Chapter 12: Engineer Support

This page is a section of TC 7-100.2 Opposing Force Tactics.

The OPFOR realizes that engineer support is vital for the successful execution of combat. Due to the fluid nature of modern combat, effective engineer support is essential for ground forces to employ or preserve combat power, as the conditions dictate. Engineer support can give combat forces the ability to maneuver quickly to exploit windows of opportunity. It can help change the nature of the conflict to something for which the enemy is not prepared.

Adaptive Engineer Support

OPFOR engineers must be flexible enough to support two basic types of combat. The first is the fight against a less powerful neighbor, in which the OPFOR expects to dominate what is generally a traditional, conventional fight. The second is the fight against a more powerful force, a fight in which the OPFOR expects to be overmatched in at least some conventional capabilities. When the enemy is the dominant force in the region, this will likely compel the OPFOR to fight a defensive fight. In order to defeat this more powerful enemy, the OPFOR employs innovative, adaptive tactics to mitigate the enemyâ s advantages. An example of this innovativeness is the manner in which the OPFOR attempts to change the nature of the conflict. To accomplish this, the OPFOR attempts to place the enemy on the defense rather than offense, wherever possible. One means of accomplishing this is the constant and ubiquitous use of mine warfare. There is no sanctuary for the enemyâ s mines are everywhere. Two examples of this areâ

- Emplacement of â toe-popperâ mines on enemy foot traffic routes to produce wounds, not kills. This stresses the medical evacuation system and creates tentativeness among enemy soldiers. This could be tied in with attacks on the enemyâ s medical evacuation system.
- Maximum use of antihelicopter mines against possible attack helicopter firing positions or landing zones.

Other examples of adaptive methods engineers are likely to employ against a more powerful enemy (in addition to methods used in a more conventional battle) are interspersed throughout this chapter.

Missions and Tasks

The primary engineer missions performed in combat are reconnaissance, mobility, countermobility, and survivability. (See sections below on each of these missions.) Some examples of specific engineer tasks required to support those missions are toâ

- Conduct engineer reconnaissance of the enemy and the terrain.
- Prepare and maintain routes of movement and supply.
- Clear passages through obstacles and areas of destruction.
- Perform demolition work.
- Establish and maintain water obstacle crossings.
- Establish and improve engineer obstacles.
- Prepare fortifications.
- Protect personnel and equipment from the effects of conventional direct and indirect fires, precision munitions, and chemical, biological, radiological, and nuclear (CBRN) strikes.
- Carry out engineer measures to eliminate the aftereffects of CBRN weapons.
- Support information warfare (INFOWAR) and carry out engineer camouflage, concealment, cover, and deception (C3D) measures.
- Extract and purify water and establish water supply points.

See tables 12-1, 12-2, and 12-3 for how these tasks support the preparation and conduct of offense, defense, and tactical movement, respectively.

The OPFOR plans the complete integration of civilian and military engineer resources. For example, maneuver commanders may use civilian earthmoving, road-building, and construction equipment and personnel in support zones. This allows constituent combat engineer equipment and personnel to accompany maneuver forces in battle. Civilian workers or maneuver units can perform many basic combat engineer tasks, with engineers providing guidance and technical expertise.

Engineer tasks are a shared responsibility throughout the OPFOR. For instance, combat troops, as well as engineers, perform mine warfare tasks such as minelaying, minefield recording, and mine removal or breaching. Engineer and combat arms personnel also perform survivability tasks such as constructing fortifications, clearing fields of fire, and camouflage. The same is true for water obstacle crossings, where some units and equipment can ford, swim, or snorkel across with little or no engineer support. Although the highest level of engineer training and the greatest technical capabilities exist in the engineer troops, all military personnel and units train in fundamental engineer tasks.

The OPFORâs intent is to make the entire force as flexible and capable as possible while minimizing dependence on limited engineer support. This allows maneuver forces to autonomously execute rudimentary or basic engineer tasks. It also frees the engineer troops toâ¯

- Perform engineer-specific or critical tasks supporting the maneuver commanderâs intent.
- Exploit and expand successful engineer effort begun by the combat troops.
- Support units that have little or no engineer capability.

Offense

During preparation for the offense, the engineers focus on four major activities:

- Preparing routes for the advance and employment of combat forces.
- Providing survivability support to units in assembly areas.
- Establishing passages in obstacles and minefields.
- Establishing and maintaining crossings over water obstacles.

Table 12-1 identifies these, along with other specific engineer tasks required to support the actual conduct of offensive actions.

During the offense, the engineersâ primary mission is to support the attack and assist in maintaining a high tempo of combat. Once the attack has started, engineer troops continue to perform tasks contributing to high rates of advance. Occasionally, they create obstacles to protect flanks, disrupt counterattacks, and block enemy reinforcements. Ongoing engineer reconnaissance is performed independently or in conjunction with other reconnaissance elements.

The OPFOR views commitment of exploitation forces or reserves as one of the most critical and vulnerable periods of combat. Engineer troops play a vital part in ensuring its success. They ensure the forceâs timely arrival on the line of commitment and provide support for its deployment and protection against flank attacks.

Table 12-1. Engineer support for preparation and conduct of the offense

Tactical Missions Requiring Engineer Support	Engineer Technical Tasks
Movement forward, deployment, and transition to the offense.	Conduct engineer reconnaissance of enemy and terrain.
Preparation of assembly areas.	Prepare fortifications in assembly areas.
Crossing water obstacles.	Clear passages in obstacles and perform demolition work.
Supporting disruption and battle zones.	Establish and maintain water obstacle-crossing sites.
Repelling counterattacks.	Establish obstacles.
Penetration of enemy defenses.	Extract and purify water and establish water supply points.

Conduct of the battle. Commitment of exploitation force or reserve. Reinforcing captured positions.	Carry out engineer C3D measures. Prepare and maintain movement routes. Eliminate aftereffects of CBRN strikes.

Defense

When the enemy is the dominant force in the region, the OPFOR generally fights a defensive fight. In order to defeat a more powerful force, the OPFOR employs innovative engineer methods to mitigate the enemyâ€™s advantages, in addition to those employed in the more conventional battle.

Engineer support for the defense focuses on reconnaissance, countermobility support, and survivability support. It places emphasis on fortifying battle positions and assembly areas, performing engineer C3D measures, and adapting the terrain for defense. The defense is also conducive to the extensive use of various obstacles to interfere with the enemyâ€™s advance.

The general aims of engineer support the defense includeâ€”

- Controlling access and tempo by delaying, disaggregating, and canalizing enemy forces.
- Establishing conditions necessary for organizing the defense.
- Ensuring the integration of engineer support to INFOWAR and preparing deception positions.

Table 12-2 identifies specific engineer tasks required to support defensive actions.

Table 12-2. Engineer support for preparation and conduct of the defense

Tactical Missions Requiring Engineer Support	Engineer Technical Tasks
Repelling enemy attacks in front of the battle line. Preparation of defensive areas. Troop movement. Battle to hold positions. Repelling enemy penetrations of defense. Overcoming covering force zone. Counterattack by exploitation forces or reserve. Reinforcing lines taken in counterattack. Transition to the offense.	Conduct engineer reconnaissance of enemy and terrain. Prepare fortifications in battle positions and assembly areas. Clear passages in obstacles and perform demolition work. Establish and maintain water obstacle-crossing sites. Establish and improve obstacles. Extract and purify water and establish water supply points. Carry out engineer C3D measures. Prepare and maintain movement routes (for maneuver and supplies) Protect personnel and equipment from the effects of conventional direct and indirect fires, precision munitions, and CBRN strikes. Eliminate aftereffects of CBRN strikes.

The type and scale of engineer support depends on the tactical situation, enemy forces, and the conditions under which the OPFOR assumes the defense. If the OPFOR does so during the course of the offense, support may have to begin with the protection of threatened axes by obstacle detachments (ODs) and antitank reserves (ATRs) and the improving of routes needed for regrouping. If the OPFOR assumes a defense when not in contact with the enemy, support can begin with the creation of defensive works and the improvement of routes necessary for the OPFOR units to deploy. In both cases, engineer work supports development of the battle position by enhancing the effectiveness of OPFOR weapons and protecting personnel and equipment from the effects of conventional fire and weapons of mass destruction.

In the disruption and battle zones, the goals of engineer support are to hold up the enemy advance. In battle zones, engineer support facilitates organized withdrawal, maneuver, or counterattack by friendly forces. Defensive planning measures ensure extensive use of obstacles, integrated with preplanned direct and indirect fires, to affect the enemyâ€™s advance and facilitate his destruction.

Command and Control

Engineer units allocated to a tactical group in constituent or dedicated relationships may be retained directly under the command of the tactical group commander. However, rather than keeping all organic and allocated engineer assets under his direct command and control (C2), the tactical group commander may suballocate some of his constituent or dedicated engineer units to his subordinate units. Additionally, tactical group commanders controlâ ¯but do not commandâ ¯other engineer assets that are allocated to them in a supporting relationship.

In the case of a division tactical group (DTG), the commander can allocate engineer units to his integrated fires command (IFC) and/or integrated support command (ISC). Some engineer units may be grouped under the integrated support groups (ISGs) that perform combat support tasks for the IFC or the DTG.

Staff Responsibility

In maneuver divisions, brigades, and tactical groups, engineer officers are permanent members of functional staff subsections under the chief of force protection and the chief of infrastructure management. Additionally, an engineer liaison team from each subordinate or supporting engineer unit supports the staff. These teams provide the operations officer with detailed expertise on engineer functions and provide a direct communications conduit to subordinate and supporting units executing such functions. Based on the advice of the liaison teams and coordination with the engineer units through the respective liaison teams, the functional staff chiefs advise the operations officer and/or the commander on engineer employment within their functional areas. The senior engineer team leader is designated as the chief of engineer liaison teams (CELT) and is the primary staff advisor to both the operations officer and the maneuver commander. In those units without liaison teams, the senior engineer serves as the CELT.

Other liaison teams may fall under the chief of current operations, to advise and assist in mobility and countermobility functions. The engineer liaison teams also coordinate, as necessary, with other staff elements, including the chief of INFOWAR. Liaison team leaders speak for the commanders of their respective units.

The maneuver commander specifies the tactical combat action(s) of his subordinate and supporting units, their start time and duration, and the area for these actions to take place. With this information, the engineer officers on his staff determine the required engineer missions to support the maneuver commanderâ s plan. They prioritize engineer efforts to execute the technical tasks necessary to accomplish the overall mission. They can then determine the appropriate mix of troops, equipment, and materials necessary to perform the tasks under current conditions. They advise the commander and his staff on the best employment of available engineer assets to support the maneuver commanderâ s mission, intent, and objectives.

The engineer liaison teams keep their respective engineer unit commanders informed of requirements for engineer support and pass on any guidance from the maneuver unit commander and staff on possible task-organizing. Then they monitor the execution of the directed missions. They provide input to the maneuver commanderâ s combat orders and battle plans, the reconnaissance plan, the obstacle plan, and deception plans. They help organize the crossing of water obstacles and other barriers, and the preparation and maintenance of movement routes. They coordinate with the division, brigade, or tactical group chief of logistics regarding the preparation, improvement, and maintenance of supply and evacuation routes.

The main steps that the liaison teams perform in support of combat actions areâ ¯

- Helping the engineer unit commander decide the appropriate organization of engineer support and reporting it to the maneuver commander.
- Participating in the reconnaissance conducted by the maneuver commander.

- Monitoring the completion of tasks by engineer units during the preparation for, and conduct of, combat.
- Reporting the status of engineer support to the maneuver commander.

Task-Organizing

There are no doctrinal constraints on task-organizing for mission success. The ability to allocate assets downward and to task-organize is restrained only by the availability of assets and the nature of the mission. If the necessary assets and/or capabilities are not available within the organization, the OPFOR commander will request the appropriate assets through his higher headquarters.

Engineer assets generally are constituent at no lower than brigade level. However, the OPFOR prefers to task-organize for mission success at even lower levels, when the assets are available. This may dictate that, instead of maintaining engineer units in their original composition, the commander may choose to break them down and combine them into smaller multirole engineer support elements. These engineer elements range in size from companies down to multirole platoons and engineer squads.

