# ENGINEERS IN THE 21ST CENTURY

*By Captain Mario Perez, Lieutenant Colonel C. Kevin Williams, and Colonel E. W. Chamberlain III*

When the smoke cleared and the electrons stopped flowing at the Division Advanced Warfighting Experiment (DAWE) at Fort Hood, Texas, 26 October – 15 November 1997, the free world was once again safe as the 4th Infantry Division (Mechanized) reigned victorious over the BISDON Alliance. The experiment highlighted several learning points affecting how combat engineers will be employed in the future battlespace.

The purpose of this experiment was to test the division's command and control structure and the effectiveness of several new high-technology systems. Although Force XXI places new combat systems in engineers' hands, the concept represents more than incorporating new technology into current doctrine. For success in the future battlespace, engineers must shift the way they operate. Major countermobility and mobility issues identified during the DAWE will affect how combat engineers will support mid- to high-intensity environments. This article describes how the 3rd Brigade Combat Team (BCT)—the Iron Brigade—and the 4th Engineer Battalion, 4th Infantry Division, employed future engineer systems to aid in defeating the enemy.

## Countermobility Operations

The Raptor Intelligent Combat Outpost is the most dramatic example of a new high-technology system combat engineers will use to shape the future battlespace. The purpose of the Raptor is to improve the commander's ability to dominate battlespace. This is achieved by employing an unmanned and unobserved outpost that can detect, report, and engage the enemy. The Raptor is best described as a *hunter-killer* system. It consists of three advanced acoustic sensors, two gateways, a control station, and sixteen munitions—currently it employs improved Hornet munitions. Sensors and communication networks linked into the control station at the maneuver brigade tactical operations center (TOC) extend the eyes and ears of the commander to areas he cannot see or where he cannot assign combat forces to cover.

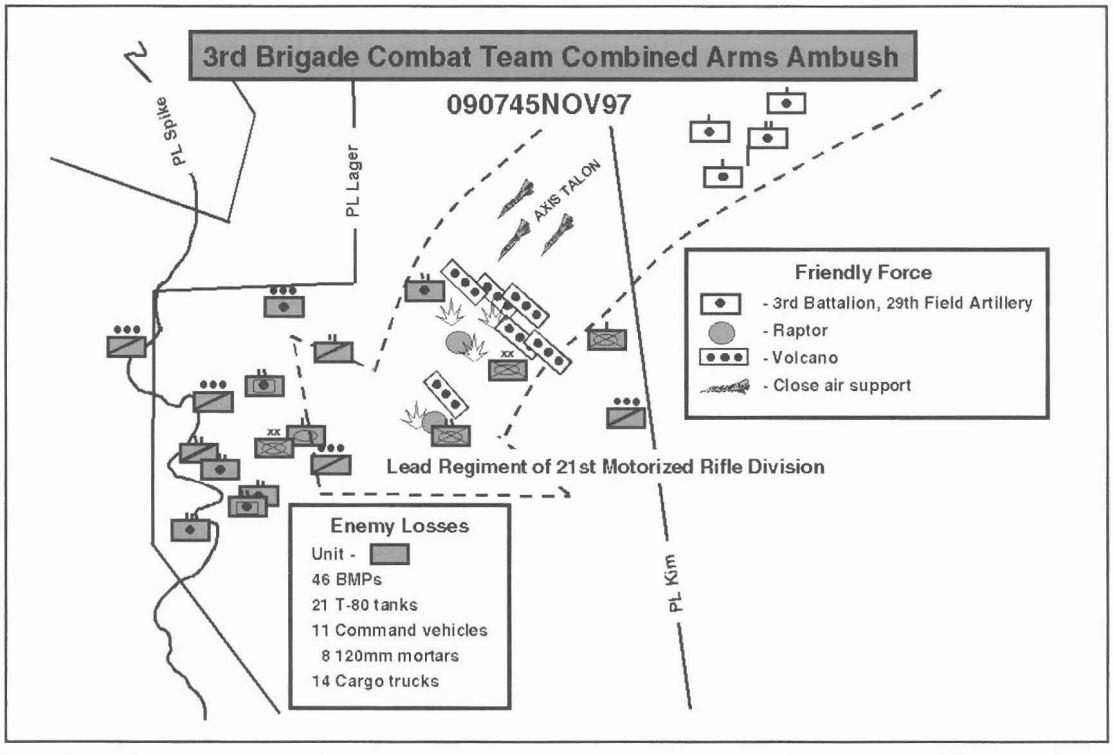
The Raptors' sensors *hunt* the enemy and pass combat and targeting information through a governing gateway to the control station in the same way that a manned observation post or forward observer passes information to the TOC. The acquired information enhances the commander's situational awareness and provides targeting information for indirect fires, attack helicopters, or close-air-support missions.

