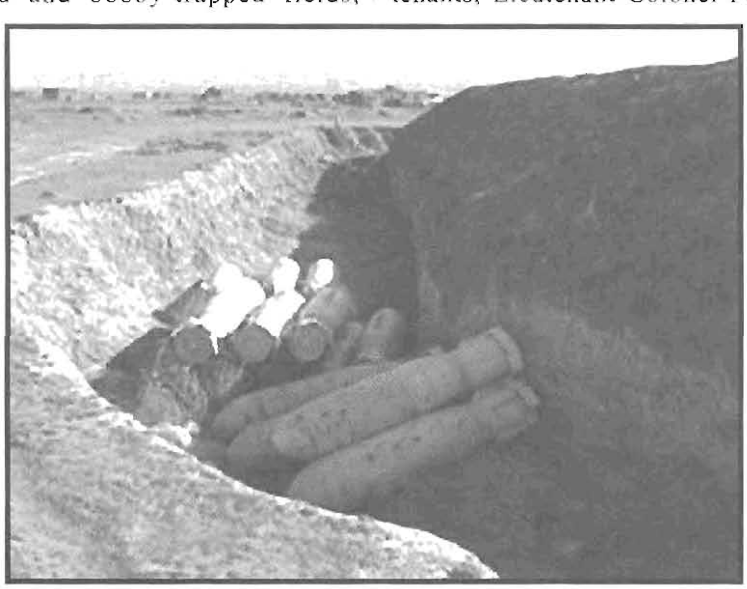
The initial report was wrong. It was always wrong. Yet we had to do something. We informed the battalion commander and briefed him on the situation: a young boy was badly injured while playing with unexploded ordnance near a mine-infested trench outside the local town. He managed to make his way back to a farm road and then got a ride to the hospital, where he was being treated. He told a doctor, who informed the local Implementation Force camp commander, that his friend was unconscious and still in the trench. The time was 1830 hours and darkness was quickly approaching. Under the rules of engagement, we were not required to react. But we did. The commander of B/23d Engineer Battalion already had a platoon on alert. Within minutes, a sapper squad equipped with mine detectors and basic suits[1] was en route to the trench. The brigade commander requested helicopter support. Using a spotlight, a helicopter flew up and down the trench line, looking for the injured boy. The search ended early in the morning when they found the dead body. It was the summer of 1996.

This example, though tragic, demonstrates a recent example of the ability of American engineers to respond quickly to unknown and unforeseen missions and threats. This ability to adapt, however, is not new. In fact, several engineer units during the 20th century, trained in engineer doctrine, have executed missions that challenged and forced our leaders to look for solutions that may or may not be readily available. This article will examine three of them during three different operations.

World War II

More than half a century ago, thousands of America's engineer soldiers entered the European theater of war, trained on assault river crossings, mine emplacement, and demolitions. However, when the engineers hit the beach, they encountered missions that would challenge their men and test their leadership. Not knowing what to expect, sappers from the 291st Engineer Battalion, commanded by Lieutenant Colonel David Pergrin, landed on Omaha Beach, just over 2 weeks after the invasion. The engineers' initial task was to provide support directly behind the 9th and 83d Infantry Divisions and maintain the quickly deteriorating 1st Army main supply route between Carentan and Ste. Mere-Eglise and south of Carentan toward Periers. The engineers would be faced with heavily mined and booby-trapped fields, villages, and buildings throughout their zone, as well as numerous bridges blown by retreating Germans.[2]

There were several areas where engineers adapted to an environment and faced missions that looked nothing like the missions they encountered at home-station training. The first of these was the initial advance into France. Advancement was very slow through the Norman bocage because of the massive walls of hedgerows, each about 12 feet high and 8 feet thick. In addition, whenever troops smashed through a hedgerow, they encountered German minefields hastily emplaced as they withdrew across the fields and along the connecting roads.[3] Along with the hedgerows were waterways, trenches, deep valleys, orchards, and wooded areas. There was no doctrine to bust through. In fact, there was no equipment available. Based on a recommendation from one of his lieutenants, Lieutenant Colonel Pergrin



Unexploded ordnance, such as these 500 kg bombs, provided a challenge to the engineers at the airfield base camp in Afghanistan.

ordered that several of the bulldozer cabs be protected "by means of makeshift armored driving compartments."[4] The first of the "armored" bulldozers began crashing through hedgerows followed by advancing infantry shortly thereafter.

Another example of engineer adaptability was in employing mine detectors. Designed to detect metal in antipersonnel and antitank mines, mine detectors were the primary means to clear a mined area. Not anticipated, however, was the use of the mine detector to clear a path to recover dead paratroopers in the mine-infested swamps around Omaha Beach.[5] Trained engineers could be counted on to complete this morbid task. The 291st Engineer Battalion constructed 67 bridges (11 under fire), cleared 7,000 mines, deactivated 15 bombs, took 8,500 prisoners, and rescued 235 noncombatants.[6]

Vietnam

Twenty years later, America's engineers would again prove to be self-reliant, resourceful, and adaptable during the early 1965 troop buildup in South Vietnam. Because the active duty engineers lacked the manpower base at the beginning of the troop buildup, and because there were only two engineer training facilities, units going to South Vietnam were woefully short on engineer experience and skill during the first year.[7] The initial engineer missions included supporting the tactical operations, constructing logistical facilities, and "making the environment amenable to the Army interests."[8] During the initial planning, engineers estimated that there were 170 battalion-months' worth of engineer effort required and only eight active battalions deployed, leaving almost 2 years to accomplish the work.

Engineers showed their adaptability in several situations. The first of these was the requirement to clear areas for camps and helicopter landing pads and open major transportation routes. The thick jungle vegetation and trees posed a significant obstacle to the land-clearing operations. The fix was the Rome plow—a special tree-cutting blade that replaced the standard blade on the D7E tractor.



One of the "hulks" in Afghanistan that needed to be moved for C-17 traffic. Soviets left the MIG, stand, and tools right on the spot.

As engineers discovered during World War II, a special heavy-duty protective cab was needed. In this case, it was standard issue. The perilous job of operating the Rome plow almost guaranteed that the engineer would "statistically cinch...a Purple Heart."[9] The significance was the "fact that these engineer soldiers were not specially trained or screened for land-clearing assignments."[10]

Next was the requirement to clear tunnels. The 1966 search-and-destroy tactics uncovered a vast network of tunnels that was as much as 20 years in the making. "Constructed in impervious layers of hard clay at varying depths, with small, well-camouflaged entrances, these tunnels defied any simple method of destruction."[11] Engineers put together a tunnel-demolition team, known as "tunnel rats," that developed several means of destruction. One way was to prepare and place explosive charges deep in the tunnel with sacks of powdered riot-control agents placed on top of the charges. The chemical remained effective from 2 to 6 months. Another method was to use acetylene gas, and still another way was destruction by flooding. Again, the significance was the fact that these engineer soldiers were not specially trained or screened to be tunnel rats.

Finally, engineers in Vietnam conducted quarry operations, constructed fuel pipelines, cleared miles of jungle, moved tons of earth, repaired hundreds of bridges, and installed steel matting for numerous airfields[12]—again, missions that were nothing like the ones they encountered at home-station training.

Bosnia

America's engineers, 25 years later, would again prove to be self-reliant, resourceful, and adaptable during operations in Bosnia. Thousands of engineer soldiers entered the Balkan region trained on mobility, countermobility, and survivability. However, when the engineers from the 23d Engineer Battalion arrived, they found that very little—if any—of their home-station training or Combat Maneuver Training Center rotations had prepared them for the yearlong deployment. The initial problem the engineers faced was a great deal of mud and mines. With the majority of the Posivina Corridor comprised of lowlands in the vicinity of rivers, minefields, destroyed towns and factories, occupied communities, and agricultural fields, engineers would again have to execute missions that were not by the book.

The first example was with the U.S. Army Europe and V Corps initial plan for base camp construction. The plan was for a brigade operating base (BOB), housing 1,800 soldiers and equipment, and two forward operating bases (FOBs), housing 1,200 soldiers and equipment each. When the engineers assessed the terrain and the maneuver commander's intent, the BOB and two FOBs would not be feasible. From the perspective of

hardstand parking, engineers faced the option of constructing the BOB/FOBs in operating agricultural fields or upgrading damaged hard facilities. Based on soil conditions, water table levels, vehicles stuck in fields, and current on-the-ground experience, engineers had to adapt and reevaluate the recommendation. The solution was a combination of constructing operating bases in agricultural areas and on hardstands in a local town.

Next was the "doctrinal" classification of the numerous routes in the area of responsibility. The problem with FM 5-36, *Route Reconnaissance and Classification*, is that it does not address mines on routes or the status of a route after it has been proofed. The solution was the implementation of a "route status" to enhance and clarify FM 5-36. Additionally, the unit implemented a route tracker that the task forces updated and provided to the brigade via a fragmentary order twice a month. The tracker included the date the route was cleared and proofed, if it was marked, the military load class, and a comment block that could include the type of surface, bridges, and any obstructions (such as large potholes). This route tracker greatly enhanced the unit's ability to plan patrols and eventually transfer the sector to another unit. By using existing doctrine, engineers developed a useful tactic, technique, and procedure for tracking routes and adapted to a new environment.

Engineers were constantly updating the route status by conducting reconnaissance in the sector. On one such patrol, locals—complaining that their horse-drawn carts would not cross an armored, vehicle-launched bridge (AVLB)—approached the engineers and asked them to remove the bridge. A horse had fallen between the roadway gap and had fractured a leg. Knowing that removing the AVLB was not an option, since M1 tanks frequently used it, the engineers installed decking to cover the gap.

This problem identified a requirement for the engineers to hold forum or an engineer joint military commission (EJMC) with local engineers in the former warring factions (FWFs). So, on 1 March 1996, the 23d Engineer Battalion held the first of several EJMCs. Located in a temperature-controlled (temper) tent on a pothole-infested parking lot next to a partially destroyed diner, the three FWF engineers met for the first time since the war. Sappers from the 23d Engineer Battalion provided security and escorted the FWF engineers to the site. The meeting lasted for 3 hours and uncovered, for the first time since crossing the river, the complexities involved with meeting requirements outlined in the Dayton Peace Accord and other non-military-related engineer problems, such as the decking requirement for the AVLB. This showed how an engineer unit—trained on mobility, survivability, and countermobility tasks—adapted to a new environment, demonstrated its flexibility, and quickly learned how to live in a very austere and dangerous post-combat zone.

