ENFORCE
BREAKOUT SESSION SUMMARIES

By Lieutenant Colonel Susan Myers and the ENFORCE Team

ENFORCE Conference breakout sessions are evolving into a regimental think-tank, and the information they provide is valuable to staff and action officers working issues that impact our engineer force. Other sources of communication, such as the Engineer Center home page, video teleconferences, council of colonels, and e-mail newsletters, offer opportunities to link engineer leaders with the latest developments. Summaries of breakout sessions held during the April 1998 engineer conference follow. Some have been updated to reflect actions taken since the conference.

Echelons Above Division

By Peter Malley

This session had two purposes: First, to inform participants about proposed engineer force structure requirements to support Force XXI, new evolutions of the battlefield, and future redesigns of the echelons above division (EAD) organizations. Second, to seek input to assist in determining the "right" designs for EAD organizations based on wartime missions and future concepts—i.e., Force XXI and Army After Next.

We began by explaining how engineer structure is developed from approved doctrine, concepts, and comments from field personnel. We described how the workload allocation rule for the Engineer Battalion, Combat Heavy, was developed using 23 wartime tasks and the number of personnel assigned to the unit. This discussion raised the following questions:

- **Why aren't equipment hours factored into the workload allocation rule?** We asked the Concepts Analysis Agency to answer this question. The data used to determine engineer requirements is based on information provided by the Engineer Strategic Studies Center and identified wartime tasks. Neither of these sources itemizes equipment hours. Engineer School leaders will review this issue to determine if equipment hours can be factored into the workload allocation rule.
- **Who will develop the EAD operational and organizational (O&O) plan for Corps XXI?** TRADOC is developing the Corps XXI O&O plan. It will be accomplished through a series of workshops attended by proponent school personnel. A "tiger team" has been developed to provide engineer input on specific issues. The tiger team includes doctrinal and concept developers and is chaired by a colonel.
- **Will the engineer organization include one engineer group with planning capabilities or will a modular section be available to augment the senior engineer organization in theater?** This question will be answered during the Corps XXI redesign process, which will be completed by October 1998.

We briefed the evolution of the future battlefield layout and potential roles for engineers. MG Flowers provided his guidance and perceptions in response to questions. This topic will remain a hot issue and will be reviewed as it develops.

We discussed proposed redesigns of EAD organizations. Two major organizations, the Engineer Combat Battalion, Corps Mechanized, and the Engineer Battalion, Combat Heavy, were described in detail. Others, such as the Engineer Command, the Combat Support Equipment Company, and the Engineer Combat Battalion, Corps Wheel, were summarized. Participants were most concerned about the following units:

- **Engineer Combat Battalion, Corps Mechanized.** Today this unit is a mirror image of the heavy division battalion. Participants concurred that the organization requires changing and that it should be revised based on breaching, survivability, countermobility, and general engineering capabilities no longer available within the heavy division battalion. We agreed to review the possibility of adding a Delta Company in the design and discussed adding more 62 MOS operators and reducing the number of combat engineers. We agreed to consider replacing ACEs with D7 dozers—that decision will depend on the availability of ACEs. Questions were raised about requirements for the CEV (future) and the Panther. Consensus was that a "bunker buster" or some type of weapon could be used in lieu of the CEV (future), and that the Panther could be placed in war stockage and withdrawn when necessary. The group suggested that we replace the M548s (Volcano vehicle) with a newer version and provide a dedicated support vehicle for MICLICs. We agreed to add a property book officer to this organization because the unit has considerable property that requires this officer's expertise.
- **Engineer Battalion, Combat Heavy.** After reviewing the mission statement, most participants agreed there is no requirement for bituminous paving, quarrying, or crushing operations. Engineer School personnel will review this requirement during the redesign process. We reviewed the 23 wartime tasks and recommended that three more be added: force provider, chemical decontamination support, and lines of communication bridging requirements. It was suggested we also add range construction and road construction and upgrading to the list.

The Concepts Analysis Agency agreed that these tasks can be added if the commanders in chief (CINC) have these requirements. The tasks will be added based on CINC input.

