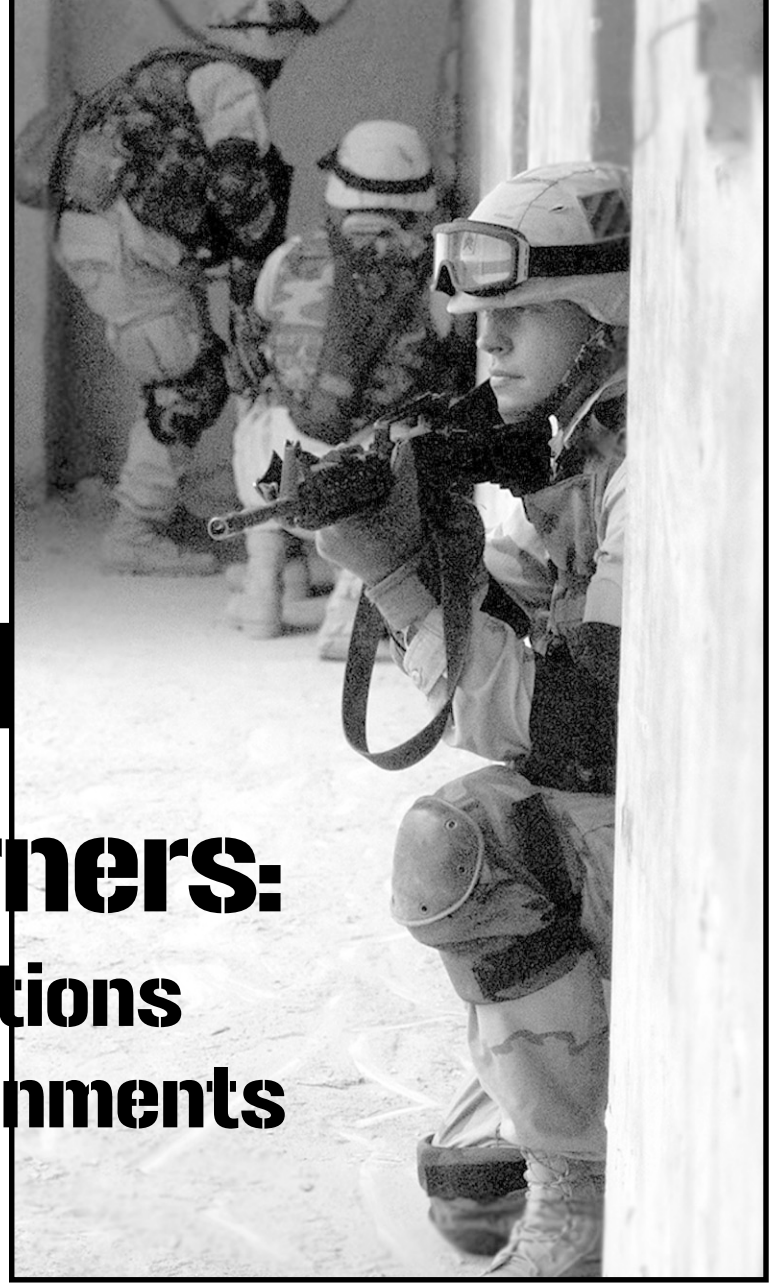
Breaching Around Corners:

Engineer Operations in Urban Environments



By Lieutenant Colonel Anthony C. Funkhouser

The Department of Defense and the Army recently published new strategic-, operational-, and tactical-level doctrine for urban operations: Joint Publication 3-06, *Doctrine for Joint Urban Operations*; Field Manual (FM) 3-06 (Doctrine Review and Approval Group [DRAG]), *Urban Operations*; and FM 3-06.11, *Combined Arms Operations in Urban Terrain*. The Army has long published doctrine on military operations on urbanized terrain (MOUT), but the previous doctrine was typically constrained to tactics, techniques, and procedures at the brigade level and below. The doctrine was flexible and allowed commanders the option to enter a city or isolate it and bypass. Due to the complex nature of urban operations, commanders typically opted to isolate and bypass. However, this may no longer be a solution. We now face adversaries that use asymmetric tactics and/or terrorism because there are few who can directly oppose America's combat capabilities. Future threats may use cities to negate our technological advantage and use the civilian population to impede and complicate operations. Commanders may enter cities to pursue the threat or to seize intermediate objectives. For this reason, it is imperative that engineers understand the potential problems under all these circumstances.