Conclusion

These examples show how America's engineer units during World War II, Vietnam, and Bosnia—trained in engineer doctrine—demonstrated that, while doctrine is our bedrock, there are situations that will challenge and force our leaders to look for solutions that may or may not be readily available. Adaptability and flexibility of our soldiers must remain paramount. I firmly believe that doctrine is the foundation of our training, and it directly led to the success of our engineers on the battlefields and deployments mentioned above. In fact, FM 5-34, *Engineer Field Data*, provides engineer soldiers at all levels with a source of reference doctrine that is handy and useful. However, I also believe that soldiers and leaders will face "junk-yard-war" -type scenarios (especially for engineer units entering an immature theater) that will reward creativity and original thought. A "can-do" attitude in conjunction with a sound understanding of engineer doctrine will ensure mission accomplishment. I predict that this will last well into the 21st century.

This is not to say that we should change our development of doctrine or stop training. On the contrary, I suggest that we need to step up our training to make it tougher and more *realistic*. An example of this could be an engineer squad leader taking his squad to a local junk yard and constructing steel hedgehogs or tetrahedrons out of vehicle hulks (apparently not in short supply in numerous operations). Take it a step further and assume that the hulk is booby-trapped. This kind of "out-of-the-box" training—coupled with FM 5-34 and a complementary professional-development program that includes thought-provoking historical studies—will increase our ability to be self-reliant, resourceful, and adaptable.

Major Stor is the assistant division engineer for the 10th Mountain Division, Fort Drum, New York.

Endnotes

[1] A Kevlar overgarment with thick antiballistic boots and gloves.

[2] Pergrin, D. *First Across the Rhine.* New York, New York: Macmillan Publishing Company. 1989, p. 26.

[3] Pergrin, p.32.

[4] Pergrin, p. 34.

[5] Pergrin, p. 25.

[6] Pergrin, cover page.

[7] Ploger, R. Major General,. *Vietnam Studies U.S. Army Engineers 1965 - 1970.* Washington, DC: U.S. Government Printing Office, 1974. p, 23.

[8] Ploger, p.199.

[9] Ploger, p.103.

[10] Ploger, p.104.

[11] Ploger, p. 92.

[12] Ploger, p. 95-129.

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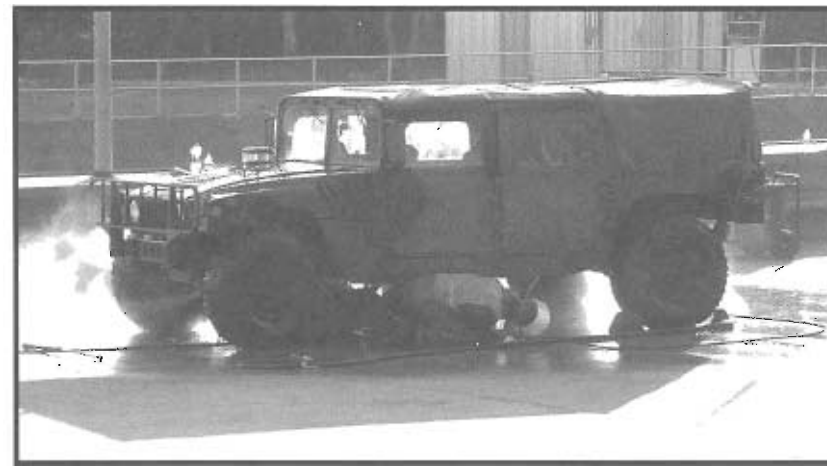
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Operation Enigma Strike:

Testing the Deployability of the 130th Engineer Brigade FEMs

By Major George Simon and Captain Christopher Jeszenszky

In the May 2001 issue of *Engineer* ("Transforming the 130th Engineer Brigade...One Step at a Time"), the 565th Engineer Battalion, located in Hanau, Germany, described its Force-Enhancement Modules (FEMs) developed in conjunction with the 130th Engineer Brigade. These FEMs provide the U.S. Army Europe (USAREUR) Immediate Ready Force with engineer-specific capabilities such as bridging and topographic support. The FEMs are part of the USAREUR initiative to transform the Europe-based Legacy Force into an agile, responsive, deployable force that supports the Army Transformation.



Soldiers of the Deployment Processing Center pusher unit wash vehicles before the Air Force joint inspection.

The next step—after building the FEMs based on the initial concept, as shown in the May article—was to conduct a test of the entire deployment process. While the FEMs from the 565th looked good on paper and in the motorpool, the battalion and companies did not have experience in the full-deployment process. Everything needed to be tested—from the soldiers and vehicles comprising the FEMs to the company- and battalion-level staffs that would plan and execute the deployment. Deployment planning had not been done in the battalion since its mission to support Task Force Hawk in Albania in 1999, and a concept such as the FEMs had never been considered.

Since the battalion had recently been tasked with numerous support missions in the Balkans, this was a likely scenario to use for the FEM deployment exercise, named Operation Enigma Strike. The initial attempt was to find a mission in the Balkans with which to exercise the FEMs, but continuously changing dates and requirements forced the battalion to develop its own mission. The battalion staff went to work planning a Kosovo deployment, which would utilize the terrain-analysis FEM (Table 1) and the bridge-construction/reconnaissance FEM (Table 2, page 42).

Terrain-Analysis FEM

Personnel		Equipment
Terrain analyst 1 x SGT 81T20 Terrain analyst 2 x SPC 81T10	DTSS-L	1 x M997 and SINCGARS 1 x Laptop computer with printer 1 x GP, small tent 1 x GPS 2 x NVGs 1 x HP Kayak system with plotter 1 x TACSAT and Tele -Engineering 1 x Topo database 1 x Trailer-mounted tactical quiet generator (TQG)

Aircraft requirements
1 x C-130

Concept - Provide an enhanced digital terrain-analysis capability to the IRF or any deployed force up to brigade-size; product list includes MCOOs, elevation tints, 3-D maps, overprints, topographic line maps (TLMs), fly-throughs, etc.

Table 1

The battalion executive officer led the staff through the military decision-making process, creating a realistic scenario and operations plan for the mission. The scenario was so well conceived and the staff so secretive about the mission that the soldiers in the companies believed that they were actually going to Kosovo for up to 30 days.

The real challenge though was in the resourcing and execution of this massive plan. The resourcing fell to the battalion S3 training officer and the battalion S4 supply officer. Since this was not an operational deployment, the 130th Engineer Brigade had to pay for the flight time, and genuine operational deployments to the Balkans were given flight priority. The initial intent was to fly to Kosovo, but restrictions on the number of forces precluded the units from doing so. The next best option was to deploy outside of Germany. Given the 120+ day time requirement to process these requests through the various Ministries of Defense, this option could not be used either. The remaining option—

which was ultimately used—was a flight within Germany, from Ramstein Air Force Base (AFB) to Rhein-Main AFB.

Once a flight was established, a date for the FEMs to process through the USAREUR Deployment Processing Center (DPC) had to be secured. The next challenge came when the battalion discovered that the DPC required units to schedule a practice activation 120 days in advance. Since past interaction with the DPC was limited to the battalion operating the DPC or processing during operational deployments to the Balkans, this was mistakenly overlooked. Fortunately, the battalion was able to coordinate a shared processing time with another Hanau unit, 5-7 Air Defense Artillery, which was conducting a validation exercise during the same period.

As this drama unfolded and the plan solidified, the companies were busy preparing their soldiers and equipment for the deployment. The 38th Engineer Company (Medium Girder Bridge), which owns the bridge FEM, and the 320th Engineer Company (Topographic), with the terrain-analysis FEM, had much experience in deploying soldiers to the Balkans. The seasoned NCOs lead the newly arrived NCOs and soldiers through the preparation. The soldiers went through all of the necessary predeployment preparations—from briefing to physicals.

With the scenario in place, the aircraft purchased, and the DPC scheduled, it was time to execute the mission. The first stop was the DPC. Since so many units of various sizes and compositions deploy from the European theater, USAREUR has established a permanent DPC located at Rhine Ordnance Barracks near Ramstein AFB. The purpose of the DPC is to ensure that unit vehicles and equipment are ready to deploy by air. Units arrive at the DPC with individual readiness training and personnel deployment processing already complete. The DPC is staffed by two sets of personnel: permanent party and a rotational "pusher" unit. Pusher-unit duties are tasked to the major subordinate command in V Corps. It was during the transition exercise between two pusher units that the bat-talion was able to fit into the DPC's hectic schedule.

The key to moving through the DPC smoothly was a well-prepared soldier who was qualified to handle hazardous materials (HAZ-12) and a unit movement officer (UMO). The first station (Station #1) of the DPC handles the paperwork for the vehicles: load plans, shipper's declarations, material safety data sheets, etc. The battalion's experienced HAZ-12 NCO, who had also served as the Station #1 NCOIC during the 565th's pusher-unit rotation, had all of the paperwork completed before arriving. It was also vital to have a UMO who had access to Automated Air Load Planners System (AALPS) software to complete the aircraft load plan. The battalion used the DPC's AALPS computer to input the load plan. The best scenario would have been to do this on the unit's own mobile computer, since it would have made things go more smoothly later in the processing.

Bridge-Construction/ Reconnaissance FEM

Personnel	Equipment
Combat bridge crewman 1 x SSG 12C30	1 x M998 with SINCGARS
Combat bridge crewman 2 x SGT 12C20	1 x Laptop computer with printer
Combat bridge crewman 1 x SPC 12C10	1 x GP, small tent
	1 x GPS
	2 x NVGs
	1 x Fixed-bridging manual set
	1 x TACSAT and Tele -Engineering

Aircraft requirements
1 x C-130

Concept - Conduct bridge and route reconnaissance and supervise construction of Mabey Johnson/Bailey bridges.

Table 2

Although the paperwork portion ran smoothly, the other part of Station #1, where the load plans were verified, proved to be another challenge. The terrain-analysis FEM is designed around an M997 ambulance high-mobility, multipurpose wheeled vehicle (HMMWV). The purpose is to provide the FEM soldiers "office space" for their computer systems and high-speed plotters. Unfortunately, secondary loads need to be tied down in order to fly, and the inside of the M997 doesn't offer any tie-down points. The unit was finally able to secure the load, but good tie-down points are essential for the sensitive equipment that the terrain-analysis FEM uses. Since the same office space was not needed for the bridge-construction/ reconnaissance module, there were no tie-down issues for the M998 HMMWV used in that FEM.