Engineer assets deploy throughout the battlefield and perform numerous distinct missions simultaneously during the course of the battle. In this way, route-clearing assets perform one function, while others perform demolitions, lay mines, construct obstacles, prepare battle positions, or set up water purification sites. Occasionally, the combined arms commander can also allocate to these groupings additional non-engineer assets, such as artillery, tank, or infantry troops. He can also augment maneuver elements with the engineer groups.

The following is a list of typical task-oriented engineer groupings:

- Obstacle detachment (OD, see Countermobility).
- Movement support detachment (MSD, see Mobility).
- Engineer reconnaissance patrol (ERP, see Engineer Reconnaissance).

Support to Information Warfare

The complete integration of engineer support of INFOWAR is critical at the tactical level, especially when fighting a powerful enemy. Deception is one of the basic elements of INFOWAR. Engineer support of the deception plan is vital for the deception to succeed. (See the subsection on C3D under Survivability.) Engineersâ largest role in an integrated deception plan is that of constructing physical decoys (simulations in deception positions), enabling the enemy to see what he expects to see.

However, engineer support to INFOWAR is not limited to C3D measures. For example, engineers may support the INFOWAR campaign with psychological warfare activities to lower morale and instill a sense of tentativeness among enemy soldiers, and to undermine confidence of â enemy-friendlyâ populations. This can be achieved simply by the ubiquitous use of booby traps and mines. See chapter 7 for additional information on INFOWAR at the tactical level.

Engineer Reconnaissance

Engineers conduct reconnaissance independently, or combined with chemical and reconnaissance elements. If the maneuver unit commander needs unique, specific engineer data for planning and preparation, he may order or request the use of engineer assets to form engineer reconnaissance patrols (ERPs), observation posts (OPs), and photographic reconnaissance posts. Engineer reconnaissance elements usually gather the following information:

- Enemy engineer preparation of battle positions and individual fighting positions.
- Location, type, and composition of enemy obstacles.

- Conditions of roads, bridges, water obstacle-crossing sites, and routes.
- Presence of local building materials and other materials available for engineer tasks.
- Protective and camouflaging properties of the terrain.
- Enemy obstacles and demolitions created both during the preparation for the attack and during the attack.
- Movement routes and trafficability of off-road terrain for the attacking combat units.
- Locations where the enemy established obstacles during his withdrawal.
- Water obstacles on the main axis of advance.
- Local water supplies.

Water obstacles place additional requirements on engineer reconnaissance missions. See Reconnaissance under Water Obstacle Crossing, below, for a listing of the types of information required and who is likely to obtain it.

Reconnaissance Patrols

To provide engineer expertise, the OPFOR can allocate engineer specialists to accompany a tactical reconnaissance patrol dispatched by a division, brigade, tactical group, or even a battalion-size detachment (BDET). Additionally, reconnaissance elements of maneuver units can provide limited engineer-related information, although with less technical precision. However, under most conditions, the missions of all these reconnaissance elements preclude them from concentrating solely on engineer requirements. Therefore, the maneuver commander may order or request the engineer unit to form its own engineer reconnaissance elements.

A brigade or brigade tactical group (BTG)â or in some cases, a BDETâ can include two or three engineer reconnaissance personnel in a regular reconnaissance patrol or security element. When engineer personnel augment other patrols in this manner, there is not likely to be a separate ERP.

Engineer Reconnaissance Patrols

When the engineer mission is expected to be a complicated one, however, it is better to form one or two ERPs. The use of two patrols allows the conduct of engineer reconnaissance by the leapfrog method. Ideally, the ERP(s) would begin their mission 1 to 2 hours before the main body of the brigade, BTG, or BDET starts to move. They assess the routes chosen by the staff, checking the validity of plans made from a map and reporting onâ

- Obstacles and the effort required to overcome them.
- Conditions of crossing sites on water obstacles.
- The general nature of the terrain.

Engineer advice is an important element in the selection of routes and crossing points.

ERPs vary in strength from a squad to a platoon. A divisional brigade or BTG is more likely to form a squad-size patrol from its engineer company. An ERP can also include one or two CBRN reconnaissance specialists.

Route Reconnaissance

When engineers reconnoiter routes, one of their goals is to identify anything that could impede mobility. Taking into consideration any guidance from supported commanders and their staffs, the engineer unit commander can increase the size of his reconnaissance element and divide it into smaller teams in order to cover several points simultaneously. This allows him to assess a large number of features in the shortest amount of time.

When moving in areas where contact with enemy forces is unlikely, the engineer or maneuver commander can send an ERP ahead to obtain the required data. When anticipating enemy contact, engineer reconnaissance and data collection may be limited to reports from troop reconnaissance elements reporting on the engineer aspects observed along the route.

When reconnoitering routes, engineers attempt toâ –

- Verify the condition of the route.
- Determine aspects of off-road terrain.
- Identify all obstacles and locate bypasses or recommended breach sites.
- Inspect bridges and dams.
- Identify suitable halt and assembly areas.

They report information on these topics to the commanders of the engineer and/or maneuver units that sent them out.

When the OPFOR route of advance encompasses potential water obstacles, ERPs try to find spots to set up ferry and bridge crossings, plus assembly or preparation areas. If bridges exist, engineers gather information onâ

- The support structure.
- Load capacity.
- Necessary repairs.
- The presence of mines and demolitions on the approaches and on the bridge itself.

Mobility

When the OPFOR is the dominate force in the region, fighting a less powerful enemy, the OPFOR generally has freedom to maneuver wherever it wants whenever it wants. If the enemy hinders its movement, the OPFOR has alternatives because it dominates the region. However, when fighting a more powerful opponent, it is especially critical that the OPFOR maintain the ability to move unimpeded. This ability allows the OPFOR to control the access and tempo of enemy forces. As long as the OPFOR has complete access to the battlefield, it will allow no sanctuary to the enemy and determine the nature of the conflict. Engineer support can create opportunities for infiltration of small forces into unexpected locations, to inflict damage or to support INFOWAR.

Engineers are responsible for accomplishing tasks permitting the unimpeded movement of forces along the movement route, plus activities at assembly and halt areas. They also support the crossing of water obstacles. Table 12-3 lists the specific engineer technical tasks that provide the required support for tactical missions prior to and during tactical movement.

Table 12-3. Engineer support for preparation and conduct of tactical movement

Tactical Missions Requiring Engineer Support	Engineer Technical Tasks
Preparation of assembly and halt areas. Tactical movement. Crossing water obstacles.	Conduct engineer reconnaissance of enemy and terrain. Clear passages in obstacles and perform demolition work. Establish and maintain water obstacle-crossing sites. Extract and purify water and establish water supply points. Carry out engineer C3D measures. Prepare and maintain movement routes. Prepare fortifications at assembly and halt areas. Eliminate aftereffects of CBRN attacks.

Movement Routes

A movement route can follow any line and may include existing roads, cross-country roads, and off-road areas. After careful consideration of reconnaissance data and consultation with engineer officers on his staff, the commander specifies the particular movement route(s) his force will use. The engineer units and their liaison teams in the maneuver unitâ s staff are then responsible for planning and coordinating engineer support to prepare and maintain the specified movement routes. They provide input to the engineer support plan for the commander, who then issues orders, missions, and requirements to the constituent and dedicated engineer unit commanders for execution.

Movement Support Detachment

The MSD is a task-oriented, temporary grouping of engineer assets to support route clearance and movement of the force in preparation for, and during tactical movement. The composition of an MSD is not fixed and varies depending upon theâ ¯

- Condition of the terrain.
- Character of enemy actions.
- Amount of work necessary.
- Assigned rate of movement for the columns.
- Availability of engineer troops and equipment.

Since its various technical tasks involve different types of equipment, the MSD frequently task-organizes into smaller elements to allow concurrent actions along the movement route. A typical MSD consists of a reconnaissance and obstacle-clearing element, plus one or two road and bridge construction and repair elements.

Reconnaissance and Obstacle-Clearing Element

Responsibilities of the reconnaissance and obstacle-clearing element includeâ ¯

- Marking the movement route.
- Making immediate assessments of the terrain and obstacles.
- Identifying bypasses.
- Creating and marking passages through obstacles.
- Determining the character of destruction along the route.
- Locating building materials.

Augmenting assets from the division engineer battalion can use explosive charges or mechanical equipment to overcome rubble, rock barriers, and dragonâ s teeth (concrete pillars or iron posts). Engineers can breach wire obstacles after examining them for booby traps and electrification. Tree barriers may require the use of dozer blades or explosives.

The reconnaissance and obstacle-clearing element typically includesâ ¯

- An engineer unit base.
- Hand-held or vehicle-mounted mine-detection equipment.
- Explosives.
- Mineclearing vehicles such a tank with roller and plows.
- Route- or obstacle-clearing vehicles.

Road and Bridge Construction and Repair Element

The road and bridge construction and repair element usually hasâ

- One or more engineer squads.
- Tank- or truck-launched bridges.
- Route-clearing vehicles.
- Cranes and road graders.

The equipment varies depending on mission requirements and what was passed down from higher levels of command.

Responsibilities of the road and bridge construction and repair element includeâ ¯

- Mineclearing and obstacle clearing along the route.
- Reinforcement of bridges and repairs to roads.
- Construction of bypasses.

- Building and reinforcing bridges.
- Establishing fords and bypasses.
- Strengthening the route in swampy sections.
- Removing rubble.
- Repairing damage.

This element can also complete the route reconnaissance and marking of the route begun by the reconnaissance and obstacle-clearing element.

MSD Position During Tactical Movement

While moving, the MSD travels in advance of the main body, preparing the route so the main body can continue its advance unimpeded. Elements of the MSD are often performing tasks in proximity to elements of the security detachment. The location of the MSD in relation to the security detachment depends upon the possibility of enemy contact. When enemy contact is likely, the MSD may follow the security detachment. If enemy contact is unlikely, the MSD may be well ahead of the security detachment.

Obstacle Breaching

The OPFOR is prepared to overcome obstacles during all phases of combat. In the offense, the OPFOR expects to cross obstacles on movement routes and throughout the enemy defense. Creating passages for the advance of the force in the face of enemy resistance is a combined arms task.

Explosive Obstacle Breaching

Explosive devices are the most significant obstacles the OPFOR expects to encounter. The OPFOR expects the enemy to use explosive obstacles and other obstructions for defensive purposes to impede the OPFORâ€™s advance. In order for the OPFOR to conduct (or continue) an attack, maneuver units must breach these obstacles under direct and/or indirect fire. Units engaged in breaching these obstacles are extremely vulnerable to all enemy fires. Whenever possible, the OPFOR attempts breach a minefield from tactical movement, with minimum delay, and press the attack without first halting to consolidate on the far side of the obstacle.

The OPFOR may be required to breach enemy minefields when fighting a more powerful force. Although it may breach them in the more conventional manner described here, the OPFOR can also devise innovative methods to cross minefields. One such method might be to manually clear a path through the minefield through covert action. Several lanes could be cleared in this fashion. Then, at a time of the OPFORâ€™s own choosing, dismounted troops could infiltrate through the minefield and rendezvous at a designated location on the other side, undetected by the enemy. See figure 12-1.