- **Engineer Command.** The Engineer School requested that representatives from the two engineer commands review their tables of organization and equipment (TOE) to determine whether this unit can be redesigned using modular sections versus the standard TOE staff positions. They agreed to this request.
- **Engineer Brigade, Theater Army.** Requirements for the brigade headquarters are not clearly defined in engineer doctrine. Colonel Quinn, 411th Engineer Brigade, provided a paper that identifies the brigade tasks. His data will be used to define the unit's mission and roles in future force structure requirements.
- **Engineer Combat Battalion, Corps Wheel.** Several commanders wanted to discuss this organization, but we could not because no proposed redesign has been developed. The commanders agreed to review their Unit Reference Sheets and submit suggestions for the redesign.
- **Engineer Combat Support Equipment Company.** Two options were raised: The Engineer School either develop a workload allocation rule or embed this company in the Corps Mechanized and Wheel Battalions. Consensus is that this unit must remain in the structure because its capabilities are critical to adequately support divisions.
- **Engineer Battalion Headquarters Team.** Participants requested that the Engineer School develop a team to command and control the separate corps companies and teams. Engineer School staff are reviewing this proposal.
- **Engineer Terrain Analysis Platoon.** We briefed a proposed redesign, which has increased the number of Active Component spaces to support terrain analysis requirements. Participants suggested we place some of the platoon sections in the Reserve Component structure. The Terrain Visualization Division is reviewing this proposal.

Comments and suggestions regarding this session are welcome and may be sent to the following e-mail address: malleyp@wood.army.mil.

Digital Breach Operations

By Lieutenant Colonel Harry Greene

This session began with presentations on the Wolverine and the Grizzly, which will form the backbone of the future heavy divisions' breach capability. When fielded in FY00 and FY04, respectively, both the Wolverine and the Grizzly will have situational awareness capabilities similar to those of the supported heavy maneuver force. We also discussed engineer command and control and the engineer portion of Force XXI Battle Command Brigade and Below (FBCB2). After these briefings, we posed the following questions to stimulate discussion:

- Given the information dominance provided by a digital force, do leaders still need to conduct a dismounted reconnaissance to determine the best breach site?
- Can we reduce the number of breach rehearsals or change the type of rehearsals conducted?
- Is it smart to use an M1 tank to follow reduction assets through a lane and provide security?

While we did not come to resolution on these questions, we will use the information and opinions gathered to shape future doctrine development for digital breaching operations. Several themes recurred during our discussion:

- Digitization and the resulting information dominance are most useful before and after a close fight. During a close fight, we expect communications to be conducted by methods similar to those used today. Attendees agreed that FM radios provide the most responsive form of communication at critical points in a battle.
- Marking lanes digitally is most valuable when vehicles approach the breach lane. Manually marked lanes are still required at the entrance and as vehicles move along the breach lane.
- Humans will remain a critical element on the digitized, situationally aware battlefield. Human eyes are needed for reconnaissance, and leadership is critical at the breach.
- Digitization and situational awareness were discussed at length. Participants agreed that digitization will increase the availability of information and the speed at which information is disseminated. We did not agree on how that information will impact the decision-making process.
- The presentation on engineer use of FBCB2 provoked lively discussion on reporting and command and control links. Engineer School leaders are working to clarify the types of reports required and the proper flow of reported information.

This breakout session served as a means to continue ongoing dialog concerning how digitization and situational awareness will impact engineer operations. Discussion will continue in *Engineer* magazine and at future ENFORCE conferences. The point of contact is guilford@wood.army.mil.

Force XXI Topography

By Lieutenant Colonel Earl Hooper

We began with a review of Task Force XXI and Division Advanced Warfighting Experimental designs and insights for future topographic missions. Most of the discussion focused on Topographic Force Structure 2010. The Terrain Visualization Center is

developing future topographic structure options, and two major options were presented. Lieutenant Colonel Hooper described a single theater battalion with robust corps companies. Lieutenant Colonel Luce (commander of the 29th Engineer Battalion) presented a two-battalion design with heavy theater companies and a unified brigade headquarters. Both designs focus on a set of key factors, which will drive future topographic missions and which, in turn, will drive our doctrine. Descriptions of the key factors follow.