Upon arrival at the "purple ramp" at Ramstein AFB for the Air Force joint inspection, the battalion was met with a



Soldiers of the 38th and 320th Engineer Company FEMs prepare for takeoff in the C-130.



A K-loader is used to load the C-130 so that the HMMWVs can roll straight onto the aircraft.

few more challenges. The Air Force has different classifications for real-world missions and training missions. With those classifications come different requirements for paperwork and vehicles. For the Kosovo deployment scenario, the mission would have been considered a Chapter Three flight, which allows for three-quarters of a tank of fuel in the vehicles. However, since this was only a flight within Germany, it was classified as a special assignment air mission (SAAM)-channel flight—a routine flight. A SAAM-channel flight only authorizes half a tank of fuel in the vehicles.

The units had to drive back to Rhine Ordnance Barracks, defuel, and resubmit the hazardous-materials paperwork. This was the point at which the soldiers finally became aware that they were not actually going to Kosovo. Although disappointed that they were not deploying on a real-world mission, they were still excited to get the experience of going through all of the motions.

As loadmasters sometimes vary on their individual requirements, the aircraft load plans needed some adjustments. It took several tries to get the load plans to meet Air Force standards. At this point, it would have been beneficial to have the mobile computer with the AALPS on hand to make final adjustments to load plans, rather than relying on the DPC each time.

The biggest lesson learned from this deployment came as the vehicles were loaded on the aircraft. According to aircraft load manuals, loading an M997 ambulance on a C-130 requires a K-loader because of height restrictions. A K-loader allows the vehicle to be raised up like an elevator and driven straight into the aircraft. The problem lies in the fact that the FEMs are designed to deploy to undeveloped areas that will not have a K-loader on hand. After discussing the problem with the loadmaster during the flight from Ramstein to Rhein Main, he decided to try to unload the ambulance without the K-loader. It was a tight fit, but the ambulance unloaded on its own. However, the loadmaster explained that it may not fit on every C-130, and other loadmasters may not be willing to unload without the K-loader.

This was the first deployment test in the brigade for the FEMs. The 565th went through the complete process—from receipt of mission through all preparation-for-deployment stages to flying the FEMs to their mission site. The test provided vital information to be included in the 130th Engineer Brigade's FEM deployment standard operating procedure.

The deployment of a bridge-construction reconnaissance FEM was successful; however, the battalion will now take another look at the working environment for the terrain-analysis FEM. As stated earlier, the original concept was to use the ambulance as office space. This would allow the terrain team to concentrate on its job rather than worry about setting up and tearing down tents. At this point, the battalion must find another vehicle that can be used as an office that fits on a C-130, modify the ambulance, or develop a FEM that operates from tents.

Though there are still issues that need to be addressed in the deployability of the FEMs, this was a great multiechelon training event and a valuable learning experience at all levels. It was an opportunity for all involved to sharpen their skills in deployment processing. In addition, the planning horizon for training versus operational deployments varies considerably. The battalion staff is now better prepared to plan for both. The lessons learned during this mission will be used in the planning of future deployment exercises for the remaining FEMs of the 130th Engineer Brigade.

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Captain Jeszenszky commands the 502d Engineer Company (Assault Float Bridge), 565th Engineer Battalion. Previous assignments include S3, 565th Engineer Battalion; operations officer, Directorate of Public Works, 6th Area Support Group; and S4, Engineer Brigade, 1st Cavalry. CPT Jeszenszky is a graduate of the Engineer Captain's Career Course and holds a master's degree in engineering management from the University of Missouri-Rolla.

The Evolution of the Engineer Force: Part I

By Dr. Larry Roberts

While engineers have been a component part of the American Army since the days of the American Revolution, the force structure of the engineers, as understood today, is a 20th century phenomenon. The structure of the force has changed over the last 90 years in response to changes in doctrine, tactics, and national military strategy. However, the battlefield functions of engineers have remained constant. Indeed, the basic missions of engineers, or those performing engineering work, have remained the same since the dawn of organized human conflict. Simply stated, engineers facilitate the movement of the maneuver arms, obstruct or impede the movement of the enemy, and construct works necessary to protect and sustain the army in the field.

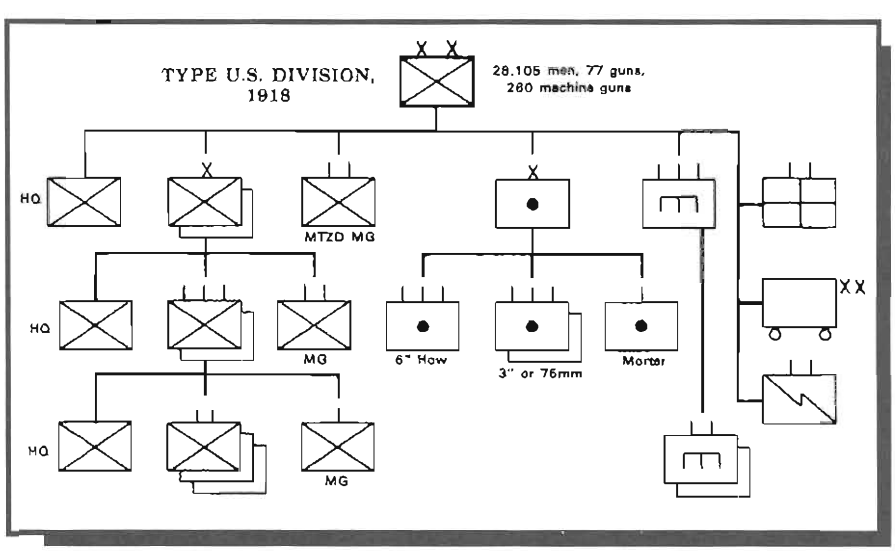
World War I

The basic structure of the modern engineer force dates from World War I. Before 1917, engineers were generally considered technical troops whose work largely focused on roads, fortifications, and facilities. Engineers were generally under the direction of the field army commander. Before World War I, there were only three engineer battalions in the Regular Army. In previous conflicts, such as the Civil War, engineer regiments—often volunteer organizations—were raised for the conflict and demobilized at the cessation of hostilities.

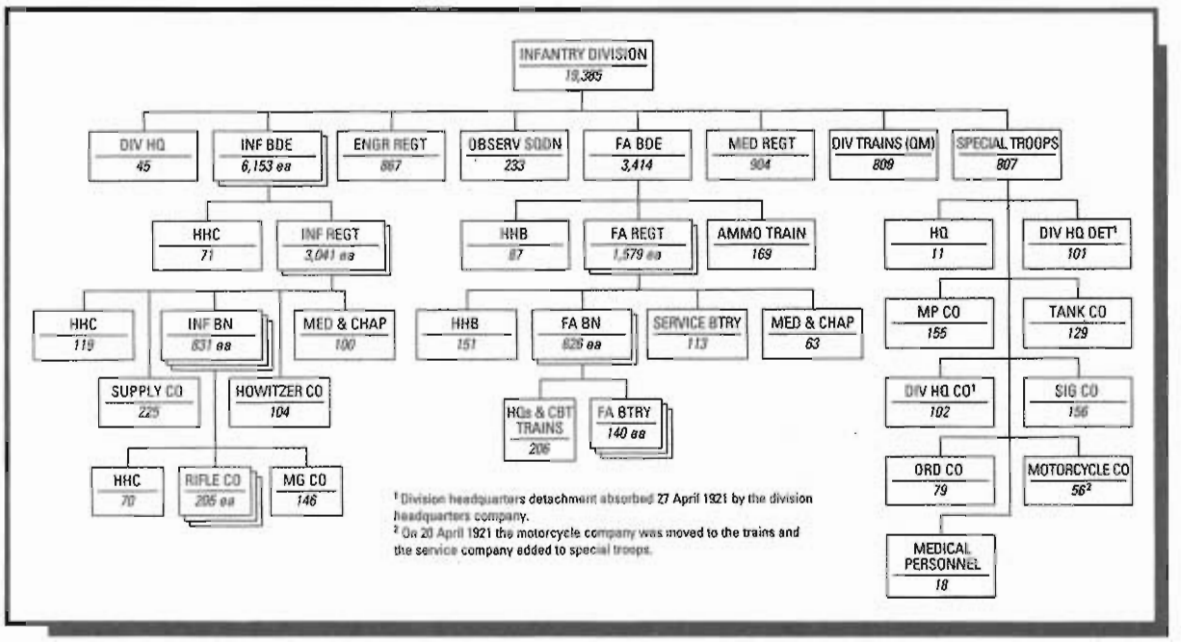
The driving force in changing this status was the advent of the combined-arms division. Before World War I, divisions were largely single-arm organizations, mostly infantry. Support units of artillery, and in some cases engineers, were assigned only as the tactical situation dictated. In 1911, the War Department began design work on a "maneuver division." The objective was to field a division comparable to those of European armies which contained all of the requisite combat, combat-support, and combat-service-support elements needed to fight as a self-contained force. The Corps of Engineers was heavily involved in this effort and ultimately recommended an engineer regiment for this division. By the entrance of the United States into World War I, this division had been tested and adopted as the standard tactical organization for war. Although adjusted by lessons learned in France during the war, this structure remained in effect for more than 20 years. Because the cornerstones of the division were four infantry regiments, the organization was referred to as the "square" division.

The engineer regiment assigned to this organization mustered 1,634 officers and men. In addition, the regiment had a trains section with an additional 84 officers and men who provided transportation, both horse-drawn and mechanical. The divisional regiment relied on picks and shovels for most of the engineering work performed. Building fortifications, constructing bridges, doing pioneer-level roadwork, and serving as the divisional reserve were the major tasks. The regiment consisted of two battalions with three companies each. The basic work unit in the regiment was the six-squad platoon. Each company had four platoons. This regiment was expected to perform all of the engineer work in the division sector.

Army planners, including engineers, did not have time before World War I to examine the proper composition of corps and armies. What emerged by 1919 was based totally on the experiences in Europe. Engineers and others quickly recognized the need for additional units at the corps and army levels. Two different types of organizations came into being. The first was a basic engineer labor battalion, referred to later as the separate battalion. These were largely work units comprised of black soldiers and white officers and NCOs. The second type of engineer unit was a specialized organization. The American Army in France ultimately had engineer railway, port-construction, forestry, mechanical, electrical, and depot units. As their names implied, these units concentrated on a particular aspect of general engineering



U.S. Army Divisional Structure - World War I



Division Structure - 1920

in support of their corps or the army as a whole. The need for construction or sustainment engineering was so great that engineer railway regiments were among the first American troops to arrive in France.