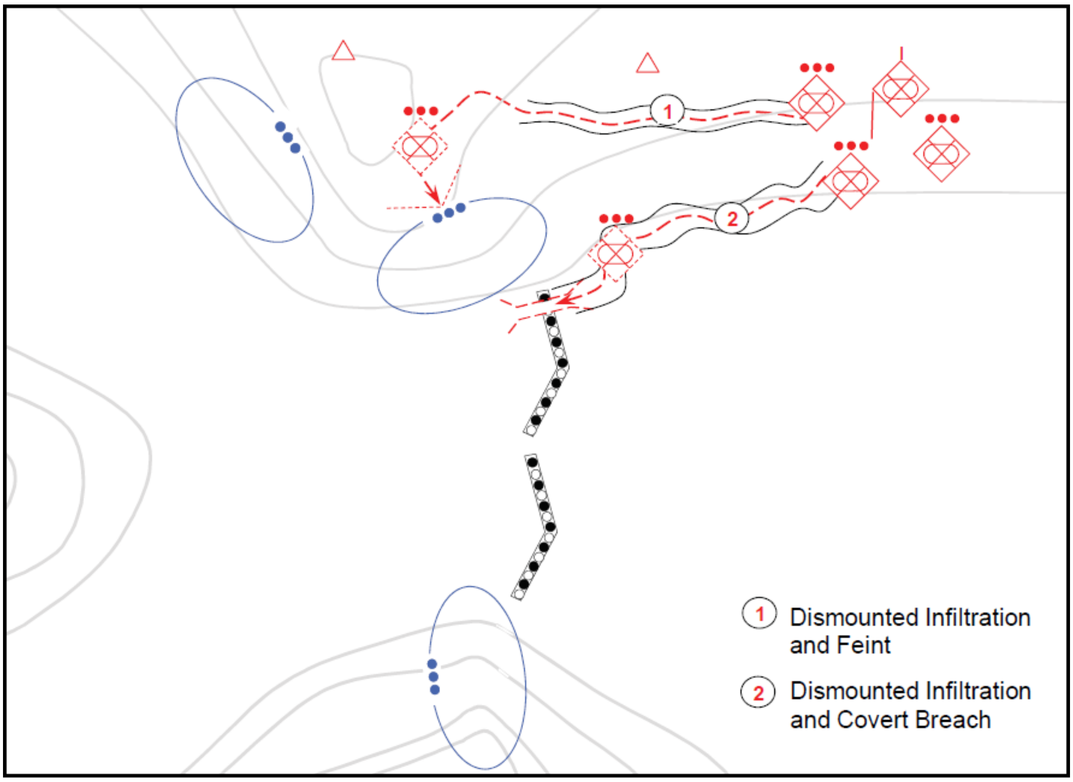

Figure 12-1. Covert breach (example)

Organizing Forces and Elements

There are three fundamental methods by which the OPFOR organizes for breach operations. First, and most preferable, is to make no special alterations to task organization for breach operations. A detachment is expected to breach as part of its situational breach battle drill (see chapter 5). Therefore, its higher commander will make every attempt to include in its task organization the means necessary to breach any anticipated obstacles without the need to deviate from the basic structure of action, support, and security elements or the need for outside assistance. The action element temporarily becomes a breaching element in order to reduce the obstacle such that it can accomplish its mission (as the action element).

Should any anticipated obstacles require significant allocation of specialist assets, the detachment commander may form a clearing element. A clearing element is a type of specialist element that penetrates obstacles permitting the action element to accomplish the detachmentâ s mission.

Complex or extensive obstacles may require the formation of an MSD. MSDs are typically formed by tactical groups to support the movement of multiple detachments through a given zone of obstacles or to support their movement across a major water obstacle. (For more detail on MSDs, see that subsection above.)

Planning

Planning and preparation for the breaching of an explosive obstacle includesâ

- Reconnaissance of the obstacle, including attempts to locate a bypass, and marking optimal breach locations.
- Infiltration of stealth breach teams, if possible.

Breaching Methods

The OPFOR has three basic means to breach a minefield: explosive, mechanical, and manual:

- Explosive means such as line charges, bangalore torpedoes, and volumetric explosives all work by detonating mines through explosive pressures.

- Mechanical mineclearing plows or plow and roller combinations mounted on combat vehicles provide the main countermine capability to conventional forces. These systems detonate mines by striking them in advance of coming into contact with a vehicle or by physically moving the mines out of a defined path.
- Manual breaching requires personnel to physically displace or defuse explosive devices.

Mechanized Breaching

Mechanized and tank units make use of all three breaching methods to rapidly create lanes through obstacles with minimal delay. All OPFOR mechanized and tank units are trained, equipped, and expected to breach explosive obstacles without resorting to requests for help to higher levels of command (see figure 12-2).

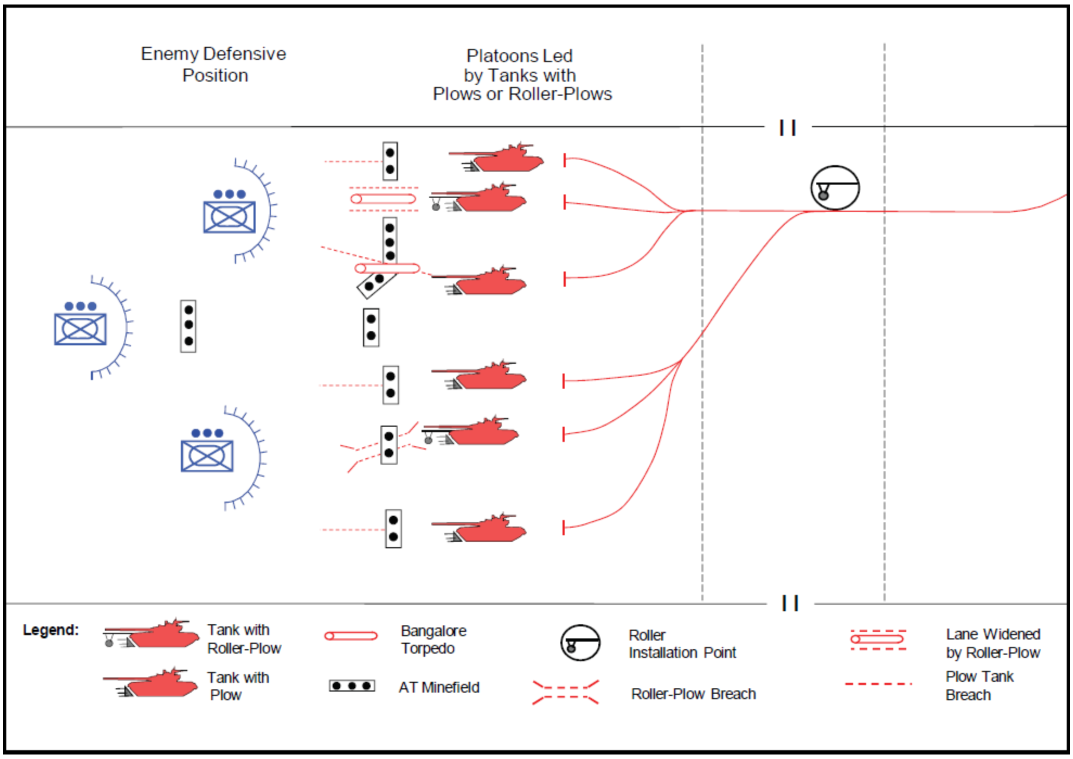

Figure 12-2. Mechanized breach (example)

Despite the advantages of mechanical means attached or integral to combat and combat engineer vehicles, it is still preferred that explosive breach means, whether mechanized or employed by infantry or engineer forces, be the primary method for executing a mechanized breach. This is because mechanical means place the combat vehicles at more risk. Mechanized explosive means are also the least vulnerable to booby traps placed in and around obstacles to make their breaching more difficult.

If at all possible, non-mechanized and/or affiliated irregular forces will breach anticipated obstacles in advance of a mechanized force. Such forces typically employ C3D to prevent detection while creating the breach.

Nonexplosive Obstacle Breaching

The breaching of nonexplosive obstacles is essentially the same as breaching explosive ones with these salient differences:

- Mechanical and manual breach methods will typically take precedence.
- Significant nonexplosive obstacles (large antitank [AT] ditches, rivers, or rubble from a collapsed multi-story building) will not be rapidly breachable by manual means, if at all.

During the offense, an MSD also creates lanes through nonexplosive obstacles. In this case, the

MSD may require additional engineer augmentation beyond just countermine equipment. For example, it may employ obstacle-clearing vehicles to knock down berms. It may also use truck-launched bridges to cross AT ditches.

Water Obstacle Crossing

The enemy is expected to use rivers and other water obstacles for defensive purposes. In order to conduct (or continue) an attack, OPFOR maneuver units must often cross water obstacles whose opposite banks may or may not be occupied by the enemy. Crossing is a generic term identifying the site of a water obstacle crossing or the act of crossing. Crossing involves using bridges, ferries, fords, or amphibious combat equipment. The OPFOR identifies two methods of overcoming water obstacles:

- Opposed crossing (when expecting enemy contact).
- Unopposed crossing (when not expecting enemy contact).

Rarely would the OPFOR attempt the classic opposed water crossing (described below under Opposed Crossing) when fighting an opponent more capable than itself. However, there may be times when the OPFOR must cross rivers in territory occupied by the enemy. Even then, it would typically only attempt the opposed crossing if convinced of success and if the enemy did not believe the OPFOR would attempt the crossing. This crossing would be integrated into the overall battle plan and the INFOWAR plan.

More likely, however, when opposing a stronger force, the OPFOR would attempt to cross the river covertly at night or during inclement weather. This would allow the OPFOR to infiltrate unitsâ a few vehicles at a timeâ ¯across the river. The units would regroup at a designated area and continue operations in enemy territory. Engineer support for this may only be engineer reconnaissance of the river and routes. Engineers could also build (undetected) an underwater bridge out of sandbags, or make rafts rigged to transport vehicles.

Note. Aside from water obstacles, crossings can involve other kinds of gaps, such as ravines. These other kinds of gap crossing can employ some of the same engineer assets and methods used to overcome water obstacles.

The OPFOR also expects to make most crossings without the advantage of an existing bridge or convenient fording site. Therefore, engineers must be prepared to provide specialized bridging and amphibious transport (tracked amphibians and ferries) to facilitate a timely crossing.

Organizing Forces

There are no doctrinal constraints on task-organizing for mission success. The ability to allocate assets downward and to task-organize is restrained only by the availability of assets and the nature of the mission. The OPFOR normally designates functional forces for a water obstacle crossing as follows.

Crossing Force

The crossing force is essentially the exploitation force for the obstacle crossing. It is the force whose movement the operation is designed to facilitate.

Crossing Site Force

The crossing site force is the enabling force of the crossing. Its mission is to enable the crossing force to move rapidly through or over the obstacle and continue its mission.

Security Force

The security force has the same function as that in any offensive course of action. Security forces for obstacle crossings will typically have a strong air defense capability.

Crossing Zones and Sites

A crossing zone is a specialized form of area of responsibility (AOR). It is the AOR of the crossing force and is commanded by the crossing commander. Its size and orientation depend onâ

- The nature of the obstacle.
- The number of crossing sites.
- The size force that needs to cross.
- The ability to neutralize the enemy.

Under favorable conditions, the crossing zone of an opposed crossing may be identical with the unitâs attack zone.

At tactical group level, the CELT advises the commander on selection of crossing sites within the crossing zone based on reconnaissance of the obstacle and approaches to it. The number of crossing sites within a zone depends onâ

- The tactical situation.
- The nature of the water obstacle and surrounding terrain.
- The types of crossing equipment available.

There are usually separate sites for each type of crossing means: swimming, fording, snorkeling, tracked amphibian, ferry, and bridge. Especially for opposed crossings, preference is given to those sites where there areâ¯

- Relatively weak enemy defenses.
- Concealed movement routes to the water obstacle.
- A bend toward the attackers.

Crossing site force commanders have responsibility for the conduct of the crossing and the tactical arrangement and security of the crossing zone. Crossing force units are placed in a supporting relationship to the crossing site commander while within the crossing zone.

Categories

The width of the water obstacle affects the method of crossing, the type of crossing, the need for augmentation, and the length of time to conduct the crossing. In terms of width, water obstacle categories areâ

- Narrow (less than 100 m).
- Medium (100 to 250 m).
- Wide (250 to 600 m).
- Large (greater than 600 m).

In terms of depth, the categories areâ

- Shallow (up to 1.5 m in depth).
- Deep (1.5 to 5 m in depth).
- Very deep (over 5 m deep).

Although canals are narrow obstacles, engineers place them in a special category because their deep water and steep banks make it difficult to use tracked amphibians, ferries, and standard bridging equipment. It is often necessary to erect piers and special constructions to negotiate them.

Reconnaissance

Depending on the situation, an ERP, the reconnaissance element of an MSD, or engineers augmenting other division and brigade reconnaissance elements can reconnoiter a water obstacle. The reconnaissance includes determiningâ¯

- The depth, width, and current velocity.
- The composition of the bottom.
- The presence of underwater obstructions or mines.
- Possible fording, ferrying, bridging, and snorkeling sites.
- The composition, height, and slope of the banks.
- Approach and exit routes.
- The camouflage potential of the area.
- The presence and nature of obstacles on the banks.
- Critical terrain features overlooking both banks.
- Information on the nature of enemy fortifications and defensive positions.