The Raptors' Hornets can also communicate with a controlling gateway and provide an on-site *killer* capability for the commander. He can employ the Raptor as a stand-alone system or in conjunction with other lethal systems. The control station can place the Hornets in either a "sense" or an "armed" mode. A Raptor in the sense mode tracks and reports activity and passes targeting information back to the TOC. An "armed" Raptor not only tracks and reports, it also attacks targets with its Hornet munitions. Because Raptor has the ability to overwatch itself, report its location and status, and provide targeting information, the need for continuously manned over-watching forces is reduced or eliminated.

The Iron Brigade employed the Raptor in three basic ways during the DAWE:

- The Raptor was employed forward in the brigade's sector to provide reconnaissance, intelligence, surveillance, and target information in targeted areas of interest (TAI). The Raptor confirmed avenues of approach used by the enemy during his attack, and we used that information to trigger artillery fires or close air support.
- The Raptor provided flank protection for the brigade. The system can be employed quickly on an avenue of approach into the brigade's flank—a platoon can emplace one kilometer of coverage in about one hour. The Raptor delayed enemy movement, and the early warning it provided allowed us to reposition combat power.
- We also employed a technique called the "Raptor Raid," which is an air-assault mission where engineers emplace Raptors deep in enemy flanks. We conducted Raptor Raids simultaneously with ground movements into the sector. After ground forces arrived in the sector, we switched the Raptor to the "sense" mode so the ground forces could immediately counterattack.

The Iron Brigade had its greatest success using the Raptor as part of a deep fight engagement area. We built the engagement area using air Volcanos at a natural TAI where several avenues of approach converged. Artillery, attack helicopters, and close air support covered the engagement area with fires. Raptors in the sensing mode triggered deep attacks as the enemy entered the engagement area. After the enemy began breaching the Volcano obstacles, the Raptors were switched to the armed mode. The combined effect of the deep




attacks and placing obstacle systems forward of the brigade's location broke up enemy formations and added to his confusion of our intent and where our combat elements were located.

The Raptor is an excellent system, but we noted some limitations during the DAWE. The simulated capabilities portrayed were based on a Raptor system that technically could be available to the division by 2003. For example, the Raptor's communication link was limited to 30 kilometers from its control station, and the components must be hand emplaced. The Maneuver Support Battle Lab at Fort Leonard Wood is experimenting with a long-distance communication link and an unmanned, deep-delivery system to fix that shortfall. Additionally, the Raptor was difficult to control across the division area because of the fluidity of the battlespace and rapidly changing brigade sectors. An engineer brigade headquarters is needed to assume overall control of the Raptors and to arbitrate which BCT will control specific Raptors. This headquarters could also control the resupply of Raptors throughout the division.

The potential elimination of conventional mines by law will significantly impact 21st century engineers and their ability to accomplish countermobility missions. During the DAWE, the division depended heavily on Hornet, Raptor, Volcano, Gator, and ADAM/RAAM munitions. Because these systems are relatively easy to employ, the Iron Brigade emplaced approximately 90 kilometers of obstacles in 30 hours. Engineers may need to re-evaluate the way both air and ground Volcanos are used and how best to control them. We currently use Volcanos mainly as situational obstacles to supplement the commander's obstacle plan. In the Force XXI environment, Volcanos may be the primary countermobility system available to engineers.

Engineer platoon leaders traditionally supervise the siting and emplacement of Volcano minefields. Assuming that the dramatic increase in Volcano use experienced during the 1997 DAWE is accurate, it will be impossible for a platoon leader to directly supervise all Volcano emplacements. This is especially true when Volcanos are used to support a maneuver element on the move by emplacing Volcano obstacles on the flanks. With the platoon leader providing mobility support, the team tasked to emplace Volcanos must travel to an obstacle site with an obstacle intent, adjust the obstacle based on the terrain, emplace an effective obstacle, and link up with the platoon on the move. To accomplish that significant feat, Volcano section and squad leaders require intensive training on the capabilities and employment of the Volcano system. Engineer leaders must follow unit standing operating procedures (SOPs) and incorporate rehearsal requirements into the brigade's defensive plan.