The Interwar Period, 1919-1941

In the years following World War I, the Army—and by extension the engineer force structure—underwent substantial changes. In most instances, the changes were in the nature of reductions in the size of divisions and supporting units. These changes were prompted by several factors: First, the national military policy of the United States changed. Disillusioned by the Treaty of Versailles and the general outcome of the war, the American people turned their back on involvement in international affairs; isolationism became the trend. Consequently, the Army shifted its focus to defense of the continental United States and, to a lesser degree, its overseas possessions. Believing that the threat to the United States was minimal because of the ocean barrier, few individuals saw the need for a substantial military force. Hence, the Army was cut in both manpower and equipment.

Second, Army leaders, reviewing the performance of the American Expeditionary Force in France, believed that changes were needed. While the 28,000-man square division might have been appropriate for a war of trenches, "open warfare" called for a more mobile force. In this context, mobile meant the ability to move the division tactically and, to a lesser extent, strategically. Lacking shipping, the United States had been forced to send its units to France with little more than personal equipment and infantry small arms. Artillery, transport (both mechanical and animal), and other equipment were provided on the continent by the British and the French. At the tactical level, the movement of the large division constituted a transportation nightmare. The "road space" or transportation footprint of a division became a major factor for those planning future organizations.

The divisional structure was therefore trimmed in the 1920s and early 1930s. The overall strength of the division declined from the 28,000-plus World War I unit to an organization of slightly more than 19,000 in the 1920s. While some of the reductions were in the combat arms, a large part was in the combat-support units.

The Engineer Regiment was effectively cut in half. This reduction was based on two thoughts: First, the return to open warfare reduced the dependence on field fortifications, a major task of the engineers. Second, a division requiring less road space would have a reduced need for roads and the associated works such as bridges. Although a two-battalion regiment was retained, the number of platoons in each company was reduced from four to two. Similarly, the number of squads in the platoons was reduced from six to four.

Army planners essentially ignored the issue of organizational design for corps and army organizations. While war plans did call for a specific number of corps and army units, the functional organization of these units and their relationship to the maneuver division received little attention. The Corps of Engineers did examine the issue and changed the nature of its forces at echelons above division. Nondivisional units fell into one of two categories, general and special. The engineer general-service regiment and separate battalion were units that performed general engineer support functions for the corps and divisions, mainly road construction and maintenance. Special units included railway, topographic, heavy and light pontoon, water supply, and depot battalions and companies. Engineer doctrine projected that two-thirds of the field army's engineer force would be nondivisional in nature, either general or special.



Motorization and mechanization were supposed to reduce the need for engineers.

There were more organizational changes in the 1930s. The changes in the divisional structure in 1932 were comparatively minor. However, changes made at the end of the decade were significant. In 1935, the Chief of Staff, General Malin Craig, directed a review of the organization and tactics of the Army. Craig wanted to increase the tactical mobility of the division and incorporate new developments and technologies made in the areas of armor, motor vehicles, airplanes, communications, and weapons. For the next 5 years, the Army would wrestle with the organization of the division and the tactics it would employ in war. The advent of the German blitzkrieg in 1939 and 1940 hastened the work and forced the Army to finalize its design in 1940 and 1941.

For engineers, the issue revolved around the issues of tactical mobility, firepower, and armored protection. Many in the Army, primarily General Leslie McNair, believed that the modern division had to be light and highly maneuverable. Units not needed on a habitual basis would be withdrawn from the division and assigned to the corps. Improved cross-country mobility for fighting vehicles and even cargo trucks obviated the total dependence on roads. Proper reconnaissance, coupled with improved tactical mobility, would permit either the seizure of bridges before demolition or the determination of alternate routes when bridges were destroyed. A highly mobile force, especially one including armored vehicles, had little need for field fortifications or obstacles. Increased firepower, coupled with mobility, precluded the need for breaching forces, as the tactical unit would either go around established field fortifications or seize the ground before the enemy could emplace them.

These beliefs coalesced in the "triangular" division, a division with approximately 15,000 officers and men. The term triangular referred to the fact that the fighting strength of the division was found in the three infantry regiments, as compared to the four regiments of the square division. Divisional support units were either drastically cut or transferred completely to the corps.

Engineers fought a determined battle to retain a viable force for this new organization. Initial proposals called for a divisional engineer battalion of slightly more than 500 officers and men. At one point, however, the Corps responded to a subsequent proposal to reduce this to an engineer company of 175 officers and men. By 1940, the Corps had convinced the Army leadership that a battalion of slightly more than 600 officers and men was the proper unit for providing engineer support to the division. There were many engineers who believed that more engineers were needed. However, the leadership of the Corps adopted an approach of arguing for what they believed they could get, rather than what was needed. The divisional engineer battalion for the new armored divisions was slightly larger because of the addition of a bridge company.

The Corps was more successful in developing a viable engineer force at echelons above division. By 1941, the corps were authorized two combat regiments with 1,257 officers and men each. The mission of these two-battalion regiments was to perform all the engineering work in the corps area and, when needed, engineer work in the division area. The existence and size of these regiments was a concession on the part of the Army and the Corps that the divisional engineers did not have sufficient strength to accomplish all the engineering tasks in the division area. Corps combat units tended to have the same weapons as the divisional engineers but with more equipment. Doctrine generally oriented the corps engineer regiments to roads, bridges, and rear-area fortifications. Doctrine also called for the corps engineers to move forward to the front lines and provide direct support for division operations in cases such as river crossings.

The pre-World War II engineer force structure called for three general-service regiments, six separate battalions, and a number of special units, such as maintenance and supply companies, at the army level. The general-service regiments had slightly more than 1,200 officers and men and the requisite heavy equipment to perform the more substantial work needed on roads, bridges, and facilities. The separate battalions were as large in manpower as the general-service regiments. Ironically, the battalion's organization and functions were more closely related to the divisional combat-engineer battalion than other army-level organizations. As a matter of custom, the battalions were designed to augment the corps combat regiments as

needed. Other engineer units at the army level included topographic, railway, pontoon, dump truck, depot, and maintenance units. Additional general-service regiments, separate battalions, and special units were authorized for the general headquarters (GHQ) echelon. In reality, this was the part of the theater of operations which contained the services of supply.

World War II

In May 1941, the Chief of Engineers, Major General Julian Schley, spoke to a gathering of the Society of American Military Engineers in Washington, D.C. He outlined the current status of the Corps and the strides that had been made in developing engineer organizations. Schley tried to ease the fears of many by saying that the advent of heavy machinery and power tools had more than compensated for the decline in the manpower in divisional units. This—plus the existence of an extensive engineer force at corps, army, and GHQ—meant that the engineers could meet the challenges of modern war. However, what Schley—and many maneuver commanders—did not recognize was that the modernization of the Army had in fact increased the engineer workload in war. The advent of armored forces increased dramatically the demand for stronger, more mobile bridges. The heavy cargo trucks adopted by the Army increased the demand for road construction, where roads were primitive or nonexistent, and road maintenance for existing routes. While trenches and associated field fortifications may have passed into history, they were replaced by mines and any number of other expedient obstacles.

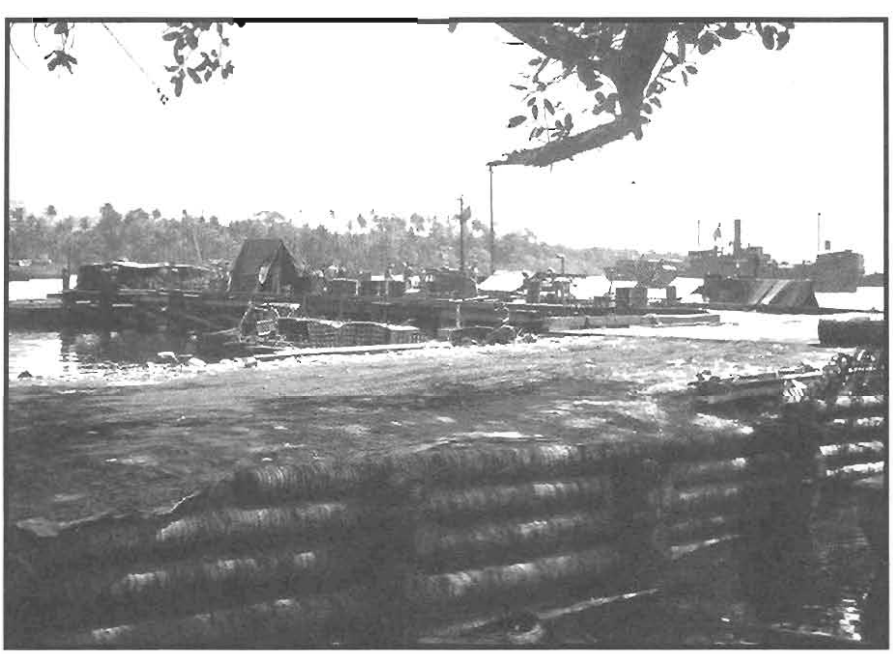
Engineers responded to the increased demand for engineer troops by adjusting boundaries within the division, corps, and even army zones of operation. Corps combat units often performed work in the divisional area immediately behind the front lines. They also worked along with divisional engineers in operations such as river crossings and breaching operations. In fact, it became unwritten doctrine in Europe that actual river crossings and bridge construction would be done by corps engineers. This freed divisional engineers to assist the maneuver forces on the far shore. In Europe and the Pacific, a corps engineer battalion was habitually attached, and even located, in the divisional area. In certain operations, corps engineer support exceeded a single battalion. The 19th Engineer Combat Regiment provided the river-crossing support for the 36th Division during the crossing of the Rapido River in Italy. The 1171st Engineer Combat Group supported the 28th Infantry Division in its disastrous battle at Schmidt and in the Hurtgen Forest.

This level of commitment to supporting the divisions often forced the corps engineer to ask for help from the army. Consequently, army engineer units, often general-service regiments, ended up working in the forward corps area. As might be expected, the army engineer called on the communications zone engineer for assistance in performing needed engineer work in the army area.

