Engineers:
Masters of Terrain

By Colonel Thomas J. Hodgini and Michael L. Fowler

When United States armed forces are called upon, they will be required to quickly achieve "full-spectrum dominance" over any potential enemy. Joint Vision 2010, the vision of the Joint Chief of Staff, states that forces will have to rely on their speed and agility supported by advanced communications and information technology. According to a recent issue of *Defense News*, this vision was largely written by a former commandant of the Engineer School, Lieutenant General Daniel W. Christman.

As the Army enters the 21st century, several factors will require that the Army modify the way it conducts operations. Some of the factors driving this change are new technology, reduced resources, extended battlespace, and the move toward a CONUS-based force. The ability to project ground forces from the continental United States to anywhere in the world is the essence of deterrence for regional conflicts.

Even with these changes, the great battle captains of history would recognize old patterns of war in today's conflicts after overcoming their initial astonishment at the weapons of modern war. Those battle captains did not achieve victory solely on the basis of superior weapons. They also employed doctrine that dominated maneuver and controlled their adversaries.

The Vision

In the 21st century, engineers will master terrain to shape the battlespace. As a key member of the combined arms team, engineers will combine their skills with technologically advanced, information-based systems to give the maneuver commander the conditions he needs for decisive victory. We cannot realistically expect battle leaders to intuitively grasp the value of terrain. Instead we must provide tools and decision aids to build this capability. Terrain visualization technologies offer leaders real-time, three-dimensional capabilities to walk or fly through terrain before deployment and battle. Where the industrial revolution harnessed energy and machines to enhance muscle power, the information revolution harnesses communications, sensors, and computers to enhance brain power. This is the power of Engineer Force XXI (ENFORCE XXI).

ENFORCE XXI is a term that describes the evolution of engineer soldiers and units into the future U.S. Army. While only the shadows of great future events can be dimly perceived in our time, the requirements for the future Army reflect some current conditions. Our current National Military Strategy requires that the Army project military power to compel any adversary to do our will, deter aggression, reassure our allies, and support at home.

ENFORCE XXI incorporates combat engineers within maneuver forces to achieve decisive victory in support of national policies. Tomorrow's operations place engineers as full partners within joint and coalition responses. As partners in information-based operations on the digitized battlefield, engineers are integrated in versatile organizations that can function in both war and stability and support operations across the full spectrum of environments. The ENFORCE XXI organization is easily tailorable, rapidly deployable, operationally agile, capable of leveraging technological advancements, organized around information, and formed with an optimum mix of both the Active and Reserve Components.

Our vision of ENFORCE XXI employs enhanced battle command, information, and technology to empower highly efficient units to accomplish much larger missions in mounted and dismounted battlespace throughout the continuum of operations. The result: increased force lethality and survivability. Leap-ahead technologies enable engineers to emplace obstacles just in time to control the enemy. Areas filled with intelligent munitions allow free passage by friendly forces and coordinated attack on the enemy. Ground robotics systems take the soldier out of harm's way in especially dangerous situations. Engineers predict requirements and base responses on simulated dynamics in a virtual world. Robotics construction equipment, cruise-controlled operating aids, global positioning systems, and range-of-sensor controls bring precision, speed, and nonstop operations to construction. Engineer headquarters mass efforts precisely, monitor execution, and make changes on the move. These engineer operations are key to the success of "full-spectrum dominance."



Mastering Terrain

The engineer mission to master terrain is conducted at all levels of an operation—from task force to theater to strategic levels of CONUS locations—and is dispersed over all of the extended battlefield. Mastering terrain includes four primary functions:

- Force mobility
- Force countermobility
- Terrain visualization
- Force protection

These functions (shown on the front cover) allow the commander to fight where he wills; go where he wills; use the terrain as a weapon; portray the terrain; and mount, sustain, and recover from operations by creating and maintaining an array of lines of communications (LOC). (In Force XXI, the LOC may be a mixture of combat trails, main supply routes, and strategic forced-entry locations.) The four functions also encompass engineer support in defensive areas and combat service support areas as well as the requirement for engineers to fight as infantry when necessary. Detailed descriptions follow.

