

ENGINEER VISION 2010

By Major General Robert B. Flowers and Michael L. Fowler

Engineer Vision 2010 is the blueprint for the engineers' contributions to the operational concepts identified in *Army Vision 2010*. It is the conceptual template to show how Army engineers will channel their vitality and innovations and leverage technological opportunities to achieve new levels of effectiveness as an integral part of the combined arms team. *Army Vision 2010* provides a coherent view of the future and the implications for land operations expressed in terms of emerging operational concepts. *Engineer Vision 2010* focuses on the implications of that environment for the fundamental capabilities and contributions of engineers toward the successful conduct of land operations—the ability to provide prompt and sustained engineer support to operations on land throughout the entire spectrum of crisis. *Engineer Vision 2010* identifies the operational imperatives and enabling technologies needed for the engineer force to support the rest of the Army as it fulfills its role in achieving full-spectrum dominance.

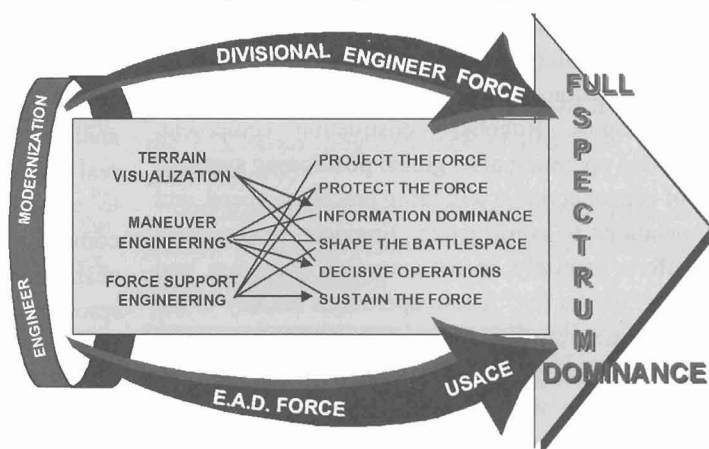
The Vision

United States Army Engineers

- Trained and ready
- A responsive and versatile member of the strategic force
- Exploiting information technologies with effective physical and technical capabilities to master terrain, support the nation, and achieve decisive victory

In the 21st century, through maneuver engineering, engineers will employ obstacles and modify terrain to support maneuver operations and shape the battlespace. As members of the combined arms team, engineers will combine their skills with technologically advanced, information-based systems to give maneuver commanders the knowledge of the physical battlespace, lethality, and force protection they need for decisive victory. Engineers will provide terrain

FORCE XXI PATTERN OF OPERATION ENGINEER ENABLERS



visualization tools and decision aids that offer commanders real-time, three-dimensional capabilities to walk, drive, or fly through terrain prior to and during deployment. To facilitate dominant maneuver, the engineer force will modify terrain and employ state-of-the-art obstacle systems to influence the conduct of enemy operations, facilitate the ability to concentrate friendly forces by securing selected avenues of approach, and reduce or clear natural and emplaced obstacles to ensure freedom of movement for U.S. and allied forces. Force-support engineering will be performed throughout the battlespace to provide essential contributions for sustainment and protection missions and to promote efficient, rapid, and seamless operational transitions.

Engineer primary functions are described as terrain visualization, maneuver engineering, and force-support engineering. The figure above shows how these functions integrate with the Army's pattern of operational construct.

Mission: Mastering Terrain

In the 21st century, engineers will employ enhanced battle command, rapidly disseminated digital information, and advanced equipment technologies to achieve much higher levels of productivity than are possible today. The high operating tempo (OPTEMPO) of mounted and dismounted operations conducted by widely dispersed combined-arms elements will require that engineers be as

mobile, survivable, and sustainable as the forces they support. Situational awareness will enable engineers to quickly emplace obstacles in response to frequent changes in the threat or battlefield conditions. Engineers will control dynamic obstacle systems composed of intelligent munitions to allow free passage by friendly forces while depriving freedom of movement to potential enemies. Unmanned ground vehicles and teleoperated or robotics systems will enable engineers to accomplish hazardous missions without exposing soldiers to unnecessary risk, while providing tremendous increases in productivity. Engineers will predict requirements and base mission planning on simulations and analyses that employ state-of-the-art technologies. Robotics construction equipment, cruise-controlled operating aids, global positioning systems, and range-of-sensor controls will bring precision, speed, and nonstop operations to construction. Engineer headquarters will mass efforts precisely, monitor mission execution, and make changes "on the fly." These operations are key to the success of full-spectrum dominance. The expanded use of tele-engineering from CONUS support activities will provide a significant new capability.