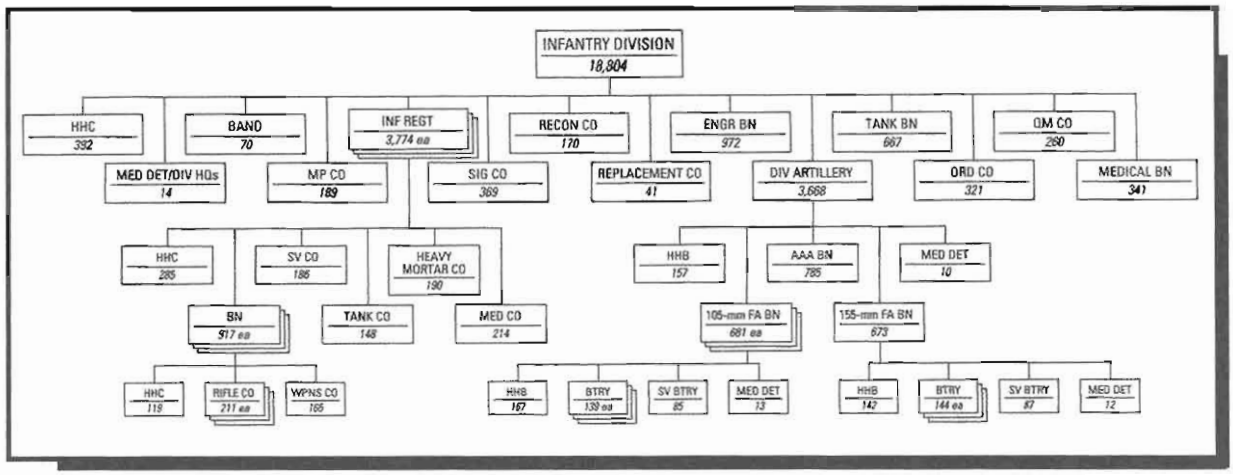
Following the war, the European Theater convened a general board to examine tactics and organizations with the objective of making recommendations for the postwar Army. The officers who examined engineer tactical policy noted, "The inadequacy of the engineer component of the division caused an abnormal forward displacement of engineers in all echelons." The published history of the engineers in the Southwest Pacific noted:

"The division engineer troop component of one combat battalion proved without exception to be incapable of providing sufficient close support for a division. It was grossly inadequate to meet the requirements imposed upon it by the tactical and technological conditions faced in the Pacific.... To provide the required engineer support, therefore, it became the standard practice to augment the engineer component of a division by attaching an additional engineer battalion from corps troops. This standard practice was followed, not alone in the interest of the engineers, but in compliance with the direct requests of army, corps, and division commanders who repeatedly recommended that a definite provision be made within the authorized organization of the division for this additional engineer battalion to permit continuity of training as well as employment."

An analysis of the Army force structure showed that for every infantry or armored division, there were 1,668 combat-engineer troops and 2,276 support-engineer troops at corps, army, or the communications zone. The former were primarily in the combat battalions, the latter were in the general-service regiments,



Dock and pier facilities in New Guinea, Southwest Pacific



Infantry Division Structure - 1948

and special engineer forces were operating well forward of the administrative and operational boundaries which defined division, corps, and army areas. In spite of this circumstance, there was no significant change in the structure of divisional engineers. The armored engineer battalion was reduced late in the war by the deletion of the bridge company, which was moved to corps control.

There were changes to the force structure for corps and army engineer units. In late 1942, the War Department started to convert nondivisional regiments to groups. Advocated by McNair, the argument was that the group was a more flexible command and control headquarters. Regiments were limited to their authorized battalions. Groups could control a varied number of subordinate elements. This would allow corps and army commanders to shift battalions and companies to areas where they were needed, while maintaining the continuity of the group headquarters associated with a tactical area. Engineer commanders generally considered this to be a bad idea. First, the regimental structure enhanced esprit and morale. Separate units, with little or no history, would be hard-pressed to establish this pride of unit. Second, the separate battalions had to have sufficient administrative and logistical personnel and transport to allow it to function independently. Providing these resources for battalions created larger personnel and equipment bills than was required under the regimental organization. These concerns, shared with many other branches, were generally ignored. Consequently, the corps engineer combat regiments were broken up in 1944, and their battalions were given separate numerical designations. Ultimately, general-service regiments suffered the same fate. The War Department also began transforming the large separate battalions to one or more standard engineer combat battalions.

A second change for the engineers involved a reorientation of engineer general-service regiments. While these organizations performed a variety of functions, the term "construction" tended to describe most of them. Consequently, engineer commanders, primarily in the Pacific, began to urge the redesignation of general-service regiments and battalions as construction battalions and groups. In the Pacific, the need to build most of the logistical and transportation infrastructure for American forces tended to focus army and corps engineers on this function. The process of redesignating general-service regiments and similar organizations to construction units had been largely completed by the end of hostilities in the Pacific.

As it had done in 1920, the Army examined its wartime structure in an effort to determine the most effective organizational structure for the postwar force. As has been mentioned, the general boards were created in Europe for this purpose. Although not formalized in boards, other theater commanders and their subordinate commands and staffs also forwarded recommendations. Senior engineer commanders were unanimous in recommending a return to the two-battalion engineer regiment for the division. They also recommended the return to the regimental structure for larger corps and army engineer units. Senior commanders in the Pacific noted that group commanders ended up devoting more time to the incoming or outgoing movement of separate battalions than they did the management and support of those under their control. Engineers in both Europe and the Pacific agreed that combat and construction units were the principal elements of the engineer force in war and that specialized units—such as topographic, maintenance, water, and depot—continued to fill a needed unique-mission requirement for deployed forces.

Engineer Force Structure, 1946-1950

The Corps was partially successful in convincing senior Army leaders that the engineer force of the field army needed significant increases. However, it was not successful in reconstituting either the two-battalion divisional engineer regiment or the regimental organization as a whole. This was in spite of the fact that the maneuver arms, principally the infantry, retained the regimental system for another 10 years. In 1948, the Department of the Army reorganized the infantry division, based on the experiences of World War II. Divisional engineer battalions were

increased almost 50 percent. This was largely through the addition of a fourth letter company and the addition of a bridge platoon and an assault platoon to the headquarters and headquarters company. The armored divisional engineer battalion had a corresponding increase in personnel and equipment. With the addition of the fourth lettered company, the division engineer could allocate one company to each of the division's regimental combat teams and retain the fourth company for work within the division area. The fourth company could also reinforce one of the other battalions as needed. Doctrine at that time accepted that "In a major attack, the engineer battalion will normally need and receive assistance from a corps engineer combat group." This assistance could take the form of relieving the divisional engineers from other work in the division area or direct assistance in the attack itself.



A tactical bridge built across the Rhine River by a corps engineer combat battalion.

The divisional support role of nondivisional combat battalions was clearly evident in their organizational structure. The engineer combat battalion-army had 712 officers and men. It was similar to the divisional battalion with several important exceptions. First, the battalion had only three companies and lacked the bridge and assault platoons of the divisional battalion. It also had less construction equipment—such as road graders, cranes, and trucks—than the division. Clearly, the battalion's function was to reinforce the maneuver units. It lacked the equipment and personnel to perform substantial construction work in either the division or corps area. The construction-type work in the corps area—such as roads and bridges—was assigned to separate companies attached to the engineer combat group. These included dump-truck, light-equipment, and bridge companies.

There were no engineer units specifically assigned to the corps. All nondivisional organizations were assigned to either the army or the communications zone. The existence of engineer units at the corps meant that a number of organizations were "attached" to the corps as needed. Depending on the tactical situation and the units required, one or more group headquarters was attached to the corps to provide command and control. Existing doctrine did accept that on a normal basis, there would be two combat groups (each with three battalions and associated companies) per corps (of three divisions). This would allow the allocation of a battalion to each of the divisions, leaving the other three for work within the corps area. Not all nondivisional combat battalions or groups were to be found in the corps. Doctrine and force structures called for at least two combat groups (three battalions and supporting companies) per field army, in addition to the divisional and corps engineer units.

The construction battalion and groups were considered either army or communications-zone assets. Doctrine generally precluded their use in the corps and division areas. These units were responsible for the more permanent road, bridge, and facility work needed in the rear areas. The units were joined in army and communications zone areas by technical units such as port-construction, depot, and maintenance units.

At the end of the first half of the 20th century, the engineers had developed a force structure based on the lessons of two world wars. That structure had been tested in theaters of operation around the globe. The challenge for the second half of the century was to apply this structure and the associated lessons with conflicts short of conventional war. This was made additionally difficult as the Army increasingly looked to technology to solve battlefield problems. Equipment became systems and moved from being implements of war to the cornerstone of doctrine and force structure.

This is the first of a two-part article. Part II begins with force structure during the Korean War and continues through the 20th century, to include Vietnam, Desert Storm, and the Engineer Restructure Initiative.

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Officer PERSCOM Notes

Strategic Communication: The Army Knowledge Management Strategy

In August 2001, Secretary of the Army Thomas E. White and Chief of Staff of the Army (CSA) General Eric K. Shinseki signed a memorandum outlining the goals and direction for Army Knowledge Management (AKM), a strategy to transform the Army into a "network-centric, knowledge-based force." The center of this strategy is the Army Knowledge Online (AKO) portal. AKO is strategically changing the way we do business.

A main feature of AKO is the career lifetime e-mail. With an AKO account, e-mail can be accessed anytime from anywhere around the world. The user can forward messages from the AKO account to a different e-mail address—a regularly used one that is adjusted if the user moves or changes accounts. The AKO e-mail address remains the same no matter how many times the person moves or how many times his other e-mail address changes.

The lifetime e-mail feature is particularly useful for PERSCOM because it can maintain contact with officers in the field throughout their career. The CSA mandated that every soldier would have an e-mail address through AKO by 1 October 2001; however, less than 5 percent of engineer officers have an address on record at PERSCOM. You can help the Engineer Branch achieve this goal by sending us your AKO e-mail address today.

AKO has other services in the works. Soon, all soldiers will be able to review their Official Military Personnel File (OMPF), online, through AKO. Currently, majors going before the FY02 lieutenant colonel promotion board can review their files online. Accessing your files through AKO will eventually eliminate the process of requesting a microfiche, which can take weeks for a response. For more information on AKO capabilities and services, go to *www.army.mil/ako*. To apply for your AKO account, go to *www.us.army.mil*.