The newly published doctrine provides a new urban operational framework—*assess*, *shape*, *dominate*, and *transition*. This provides a means for the commander to frame how he visualizes, describes, and directs the urban fight. The two new Army manuals provide limited considerations for engineer missions. Many of our maneuver peers, and even engineers, think of engineer operations as solely limited to combat operations (mobility/countermobility/survivability). However, at the operational and tactical levels, engineers provide significant contributions from the geospatial and general engineering functions. The following paragraphs describe some additional battle command considerations for engineer operations in urban terrain. This article examines the *assess* portion of the urban framework as a primer to stimulate thought.

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Engineers in MOUT

As the commander frames the urban fight, he begins with an assessment of the terrain, the threat, and friendly capabilities.

See the Terrain

The complexity of urban terrain demands map products that provide a common operational picture for the commander to visualize the urban three-dimensional terrain. The National Imagery and Mapping Agency, Alexandria, Virginia, produces urban terrain imagery. There are a number of commercial off-the-shelf software products like FalconView™ and Tactical Operational Scene (TopScene™) that use satellite imagery and allow a fly-through capability. However, these products do not provide detailed infrastructure information such as utilities, sewer systems, and bridges. This important information that maneuver commanders need to make informed decisions can be accessed through the U.S. Army Corps of Engineers Topographic Engineering Center, Alexandria, Virginia, which has developed an Urban Tactical Planner software program intended to support MOUT. It is a compact, field-ready suite of urban terrain data and geospatial analysis tools. These tools facilitate rapid visualization of key aspects of the urban environment, including buildings, roads, railroads, streams, forests, marshes, water bodies, and vertical obstructions. It uses streamlined data sets to provide the greatest amount of data in a small, easy-to-use package. The product is designed to be produced on short timelines to meet contingency planning requirements as they arise. Urban Tactical Planner provides an overview of the urban terrain in the form of maps, imagery, elevation data, perspective views, handheld photography, video clips, scanned building plans, tables, and text. The data is structured for use with ArcView® 3.0a Geospatial Information System (GIS) software—the most common commercial off-the-shelf desktop GIS. ArcView 3.0a, the basic software used by the Army's Digital Terrain Support Systems, allows terrain teams to manipulate data and apply unit-specific control measures. The Topographic Engineering Center provides databases for many cities on its Secret Internet Protocol Router Network (SIPRNET) Web site at <*tec.smil.mil*.>

Soldiers operate in the confined space of a MOUT environment.

"Engineers enable maneuver commanders freedom of maneuver within the urban environment to accomplish their mission."

See the Enemy

As we examine the threat in the urban environment, we know that no matter how a threat fights (whether from house to house or in concentric circles or concentric circles with strong points), the maneuver commander will face the challenges of moving through a dynamic environment filled with complex obstacles. Urban obstacles may include existing debris, furniture, vehicles, wire, and rubble. These alone hinder the maneuver of units but are complicated with the movement of civilians throughout. Civilians can be considered dynamic impediments to maneuver and must be influenced away from the route. To complicate matters even further, the threat may introduce mines and other improvised explosive devices (IEDs). No longer in a two-dimensional plane, mines not only may be placed under roads but also may be positioned for a side or top attack mode that is command detonated or activated. Antipersonnel (AP) mines, IEDs, and booby traps may also be used in many areas, buildings, and other likely avenues of approach.

Recent urban combat experiences in Northern Ireland, Grozny, Jenin, and Afghanistan reveal an accelerated adaptation to countermeasures developed by friendly forces. The threat will also adapt and use IEDs to complicate our detection and neutralization efforts. Examples of recent IEDs found around the world include remote detonation devices using electronics, radio control, or even cellular telephones to initiate the systems. These methods are all shared via the Internet. So what British Forces encounter in Northern Ireland may soon confront our soldiers in another urban area of operations. Some current IED techniques are as follows:

Coupling. One mine or explosive is linked to another, usually with a detonating cord. When the first device is detonated, it detonates the linked explosive. This technique is often used to defeat countermine equipment such as mine rollers. When the linked devices are directional fragmentation mines, they can create a large, lethal engagement area.

Boosting. Buried low-metal mines are stacked atop one another, and the farthest mine from the surface is fuzed. This reduces the probability of detection and increases the force of the blast.