- **A common terrain operating environment (CTOE).** This does not mean that we all have the same view of terrain. We know that requirements for terrain visualization, analysis, simulation, and modeling differ across each battlefield operating system and across each echelon. The CTOE is the commonality of the underlying terrain data that drives each system to accomplish its terrain visualization and evaluation missions.
- **Rapid data production and data dissemination.** Data production from the National Imagery and Mapping Agency (NIMA) is critical. That agency's future plans call for it to provide foundation data "on the shelf." The foundation data will not meet all terrain data requirements for our future digitized organizations. Rather, that data must be reinforced with more detailed data sets produced "just in time" to support military operations. The "just in time" data production forms the basis of mission-specific data sets (MSDS). For the Army topographic community, this opens two new missions. The first is to get rapidly produced data to digital systems throughout the battlefield. The second is to fill data voids in the MSDS with data produced by Army topographic elements. The NIMA phrase used to represent this sift in data production philosophy is "just in time, not just in case" data production.
- **Expanded availability of terrain analysis support.** Future digital command and control systems offer extensive communications connectivity. This allows the analysis and dissemination of terrain data. Previous terrain analysis efforts normally reached only G2/G3 elements due to limited personnel and the low volume of hard-copy products. Digital distribution allows each command and control node down to the maneuver battalion level access to many of the analysis products previously limited to operations and planning elements at division level or above.
- **Embedded terrain evaluation in command and control systems.** Each system can perform many basic evaluation tasks and develop visualization products formerly provided by terrain analysis teams. These tasks include lines of sight, masked area plots, intervisibility plots, oblique views, perspective views, and slope analyses. Embedded tools allow individual users to obtain many visualization products without direct support from a topographic element. This capability is key to the overall terrain visualization mission in Force XXI. Topographic missions continue to shift toward data creation, management, and dissemination. The new missions provide the terrain data that empower the evaluation capability embedded in future command and control systems.

Attendees at this session provided an excellent cross section of the engineer community. The collected expertise included all topographic battalion commanders, the commandant of the Defense Mapping School, and the commander of the Topographic Engineering Center. The session closed with comments from MG Flowers and BG Arnold. They encouraged the team not to focus on fixing the existing structure but to design a structure that will meet future requirements.

The Terrain Visualization Center is working with the Concepts Division of the Directorate of Combat Developments and the Engineer Personnel Proponency Office to expand the two echelons-above-division options noted above. The assistant commandant provided an initial review and guidance in June. We are preparing a detailed concept design that will be staffed throughout TRADOC this fall. The point of contact is hoopere@wood.army.mil.

Long-Range Experimention Plan

By Vern Lowrey

The Maneuver Support Battle Lab (MSBL) hosted a breakout session to discuss engineer-related experimentation proposals as far forward as FY01. We briefed the battle lab experimentation process described in TRADOC Pam 71-9, *Requirements Determination*. We also discussed an ongoing effort by TRADOC to expand Army experimentation efforts over five axes:

- **Army XXI axis** to determine final requirements for the First Digital Division (FDD) by FY00.
- **Corps/Echelons Above Division axis** to experiment with structures needed to support the FDD and follow-on digital divisions that support fielding the First Digital Corps (FDC) by FY06. A corps Advanced Warfighting Experiment (AWE) will be conducted in FY03.
- **Joint Contingency Force axis** to experiment with contingency and expeditionary forces will culminate in an AWE planned for FY02.
- **Battle Force Group/Strike Force axis** to experiment with concepts tied to a highly lethal and deployable force.
- **Army After Next axis** to continue intellectual thought and discussion on Army force requirements beyond the year 2025.

We then discussed proposed engineer-related experiments based on the new Army patterns of operations (project the force, protect the force, gain information dominance, shape the battlespace, conduct decisive operations, and sustain and transition the force). Resourced MSBL experiments will tie into each Army axis as appropriate.

Feedback from ENFORCE participants was extremely helpful in validating engineer-related experiment proposals.

Tighter linkage of MSBL experiment efforts was discussed with the Director of the U.S. Army Corps of Engineer laboratories. A proposal was made to tie materiel-related experiment efforts with existing operational requirement documents to determine if the requirements are still valid or need modification.

The MSBL Long-range Experimentation Plan (LREP) has been staffed with the U.S. Army Chemical, Engineer, and Military Police Schools. It is posted on the MSBL Internet home page. Comments or suggestions for future engineer-related experimentation ideas are welcome. The point of contact for the LREP, Major Steve Jeselink, may be reached at (573) 563-4082 or Defense System Network (DSN) 676-4082.

The Bradley-Equipped Engineer Company

By Lieutenant Colonel Dick Hornack and Major Doug Victor

During this session, we solicited input concerning the Engineer Regiment's transition to the Bradley engineer fighting vehicle (BEFV). The Engineer School will use data from the session to develop and finalize an operational and organizational (O&O) concept to incorporate into the BEFV concept evaluation plan. The O&O concept will address the optimum organization for the engineer company, training issues, and doctrinal impacts of a Bradley-equipped engineer force. The Maneuver Support Battle Lab will continue to work this action.