The engineers transmit this information to the CELT for planning purposes. They mark recommended crossing sites, bypasses, routes, and critical areas for the follow-on engineer elements responsible for establishing the crossing.

The divisionâ s engineer battalion has qualified divers with scuba gear; specialized vehicles and equipment to analyze soil data, stream velocities and depth; and mine-detection equipment. Commanders can also use maps, aerial photographs, engineer and fighting patrols, radars, signals reconnaissance, and human intelligence to gather data on crossing sites.

The number of ERPs depends on the width of the water obstacle and the number of required crossing sites. Patrols vary from squad to platoon size. The patrols can be equipped with one or more of the following types of vehicle:

- Amphibious scout cars, APCs, or IFVs.
- Tracked amphibians.
- Special engineer reconnaissance vehicles.

Planning and Preparation

Based on reconnaissance, the commander organizes his unit to ensure the most expedient crossing and continuation of the offense. When approaching a water obstacle, he selects his unitâ s formation based on the mission, enemy, and terrain. Constituent and dedicated engineer assets typically deploy well forward. Mechanized infantry units lead, while fire support and direct air support elements deploy forward to overcome expected enemy resistance on the line of the obstacle. As in an ordinary attack, this involves lateral deployment of the formation as late as possible and immediately before assaulting the water obstacle. Direct air support is more critical during water obstacle crossings than during other types of ground combat action.

Units engaged in a water obstacle crossing are extremely vulnerable to enemy aviation. Therefore, there is a need for air defense at crossing sites before a crossing is attempted. In some tactical situations, air defense assets may move across first to maximize the range of their weapons to protect subsequent units making the crossing. Placement and movement sequence of air defense assets varies as the commander assesses each crossing individually. (See Air Defense below.)

Crossing of water obstacles always requires some measure of engineer preparation, even if it is only limited to engineer reconnaissance at the crossing site. Whenever possible, the OPFOR attempts to cross water obstacles with minimum delay and press the attack into the enemyâ s depth without first halting to consolidate on the far bank.

Means

The OPFOR places high priority on the fielding of water obstacle-crossing systems. Any obstacle that slows tactical movement causes a concentration of forces and invites destruction. To ensure a rapid advance, many OPFOR APCs, IFVs, and reconnaissance vehicles are amphibious, as are some self-propelled artillery and tactical air defense systems. Therefore, the OPFOR employs amphibious combat vehicles and specialized water obstacle-crossing systems at the division, brigade, and tactical group level whenever possible. If APCs and IFVs are amphibious, virtually all vehicles within mechanized infantry or tank battalions would have either an amphibious or snorkeling capability. During crossings, tracked amphibians are primarily used for carrying towed artillery pieces, trucks, small vehicles, and troops. When not engaged in a crossing, they may be used as tracked cargo carriers. The OPFOR recognizes the need for tactical water obstacle-crossing assets during all types of combat and ensures sufficient assets are readily available in engineer units at higher levels.

The OPFOR crosses some narrow water obstacles by fording, by swimming with amphibious combat vehicles, or by using tank- or truck-mounted and low-water bridges. Other narrow obstacles (up to 100 m) and medium obstacles require tracked amphibians, ferries, or pontoon bridges. Wide and large water obstacles require tracked amphibians, ferries, or pontoon bridges (sometimes configured as rafts or ferries). Crossing large water obstacles may necessitate the use of heavy floating bridges or girder bridges erected by special-category engineers of the strategic-level transportation services.

The characteristics of the water obstacle mainly determine the method chosen for the crossing. (Table 12-4 lists the preferred crossing methods, depending on the type of obstacle.) However, the nature of enemy defenses, the mission, and the availability of engineer systems are also factors.

Table 12-4. Preferred water obstacle-crossing methods

Water Obstacle Characteristics	Preferred Crossing Method
Depth <1.5 m	Ford
Depth >1.5 m	Ferry or bridge
Width <20 m	Tank- or truck-launched bridge
Width 20-100 m	Pontoon bridge
Width >100 m	Ferry or tracked amphibian

Execution

Typically, a division or DTG crosses a major water obstacle with crossing forces consisting of brigades and/or BTGs operating in separate crossing zones. A typical brigade or BTG crossing zone is up to 10 km wide, with two to three detachments crossing first. A brigadeâs or BTGâs combat elements typically can cross a significant water obstacle in approximately 2 to 3 hours. Assuming that not all subordinate brigades or BTGs can cross simultaneously, it may take approximately 5 or 6 hours for a divisionâs or DTGâs combat elements to cross a significant water obstacle.

C3D is the primary consideration in conducting a water crossing. The OPFOR is aware that even a crossing considered âunopposedâ is vulnerable to air and missile attack. The OPFOR will make every effort to conceal and protect crossing units, sites, and means from detection and attack.

Opposed Crossing

Opposed water crossings are the least preferred method of overcoming an obstacle. This type of crossing requires secrecy, surprise, and high speed supported by C3D and direct and indirect fire. To preserve the secrecy of the intended crossing and its location, the OPFOR generally uses minimal preparation or construction prior to its execution. It emphasizes conducting the crossing while moving as swiftly as possible and then continuing the offense on the opposite bank.

In a mechanized crossing, the OPFOR maximizes the speed and maneuverability advantages of combat vehicles. In the initial wave of the lead elements, amphibious APCs or IFVs make a rapid amphibious crossing to seize a bridgehead on the far bank. The crossing is usually covered from the near bank by all available fires and usually takes place either at night or under a smokescreen. These fires include direct artillery and tank fires, as well as all available indirect fires. Direct air support, generally fixed-wing, is more critical during water obstacle crossings than during other types of ground combat action. Heliborne (or, less probably, airborne) forces may seize and hold a bridgehead on the far bank.

In non-mechanized opposed crossings, C3D generally takes a greater role. Feints and demonstrations may be used to confuse the enemy as to the actual crossing zone. Low-visibility conditions are also ideal for conducting both opposed and unopposed crossings.

Unopposed Crossings

After an opposed crossing, the OPFOR can move company- or platoon-size pontoon bridge units to the crossing site. If preceding units (including the security detachment of a brigade or BTG) have eliminated enemy resistance at the water obstacle, battalions or BDETs in the main body of a brigade or BTG can conduct an unopposed crossing. If the brigade(s) or BTG(s) must conduct an opposed crossing and are successful, this allows the divisionâs or DTGâs follow-on forces to conduct an unopposed crossing.

Bridges. Bridge crossings are a typical feature of unopposed crossings. Construction of bridges starts when the enemy is denied the ability to subject the crossing to direct or observed fire. Bridges have greater load-bearing and throughput capacities than other crossing means and are preferred in order to maintain high rates of advance.

The division or DTG commander may send out an independent mission detachment (IMD) ahead of the security detachments of his lead brigades or BTGs when there is an opportunity to seize a bridgehead over an undefended or poorly defended water obstacle or bridge. A brigade or BTG can possibly send out an IMD of its own. In either case, the IMD attempts to bypass enemy resistance forward of the water obstacle and infiltrates to the far side of the water obstacle to establish a bridgehead.

If the air situation is unfavorable, the OPFOR may only use bridges during periods of limited visibility. At other times, it would tuck the bridges into the bank and camouflage them.

The crossing commander designates traffic control points (TCPs), OPs, and work teams at the crossing site. A bridge team is assigned toâ

- Inspect pontoon couplings and bank moorings.
- Evaluate and repair damage.
- Monitor entry and exit of vehicles.

Low-water bridges can free pontoon bridges, ferries, and tracked amphibians for use in other crossings. Low-water bridging is relatively permanent, using piling to provide support.

Ferries. Ferry crossings are used to transport nonamphibious heavy equipment across medium to wide water obstacles. This usually requires three to four ferries per site. Ferries can be joined into a pontoon bridge or can be used as individual ferries. Individual folding pontoon bridge sections can also be used as ferries. Ferries are not usually employed in the initial wave of an opposed or unopposed crossing but rather in subsequent waves of tanks and other combat vehicles.

Ferry crossings begin can 15 to 20 minutes after the start of an opposed crossing. Ferries are launched from prepared ramps, and personnel from the ferry platoon create landing ramps on the far bank. Floating pontoon bridge rafts are maneuvered and positioned by powerboats.

Engineer missions in the unopposed crossing are the same as they are in the opposed crossing, but engineers are also assigned to prepare mooring and launching sites and to assemble the ferries. Based on engineer reconnaissance data, the crossing commander selects mooring sites, determines the number and disposition of ferries or pontoon bridges used as ferries, and plans traffic control. An engineer squad or a traffic control unit directs movement to the sites.

Tank Snorkeling. Snorkeling is attempted when fording, bridge, or ferry crossing sites are not available or when an opportunity for surprise exists. Snorkeling crossings are used only at water obstacles that haveâ ¯

- Depths of 5.5 m or less.
- Prepared entry and exit points.
- Entry slope of 47 percent (25Â°) or less.
- Exit slope of 27 percent (15Â°) or less.
- Stream velocities of 3 m/s or less.
- Hard, level bottoms with no boulders, craters, or soft spots.

Fording. In opposed and unopposed crossings, the OPFOR establishes fords at shallow water crossing sites. Since fordings are not as complicated as other crossings, the unit may remain in tactical movement formation. If possible, multiple units cross simultaneously on a wide frontage.

Deeper fords can be undertaken by tanks without the use of snorkels but may require partial sealing of the tanks up to the turret ring. When partially sealed, air for the engine and crew is drawn in through open turret hatches. Deep fording by tanks is limited to depths not exceeding 2.3 to 2.5 m, depending on currents.

Assembly and Preparation Areas. Engineers assist in the preparation of assembly areas and of boarding and preparation areas near crossing sites. As units leave assembly areas, they pass through an engineer checkpoint (ECP). The ECP is a checkpoint to ensure that vehicles do not exceed the capacity of the crossing means. At the ECP, vehicle drivers receive final instructions on site-specific procedures and information, such as vehicle speed and interval. Near the ECP is the first of a series of TCPs to direct the unit to the appropriate crossing site and avoid bunching up at the crossing site or on the approach route.

Figure 12-3 on page 12-18 shows an example of a mechanized infantry battalion crossing supported by tracked amphibians, ferries, and a pontoon bridge. In this example, two companies cross by amphibious means, while the third company and support elements are able to cross over a pontoon bridge in tactical movement formation. Normally, bridges are erected only after the far bank is secured to a depth precluding enemy direct fire on the crossing site. However, if the enemy defense has been neutralized by fire or the opposite bank has been seized by airborne or heliborne forces, bridge construction may begin along with the opposed crossing.

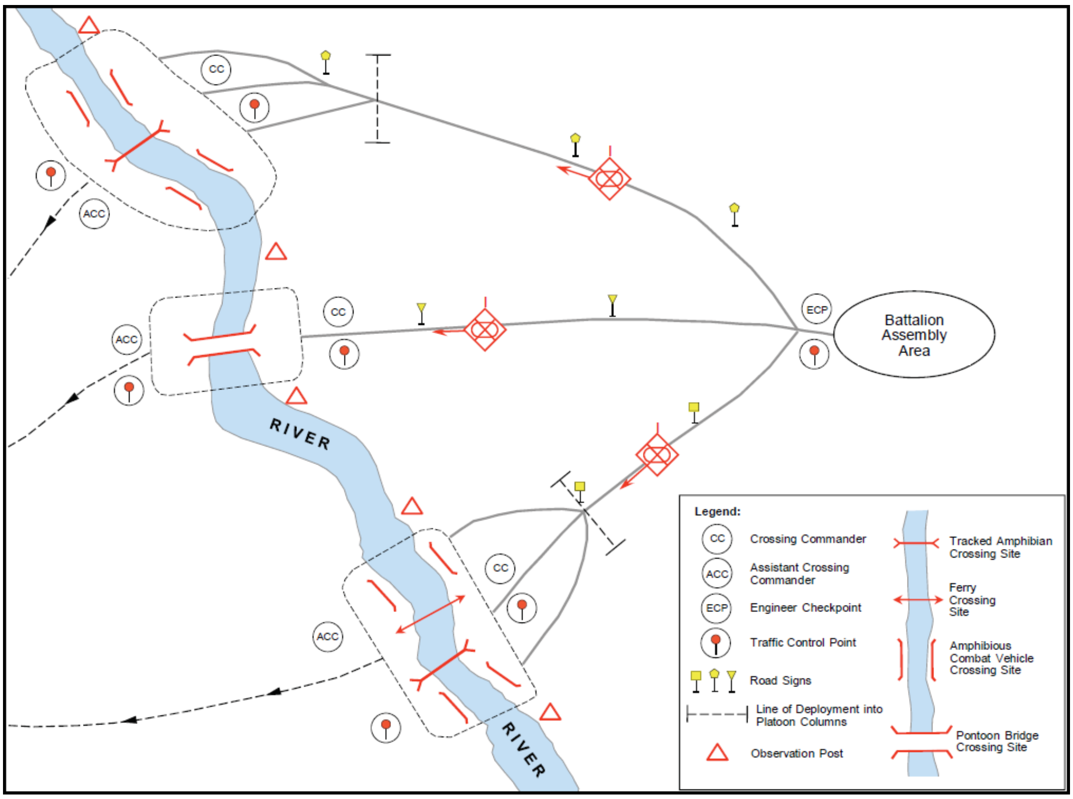

Figure 12-3. Engineer support of a mechanized infantry battalion crossing (example)

Air Defense

Forces conducting water obstacle crossings are high priority targets for enemy air strikes. Thus, the importance of air defense increases. The mission of air defense units is to protect the airspace above and around the crossing site. (For more information on air defense, see chapter 11.)