A vital component of the future engineer force is the ability to gain and maintain information dominance. Information dominance will allow the engineer commander to rapidly and accurately assess situations and tailor engineer unit capabilities to suit the mission. Tailored units will be part of a mission-organized force that is designed to meet the maneuver commander's intent.

The principal engineer mission—mastery of terrain—is conducted at all levels of operations and in support of widely dispersed combined-arms forces that operate throughout an extended battlefield. Mastering terrain involves three primary functions: terrain visualization, maneuver engineering, and force-support engineering. These functions support the entire force three ways. They—

- Provide commanders an understanding of the terrain.
- Enable engineers to execute operations that control the enemy's ability to move and fight freely while facilitating the ability of friendly forces to do so.
- Provide engineering support to friendly forces to maintain the tempo of our operations.

These functions enable the commander to portray the terrain; fight where he wills; move where he wills; use the terrain as a weapon; and mount, sustain, and recover from operations by creating and maintaining an array of lines of communication (LOC). The LOC include combat trails, main supply routes, strategic entry locations, facilities, airfields, logistics bases, etc. The primary functions also encompass engineer support in defensive and combat

service support areas. The requirement remains for engineers to fight as infantry whenever and wherever necessary.

Terrain Visualization. Engineer analyses of integrated joint, allied, and commercial data allow the commander to understand and "see" all dimensions of the battlespace before and during operations. By converting terrain images and other information to digital terrain data, engineers provide terrain information that relates information and data generated by every other Army battle command system to the operational environment. Engineers provide the allied forces' battle command staff with detailed knowledge of the battlespace and the precise terrain data needed to make informed battle-command decisions. By providing a terrain picture, detailed analyses of the terrain, and updating video-mapped images in real time, engineers give our forces the information they need to operate. By forecasting terrain changes over time, the commander can adjust and preplan engineer support for changes in the battlespace due to time, weather, degrading resources, etc. Digital terrain data and analysis tools underpin all information technologies friendly forces use to depict the battlefield.

Maneuver Engineering. The engineer force modifies, overcomes, and uses terrain so the commander can set the conditions for battle and achieve decisive victory while minimizing friendly casualties. This engineer support allows the maneuver commander to focus on tactical operations with advice on the best use of terrain, which allows him to set the stage for precise maneuver. Force XXI units will rely on their mobility and firepower to quickly overcome the enemy. Mobility is a key concern for the maneuver commander, and his ability to decide where and when to move must be unrestricted. The engineer force ensures this capability by building and maintaining lodgments in any environment; by finding, fixing, and building routes through any terrain; by eliminating obstacles that may impede maneuverability; and by breaching entryways into defensive structures in a MOUT (military operations in urban terrain) environment.

By using terrain as a weapon, the commander can precisely locate target sets for direct and indirect fires. By employing obstacles before and during battle and leveraging the natural, restrictive effects of terrain, engineers cause anxiety, fear, and confusion for the enemy. Obstacles affect the enemy's ability to operate and disrupt his operations and momentum, thus providing opportunities for friendly forces.

Force-Support Engineering. 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 support provides full-dimensional protection from enemy fire, weather, the environment, and physical

limitations. Managing terrain, upgrading terrain, and construction yield friendly forces the capability to reinforce, support, maintain, supply, and reconstitute the force. Modern combat systems and new technologies (such as information-based construction techniques and lightweight, high-strength construction materials) enable engineers to provide more responsive and complete force protection.

Throughout combat operations, forces require protective positions. These positions are for soldiers, armor/mechanized vehicles, artillery, aircraft, and other 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 protective positions, engineers use camouflage and concealment to increase force survivability.

As operations continue, the force requires areas to conduct reconstitution operations. Engineers provide the technical expertise to plan, construct, manage, and contract, as required, adequate areas to lodge and care for soldiers.

Engineer support to the force contributes to focused logistics by creating and maintaining supply links. For the maneuver force to maintain mobility, their supply lifeline must remain open. Without adequate supply links, combat service support units are unable to deliver assets needed to keep the force moving and fighting. Engineers design, create, and maintain LOC in all areas so that traffic can move throughout the battlespace.