To support the CSA's strategy for AKM, the Engineer Branch has upgraded its home page to improve information distribution to the Engineer Regiment (see Figure 1). We have added assignment information, the Engineer Branch Brief, professional-development guidelines, frequently asked questions, and other useful information. At a minimum, we update monthly. Many of your questions can be answered by simply going to *www.perscom.army.mil/openg/enmainpg.htm*. Check the Web

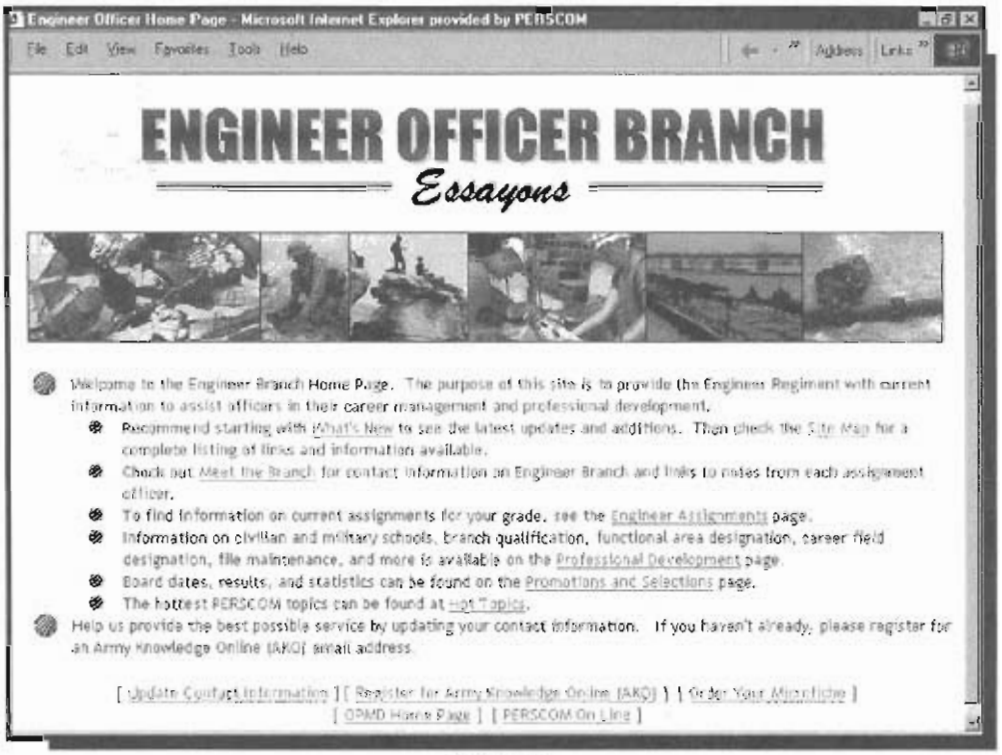


Figure 1

site periodically to stay connected and informed. If you have suggestions for improving the home page, call the Web page manager at (703) 325-0766.

Lieutenant Colonel Assignments

Lieutenant colonels must know what they want to do and where they want to go before contacting the assignment officer. Their long- and short-term goals in those areas are important factors in determining assignments. A realistic assessment of promotion and command potential can save a lot of stress and frustration in the assignment process. The lieutenant-colonel population consists of about 420 officers who are managed based on lieutenant-colonel command potential. Assignments are based on which track an officer falls under: command or noncommand.

Command Track

Engineer lieutenant colonel commands are 24 months. Officers who are successful in command can expect to be assigned to a former battalion command (FBC) position. Conditions and priorities change, but typical FBC assignments include the Engineer School, Pentagon, PERSCOM, and Joint positions. About 90 percent of former battalion commanders will attend senior service college 2 to 3 years after completing command.

Noncommand Track

Officers not on the command track can expect to be assigned as a professor of military science; director of public works; deputy district engineer; instructor; staff officer for the Joint staff, Department of the Army staff, or installation or MACOM staff; or in multiple positions in the Active Component/Reserve Component (AC/RC). They are still competitive for promotion to colonel and should plan their career accordingly. Please contact the Engineer Branch for a file assessment.

Assignment Considerations

Officers should consider the following before talking to an assignment officer about their next assignment:

- Priority: location or position.
- Current time on station.
- Overseas vulnerability (6 to 10 years).
- Preference: short- or long-tour overseas.
- Personal desires and family considerations.
- Exceptional Family Member Program.

Army requirements have priority. However, the more an assignment officer knows about the individual officer and his/her family situation, the better the chances are that the officer's personal and professional needs will be met.

POC is Major Jeff Freeland, lieutenant colonels' assignment officer, Engineer Branch, OPMD, PERSCOM.

Major Assignments

Engineer majors are unique in the assignment process. Their time as a major is fast and furious, but if they maintain contact with their assignment officer and stay motivated, they can meet all requirements and remain competitive for lieutenant colonel. Department of the Army Pamphlet 600-3, Chapter 16, paragraph 16-3, d.(3) (a) specifies 12 months as the minimum required for branch qualification. However, recent board statistics place the average time for officers selected for promotion to lieutenant colonel far greater than the minimum. Our goal is to position engineer majors at locations so they get 24 months of branch-qualifying time. PERSCOM does not pinpoint officers to branch-qualifying jobs; it assigns officers to a MACOM, which will establish when an officer goes into a branch-qualifying job and in what unit that officer will serve. The key to ensuring that you get enough branch-qualifying time to be competitive for lieutenant colonel is to complete military education level (MEL) IV, either resident or nonresident, no later than 36 months before your lieutenant colonel promotion board. This allows the Engineer Branch ample time to position you at a location to get branch-qualified.

You are the best manager of your career. The Engineer Branch is here to assist and provide guidance. The PERSCOM and Engineer Branch home pages contain valuable information to assist you in this process. To help manage your career effectively, we must have current contact information, which includes home and work telephone number, home address, and an AKO e-mail address. Maintaining current contact information will also assist us with the assignment process. Assignments become available on a cyclic basis (see Figure 2, page 52).

As the Army continues to transition, engineer-assignment priorities will change to support this transition. Every officer should maintain situational understanding of the Army's future. The Engineer Branch will assist every officer with professional-development opportunities to be successful through this transition. Maintaining contact with us and staying informed of the Army's future will greatly assist in this process.

POC is Major Dave Holbrook, majors' assignment officer, Engineer Branch, OPMD, PERSCOM.

Captain Assignments

Following company command, an officer can expect to be assigned to a developmental position where there is an Army and engineer requirement for a branch-qualified captain. These positions range from an observer-controller or trainer at one of the combat training centers or in an AC/RC unit, to a company commander or operations officer in the U.S. Army Recruiting Command (USAREC). Opportunities also exist to serve in Reserve Officer Training Corps (ROTC) as an assistant professor of military science or operations officer and in the U.S. Army Corps of Engineers as a project engineer.

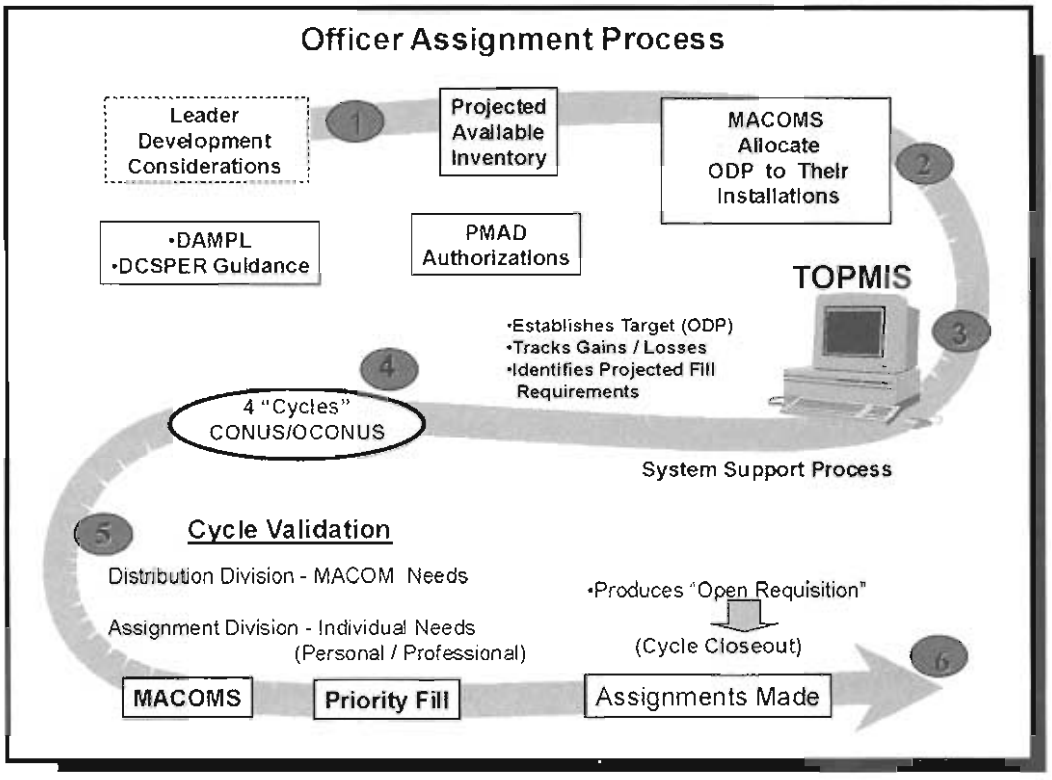


Figure 2

Branch-qualified captains are a vital but short resource. Requirements for branch-qualified captains usually exceed the number of available officers. This shortfall of captains, coupled with the critical nature of the requirements, creates a level of anxiety for the officer being assigned and the assignment officer during the assignment process. Much of the anxiety is based on false perceptions in the field of common branch-qualified captain assignments.

The most common misperception is that a "3R" (AC/RC, USAREC, ROTC) assignment hurts an officer's potential for promotion, schooling, and battalion command. Almost 75 percent of branch-qualified engineer captain assignments are in this category, so almost every officer can expect a 3R assignment.

AC/RC and USAREC assignments foster the most concern from officers in the field; however, they are critical Army missions to which PERSCOM assigns the best officers. Congress mandates the filling of AC/RC units, and General Shinseki made recruiting his number one mission-essential task. Accomplishing the AC/RC and USAREC mission is vital for ensuring that our Army continues to fight and win the nation's wars decisively.

Three thoughts: First, 3R assignments are developmental positions that prepare an officer for increased responsibilities as a field grade. They provide an excellent opportunity to positively impact the future of our Army and Corps. Second, successful company commanders have proven that they can lead, train soldiers, and accomplish the mission. The challenge becomes sharing their experience with others so they may accomplish future missions for the Army. Third, if an officer is at risk for promotion, 99 percent of the time that risk was determined before or during company command. Rarely is the officer's current command responsible for the officer not getting promoted. Successful completion of company command is the best indicator of future success.