The OPFOR expects that most water obstacle crossings will be opposed by enemy air and ground defense and made without the advantage of an existing bridge, convenient fording sites, or defensive air cover. Accordingly, doctrine calls for conducting such opposed crossings rapidly, without slowing the pace of the offense. The leading maneuver battalions and BDETs (or brigades and BTGs) may have to provide their own air defense while crossing and then cover the crossing of follow-on forces.

For unopposed crossings, the maneuver unit may cross a water obstacle without deploying from its movement formation. In this case, division-, brigade-, or tactical group-level air defense units can establish firing positions on the near bank to cover the site for the time it takes the column(s) to cross. The air defense units then move to the far bank and either establish firing positions or continue to move.

Smoke

Most opposed crossings are conducted under the cover of smoke or other obscurants, which can degrade the enemyâs ability to locate and target the actual crossing sites. However, smoke can also degrade or prevent visual acquisition of air threats by some OPFOR air defense systems. Therefore, wind and obscurant conditions must be accounted for in the deployment of air defense weapons for the crossing. (For more information on smoke employment, see chapter 13.)

Countermobility

The OPFOR makes extensive use of countermobility operations to limit access and control tempo by delaying, disaggregating, and canalizing enemy forces. The obstacle plan is completely integrated with the maneuver, fire support, and INFOWAR plans.

OPFOR engineer obstacles include any actions taken to inflict losses and to delay and impede enemy movement. The creation of engineer obstacles and execution of demolition activities are critical engineer functions in all phases of the battle.

Countermobility support is extremely innovative, especially when the OPFOR fights a more powerful enemy. Minefields may be irregular-shaped and are thoroughly merged with the terrain. They also tend to be much smaller than those laid in linear operations, which may easily be over a kilometer in length. Some examples of adaptive engineer countermobility methods likely to be employed against a more powerful force (in addition to methods used in a more conventional battle) areâ¯

- Lay mines intermittently along road or trails. This involves the enemy in prolonged, potentially dangerous and time-consuming detection and clearance operations, and requires a great deal of enemy manpower.
- Mine and re-mine enemy lines of communications (LOCs). This requires the enemy forces to constantly sweep for mines. Once a road is swept and left unsecured, the OPFOR re-mines it.
- Limit access by denying the enemy key facilities. For example, destroy airfield runways in an aerial port of debarkation (APOD) or docks in a sea port of debarkation (SPOD).
- Deny LOCs from APOD and SPODs to enemy maneuver units, staging areas, or base camps. Contain (or trap) enemy forces in specific areas such as an APOD or SPOD and built-up areas.

- Maximize the use of controlled minefields. This lets the OPFOR pass through the minefield and activate it prior to the arrival of enemy units. It can also be used to trap enemy units. This is used in conjunction with artillery as a kill zone.
- Use off-road and chemical mines whenever possible. Always use antihandling devices to slow clearing efforts.
- Target vehicle mine plows and rollers as high-priority targets.
- Use plastic mines to defeat mine detection sweeps.
- Plant underwater mines at port or ford sites.

Obstacle Detachment

The OD is the basic building block of the OPFORâ s countermobility effort. ODs are temporary, task-organized groupings composed primarily of engineer assets intended to create minefields and obstacles. Their basic equipment includes mechanical minelayers and trucks carrying mines, explosives, and other equipment. They are sometimes augmented with mechanized infantry troops for close protection and extra labor. The size and composition of the OD depend on the tactical situation and the needs of the maneuver commander.

In addition to minelayers, ODs may add other engineer resources to support critical obstacle development. The division may supplement the OD with engineers for demolition work, ditchers to create AT ditches, and other engineer systems. This augmentation does not normally occur until the earthmoving equipment completes other tasks, such as preparing fortifications.

Missions

The OD uses its ability to rapidly lay minefields and construct obstacles toâ ¯

- Protect flanks.
- Strengthen captured positions.
- Disrupt attacks, counterattacks, and other enemy activities.
- Strengthen the defense.
- Cover gaps between battle positions.
- Deny the enemy access to key terrain.
- Block the axis of an enemy armored advance.
- Block enemy penetrations.
- Block enemy reinforcements, exploitation forces, or reserves.
- Channel the enemy into a kill zone and contain him there.
- Protect the flank of a counterattacking force.

In the defense, the OPFOR commander may hold the OD and other forces in reserve and can quickly employ them during an enemy attack, to mine potentially vulnerable gaps. Engineer tasks during the defense implement obstacle plans, particularly AT obstacles. Together with ATRs, ODs provide a quick-reaction AT force to block enemy penetrations.

Engineers can lay mines and construct obstacles in the disruption zone and on likely enemy armored avenues of approach. They can also lay obstacles in the depth of friendly units in the battle zone, and at subsequent defensive positions throughout the AOR. However, simultaneous obstacle construction throughout the AOR can only occur when sufficient time, equipment, and personnel are available. In any part of the AOR, minefields and other obstacles require barriers, security, and marked maneuver passages.

Engineers create obstacles on possible enemy approaches to OPFOR battle positions or artillery and air defense firing positions, in the gaps between battle positions, and on flanks. They normally construct barrier systems in coordination with the overall fire support plan.

In preparation for movement, a division, brigade, or tactical group creates one or more ODs to maximize mechanical minelaying and explosive obstacle support for maneuver forces. The OD provides countermobility support and denies key terrain to the enemy. Its mission is to alter the tactical situation by emplacing obstacles in response to enemy actions. During the tactical movement, the OPFOR commanderâ s greatest concern is armor attacks against the flanks. Therefore, the OD emplaces AT obstacles in front of detected armor threats or along possible routes suitable for armored vehicles.

Positioning

Although the OD can act independently, the division, brigade, or tactical group often assigns it to move and act in close coordination with the ATR. Even in the latter case, the OD still reports directly to the engineer unit commander, who assigns its priorities, areas of concern, and task organization. This arrangement provides the maneuver commander with a combination of organizations capable of rapidly emplacing AT obstacles as well as covering the obstacles with AT fires. A minelaying squad of an engineer mine warfare platoon or minelayer platoon usually serves as the core of an OD.

While conducting tactical movement, the OD may travel behind elements of the security detachment and in front of the main body. Sometimes, it may move on a threatened flank or forward within the main body, ready to deploy to either flank.

Following the maneuver commanderâ s guidance, the CELT recommends positioning of the OD so it can quickly deploy in response to enemy actions. This may be to seal a critical area or to provide time to shift forces and fires. The maneuver commander, the engineer liaison team(s), and other staff elements monitor the progress of the tactical movement and plan for possible enemy courses of action. They then identify possible deployment lines for the ATR and obstacle-emplacement locations for the OD. If reconnaissance assets report enemy activity along a given axis that confirms a course of action, the commander dispatches an OD and an ATR to the appropriate deployment line to conduct their missions.

Obstacle Planning

The obstacle plan is tailored and integrated into the overall operation plan with mutually supporting systems of fire. This integration is exemplified by the habitual association between the OD and the ATR. Just as it develops a fire support plan, the OPFOR also develops an integrated obstacle plan tailored specifically to each unique tactical situation. In the offense, obstacles protect flanks, disrupt counterattacks, and strengthen captured positions. In the defense, engineer obstacles may strengthen the defense, disrupt enemy operations, and cover gaps.

To develop the obstacle plan, the CELT conducts an evaluation of the situation from an engineer perspective. From this evaluation, he determines engineer allocations and priorities, and directs obstacle development and other engineer preparation.

The OPFOR divides engineer obstacles into three categories:

- Explosive obstaclesâ ¯minefields, groups of mines, and objects prepared for demolition.
- Nonexplosive obstaclesâ ¯AT ditches, escarpments, abatis, wire barriers, and water obstacles.
- Combination obstaclesâ ¯a combination of explosive and nonexplosive obstacles.

Of the three categories, explosive obstacles are the most common. Engineers and others can emplace minefields more easily and quickly when compared to the construction effort for nonexplosive obstacles. Additionally, the OPFOR plans for the self-destruct or self-neutralization capabilities frequently found in scatterable mines. It can also lay mines with remote-control devices to activate or deactivate the minefield at will. This minimizes the adverse effect of friendly minefields on future actions and reduces the need for the OPFOR to breach its own obstacles.

However, this is not the case with nonexplosive obstacles, which are time- and resource-intensive to install and eliminate. For these reasons, the OPFOR usually emplaces mines and other explosive obstacles first, and eventually supplements them by constructing nonexplosive obstacles. When this occurs, it creates combination obstacles, which are the next most common after the explosive type. It is extremely rare for the OPFOR to use a nonexplosive obstacle in isolation without any mines, explosives, or booby traps.

Explosive Obstacles

The OPFOR emphasizes the use of explosive obstacles. These include mines and demolitions. The widespread use of landmines on todayâs battlefields results from a combination of mass production, plastic mines, improved battlefield delivery systems, and development of sophisticated fuzing. Remotely delivered mines have expanded capability for changing the tempo of battle.

Mines

Mines are the most significant obstacles the OPFOR can employ and are usually emplaced in groups or in minefields. Therefore, minefields and minelaying are afforded separate sections below.

Demolitions

The OPFOR emphasizes the importance of roads as high-speed avenues of attack for both friendly and enemy forces. Therefore, it views the use of demolitions on roads as a significant way to disrupt enemy movement. Critical points at which the OPFOR might use demolitions includeâ

- Overpasses.
- Bridges.
- Ravines.
- Intersections.
- Bypasses.
- Approaches to water obstacles.
- Roadways through urban or other complex terrain.

Nonexplosive Obstacles

Nonexplosive obstacles fall into three categories: AT, antipersonnel (AP), and antilanding. Nonexplosive AT obstacles include ditches, dragonâs teeth, and various other manmade and natural barriers. AP obstacles include concertina and barbed wire. Antilanding obstacles include dragonâs teeth, AT ditches, and wire obstacles. The OPFOR uses these obstacles at potential drop or landing zones for amphibious, airborne, or heliborne assaults. The primary responsibility for the construction of nonexplosive obstacles rests with the maneuver unit. The diversion of water from rivers and streams or releasing water from dams can also cause a significant nonexplosive obstacle.

Minefields

The OPFOR frequently uses minefields during all phases of combat. There are five basic types of OPFOR minefield:

- AT.
- AP.
- Mixed.
- Decoy.
- Antilanding.

The OPFOR stresses the importance of covering minefields with both direct and indirect fires, particularly with long-range AT weapons. Minefields inflict damage on attacking enemy forces and slow and canalize enemy forces into kill zones covered by massed fires. Whenever possible, the OPFOR contains enemy forces in a window of vulnerability for the longest time possible. This facilitates the destruction of the enemy.