Subject areas used to facilitate discussion were engineer company and platoon organizations, training and doctrinal implications, and follow-on testing that will fully develop the Bradley engineer company concept.

Engineer Company Organization. Engineer combat repair teams and combat service support should mirror requirements of the maneuver community. First sergeants should be in M113s along with the repair teams. Company commanders/operations sergeants must have a HMMWV, so we need to relook HMMWV distribution within engineer companies. Units may not be able to deploy with 100 percent of their assigned systems due to soldiers who are sick, on profile, etc.

Engineer Platoon Organization. Reduction platoons should have redundant capabilities to reduce obstacles and proof and mark lanes. They need the armored combat earthmover (ACE)—a mobility asset—organic to the platoon to complement other reduction assets. The ACE can reduce antitank ditches and berms (constructed obstacles) and provide proofing capability through complex obstacles. Maintaining the ACE in reduction platoons will minimize task organization changes for offensive operations within engineer companies.

Training Implications. We presented three proposals for engineer gunnery:

- ❒ Fire tables I-VIII.
- ❒ Fire tables I-VIII; don't fire tables III and IV.
- ❒ Fire tables I-VIII (Modified); don't fire tables III and IV.

The group thought that engineer gunnery tables should parallel the maneuver tables I-XII, with tables XI and XII being the squad and platoon qualifications, respectively. Engineer qualification tables should be merged into the current Bradley tables I-XII to create an engineer gunnery program with an end state of completely qualified squads and platoons. The Engineer School will continue to work engineer gunnery issues, including resources.

Doctrine Implications. Engineer commanders expressed concern that four Grizzlies may be insufficient to support a maneuver task force during breaching operations, since we need to make as many breach lanes as possible for the assaulting task force. Engineer companies must retain as much of their current breaching capability as possible, because the Army will buy only a limited number of Grizzlies.

Follow-On Testing. To help Engineer School personnel analyze the Bradley engineer company, the 4th Infantry Division's engineer brigade transitioned one engineer company to BEFVs in April 1998, using the same configuration as the infantry Bradley company. An Engineer School team will evaluate this concept, including load plans, maintenance, training, and doctrine. The 4th Infantry Division will test the concept throughout the summer and will deploy to the National Training Center in August with two engineer companies—one Bradley company and one M113A2 company.

The Engineer School will continue to evaluate engineer gunnery tables, engineer qualification tables, ammunition implications, the feasibility of adding a bunker-busting munition to the tube-launched, optically tracked, wire-guided (TOW) missile, and the need to change to the Bradley stowage capacity to accommodate engineer equipment. A proposed FY99 concept evaluation plan will address enhancements to the Bradley, which include rollers, plows, Volcano, MICLIC, and possible hydraulic/pneumatic tools. The point of contact is steinigp@wood.army.mil.

Total Army Training System Courses

By Lieutenant Colonel Susan R. Myers

We provided information about the Total Army Training System (TATS) courses and solicited feedback as to how material should be fielded throughout the engineer regiment.

The Total Army School System (TASS) is the realization of former Chief of Staff of the Army General Gordon Sullivan's vision for the Active and Reserve Components to train to the same standard. His vision is being realized now that seven functionally aligned training battalions offer reclassification courses to the engineer Reserve Components. TATS courses are the means to standardize training technical tasks, and the Systems Approach to Training (SAT) is the process used to develop programs of instruction.

Systems Approach to Training

The Training and Doctrine Command updated the SAT process in 1995 to re-establish a long-term approach to planning future training requirements for TATS courses.

SAT has five interrelated phases: analysis, design, development, implementation, and evaluation.

Analysis. This phase identifies and describes collective and individual tasks and determines what needs to be trained. Analysis for TATS courses is accomplished by bringing together representatives from all components to determine training needs. Achieving consensus on training needs and critical tasks is a difficult process. The Engineer School received Active Duty Special Work funds to help ensure that feedback from field commanders and Reserve Component instructors is integrated into the analysis phase.

Design. This phase ensures the systematic development of training programs and materials to enhance the learning process and make it more effective. Virtual and diagnostic learning strategies being incorporated into TATS courses will require access to and fielding of technological learning systems. Linking these systems is critical to the success of future training capabilities, and the medium to accomplish the link is component distance learning plans.