Sensitizing. This technique is used with antitank (AT) mines. On some nonmetallic AT mines, the pressure plate can be cracked and the spring removed to reduce the pressure required to initiate the mine. Similarly, the pressure plate can be removed from metallic AT mines for the same effect. Alternatively, a pressure-fuzed AP mine can be placed atop an AT mine thus creating a very large AP mine.

Daisy-Chaining. Command-detonated AP mines are commonly used in daisy chaining. Enemy forces link the mines with trip wires or detonating cord. When the initial mine is detonated, the other mines will detonate. This creates a large, lethal engagement area.

The threat will also take advantage of survivability within the urban environment by digging in open areas and using existing infrastructure to conceal positions. We can expect the threat to maintain mobility between positions to interdict friendly lines of communication and to reinforce his own positions. FM 3-06 (DRAG) highlights that historically, the threat will resist his own isolation more than any other friendly effort. Since we can never achieve a 100 percent isolation, the resulting movements impact on potential future maneuver operations.

Another key to understanding an urban environment is assessing the threat's general engineering capabilities. Adversaries have general engineering capabilities in their own forces or host nation to maintain utilities and infrastructure. They have access to commercial equipment and experts to repair destroyed targets. As friendly forces target and destroy utilities or reduce their capabilities, the threat may dispatch its own forces to rapidly repair or improvise a means to maintain the capabilities we are attempting to eliminate.

See Yourself

We will seek to maintain freedom of friendly maneuver and deny threat movement throughout the urban terrain. Engineers enable maneuver commanders freedom of maneuver within the urban environment to accomplish their mission. The fundamentals for success will be our ability to—

- Predict actions and circumstances that could affect maneuver.
- Detect using early indicators of impediments.
- Act early to prevent potential impediments from affecting maneuver.
- Avoid impediments by identifying alternate routes.
- Neutralize by reducing or overcoming impediments.
- Protect the force against the effects of threat and impediments.

Friendly capabilities vary by unit. What friendly assets allow us to achieve these fundamentals? Prediction capabilities include all the intelligence, surveillance, and reconnaissance

capabilities within the organization but may be dependent on human intelligence. Current detection capabilities are limited for operations within the urban terrain. Capabilities include dozers with mine-clearing armor protection, robotics such as the Matilda, the Improved Vehicle-Mounted Mine-Detection System (IVMMDS), sappers with mine detectors such as the AN/PSS-12 or Handheld Standoff Mine-Detection System (HSTAMIDS), and coalition and/or contracted mine dogs.

Mines and booby traps are never more difficult to detect than after they are emplaced; that is why prediction and interdiction or prevention are so important. These detection assets are extremely limited within the engineer inventory, and operations within multiple or major urban areas will exhaust detection capabilities quickly. Detection training will need to occur before deployment as well as in theater to train on the adaptive enemy's techniques.

Neutralization capabilities include mine-clearing line charges (MICLICs), Panthers, plows/rollers, mine flail systems, the Antipersonnel Obstacle Breaching System (APOBS), launched grapnel hooks, explosive ordnance disposal (EOD), specialized equipment and training (sets, kits, and outfits), ladders/bolt cutters/rescue saws, and contract support for additional capabilities. None of these systems by themselves can do it all, but good engineers will determine what combinations of resources are available to accomplish the mission. The combat engineer vehicle (CEV) no longer provides rubble removal under armor. It is questionable whether the M9 armored combat earthmover (ACE) has the mass and traction to push rubble. Therefore, we need to explore other options. In Jenin, the armored D9 dozer has proved its worth in the urban fight. However, if it is not available, could we integrate an M88 recovery vehicle forward to lift vehicles out of our way when a blade vehicle may not have room to displace the rubble or other material?

Also, how do we work with EOD units forward and leverage their capabilities to identify, render safe, and dispose of unexploded ordnance (UXO) and IEDs to minimize collateral damage? Engineers must work with EOD personnel early in the planning phase to organize and delineate responsibilities for the execution of mobility operations. Potential operations may have engineers detecting, marking, and bypassing IEDs, allowing EOD personnel to render them safe and minimize harm to civilians in the area. Civilians will be a significant issue for our forces. They may not move to relocation areas and will be intermingled with our adversaries throughout the areas of operation. So what assets are available to move civilians from potential maneuver routes?

Nonlethal weapons may also provide an option to the commander, depending on the situation. There are a number of systems available that the military police have proponency for. (For more information, see *Military Police, The Professional Bulletin of the Military Police Corps,* April 2003). Therefore, engineers will have to work closely with the military police as we develop courses of action to deal with civilians along our routes.