Force Mobility. The engineer force modifies, overcomes, and uses terrain so the commander can fight where he feels is best for a quick, decisive victory while eliminating as many casualties as possible. This engineer support allows the maneuver commander to focus on tactical operations and frees him from terrain constraints. Force XXI units will rely on mobility to quickly overcome the enemy. Keeping his maneuver forces mobile is a key concern for the commander, and his ability to decide where and when to move should be unrestricted. The engineer force ensures this capability by building and maintaining an entry base in any environment; by finding, fixing, and building routes through any terrain; by eliminating obstacles that might impede maneuverability; and by breaking into defensive structures.

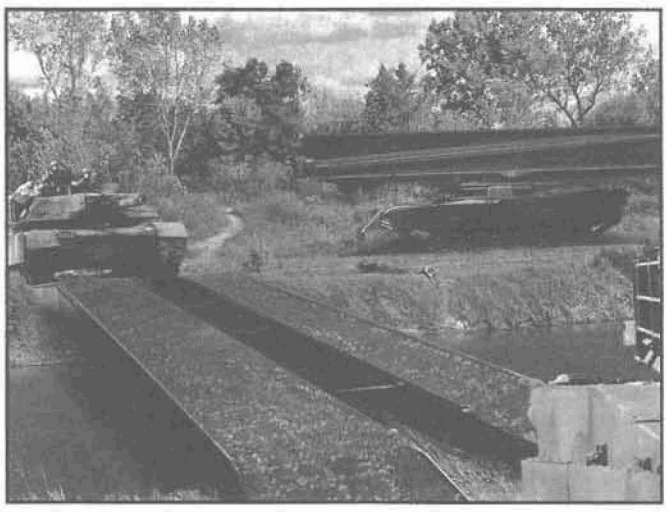
Force Countermobility. Using the terrain as a weapon against the enemy enhances the commander's ability to mass fires for an overwhelming decision. By employing obstacles before and during battle and by disguising terrain reality, engineers cause frustration and confusion for the enemy. These activities disrupt enemy operations and momentum and provide a window of opportunity for our combat forces to initiate their attack.

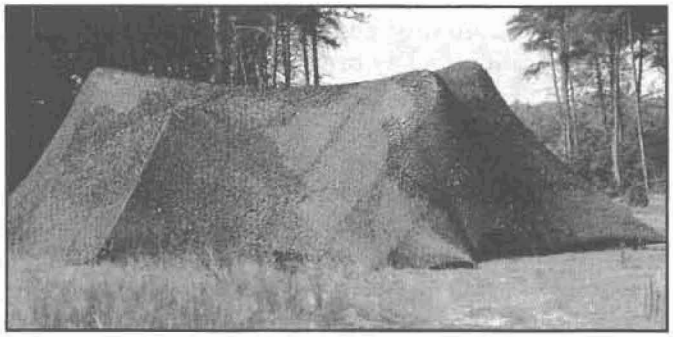
Terrain Visualization. By portraying the terrain as digital images and information, engineers enable the maneuver force to produce a precision engagement. Engineers provide the allied forces' battle command staff with a relevant picture of the battlefield and the detailed terrain data they need to maneuver and make decisions. Providing a terrain picture, detailed analyses on the terrain, and updating video-mapped images in real time are engineer missions that give our forces the information they need to operate in a digitized war. The terrain pictures and analysis tools engineers provide are the underpinnings to all appliqued information used to depict the battlefield.

Terrain visualization has already added to the success of the Army's Advanced Warfighting Experiments (AWEs). Through the Joint Venture axis of Force XXI, AWEs have provided—

- Opportunities to experiment with concepts and emerging systems.
- Methodology to evaluate results.
- Means to modify systems to meet identified requirements.
- Insights leading to optimizing military capabilities.

Additional information about the AWEs is provided in an article beginning on page 5.