Development. This process turns the design into training products, programs, and materials required to implement training. The program of instruction, lesson plans, student handouts, soldier's manuals, and interactive courseware are products of the development process. Combat engineer courses were validated this year (1998) at Fort Leonard Wood, Missouri; the Army National Guard Regional Training Institute at Camp Grafton, North Dakota; and the Army Reserve engineer TASS battalion at Camp Dawson, West Virginia. This validation process ensures that training issues from all components are incorporated. Construction and equipment operator courses will be completed this fall. All courseware will be available for distribution from the Army Training Support Command in October 1999.

Implementation. During this phase, courses are conducted using training materials and exercises based on unit training needs. The implementation process is expanding to accommodate training battalion evaluation criteria mandated by the TRADOC accreditation program.

Evaluation. Units are evaluated annually, and TASS battalions are accredited every three years (as a minimum). The accreditation system evaluates instructor and student performance, instructor credentials, testing programs, course materials, and training resources. Some of the Engineer Regiment's greatest challenges are to plan and resource training to meet military occupational specialty qualification quotas and, more importantly, to ensure that soldiers are prepared to perform critical technical tasks to standard before graduating from the course.

The Future

Engineers must continually assess both individual and collective skills and knowledge to anticipate future training requirements. Acquiring resources for training is often the weak link because of changes in doctrine and lead times needed to procure materials. Distance learning is touted as the solution to reducing the time required for training. However, our technical skills and knowledge are perishable without continuous reinforcement and practice. The Director of Training seeks feedback and lessons learned concerning training needs, distance learning, and training effectiveness from unit commanders, training commanders, and other training experts. Leaders must learn more about the TATS courses. They are the tools to train the entire Force XXI Engineer Regiment and the bridge to bringing the Active and Reserve Components together for readiness. The point of contact is stephens@wood.army.mil.

Training Modernization

By Connie Welch and Al Waltman

This session presented the Engineer School's initiative to modernize engineer training. Participants were shown prioritized lists of modernization initiatives developed by the school's Training Modernization Integrated Concept Team and were asked to comment on the list's completeness and priorities.

Updated priority lists follow.

Maneuver Engineering

1. Training aids, devices, simulators, and simulations (TADSS) to support staff training in the technical engineer areas of breaching, force protection, obstacle planning, and river-crossing operations.
2. Computer-based training and simulations to train general tactical operations center (TOC) procedures.
3. TADSS to support mine detection (virtual-reality-based).
4. An improved mine-effects simulator for the combat training centers.
5. An armored combat earthmover (ACE) simulator.
6. A Volcano simulator.
7. More training events integrated with other TRADOC schools and between courses at the Engineer School.
8. A large, regional, fast-water, river-crossing training area for the Army.
9. A bridge boat operator and raft commander simulator.
10. Multimedia training to support bridge design and Bailey bridge/medium girder bridge simulators/simulations.
11. An improved mine-clearing line charge (MICLIC) and MICLIC trainer.
12. A remedial math class or computer-based training.

Force Support Engineering

1. TADSS to support heavy construction engineer equipment, such as dozers, graders, scrapers, loaders, and SEEs.
2. TADSS similar to a simulation network to support construction engineering activities.
3. A base camp demonstration site at Fort Leonard Wood for resident training, similar to the model motor pool or the military operations in urban terrain (MOUT) facility.
4. A handheld electronic expert system, which will contain the equivalent of FM 5-34, *Engineer Field Data*, and perform calculations.
5. A simulation to support engineer and route reconnaissance.
6. Move reclassificaton training to the Total Army School System battalions.

Terrain Visualization

1. Embedded training for the Digital Topographic Support System.
2. Digital terrain training support package (CBT) for producing map products.
3. Maneuver Control System and Joint Mapping Tools Kit training in leadership courses in the Engineer School.
4. Computer-based training that demonstrates battlefield obscuration and its effects on engineer operations.
5. A camouflage training site at Fort Leonard Wood.
6. Re-evaluate the initiative to move the Defense Mapping School to Fort Leonard Wood.

Systematic/Process Topics

1. Revitalize the individual training program process to identify resource requirements, and develop and program a training strategy.
2. Nonsystem TADSS acquisition system fails and requires redesign too often.
3. Review course length limits versus increasing skill complexity due to new technologies.
4. Standardize DoD equipment: Multiple brands of equipment across the total force cause problems.
5. Human factors are not included in training and equipment designs.

Participants made the following recommendations.