Conventional OPFOR minefields generally conform to doctrinal standards. This standardization ensures that engineers and combat personnel follow consistent, uniform practices. Scatterable minefields, however, are much less predictable in pattern. Maneuver commanders use combat personnel to emplace protective minefields around individual fighting positions and perhaps battle positions. Meanwhile, engineers use minefields to shape the battlefield for the maneuver commander.

Commanders of battalions, companies, or detachments emplacing mines prepare minefield records in three copies: one for the unit, one to the brigade or BTG, and one to the division or DTG. The CELT at division, brigade, or tactical group level then uses the records to prepare combined obstacle overlays for the maneuver commander at that level. Minefields are a fundamental part of the total obstacle plan that incorporates barriers and terrain features.

Antitank

AT minefields are the primary type of OPFOR engineer obstacle and serve to destroy or disable armored vehicles. They are primarily established in belts consisting of multiple rows on avenues that are favorable for tanks in front of the battle line and on the flanks. Where difficult terrain is available, minefield belts will be tied into terrain obstacles to reduce the mine requirement. They are also placed at unit boundaries and in the depths to cover artillery firing positions, command posts (CPs), and other key assets.

The OPFOR usually emplaces AT minefields on a frontage of 200 to 300 m or more and to a depth of 60 to 120 m. The mines are laid in three or four rows with approximately 20 to 40 m separating each row. The normal spacing between AT mines in the rows is 4 to 5.5 m for pressure-activated mines, and 9 to 12 m for full-width-attack mines. The normal mine outlay for 1 km of frontage in AT minefields is usually 300 to 400 full-width-attack mines, or 550 to 750 pressure-activated mines. This mine outlay can reach 1,000 or more AT mines per km of frontage on major avenues of approach. The OPFOR refers to this density of mines as a â minefield of increased effectiveness.â

Figure 12-4 illustrates the general emplacement of an AT minefield with track-attack mines. Figure 12-5 shows an AT minefield with full-width-attack.

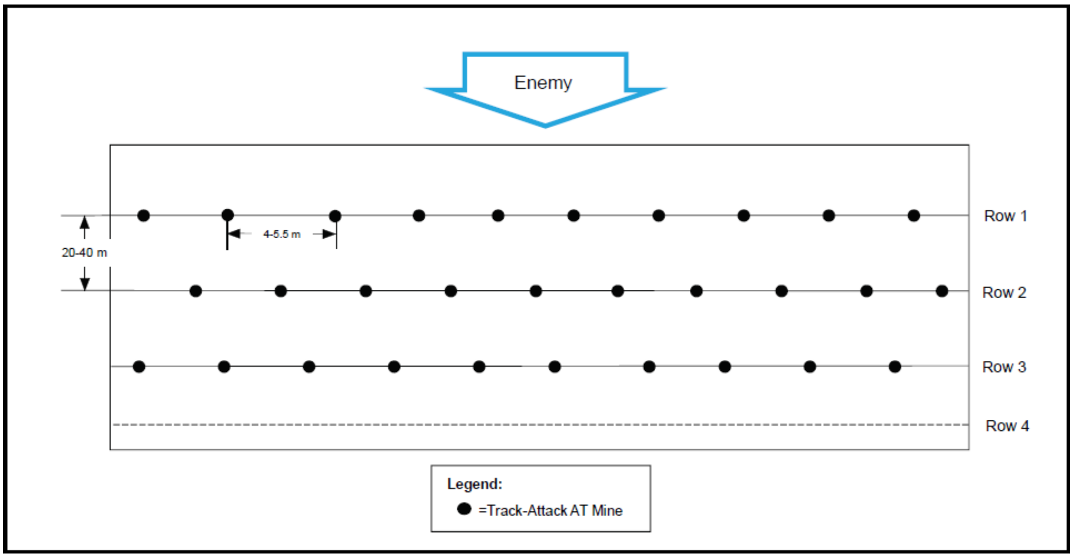

Figure 12-4. AT minefield configuration with track-attack mines (example)

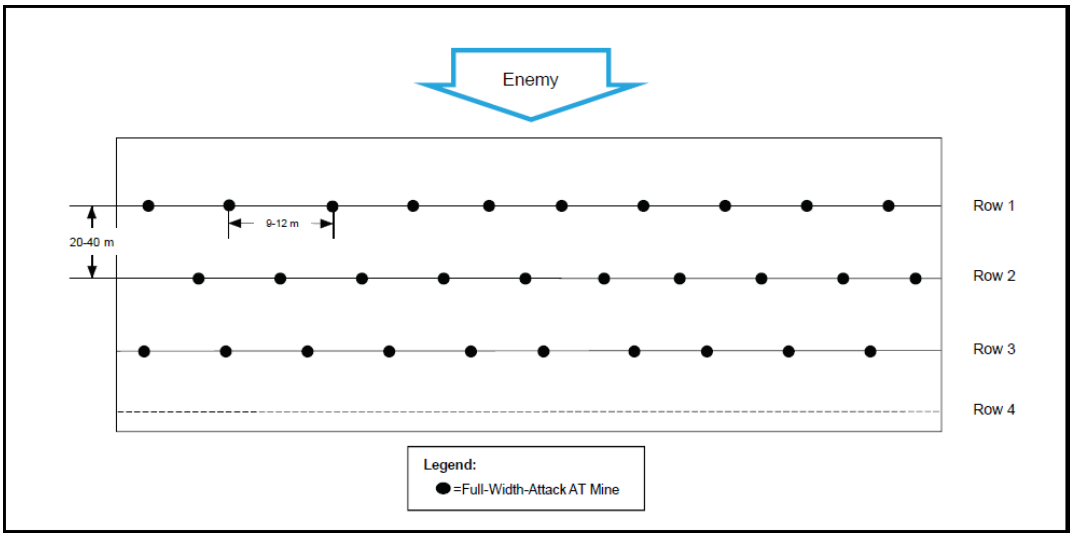

Figure 12-5. AT minefield configuration with full-width-attack mines (example)

In urban environments, the OPFOR may place groups of AT mines on narrow streets and alleys. It calculates emplacement of AT mines at the rate of one mine per 100 m of street or alley.

Antipersonnel

On the battlefield, the modern AP mine is used toâ ¯

- Inflict personnel casualties.
- Hinder soldiers in clearing AT minefields.
- Establish defensive positions.
- Deny access to terrain.

The OPFOR can set up conventional AP minefields on the forward edge of friendly defensive positions, in front of AT minefields, or along dismounted avenues of approach. These minefields can consist of blast mines, fragmentation mines, or a mixture of the two. The OPFOR emplaces AP minefields on a frontage of 30 to 300 m or more with a depth of 10 to 50 m or more. It usually lays AP mines in two to four rows with a distance of 5 m or more between rows.

The OPFOR may emplace 2,000 to 3,000 blast and 100 to 300 fragmentation mines per km of frontage. An AP minefield of increased effectiveness may have as much as three times the normal outlay of AP mines. Intervals between mines in a row are at least 1 m for blast mines and up to twice their destructive radius for fragmentation mines. Figure 12-6 shows variations of the employment of AP minefields.

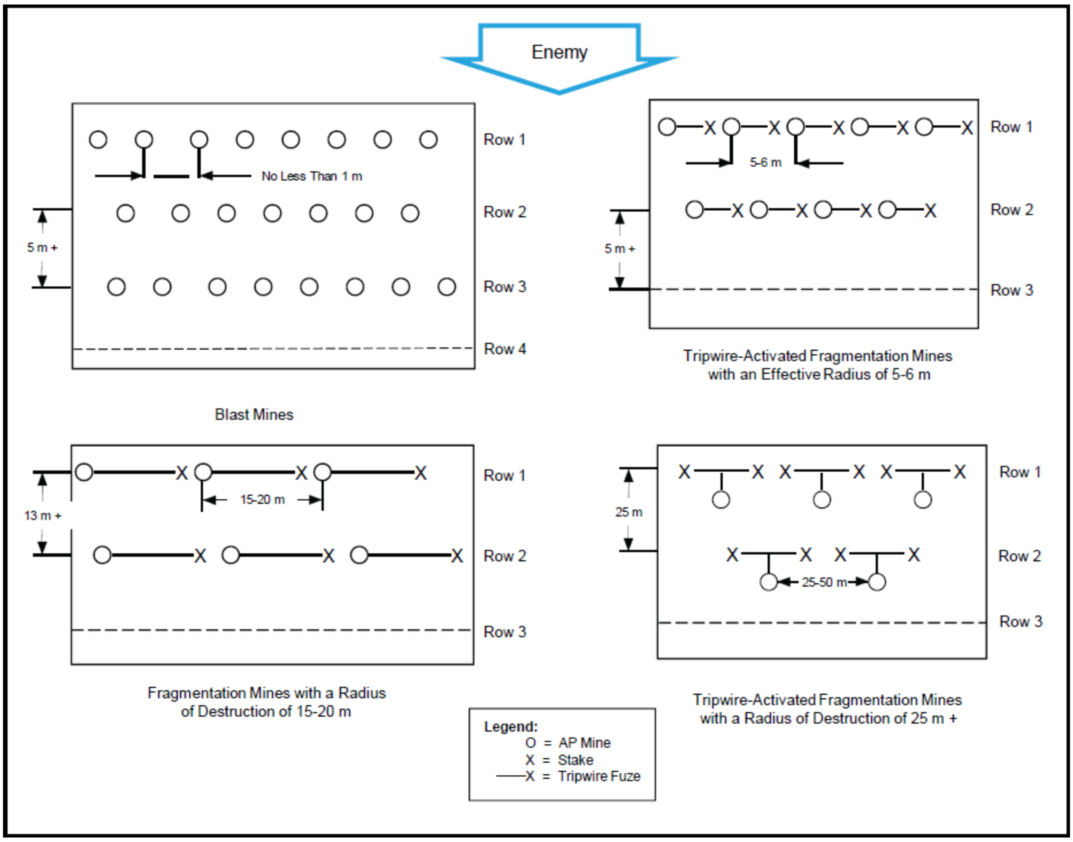

Figure 12-6. AP minefield configuration (example)

Emplacement of minefields with increased effectiveness is more likely on dismounted avenues of approach. In urban environments, the OPFOR can emplace 2 to 3 fragmentation mines for every 50 to 100 m of street. It prefers to use blast mines and fragmentation mines within buildings.

Mixed

Mixed minefields contain both AT and AP mines. A mixed minefield is generally viewed as a minefield with pure homogenous rows of either AP or AT mines. This is mainly due to the physical constraints of mechanical minelayers. They cannot lay both AT and AP mines in the same row. This does not preclude mixed minefields from having a mixture of both AT and AP mines. They can be laid manually or remotely. It is easy to remotely â seedâ an area with a combination of both. However, the AT mine requirements govern the mixed minefieldâ s parameters, outlay, and density. In areas that are not suitable for armored vehicles, AP mines constitute the majority of mixed mine obstacles. Figure 12-7 shows an example of a mixed minefield with blast AP rows between AT rows.

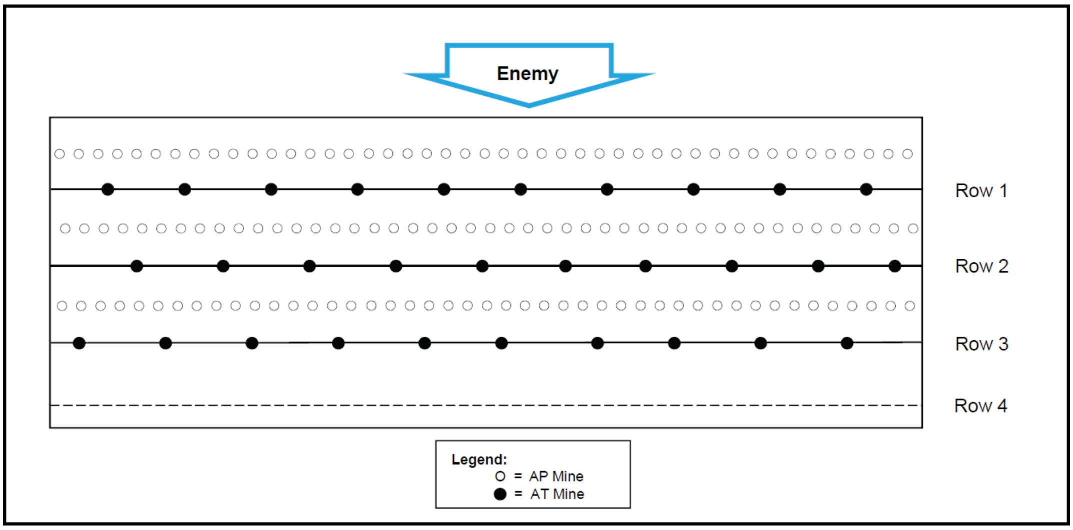

Figure 12-7. Mixed minefield with blast AP rows between AT rows (example)

Combat arms personnel set up nonexplosive and mixed minefield obstacles to cover their defensive positions. Engineers lay mixed minefields in front of the battle line and on primary avenues into the defensive depth. Mixed minefields are usually established in front of unit positions that are transitioning to the defense. Figure 12-8 illustrates an example of a mixed minefield with an AP minefield leading to full width AT minefield.