A 3R assignment itself has no negative bearing on promotion, schooling, and battalion command. Consecutive nontroop assignments, average company command OERs, and/or an overall center of mass performance will adversely affect potential. Therefore, it is important for the officer to do well in every job—for his and the Army's long-term success.

POC is Captain Ronnie Griffin, branch-qualified captains' assignment officer, Engineer Branch, OPMD, PERSCOM.



Enlisted PERSCOM Notes

By Lieutenant Colonel Peter Taylor

Greetings from the Engineer Branch. I appreciate the opportunity to update you on the health of the enlisted engineer force and trends I've observed since I assumed duties as Branch Chief this past summer.

Health of the Regiment

The Engineer Regiment, as a whole, is healthy. Today our Regiment is manned with 14 of our 21 military occupational specialties (MOSs) at 100 percent or better (see Table 1). I've been on the job now for more than 6 months, and I can tell you that no other branch enjoys this level of fill.

In the field, most units are filled at close to 100 percent. Typically, we see units filled with more skill-level-one soldiers and fewer sergeants and staff sergeants than authorized. The shortage of noncommissioned officers (NCOs), particularly sergeants and staff sergeants, is an Armywide issue caused, in part, by increased requirements for drill sergeants and recruiters. We also have several MOSs (00B, 51K, 51M, and 62F) that need more promotion-eligible specialists and sergeants to be boarded.

Despite our overall good health, we continue to experience shortages in a few of our low-density MOSs—00B, 52E, and airborne 62E/J. To address these shortages, we're bringing more soldiers into those MOSs, pushing for incentives to help retain more of those currently serving, and closely monitoring monthly promotion allocations. We also continue to accept reclassifications into these MOSs. Many of them offer attractive reclassification bonuses under the Bonus Extension and Retraining (BEAR) Program. Call this office if you're interested in reclassifying.

As a branch, we've accessed and retained well in recent years. Our recruiting successes can be attributed to the enlistment bonuses offered for some of our MOSs and to the fact that we offer challenge and variety for potential recruits. At this point in FY02, I'm pleased to report that we exceed the Army recruiting averages in all three of our career management fields (CMFs)—12, 51 and 81. Fortunately, we've been able to recoup the 12B accessions we missed earlier this year by adding enlistment bonuses and by increasing recruiter emphasis on the MOS. We see similar trends with retention. Reenlistment is strong in the 81 series, but CMFs 12 and 51 are retaining at levels slightly below the Army average. Again, we expect targeted incentives to help us meet our retention goals for the year.

The long-term projections for the Regiment are good, though we'll see our strength levels decrease slightly in those MOSs (12B, 12C, 51M, 51R, 51T) that are currently manned at better than 100 percent. This is necessary so that other MOSs, mostly nonengineer, can be brought up to strength. For every soldier in excess of authorizations in one CMF, there's a corresponding shortfall in another.

The Assignment Process

When I arrived, I was amazed to learn of the many factors that impact our ability to select soldiers for assignment—the Army Chief of Staff's manning guidance for units, individual qualifications and preferences, a soldier's permanent-change-of-station (PCS) eligibility (time on station, stabilization), and many more. I was impressed by the challenge our assignment managers and professional development NCOs (PDNCOs) face as they attempt to ensure engineer unit readiness while balancing a soldier's (and family's) preferences, professional development needs, and tour equity concerns.

MOS	Authorized Strength	Strength (percent)
12B	8,167	101
12C	658	116
12Z	228	100
00B	138	93
51B	881	119
51H	434	104
51K	115	96
51M	241	104
51R	128	159
51T	257	130
51Z	116	93
52E	185	82
62E	1,339	107
62F	280	94
62H	99	97
62J	705	97
62N	459	103
81L	247	119
81T	456	95
81Z	19	100
82D	110	115
Total	15,262	100

Table 1. Engineer Regiment MOS Strength

Given these considerations, you may wonder when you should speak with branch about your professional development needs and career aspirations. The answer, quite simply, is often and whenever you're eligible for reassignment. I recommend that you periodically call your assignment manager to initiate a dialogue and, when appropriate, follow up by submitting Deparment of the Army Form 4187, *Personnel Action*. More importantly, I encourage you to use the newly implemented Assignment Satisfaction Key (ASK) System which enables you to input duty preferences and locations directly to our database via the Internet. Our assignment managers now have the software to use your preference data when they fill requisitions—a great improvement to how we make assignments.

To better understand when you should speak with your assignment manager, it's important to know the timelines he works with and the factors he considers when making an assignment. Around mid-January, our assignment team started working assignments for fall 2002, more than 6 months out. Our standard is to place soldiers on assignment instructions (AI) at least 150 days before the report date at the next duty location. Assignment managers typically begin to work the preliminary paperwork several months before placing a soldier on AI. They need this time to screen records for nominative positions (drill sergeants, recruiters, observer-controllers, ROTC, AC/RC), obtain PCS/time-on-station waivers, research the availability of medical services to meet Exceptional Family Member Program needs, and so on. We usually fill drill sergeant and recruiter nominations 8 months before the anticipated report date.

For senior NCOs (sergeants first class and above), we work assignments even further out. Our goal is to place you on assignment instructions 12 months before your report date. This is a recent change on making assignments, so we're working toward the 12-month standard.

It's also important to know when your assignment manager will look at you for reassignment. If you're returning to CONUS, you can rely on the timelines described above to gauge when your next assignment will be worked—we seldom curtail soldiers before their DEROS. For those serving in CONUS, it's not uncommon to PCS with 24 months time on station, sometimes less. This occurs frequently for NCOs selected for drill sergeant and recruiter duty. Senior NCOs should expect that we'll work a follow-on assignment that coincides with their completion of 24 months in a leadership position (platoon sergeant or first sergeant). This doesn't mean they'll automatically PCS at this point, but we do consider them PCS-eligible once they've filled the leadership positions necessary for their professional development. That way, they'll stay competitive for promotion.

The bottom line concerning the assignment process is that we need to communicate with you frequently. Periodically call your assignment manager or PDNCO to review your assignment eligibility, preferences, and family circumstances. When you call, be realistic in your expectations. We can only send you to locations where your MOS is authorized, overseas assignments are a possibility if you haven't been stationed overseas in several years, and we probably won't send you on back-to-back assignments to TDA units. NCOs, at some point, you should expect to be asked to serve as a drill sergeant or recruiter or in an Active Component/Reserve Component (AC/RC) assignment. These are nominative assignments that our best NCOs are asked to fill—they are challenging assignments and are recognized by selection boards as being career-enhancing.

Board	Date	Target Release
CY01 CSM, SGM, and SMC	2 Oct – 24 Oct 01	Late Jan 02
CY02 MSG	5 Feb – 1 Mar 02	Late Apr 02
CY02 SFC	29 May – 27 Jun 02	Late Aug 02
CY02 CSM, SGM, and SMC	1 Oct – 23 Oct 02	Late Jan 03

Table 2. Selection Boards and Release Dates

Promotions and Training

Promotions and training are subjects that interest all soldiers. Two related areas that have recently received considerable attention are conditional promotions and NCOES attendance. As a reminder, conditionally promoted soldiers may lose their promotion if they don't attend the appropriate NCOES course (PLDC, BNCOC, ANCOC) when scheduled, typically within 1 year of being conditionally promoted. We can make exceptions for operational or hardship reasons; however, soldiers need to attend NCOES courses as soon as possible. Call this office if you have questions about NCOES attendance or conditional promotions.

Table 2 shows the latest projections for upcoming selection boards and release dates. Remember, it's up to you to review your Official Military Personnel File (OMPF) and get a current photograph submitted well in advance of your next board. Visit the PERSCOM Web site *(www.perscom.army.mil)* for the latest on selection boards and for procedures to request your OMPF.

Contacting Us

The Engineer Branch exists to support commanders and soldiers in the field. I encourage you to contact your assignment manager, PDNCO, Branch SGM, or me with any questions you have about your assignment or professional development—that's why we're here. The PERSCOM Web site has information on how to contact us. Remember, the best way to influence your future assignment is to tell us your preferences before we make your assignment.

Lieutenant Colonel Taylor is the branch chief for Engineer Enlisted Assignments.

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

Directorate of Training (DOT)

Army Development System (ADS) XXI. TRADOC hosted a workshop from 25 to 28 January 2002 to develop draft implementation plans for warrant officer and enlisted personnel. The workgroups identified unfinanced requirements for incorporation into the Planning, Programming, and Budgeting Execution System process for FY02 and the Program Objective Memorandum period FY03-08.

The agendas were as follows:

- Warrant Officer
  - Tailor technical training to unit and assignment.
  - Educate officers and NCOs on the role of a warrant officer.
  - Expand technical warrant officer accession base.
- Enlisted
  - Combining MOSs with similar functions.
  - Multiskilled soldiers.
  - Structured self-development.

POC is CW4 Frederick Kerber, 34088; DSN -4088; or e-mail *kerberf@wood.army.mil.*

MOS 51T Technical Engineer—a Feeder MOS Into the 210A Warrant Officer Program. See DA Pam 611-21, *Military Occupational Classification and Structure*, for a duty description of this MOS. For information on how to become a warrant officer, go to *http://leav-www.army.mil/wocc/.*

POC is CW4 Frederick Kerber, 34088; DSN -4088; or e-mail *kerberf@wood.army.mil.*

MOS 81T Topographic Analyst—Restoring Staff Sergeant Squad Leaders in Topographic Companies at Corps and Echelons Above Corps. The consolidation of MOS 81C cartographer and MOS 81Q terrain analyst into MOS 81T, along with changes in NCO strength, led to a reduction of 26 staff sergeant terrain-analysis squad-leader positions in engineer topographic companies (22 Active and 4 National Guard) to sergeant. In 2001, topographic unit commanders indicated a need to restore these positions to staff seargeant due to the complexity of the mission and the degree of responsibility required. The request to upgrade these positions is currently being handled through the military occupational structure process.