- Add Volcano and ACE training devices to the maneuver engineering list.
- Separate survivability issues from force protection issues on the force support list.

The second portion of this session was devoted to the Engineer Force Battle Command and Staff Trainer modernization initiative. Suggestions included:

- Consider consolidating the analog and digitized CD-ROM. Digitized training could be an annex or add-on to the analog CD-ROM.
- Add a company support platoon leader trainer.
- Add a company-level supply position trainer.

Engineer School personnel are reviewing these recommendations and will incorporate them into final prioritized lists. The lists will be presented to the school commandant for approval by mid-August 1998. The point of contact for training modernization at the Engineer School is waltmana@wood.army.mil.

Engineer Officer Advanced Course

By Major Darren Naumann

The purpose of this session was to brief results of the EOAC customer survey and Task Site Selection Board and discuss the Total Army Training System-Courseware (TATS-C) and EOAC-Reserve Component Distance Learning Implementation Plan. We also solicited input for improvements to the EOAC.

EOAC Survey. The group agreed that the EOAC customer survey is valid but were concerned that the top 10 tasks reflect priorities facing a peacetime Army. They thought that survey results should not drive the train for EOAC course instruction but should be viewed as one of many inputs to the course design. We discussed the complexity level of tasks instructed in the EOAC—whether they are the most difficult or most often encountered—and agreed that the course should focus on foundation skills on which the officer can build.

Consensus was that the survey be conducted annually, that it is beneficial for commanders to provide input to EOAC design, and that we should administer a similar survey to maneuver commanders. The following improvements were recommended:

- Change the cover letter to emphasize the importance of commanders' input to the course.
- Change the wording of questions to reflect the survey purpose; for example, "What important skills and knowledge should be taught in the EOAC?"
- Provide commanders the ability to quantify the detail level of skills and knowledge taught; for example, differentiate between "integrated," "awareness," "refresher," and "programmed" training.
- Administer future surveys to EOAC graduates as well as battalion/brigade/group commanders. To reduce costs, commanders will be responsible for distributing surveys to EOAC graduates in their command.
- Distribute future surveys to U.S. Marine Corps engineer unit commanders.

Task Site Selection Board. The group thought that the critical task list and recommendations from the board were not indicative of the engineer branch as a whole but reflected the types of units represented on the board.

Total Army Training System-Courseware. The group recommended that lesson plans for tasks encountered least often be converted and published first under the TATS-C program.

Distance Learning Implementation Plan. Participants agreed that it may be difficult to synchronize quarterly video teletraining and mobile training team sessions with Reserve Component units. They recommended that the sessions be archived so students can access them.

Recommendations. Teach EOAC students to be managers, not technicians, and focus instruction on management-level issues and systems that company commanders should know. Increase students' exposure to issues relevant to today's fight, such as support operations and stability operations, rather than focusing entirely on fighting "World War III." The point of contact is naumannd@wood.army.mil.