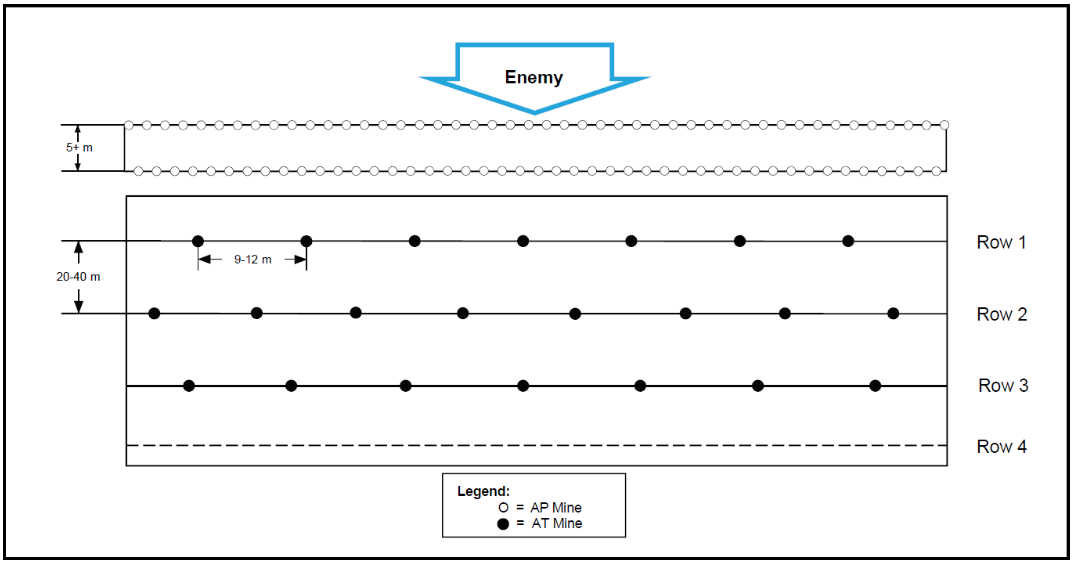

Figure 12-8. Example mixed minefield with an AP minefield leading to a full-width AT minefield

Decoy

Decoy minefields are a significant form of deception to slow movement or deceive as to true unit locations. The OPFOR uses decoy, or false minefields to mislead the enemy as to the locations of actual minefields. As part of tactical deception, units typically give the impression of minelaying activity, usually scarification of the soil, minelaying debris, minefield fences, and markers.

Antilanding

Antilanding minefields prevent landings by amphibious, airborne, or heliborne assault forces. The OPFOR uses antilanding mines at possible landing or drop zones (LZs or DZs) or when conducting combat along the seacoast or inland water features. It employs explosive, nonexplosive, and combination obstacles. Minefields established in the water consist of bottom and anchored mines and, at shallower depths, waterproof mines. The OPFOR uses all types of mines above the shoreline, emplacing them following normal minefield doctrine. At LZs and DZs, it uses fragmentation and directional AP mines. It also emplaces antihelicopter mines in locations it believes will be used as firing positions for enemy attack helicopters or in possible LZs to be used by lift helicopters.

Controlled

Many OPFOR units have the capability to lay controlled minefields. These minefields consist of landmines with electronic switches (on/off) giving the operator control over the operational status of the minefield. The operator can change the status of an area of the battlefield and either make it hazardous for the enemy or render it safe for friendly troops. This is done either by a direct hardwire link or by radio. An entire minefield can be emplaced and turned on or off, as necessary, to best support friendly operations.

On a smaller scale, select passages in a conventional minefield can contain controllable landmines, allowing for the option of clearing safe lanes for friendly use. The addition of selectable anti-removal and self-destruct features to controlled mines enhances flexibility and overall effectiveness. Controlled minefields can also be established in a maneuver defense to ensure unrestricted maneuver of units over mined areas and to cut off enemy units in pursuit.

Minelaying

The means of emplacing minefields can be manual, mechanical, or remote. Since minelaying is a common task skill, manual emplacement is performed by anybody and is the method employed by maneuver units. However, manual minelaying is labor-intensive and requires the expenditure of more time than may be available during high-speed maneuver. Therefore, OPFOR engineers may have towed and/or tracked conventional mechanical minelaying vehicles that can quickly emplace both buried and surface- laid minefields. The engineers may also have vehicle-mounted scatterable minelaying systems. These mechanical systems to allow engineers to quickly mine an area just prior to or during the battle. Engineer resources are supplemented by remote mine delivery from artillery and aircraft. Infantry units can also have man-portable remote mine dispensers.

The methods and extent of minelaying depend onâ ¯

- The OPFORâ s intentions.
- The tactical situation.
- Terrain characteristics.
- The type of mine.
- Time available.
- Available engineer support.

With the high tempo of the modern mobile battlefield, the use of remotely delivered mines is increasing. In volume, however, they do not exceed the use of conventional landmines. Conventional minefields are better suited to protecting defensive positions that the OPFOR intends to maintain for some time. In this case, it expends greater time and effort to bury and camouflage the mines and integrate the minefields into the total defensive scheme. Mine density in these types of fields is also greater. These minefields are more likely to have a mix of AT and AP mines. In setting up a fully prepared defense, troops of all units take part in preparing obstacles and laying mines.

Manual

The OPFOR manually emplaces minefields whenâ ¯

- There is no contact with the enemy.
- Mechanical minelayers are unavailable.
- Use of mechanical minelayers is inadvisable because of terrain restrictions.

A mine warfare platoon can manually lay 200 to 300 AT mines in 1 to 2 hours. It can recover about 200 AT mines an hour, if the mines are not equipped with self-destruct or antihandling devices.

Mechanical

OPFOR engineers rely extensively on mechanical minelayers. These can bury or surface-lay AT mines. The layout of mechanically emplaced minefields is the same as those emplaced by hand.

The normal sequence for mechanically laying mines is to emplace the most forward minefield first and to work progressively back to friendly defensive positions. The engineers align the mechanical minelayers parallel to the battle line. The minelayers start at separate intervals. This staggers the minelayers in a 30- to 45-degree echelon formation as they travel along the battle line. This method ensures that mines in one row are not directly behind those in another when approached by the enemy. This increases the probability for a mine encounter by ensuring that, if an attacker misses the first mine, he should still encounter one in subsequent rows. Mines can also be emplaced by helicopters or vehicles with the use of chutes (slides). Mine chutes can also be used to assist manual burial emplacement or to surface-lay mines. Figure 12-9 illustrates the mechanical AT minelaying sequence.

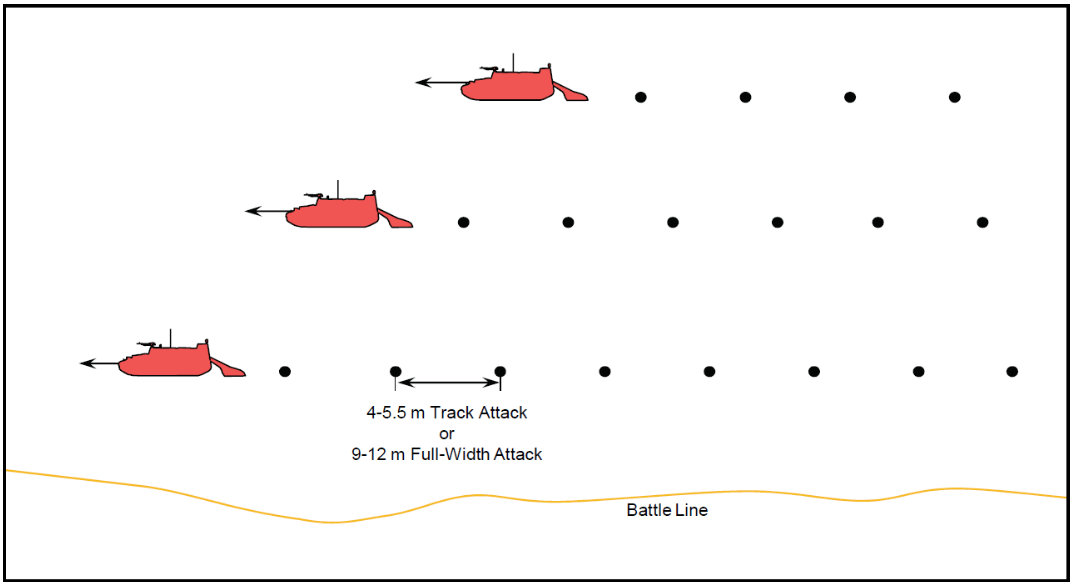

Figure 12-9. Mechanical AT minelaying sequence (example)

Remote

Remote minelaying gives the OPFOR a capability to strike targets and rapidly project mines deep in enemy territory or anywhere in the AOR. It provides increased tactical responsiveness and flexibility and reduces the manpower requirement for minelaying. It also minimizes exposure of the minelaying equipment to enemy fire. Once emplaced, these minefields can instantaneously affect the tactical situation and degrade the enemyâ s reaction time to the sudden appearance of the obstacle. Thus, they are ideally suited to the highly mobile, lethal battlefield of modern warfare. Since many scatterable landmines feature self-destruct and antidisturbance fuzing, they are well suited for missions that deny terrain for a specific period.

Remote delivery is useful against enemy reinforcing units, areas of troop concentration, CPs, firing positions, and other objectives. It can protect flanks or block enemy penetrations. The OPFOR prefers to trap a force inside a minefield rather than merely create an obstacle that the enemy can bypass. Therefore, remote minelaying can create two types of minefields: covering and containing. A covering minefield can block the movement route of an advancing or withdrawing enemy. A containing minefield can prevent the enemy unit from moving out of a deployment area (or firing position) or within the area.

The OPFOR uses remotely delivered or scatterable mines to reduce enemy mobility, inflict losses, and to create the conditions for the destruction of an enemy force. Scatterable mines also have a psychological effect on enemy morale. They can be laid close to friendly positions and covered by friendly fire or laid deep in enemy territory. Minefields created by scatterable mines lack precise boundaries or a definitive mine emplacement pattern, and generally remain on or near the surface of the ground.

Scatterable mines can be delivered from jet aircraft, helicopters, multiple rocket launchers (MRLs), trucks, and other ground vehicles, or by dismounted soldiers in the forward parapet of fighting positions. These mines are scattered randomly on the ground with no semblance to classical patterns. Frequently, these types of landmines also incorporate self-destruct or self-neutralization features to control and limit their active duration once emplaced. After the allotted time has expired, the terrain can again be used by friendly forces.

The OPFOR prefers to retain the element of surprise and therefore employs remotely delivered, scatterable mines immediately before combat or during the course of the battle. When dispensed, these minefields are generally laid immediately in front of attacking, reinforcing, and withdrawing enemy troops, or may be emplaced directly on enemy formations. Possible uses of scatterable mines are toâ ¯

- Isolate enemy forces.
- Disrupt the attacking forces, causing them to deploy early and expend mineclearing assets.
- Disrupt and delay enemy exploitation forces, reserves, or counterattack forces.
- Prevent enemy artillery from displacing during counterbattery fire.
- Interdict LOCs.
- Prevent the use of a logistics site.
- Obstruct a choke point.
- Protect flanks.
- Seal breaches in friendly obstacles or gaps between units.