Other Considerations

Other friendly force considerations include providing force protection, solving logistical issues, minimizing collateral damage, and accessing expertise to remote areas.

Force Protection. A major concern for all commanders is force protection of all these unique capabilities. In a three-dimensional environment, a unit's flank is always exposed to a potential threat. Therefore, as we maneuver through the urban environment, engineers need to simultaneously conduct countermobility operations to protect the flanks within a compressed area of operations. Protection of engineers will be vital as they are exposed to a wide range of IEDs. Concurrent training for engineers and maneuver forces on the most recently identified threat capabilities in the area of operations will improve protection of engineers and the combined arms team. Another lesson learned from Jenin and Grozny is the removal of all flammable materials from the outside of combat vehicles. Urban forces should consider increasing their requirements for fire extinguishers as the potential for fire increases in the urban area.

Logistics. Historically, certain key classes of supplies are consumed at a higher rate in urban operations—as much as five to ten times normal consumption rates. As a result, friendly forces can anticipate an increased logistical requirement for hauling supplies for urban operations and moving critical engineer assets. Since engineers tend to use large items for barriers in isolation operations, acquiring dedicated assets may become a problem. Engineers will have to be resourceful and use existing materials in the urban area to their advantage. It may require "urban foraging," which can range from contracting materials to confiscation. Engineers should conduct a thorough assessment of the urban area to identify potential locations for engineer equipment and materials to reduce haul requirements.

Collateral Damage. Collateral damage alters the urban landscape and may harm civilians. It may also impede movement along previously cleared routes and affect civilian behavior and movement. Therefore, engineers—as the terrain experts—should anticipate where collateral damage may occur and predict the impact on future operations. This engineer battlefield assessment capability may have direct influence on priority intelligence requirements and the entire force. This is no easy feat, but it is one that engineers will be expected to perform.

The Engineer Research and Development Center, Vicksburg, Mississippi, has a new software program called the Simplified Survivability Assessment that captures information and technical data from Technical Manual (TM) 5-855-1, *Design and Analysis of Hardened Structures to Conventional Weapons Effects*. The software allows users to calculate the potential damage created by various weapons on a variety of structures, estimates the protection required against various weapons, calculates overhead cover, and includes a survivability timeline program.

Friendly Capabilities. When assessing our friendly capabilities, we must examine our general engineering capabilities and requirements. General engineering will occur throughout the urban fight and may be the main effort during stability and support operations. As General Krulak, United States Marine Corps, said, "In one moment in time, our service members will be feeding and clothing displaced refugees—providing humanitarian assistance. In the next moment, they will be holding two warring tribes apart—conducting peacekeeping operations. Finally, they will be fighting a highly lethal midintensity battle. All on the same day, all within three city blocks. It will be what we call the three-block war."

We cannot expect civilians to leave cities. They will remain in their homes, and their requirement for services such as food, shelter, water, and medical treatment may outstrip our capability to provide. Therefore, we may be responsible for requirements such as sewage, electricity, and public order. Many engineer units located at echelons above corps, such as engineer commands, may be available to provide specialized capabilities and assist in these missions. If construction engineers and civil affairs personnel are not available immediately after combat operations, then units and combat engineers must initiate general engineering operations for stability or support operations.

Another general engineering capability available to the operational commander is field force engineering—a reach capability by deployed forces to the engineer commands, the U.S. Army Corps of Engineers, and even the Engineer School for virtual collaboration. This allows access to services and technical expertise to these geographically dispersed units in the field.

Summary

As you can see, many engineer requirements have second- and third-order repercussions that the commander must think through. The same process for the engineer battlefield assessment and military decision-making process applies to urban operations, but now we need to consider how the new threat will fight and what new capabilities we have. When the mission finally concludes, engineers must be prepared to transfer functions and responsibilities from military to civil authority or to another agency. This article provides a means to begin thinking through the urban fight and how engineers will make their contributions.

Lieutenant Colonel Funkhouser commands the 5th Engineer Battalion in Iraq. Previous assignments include Chief, Doctrine Development Division, U.S. Army Engineer School, Fort Leonard Wood, Missouri. In that capacity, he spent three months with the Battle Command Training Program-Operations Group F, specializing in urban operations. He also participated in the United States-Israeli Urban Operations Work Group in Tel Aviv, Israel.

Photos by SGT Kevin Doheny, 19th Public Affairs Detachment