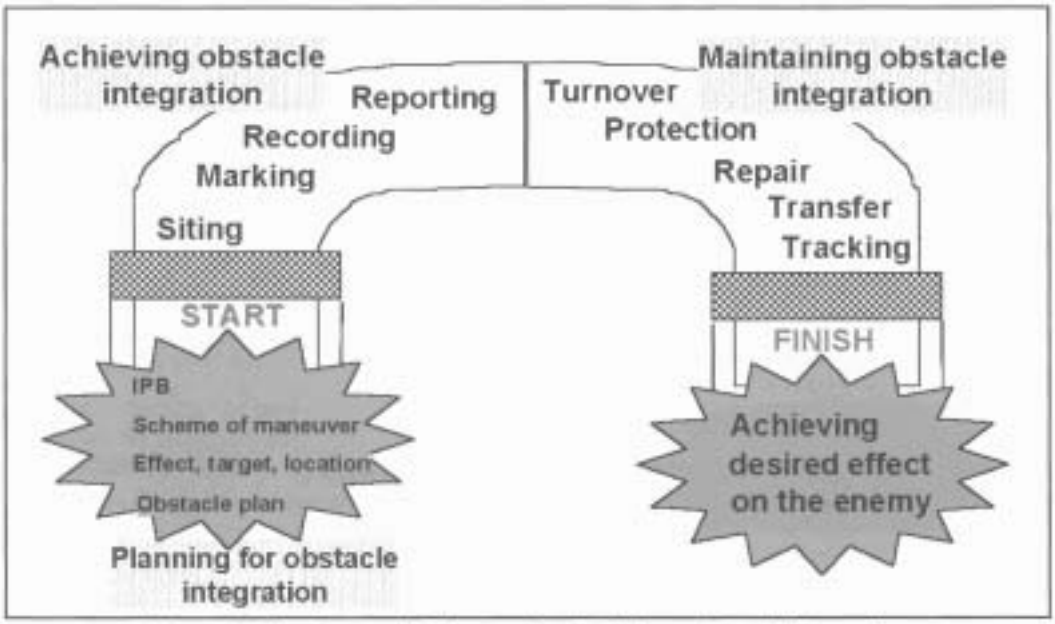

Figure 1. Planning, achieving, and maintaining obstacle integration

Scatterable Mine Systems and Integration

By Major David Holbrook, Major Michael Rose, Major Darold McCloud, and Mr. Charles Jackson

We discussed and solicited feedback on negative combat training center trends, current doctrine, and future systems related to scatterable mines. Attendees reviewed several trends related to scatterable mine employment and integration across DTLOMS, with doctrine, organization, and materiel trends being most notable. Engineer School personnel will work these issues based on information obtained during the session.

Doctrine

We agreed to develop a graphic training aid (GTA) that outlines system checks for the Volcano and MICLIC. Consensus was to limit the Volcano section to the ground Volcano, since aircraft crew chiefs conduct additional (nonengineer-related) checks on the air Volcano that are inappropriate for an engineer GTA. The group suggested that system checks for the MOPMS be included on a future GTA.

We discussed scatterable mine integration concepts in current doctrine. FM 90-7, *Combined Arms Obstacle Integration*, now being reviewed by the field, will contain information on planning, achieving, and maintaining obstacle integration (Figure 1). We concluded this section by discussing available scatterable mine assets and points in the military decision-making process that will assist leaders in planning scatterable mine integration.

Terminology was discussed in detail, particularly the term "dynamic obstacle," which emerged during the National Training Center's Advanced Warfighting Experiment (AWE) in March 1997 and was used in the Division AWE at Fort Hood last fall. Although the term has never been defined, it continues to show up in correspondence and in lessons-learned documents circulating through the Engineer School.

The term "dynamic" is frequently used in Force XXI operations, and engineers must embrace it. The Army is rapidly changing, and doctrine must keep pace. The "dynamic battlespace" we fight in today is leading the way for future systems that reach out and kill the enemy at greater distances. The Raptor is a system that fits this mold.

"Dynamic" in itself has a single meaning, but when added as a descriptor at the beginning of existing doctrinal terms, it requires definition in the doctrinal lexicon. According to Webster, "dynamic" is defined as (1) forceful; energetic (2) of or pertaining to force or energy related to motion. We proposed that to be "dynamic" an obstacle must—

- Communicate with command and control systems and other engagement systems.
- Be remotely controlled (on/off/on).
- Report battlespace intelligence (type, number, direction, and rate of movement).
- Be delivered remotely.
- Engage vehicles.

While these descriptors apply to the *future* Raptor system (see materiel section), they do not apply to current scatterable mine systems.

Participants thought we do not need another term to describe our obstacles, but they provided some interesting insights and acknowledged that many leaders use the term "dynamic obstacle." The term will be defined in future doctrine, based on the above criteria and the following synopsis of the attendees' comments:

- *Obstacle*—If it is not an obstacle, it is not linked to engineer proponency.
- *Dynamic*—Has on/off/on capability at least once.
- *Active*—Sensors are not active; they only receive. Mines are passive, while radar and sonar are active. To be "dynamic" a system must be active.
- *Mobile*—Replace the term "mobile" with "interactive" when describing the Raptor.