Artillery

Some cannon artillery systems are capable of delivering both AP and AT mines. However, MRLs are the primary means of remote minelaying. The principal advantage of MRL mine delivery is its ability to quickly emplace large minefields in a single volley, while minimizing exposure to enemy targeting and weapon systems. For example, a single volley from a 220-mm MRL battery can deliver over 2,300 AT scatterable mines to a range of 10 to 35 km. With these mines, it can emplace a covering minefield approximately 3 km wide or a containing minefield about 1,200 m wide and 1,200 m deep. For additional information on artillery systems and mine delivery capabilities, see the Worldwide Equipment Guide.

Infantry

The OPFOR may also employ small, man-portable remote mine dispensers with its lower-level infantry units. These mine dispensers, weighing only a few pounds, can be either pulled like a handcart or carried by a soldier. Depending upon the design, infantry remote minelaying systems propel mine canisters out to approximately 100 m, while rocket-dispensed systems may go out as far as 3,000 m. The operator loads the mine-filled rockets (or a propelling charge and mine canister) into the launch tube, mounts the system on the edge of a trench or firing parapet, aims the tube, connects the wire to the tube, moves off to a safe distance, and connects the wire to the blasting mechanism. With a trained operator, it takes only a few minutes to set up the dispenser and create a minefield. For additional information, see the Worldwide Equipment Guide.

Infantry-fired ground dispensers are ideal for installing small, defensive, AP or AT minefields. They allow low-level units to remotely emplace minefields to protect their battle positions, flanks, and boundaries between units, or to cover firing lines and gaps in combat formations. They can quickly close breaches in existing protective minefields and increase the density of mines on armor avenues of approach.

Ground Vehicles

In recent years, the trend has been to mount scatterable-mine dispensers on ground vehicles. Both AP and AT mines can be launched from ground vehicles. This also gives the engineers the ability to re- seed or reinforce an obstacle without entering the minefield itself.

Aerial

Other than the above-mentioned ground force systems for remote minelaying, fixed-wing aircraft and helicopters can remotely deliver mines. The following paragraphs describe aerial minelaying capabilities.

Bombers or ground-attack aircraft can lay remotely delivered minefields throughout the AOR. Aircraft are only used to deliver mines beyond the battle line when they cannot be delivered (for whatever reasons) by indirect fire means. Delivering mines from low altitudes deep in enemy territory increases the risk of losing the aircraft to enemy ground fires or air defense. Therefore, fixed-wing aircraft are generally used to deliver ordnance such as scatterable mines beyond the range of OPFOR artillery systems (including MRLs). Ground-attack aircraft lay these minefields in the enemyâ s tactical depths.

High-performance aircraft can lay mines at a speed of 400 to 800 km/h from an elevation of 50 to 200 m. Aircraft-delivered scatterable mine canisters are dropped on parachutes. The canisters are set to burst open at a predetermined height to scatter the mines.

Helicopter minelaying systems are used to emplace large barrier minefields in the execution of offensive or defensive maneuver plans. This type of aerial minelaying is normally conducted over friendly territoryâ ¯along the flanks or in the rear areas. When supporting an airborne or heliborne landing, helicopters may lay mines on enemy territory.

Aerial minelaying systems can lay both AT and AP minefields. Some attack and medium-lift helicopters and a few light helicopters have the capability to perform minelaying missions. A light helicopter does not carry armament when accomplishing these missions. Medium-lift and attack helicopters are most commonly used for aerial minelaying.

Some helicopters can dispense conventional mines by the addition of an internal minelaying chute within their cargo area. Mines are contained on custom mine racks and then fed manually or automatically onto the chute. The mines are then armed as they are dispensed. These heliborne minelaying systems can be used in formations of two, three, or four and operate relatively similar to the ground mechanical minelaying systems. The speed of minelaying can vary from 20 to 300 km/h from an altitude of 30 to 100 m. While at a near hover above the ground, the helicopters operate 20 to 40 m apart, with each laying a straight-line row. The mines in each row can be staggered and the distance between mines depends on whether the mines are pressure-initiated or full-width attack mines.

One light helicopter can deliver 60 to 80 AT mines or 100 or 120 AP mines. A medium-lift helicopter equipped with a minelaying system delivers 100 to 140 AT mines or 200 to 220 AP mines on a single sortie. To lay a minefield 15 by 30 m with AT mines takes approximately six sorties of a single light helicopter or approximately four flights of a single medium-lift helicopter.

Survivability

The construction of battle and fighting positions is a labor-intensive process and is therefore a shared responsibility of engineers and supported units. The OPFOR makes maximum use of civilian engineer assets and personnel. Full preparation of defensive positions involvesâ

- Fighting positions for individual and crew-served weapons.
- Fighting trenches and communication trenches.
- Firing positions for tanks, IFVs, APCs, air defense, and other weapon systems.
- Protection for CPs and logistics sites.

Survivability activities when fighting a more powerful opponent have several unique engineer requirements. Some examples are toâ

- Take full advantage of screening, protective, and C3D techniques, along with careful selection of terrain to passively deny the enemy the ability to acquire OPFOR positions for targeting.
- Make extensive use of local building materials, equipment, and work force.
- Protect CPs and logistics sites.
- Bury communications lines.
- Construct false positions, equipment, movement routes, and LOCs.
- Assimilate minefields and obstacles to the terrain.
- Prepare caves, tunnels, and tunnel complexes in which troops can live and from which they can fight.

Fortification

Although engineers have the bulk of specialized equipment for constructing sophisticated survivability positions, engineer support at brigade level and lower is very limited. Therefore, maneuver units at battalion and below exert maximum effort to develop and improve their own positions. (See Shared Responsibilities for Field Fortifications, below.) Considering the projected time of stay, the conditions of the terrain, and the upcoming combat tasks, the maneuver commander determines the amount, sequence, and time for the fortification of an area.

Fortified positions increase OPFOR weapons effectiveness. They also protect personnel, weapons, and material from enemy targeting and reconnaissance assets, and from the effects of enemy attack. The OPFOR categorizes field fortifications according to purpose. It divides them into structures forâ ¯

- Firing and observation.
- Protection for personnel, equipment, and material.

Fortification Priorities

Commanders assign fortification priorities to tasks that provide the best level of protection at all times against a possible enemy attack. The normal priority is from front to rear, beginning with the primary battle and fighting positions, then the temporary positions, alternate positions, and if possible deception positions. One of the greatest factors influencing the level and sequence of fortification preparation is whether the transition to the defense occurs in contact or out of contact with the enemy.

If forward maneuver units are in contact with the enemy, they prepare their own positions as much as possible. The maneuver unit is responsible for the majority of defensive fortifications. This includes emplacing minefields and nonexplosive obstacles.

When not in direct contact with the enemy and when the situation permits, engineer excavating and bulldozer equipment may be used toâ ¯

- Dig communications and fighting trenches and tank and IFV or APC emplacements. (For the most effective use of the heavy equipment, the supported mechanized infantry or tank unit must lay out and mark the areas for ditching.)
- Fortify squad trenches and platoon battle positions.
- Provide engineer reconnaissance.
- Emplace engineer obstacles.
- Prepare alternate battle and fighting positions.

Preferably, engineer preparations occur at night or under other conditions of reduced visibility.

Shared Responsibilities for Field Fortifications

Engineer tasks are a shared responsibility throughout the OPFOR. Engineer and combat personnel perform survivability tasks such as constructing fortifications, clearing fields of fire, and camouflage. Although the highest level of engineer training and the greatest technical capabilities exist in the engineer troops, all military personnel and units train somewhat in fundamental engineer tasks. The majority of defensive preparation is conducted at the maneuver unit level. The following are several examples of specific responsibilities:

- Soldiers: dig individual fighting positions and trenches.
- Combat vehicles: several hundred vehicles in a mechanized infantry division may have self-entrenching capability.
- Engineers: construct fortified positions and communications trenches; dig in critical equipment, C2 sites, and logistics facilities.

Maneuver commanders realize that fortification of battle positions or assembly area positions is a shared responsibility involving all available personnel and equipment. This process starts with infantry using shovels and armored vehicles using integral self-entrenching blades, if available. When building the positions, they must take advantage of the protective and camouflaging properties of the terrain, local building materials, engineer construction equipment, explosives, and prefabricated installations.

Meanwhile, engineers using specialized equipment dig positions for critical sites such as medical facilities and C2 centers. As scarce engineer equipment becomes available, it supports maneuver units by augmenting and improving on the work the units have already begun.

In preparation for offensive action, the primary use of field fortification is in the preparation of assembly areas. Even there, the tasks of preparation typically exceed the capability of engineers constituent to the brigade and even of those likely to be assigned as augmentation.

The goal is to prepare a separate assembly area for each battalion-size unit, using engineer equipment to construct positions for vehicles shortly after they arrive at their assigned location. Within 1 to 2 hours, engineers dig assembly area fighting positions for all personnel. The engineers may prepare prefabricated structures for battalion CPs and carefully camouflage all structures.

Camouflage, Concealment, Cover, and Deception

The OPFOR uses various C3D measures to mislead the enemy about size and location of forces and weapon systems and about the nature of defensive engineer preparations. Defensive measures includeâ ¯

- Use of screening properties of terrain, darkness, and other conditions of limited visibility during engineer preparation of defensive positions and positioning of forces.
- Camouflage painting of material.
- Use of local materials and standard-issue camouflage screens.
- Strict camouflage, noise, and light discipline.
- Construction of false battle positions, decoy positions, and decoy equipment.
- False actions to draw attention.
- Assimilation of minefields and obstacles to the terrain.

However, OPFOR applications of C3D are not limited to the defense. During the offense, C3D measures includeâ ¯

- Selection of terrain for its screening effect.
- Use of obscurants (smokescreens).
- Use of artificial and natural camouflage screens.
- Simulation of characteristic defensive measuresâ ¯toâ mineâthe terrain in view of the enemy with decoy minefields or to give the appearance of reinforced defensive positions.

- Use of concealed routes for movement of supplies and reserves.

Artificial Camouflage

The OPFOR employs artificial camouflage as a supplement when natural screens cannot provide the concealment of forces and combat material. It includes both natural and manufactured camouflage. The OPFOR uses camouflage nets and screens extensively. It improves multispectral screening by using camouflage nets, covers, and individual camouflage equipment.

Decoys

The OPFOR uses deception activities and equipment to counter enemy reconnaissance. All engineer units receive special training in constructing decoys from locally available materials. These decoys cover a wide spectrum of types and must be introduced or â discoveredâ in the same priority a real or existing unit would emplace them. The general priority of engineer construction is from front to rear, beginning with the primary battle and fighting positions, then the temporary and alternate positions. The time sequence in which these â appearâ gives credibility to the deception. The engineers may use obsolete or derelict equipment for deceptive purposes. The emphasis is on tactical systems and measures that provide effective concealment and deception.

To aid in water obstacle crossings, engineers can construct deception crossing sites, before or at the same time they are establishing actual ones. They try to draw the enemyâ s attention to simulated crossing sites while real ones remain carefully camouflaged. They give authenticity to simulated crossings by using corner reflectors, by deploying vehicles on roads and other approaches to them, by moving simulated vehicles across them, and by positioning construction and bridging equipment near simulated sites.

The OPFOR plans to employ mock-ups and decoys as an integral part of battles. Simulations can obscure OPFOR intentions and cause the enemy to waste effort by destroying decoys. The engineers bear a major responsibility for constructing simulations. The OPFOR places emphasis on those engineer simulation measures that it can transport easily and construct rapidly.

The following conditions must exist in order for decoy equipment to be successful:

- Placement must be in areas where the enemy would reasonably expect to find that type of actual equipment in use.
- Dimensions of simulated equipment must approximate those of actual equipment.

The simulations that engineers construct can represent any type equipment in the OPFOR inventory. Actual equipment that is not functional due to combat damage or mechanical malfunction can be made to appear operational by repainting it to conceal damage or by constructing components to simulate destroyed parts.

Engineers can create false excavations to simulate revetments, hull-defilade vehicle trenches, or individual fighting positions. These false excavations may be only half the depth of actual excavations, although the engineers may create the appearance of greater depth by adding dark materials such as branches, grass, or soil to the bottoms. Troops can temporarily occupy these deception positions and fire from them to aid deception.