POC is MSG Arthur Harvey, 34087; DSN -4087; or e-mail *harveya@wood.army.mil.*

Standardized MOS Codes. On 24 January 2002, MG Anders B. Aadland approved a revision to the MOS coding of all officers, warrant officers, and enlisted soldiers in the Engineer Regiment. The codes were approved, in part, in December 2002 by the Deputy Chief of Staff, Personnel (DCSPER). The table to the right shows

OLD MOS	TITLE	GRADE	NEW MOS
	Officers		
21A	Engineer general officer	1-6	21A
21B	Combat engineer officer	1-6	21G
21D	Facilities/contract construction management engineer	1-6	21D
	Warrant Officers		
210A	Utilities operation and maintenance technician	1-5	210A
215D	Terrain analysis technician	1-5	215D
	Enlisted		
	Combat Engineer Career Field		
12Z	Combat engineer senior sergeant	8,9	21Z
12B	Combat engineer	1-7	21B
12C	Bridge crewmember	1-7	21C
	General Engineering Career Field		
51Z	General engineer supervisor	8,9	21X
00B	Diver	1-8	21O
51B	Carpenter and mason	1-5	21W
51H	Construction engineer supervisor	6,7	21H
51K	Plumber	1-5	21K
51M	Firefighter	1-7	21M
51R	Interior electrician	1-5	21R
51T	Technical engineer	1-7	21T
51E	Prime power production specialist	5-7	21P
52G	Transmission and distribution specialist (Reserve only)	1-7	21Q
62E	Heavy construction equipment operator	1-5	21E
62F	Crane operator	1-5	21F
62G	Quarrying specialist (Reserve only)	1-6	21I
62H	Concrete and asphalt operations specialist	1-6	
62J	General construction equipment operator	1-5	21J
62N	Construction equipment supervisor	6,7	21N
	Topographic Career Field		
81Z	Topographer engineer supervisor	8,9	21Y
81L	Lithographer	1-7	21L
81T	Topographic analyst	1-7	21U
82D	Topographic surveyor	1-7	21S

Note: MOS codes shown in red indicate a change from the 16 November submission.

the submissions from 24 January 2002, which may change. DCSPER may double-code two MOSs and areas of concentration because it is somewhat reluctant to use the O and I alpha characters. A decision should be made in 3QFY02.

POC is SGM Wade Kerr, 34087; DSN -4087; or e-mail *kerrw@wood.army.mil.*

FM 3-34.221 (5-2), *Engineer Initial Brigade Combat Operations.* The TRADOC commander has directed an acceleration of all Initial Brigade Combat Team (IBCT) doctrine manuals. The newly established date for completing the coordinating draft of this FM is September 2002. The manual will be used to prepare for the IBCT certification exercise in early 2003 and then finalized by November 2003.

POC is LTC William Duddleston, 37537; DSN -7537; or e-mail *duddlestonw@wood.army.mil.*

AN/PSS-12 Mine Detector DTLOMS Board. As part of the implementation of a DTLOMS board decision, portions of FMs 5-34, *Engineer Field Data*, and 20-32, *Mine/Countermine Operations*, are being revised to reflect approved changes to AN/PSS-12 training techniques. The updated methods, developed by Dr. Alan Davison, will be in change 1 to FM 20-32 and include modified sweep techniques, increased sensitivity checks, and detection training methods shown to raise the AN/PSS-12 detection rate of low-metal mines from 15 to over 87 percent.

POC is LTC William Duddleston, 37537; DSN -7537; or e-mail *duddlestonw@wood.army.mil.*

Countermine and Counter-Booby-Trap Center (CCBTC). Following the TRADOC commander's directive, the CCBTC was established at Fort Leonard Wood in January 2002 to create a dynamic learning center of excellence, able to forecast and respond to future developments in mine/countermine warfare before they are encountered by friendly forces. The center will draw on the resources of the Army, Marines, and intelligence and humanitarian mine-action communities so it can not only respond to current threats but also anticipate and meet future threats. The organization and mission of the center is being finalized following the Countermine Council of Colonels and General Officer Steering Committee in March and April 2002.

POC is LTC Mark A. Thompson, 37347; DSN -7347; or e-mail *thompsma@wood.army.mil.*

Humanitarian Demining Training Center (HDTC). The HDTC continues to serve as the U.S. DoD center for mine-action training. It offers the Humanitarian Demining Basic Course to soldiers who are deploying to support humanitarian mine-action operations. The HDTC also offers training in humanitarian mine-action management and new training to support soldiers conducting humanitarian demining oversight with the Stabilization Force. It is constantly updating its HDO course and collecting information from the field on humanitarian demining. Please contact the HDTC if your unit is scheduled to conduct a humanitarian demining-related mission.

POC is SGM Kevin Fee, 36199; DSN -6199; or e-mail, *feek@wood.army.mil.*

Engineer Captain's Career Course Schedule. Below are the dates for the course for the Active and Reserve Components:

Class	Report	Start	End
ECCC 3-02	03 May 02	06 May 02	11 Sep 02
ECCC 4-02	09 Aug 02	13 Aug 02	19 Dec 02
ECCC 1-03	29 Oct 02	12 Nov 02	03 Apr 03
ECCC 2-03	11 Mar 03	24 Mar 03	29 Jul 03
Class	**Report**	**Start**	**End**
ECRC 1-03	04 Oct 02	05 Oct 02	18 Oct 03
ECRC 2-03	25 Oct 02	26 Oct 02	08 Nov 02
ECRC 3-03	24 Jan 03	25 Jan 03	07 Feb 03
ECRC 4-03	21 Feb 03	22 Feb 03	07 Mar 03
ECRC 5-03	11 Apr 03	12 Apr 03	25 Apr 03

POC is MAJ Steve Cross, 34128, DSN -4128; or e-mail *crosss@wood.army.mil.*

Requests for Information (RFIs). RFI traffic in the division remains at an elevated level. Most questions center around airfield repair/construction and bridging. Division personnel instruct a wide range of subjects and have considerable experience and expertise. Please contact them with questions you may have related to construction engineering.

MAJ Chris Kramer, OIC and geology, 35372; DSN -5372; or e-mail *kramerch@wood.amry.mil.*

MAJ Isidro Rondon-Torres, bridging, 35660; DSN -5660; or e-mail *rondon-torresi@wood.army.mil.*

SSG David Lawson, bridging, 37552; DSN -7552; or e-mail *lawsonp@wood.army.mil.*

Kenny Light, civil engineering (roads/airfields), 35655; DSN -5655; or e-mail *lightk@wood.army.mil.*

Chad Morris, civil engineering (concrete/asphalt), 35653; DSN -5653; or e-mail *morrischa@wood.army.mil.*

CW3 Arthur Flinn, Warrant Officer Advanced Course issues and project management, 35537; DSN -5537; or e-mail *flinna@wood.army.mil.*

CW2 Greg Sanden, Warrant Officer Advanced Course issues and project management, 37788; DSN -7788; or e-mail *sandeng@wood.army.mil.*

SFC Franklin Bell, airfield damage repair (RRR), drainage, drainage structures, and horizontal construction, 35329; DSN -5329; or e-mail *bellf@wood.army.mil.*

SFC Thomas Hylsky, soils and site investigations, 35653; DSN -5653; or e-mail *hylskyt@wood.army.mil.*

SSG Mark Hackett, vertical construction/structures, 35639; DSN -5639; or e-mail *hackettm@wood.army.mil.*

SSG Jason Griffin, theater construction management systems, quarry operations, and horizontal construction, 35645; DSN -5645; or e-mail *griffinj@wood.army.mil.*

New Geospatial POC. CPT Ted Read is the new geospatial instructor. He recently attended the Topographic Officers Management Course and geospatial information and services training at Fort Belvoir, Virginia, to further his knowledge in terrain analysis. He is an instructor for the Engineer Officer Basic Course (EOBC) and Engineer Captain's Career Course (ECCC). You can contact him at 37060, DSN -7060, or e-mail *readt@wood.army.mil.*

Enhancements Within the EOBC and ECCC. The landmine warfare and demolitions and the tactics blocks of instruction have been updated. With the changes, students will be more knowledgeable on threat mines, booby traps, and countermine measures to defeat them in a contemporary operating environment.

POC for the EOBC is CPT Ken Boggs, 35593; DSN-5593; or e-mail *boggsk@wood.army.mil.*

POC for the ECCC is CPT John Clarke, 35582; DSN -5582; or e-mail *clarkej@wood.army.mil.*

Mine Cards for Afghanistan. The mine card deck for Afghanistan, GTA 5-10-51, *Afghanistan Land Mine Identification*, has been completed and should be available through your local Training Support Center.

POC is MAJ Mark Griffin, 36199; DSN -6199; e-mail *griffinma@wood.army.mil.*

Directorate of Training Development (DOTD)

Field Manual Update. The following field manuals have recently been sent to ATSC for print and distribution. Look for them in the near future on the Reimer Digital Library at *http://155.217.58.58/atdls.htm.*

- FM 3-34.343, *Military Nonstandard Fixed Bridging*. This is a complete revision of the June 1991 version.
- Change 1 to FM 5-499, *Hydraulics*. This is a one-page change, required because of incorrect information that could cause a safety concern.

POC is Sandra Gibson, 37651; DSN -7651; or e-mail *gibsons@wood.army.mil.*

Directorate of Environmental Integration (DEI)

Army Proponent for Environmental Integration. Because of the 1 December 2000 approved Army Environmental Campaign Plan and Operational Directive, signed by the Undersecretary of the Army and the Army's Vice Chief of Staff, the Engineer School was designated the Army's (and branch's) proponent for the integration of environmental considerations across doctrine, training (military and civilian), leader development (military and civilian), organization (design), materiel (requirements development), and soldier (and civilian) (DTLOMS) support and within military operations. DEI represents the Engineer School in the day-to-day execution of this mission. In this role, DEI will develop, integrate, evaluate, standardize, and synchronize environmental considerations into and across DTLOMS to increase awareness and knowledge of soldiers and civilians. The objective is to positively affect environmental efficiencies and effectiveness in conducting military training and operations. This will ensure sustainable Army training areas and ranges; environmentally considerate leaders, soldiers, and units when operationally deployed; and a program synchronized with the Army's other four areas of environmental concentration—research, development, and acquisition; installation management; operations; and public outreach. Additionally, the Engineer School (DEI) is charged with collecting and disseminating environmental lessons learned.

POC is COL Robert Kirsch, 34119; DSN -4119; or e-mail *kirschr@wood.army.mil*; or Dr. Rebecca Johnson, 34119; DSN -4119; or e-mail *johnsonr@wood.army.mil.*

Visual Archives. The History Office at the Engineer School is developing a visual archives. It currently has more than 18,000 photographs, largely from World War II and Korea. Units that would like to contribute photographs (copies) or other visual material should contact Dr. Larry D. Roberts, Historian, U.S. Army Engineer School, Fort Leonard Wood, Missouri 65473. Where possible, caption information should accompany the images. If you have questions, please call Dr. Roberts at (573) 563-6109.



PIN: 079355-000