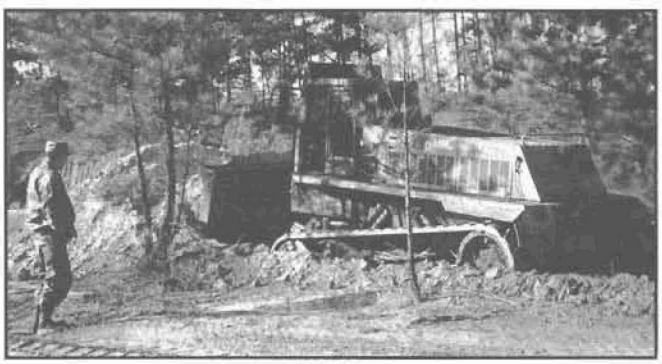




Force Protection. Managing terrain, upgrading terrain, and constructing on terrain yield the capability to reinforce, support, maintain, supply, and reconstitute the force. Modern combat systems and new technologies (such as information-based construction techniques and light-weight, high-strength construction materials) enable engineers to provide more responsive and complete force protection. Throughout all phases of operations, engineers construct and augment initial defenses with fortifications and protective structures; hide the force through wide-area camouflage; and decoy enemy fires, harden critical facilities, and install sensor systems for facility protection. This function provides full-dimensional protection for the force, not only from enemy fire but also from weather, nature, and physical limitations.

In Force XXI, the force-protection function is expanded in at least three areas.

- ***Defensive Positions.*** At different times during an engagement, forces require defensive positions when massing fires. These positions are required for soldiers, armored/mechanized vehicles, artillery, aircraft, and other support equipment. Engineer soldiers provide the expertise and equipment needed to adequately protect the force in areas where they may be subject to enemy fire. In addition to building positions, engineers use camouflage and concealment to increase the survivability of allied forces.
- ***Force Beddown.*** As forces continue to operate, they require areas to regenerate from the fatigue of military missions. Engineers provide the technical expertise to plan, construct, manage, and contract, as required, adequate areas to house, rest, and care for soldiers.



- ***Lines of Communication (LOC).*** Engineer support to the force allows focused logistics by creating and maintaining combat trails and LOC. For the maneuver force to maintain a high level of mobility, their lifeline for supplies must be kept open. Without adequate LOC and routes, combat service support units are unable to deliver the assets needed to keep the force moving and fighting. Engineers design, create, and maintain the LOC in all areas so that traffic can move throughout the battlespace.

In summary, the 21st century engineer leader will continue to be a critical link to the maneuver commander. The leader of Force XXI will control semi-autonomous units over an expanded battlespace. He will use tools such as the Countermobility Remote-Control Computer, the Obstacle Planning System, and the Route Planning and Assessment System. With a solid base in engineer, combined-arms, and joint doctrine, the engineer leader will combine leadership skills, a deep understanding of the terrain, second-nature computer literacy, and overall versatility to provide situationally responsive support.

The Road Ahead

As the Army moves toward a fully digitized force, Army leaders must realize that information alone will not defeat enemies or win wars. Much of the physics of war remains constant. A cubic yard of dirt will require the same amount of energy to move tomorrow as it did in World War II. Mastering terrain is key. Throughout the 21st century, engineers will continue to multiply lethality and dominance for the total force by leveraging terrain. Our 2010 mission of mastering terrain, along with its accompanying four battlefield functions, facilitate our efforts to reach a common vision for the regiment:

"The Engineer Regiment...trained and ready, a rapidly deployable and versatile member of the strategic force...combining efficiencies of information with physical and technical capabilities, to master terrain in support of decisive victory."

The nation will continue to achieve decisive victory, particularly when the full power of our regiment is unleashed to enable power projection, enhance infrastructure, and exploit terrain. Together, all members of the regiment, from the combat engineer soldier through our engineer commands to the USACE Corps Real Estate Support Teams (CREST) and contractors, form the greatest capability to achieve this vision that the world can produce.

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