Engineer Leaders

In the 21st century, engineer leaders will continue to be critical advisers and planners for the maneuver commander. Engineer leaders will control teleoperated or semi-autonomous units over an expanded battlespace. They will use tools such as the Centurion (a dynamic obstacle-control system), the Maneuver Control System-Engineer, and the Route Planning and Assessment System. Engineer commanders will link with world-class experts and remote databases to enhance their ability to solve problems in the battlespace. With a solid base in engineering, combined-arms operations, information operations, and joint doctrine, engineer leaders will combine leadership skills, a deep understanding of the terrain, second-nature computer literacy, and overall versatility to provide situationally responsive support.

The Future

The road leading to Engineer 2010 will be one with many curves caused by limited resources, increased OPTEMPO, and added responsibilities. To assist in mapping our future, the U.S. Army Engineer School has chartered five new integrated concept teams (ICTs), which

will develop the operational concepts for Engineer 2010. The five ICTs are: Heavy Force Engineer Operations; Light Force Engineer Operations; Theater Support Engineer Operations; Terrain Visualization; and Engineer Command, Control, Communication, Computers, and Intelligence (C4I). The ICTs are described on page 10. The Engineer School will distribute the information and plans developed by these ICTs via the school's homepage on the Internet. We request that you take time to review this information and provide us your comments and suggestions. With your help, the engineer force will continue to be a responsive and versatile member of our nation's strategic military team.



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The Road to a Regimental Vision

The Engineer Regiment's vision will be a capstone document to show the value our diverse regiment adds to the total Army as we enter the 21st century. The mission to develop a Regimental Vision was initiated by LTG Joe Ballard and MG Robert Flowers on 27 February 1998. Over the next few months, a support team will develop a first draft of the vision. A list of the milestones the support team will meet during the development process follows:

<u>Date</u>	<u>Task</u>
(1998)	
March	Support team develops draft Regimental Vision.
April	Workshop conducted at ENFORCE XXI-98.
June	Support team updates draft.
July	General officers review draft and develop an implementation strategy.
October	Regimental Vision published.
(1999)	
February	General officers assess progress and revalidate vision.
April	Regimental Vision and progress report briefed at ENFORCE XXI-99.

Integrated Concept Teams

Engineers will formulate future requirements through the efforts of five integrated concept teams (ICTs). The ICTs will develop engineer operational requirements for the Army beginning in the year 2010.

Heavy Force Engineer Operations

Senior Sponsor: Colonel Don Riley

Executive Secretary: Major Charles Radke

The Heavy Force Engineer Operations ICT will develop an operational concept for heavy maneuver engineering, validate existing capabilities or develop new operational capabilities for the future engineer force to support ground-based mounted maneuver in the 21st century, and evaluate modernization requirements based on required future capabilities. The concept will be based on results of the Division Advanced Warfighting Experiment and the resulting force structure redesign (see article, p.16). The concept also will outline the capabilities required for engineers beyond 2010.

Light Force Engineer Operations

Senior Sponsor: Colonel Edwin Janasky

Executive Secretary: Michael Fowler

The Light Force Engineer Operations ICT will develop an operational concept, validate existing capabilities or develop new operational capabilities the future light engineer force will need to support light operations in the 21st century, and evaluate modernization requirements based on required future capabilities. This operational concept will address tasks required by light engineers and outline the changes required to accomplish this role.

Theater Support Engineer Operations

Senior Sponsor: Colonel Tim Daniel

Executive Secretary: Michael Fowler

Echelons above division (EAD) engineers play a vital role in augmenting the mobility, countermobility, survivability, and general engineering required by all divisional engineers. This ICT will define the missions required for EAD engineers, determine an adequate engineer structure, and develop an optimal mix of engineer units (combat heavy battalions, wheeled battalions, mechanized battalions, combat support engineer companies, and multirole bridge companies).

Terrain Visualization

Senior Sponsor: Colonel Robert Kirsch

Executive Secretary: Jeb Stewart

The Terrain Visualization Concept was approved by TRADOC in July 1996. Even though this concept is relatively new, the accelerated pace of technological improvements in digitization, information dominance, and terrain visualization capabilities requires that it be updated. This ICT will update the Terrain Visualization Concept to define the future role of terrain visualization and the future capabilities that the engineer force will require to accomplish this role.

Engineer Command, Control, Communications, Computers, and Intelligence (C4I)

Senior Sponsor: Colonel C. M. Ferguson Jr.

Executive Secretary: Major Charles Radke

Every mission that engineers are called to accomplish includes C4I. Engineer C4I must be part of the overall Army C4I architecture. The engineer C4I ICT will validate engineer C4I requirements, ensure their compatibility with the Army's C4I plan, and develop a total, integrated modernization strategy for engineer C4I that includes requirements for topographic digital terrain data.