If conventional minefields are eliminated, engineers will depend more heavily on 48-hour duration Volcano and ADAM/RAAM minefields. The ability to rapidly affect mobility over a wide frontage of the battlespace and the lasting effects of 48-hour obstacles will force engineers to adhere strictly to obstacle-control measures. Although adherence to obstacle-control measures has always been important, it will be paramount in the high-tempo and fluid Force XXI environment. Brigade boundaries changed dramatically and often throughout the DAWE, and the brigade's area of interest was much larger than is typical today. Rapid boundary changes require engineers to maintain a greater situational awareness and may require tailoring Volcano munitions to better fit our needs. For example, we may need an 18-hour life span and an off-on-off capability for Volcanos. In any case, engineers must continually coordinate with the engineer brigade, cross-talk between engineer battalions, and strictly adhere to obstacle-control measures to maintain situational awareness in the area of interest.

## Mobility Operations

Mobility operations will not change as dramatically as countermobility operations in the near future, but we noted some important improvements during the DAWE. The Wolverine provides an incremental improvement over the current armored vehicle-launched bridge (AVLB) because it has better mobility and survivability and spans a wider gap. The Grizzly provides engineers with an enhanced mechanical breaching capability and additional flexibility when allocating mobility assets throughout the brigade. During the DAWE, the engineer battalion provided mobility support to an artillery brigade moving through the maneuver brigade sector. The engineer battalion accomplished this mission by attaching a Grizzly team (instead of an engineer line platoon) to the artillery brigade. The DAWE also reinforced the requirement to place engineer assets forward in a maneuver formation. Contrary to some current thinking, technology has not diminished this requirement at all.

Formation of the multirole bridge company (MRBC) is another good mobility initiative. The MRBC consists of a traditional float bridge company plus four 40-meter spans of the new heavy dry support bridge (HDSB). The HDSB eventually will replace the medium girder bridge. Each corps is assigned three MRBCs. In the DAWE scenario, all three companies were controlled by the 4ID. The exercise was fought in a European scenario, which reinforced the requirement for bridging assets. The 4ID had about the right amount of bridging assets to maintain flexibility within the division, but it had the entire III Corps allocation of MRBCs. The division often attacked with two brigades abreast, and each required a minimum of two spans to support an assault river crossing. Engineers may require additional bridging to meet anticipated needs.

Inclusion of a terrain team at the brigade level is a great engineer initiative. The brigade terrain team consists of two noncommissioned officers, two enlisted soldiers, and the Digital Topographic Support System (DTSS). During the DAWE, the DTSS enabled the brigade engineer to generate specialized terrain products within a matter of hours. As other battlefield operating systems' representatives became aware of this new capability, mission requirements for the terrain team increased rapidly. The team generated cross-country mobility overlays, identified tentative river-crossing sites, developed three-dimensional perspectives, masked area plots, and provided various specialty maps. There was a sharp learning curve associated with integrating the team into the brigade planning process. It was compounded by the fact that a chief warrant officer is no longer the link between planners and technical experts. Engineer units must increase the training officers and NCOs receive to take full advantage of this new capability.

The terrain team is most useful when it is integrated early into the planning process. For example, as soon as an area of interest is identified, the terrain team should start preparing general products such as cross-country mobility overlays or river analyses. If a terrain team is added as a slice element during a deployment, it cannot provide this kind of support in advance of the operation. It would help to make the team organic to the engineer battalion, because this would foster a habitual relationship and allow for home-station training. Additional work is needed to develop an SOP and a standard "push package" of terrain products for subordinate task forces. Use of the brigade terrain team was a learning experience for the Iron Brigade, and its full potential has yet to be realized.

## Looking Ahead

Transition to the 21st century brings many exciting changes to the way engineers conduct countermobility and mobility operations. To take full advantage of the new technologies, engineers must change their mindset. Force XXI represents more than the integration of new systems into old doctrine, but several constants will not change. When emplaced on the ground, obstacles will kill friendly as well as enemy forces. Obstacle-control measures, obstacle tracking, and situational awareness remain vital to brigade engineers. Technology has not eliminated the requirement to locate engineers forward in the maneuver formation. A thorough evaluation of the terrain is critical. Engineers will continue to be a valuable combat multiplier in the 21st century battlespace if we can retain critical lessons learned in the past and adapt current doctrine to fully exploit the technologies and ideas of the future.

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