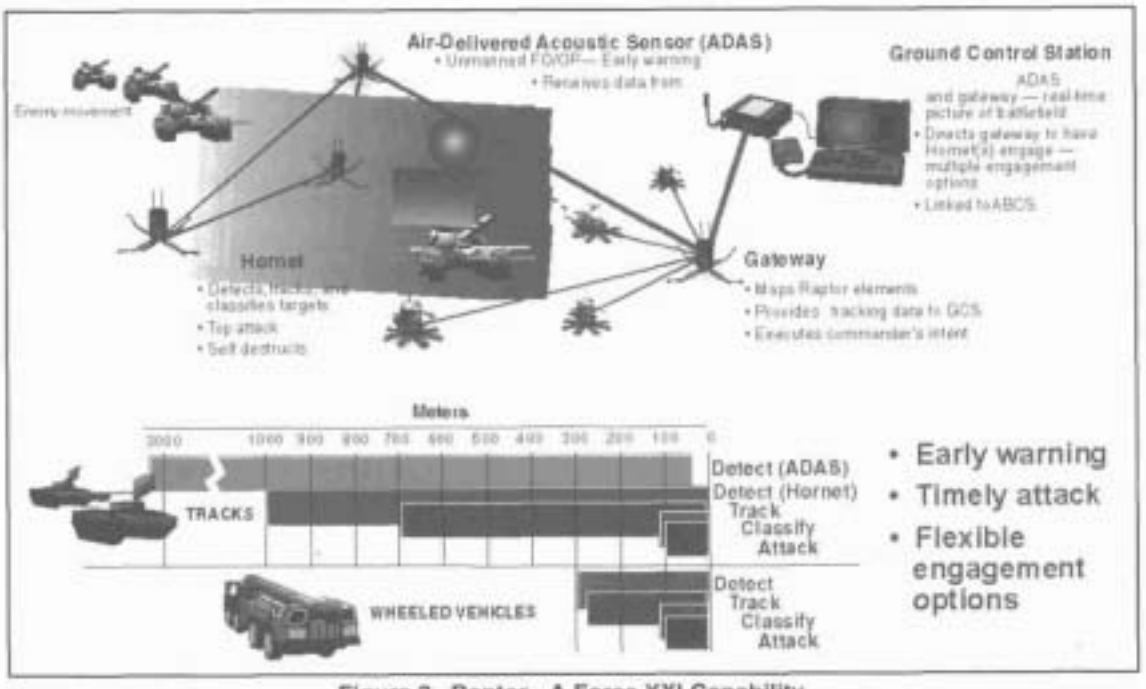

Figure 2. Raptor - A Force XXI Capability

- *Desired Effect*—Allows free mobility for the BLUE; is an obstacle to the RED; and is no danger to the GREEN (noncombatants).

Organization

Attendees agreed that the M548 Volcano carrier should have a communications platform for mounting a radio to enhance command and control of this critical asset.

Materiel

Suggestions concerning a standard minefield-marking system included:

- Establish the standard at theater corps level at the beginning of each operation.
- Use a material for the marking system that is readily available to all units.
- Include minefield-marking material in the STRAC manual.
- Ensure that the minefield-marking material can be used by both heavy and light forces.
- Adopt the Pearson Pathfinder marking system used by the British army.

Volcano Minefield-Marking System (VMMS). We discussed this possible future system, which would eliminate some negative trends users experience with the current Volcano at combat training centers. The VMMS will automatically mark the Volcano minefield as it deploys. Participants approved this concept and suggested improvements to be incorporated under the Volcano improvement plan. The VMMS should have a communications platform and built-in Global Positioning System (GPS) and be capable of being carried by soldiers (man-packed). This last feature will enable soldiers to rapidly mark any unmarked areas created by terrain or the system itself.

Self-Destruct Times. We agreed that different self-destruct times should be developed for our scatterable mine systems. The current times of 4 hours, 48 hours, and 15 days (for the Volcano) are not conducive to future mission execution. Suggestions included:

- Base changes to self-destruct times on enemy echelonment; for example, the duration should cover the time when the first echelon enters the main battle area through culmination of the second echelon.
- Change the times to 12 hours, 48 hours, and 15 days.
- Change the times to 4 hours, 18 hours, and 48 hours.
- Align all systems that have the RCU-controlled MOPMS with a command-detonation option.
- Increase the availability of scatterable mine Class V supplies (ammunition).

Raptor. Previously called the intelligent minefield (IMF), the Raptor is both a weapon and an information-collection system, which makes it hard to categorize. The system consists of air-delivered acoustics sensors, Hornet munitions, a gateway, and a ground-control station (Figure 2). Several suggested improvements to the Raptor concern safety and utility. The group thought the Hornet should have a disarm-and-reuse capability after it is fully armed. Currently the Hornet can be redeployed before final arming, but it either self-destructs at a preset time or is remotely command detonated when fully armed.

Conclusion

The ENFORCE Conference breakout sessions keep leaders of the Engineer Regiment informed of ongoing issues. Feedback gathered during the sessions will be extremely helpful in developing future doctrine and engineer systems. Your continued interest and support are appreciated.