ENGINEERING IN THE OFFENSE AND DEFENSE
B3L4038
STUDENT HANDOUT
**Engineering in the Offense and Defense**

**Introduction**
A key aspect of battlefield victory is the ability to control the enemy by controlling the terrain. Simply “owning” the terrain will not suffice. It must be effectively prepared for offensive and defensive missions and improved as needed to sustain the free movement of friendly forces while impeding that of the enemy. Offensively, Combat Engineers search for and exploit the gaps found in the enemy’s defenses while, defensively, they continuously scrutinize and mitigate what gaps they may discover within their own.

**Importance**
This class will provide you with the necessary information to effectively employ engineering assets on the battlefield with regards to mobility, counter-mobility, survivability, and general engineering.

**In This Lesson**
We will discuss the capabilities and fundamentals of combat engineering in both the offensive and defensive roles.

This lesson covers the following topics:

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**Learning Objectives**

**Terminal Learning Objectives**

1. 0300-DEMO-1003 Given an M18A1 Claymore mine and sector of fire, while wearing a fighting load, describe how to emplace an M18A1 Claymore mine to ensure the sector of fire is covered without endangering friendly personnel or equipment. 0300-DEMO-1003

2. 0302-OFF-1206 Given a unit, an assault or engineer unit, demolitions, a mission, and a commander’s intent, employ demolitions to achieve desired effects of the demolitions in support of the ground scheme of maneuver.
3. MCCS-DEF-2203 Given a unit, a barrier plan, and material needed to emplace obstacles, direct obstacle emplacement to achieve the effect desired by the commander.

Enabling Learning Objectives

1. 0302-DEF-1301e Given a unit, a mission, a mental estimate of the situation, supporting engineer assets, and a commander's intent, employ engineers in support of defensive operations to accomplish the mission.

2. 0302-OFF-1201g Without the aid of references, describe engineer capabilities that support offensive operations to support mission accomplishment.

3. 0302-OFF-1206b Without the aid of reference, identify demolition capabilities/limitations without error.

4. MCCS-DEF-2203a Without the aid of reference, identify obstacle types without error.

5. MCCS-DEF-2203b Given a mission, a commander's intent, obstacle materials, and while leading a rifle squad or platoon, plan obstacles to support the defensive scheme of maneuver.
Engineers in the Defense

"Everything that is shot or thrown at you or dropped on you in war is most unpleasant but, of all the horrible devices, the most terrifying ... is the landmine." --- Sir William Slim 1959

Engineer assets are generally centralized at the highest command level. Assignment of engineer forces and equipment in general support is desired to provide required technical skills and equipment beyond the capabilities of the supported unit and to ensure coordinated planning and logistics support. However, Engineers have the capability to operate in direct support or as attachments on small unit levels in order to accomplish the mission.

Combat Engineer Employment in the Defense

The primary role of engineers in defensive operations is to:

- Impede the mobility of the enemy.
- Field fortification.
- Provide general engineering tasks to amplify sustainability of supported unit.

Battlefield Functions in the Defense

Engineer battlefield functions in the defense are the same as in other military operations. Engineers perform the following battlefield functions:

- Counter-Mobility.
- Survivability.
- Mobility.
- General engineering.

Counter-Mobility

The primary intent of counter-mobility operations is to deny the enemy's ability to execute his plan by:

- Disrupting his combat formations.
- Interfering with his command and control.
- Creating a vulnerability that friendly forces can exploit.

The secondary intent is to destroy or disable his vehicles. Engineers conduct the following counter mobility tasks in the defense:

- Development of the obstacle plan to support the maneuver commander's concept of operations.
- Assist in the installation and recording of minefields.
- Provide technical assistance and supervise the construction of specific obstacles.
Engineers in the Defense (Continued)

Survivability

A key component of the defense, survivability includes all aspects of protecting personnel, weapons, and supplies. The objective of survivability is to reduce exposure to threat acquisition, targeting and engagement, and the effects of weather and thereby contribute to a successful defense. Depending on the priority of work and engineer assets available, engineers will provide technical assistance or assist in constructing:

- Fortifications
  - Anti-armor and crew-served weapons positions (hot and cold positions).
  - Armored vehicle positions (hull defilade vs. turret defilade).
  - Hardened command posts and combat support positions.
- Protective obstacles.
- Strong-points.
- Camouflage.
- Development of the deception plan.

Mobility

Mobility support assists forces to move rapidly, mass, disperse, and be resupplied. Engineers conduct the following mobility tasks in the defense:

- Prepare counterattack routes clear of obstacles and/or have prepared breaches.
- Prepare combat trails for counterattacks and lateral movement between battle positions.
- Prepare lanes and gaps through obstacle zones and belts.
- Reduce obstacles created by enemy fires and sabotage.
- Clear landing zones for resupply and medical evacuations (MEDEVACs).
Engineers in the Defense (Continued)

General Engineering

Engineers also conduct the following general engineering tasks in the defense:

- Maintain and improve lines of communication and main supply routes.
- Construct and repair support facilities.
- Store and dispense fuel and water.
- Construct airfields and aircraft support facilities.

Counter-Mobility Achieved Through Obstacle Construction

An obstacle is any obstruction that stops, delays, or restricts movement or maneuver. The two general categories of obstacles are:

- Existing.
- Reinforcing.

Existing Obstacles

Existing obstacle are those obstacles already present on the battlefield and not placed through military effort. They may be:

- Natural
  - Drainage features.
  - Soil trafficability.
  - Slope and relief.
  - Vegetation.
  - Climate and weather.

- Cultural
  - Cities/towns.
  - Dikes, dams, canals.
  - Drainage ditches, embankments, cuts, and fills.
  - Hedgerows and orchards.
  - Roads and railroads.
**Engineers in the Defense (Continued)**

The table below lists effectiveness criteria for existing obstacles.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Critical Value</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage (rivers and streams)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>&gt;150 m</td>
<td>Major obstacle</td>
</tr>
<tr>
<td>Depth</td>
<td>&gt;1.5 m</td>
<td></td>
</tr>
<tr>
<td>Velocity</td>
<td>3.7 mps</td>
<td></td>
</tr>
<tr>
<td>Ditch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>&gt;2.8 m</td>
<td>Exceeds tank’s self-bridging capability</td>
</tr>
<tr>
<td>Depth</td>
<td>&gt;1.5 m</td>
<td>Exceeds tank’s ability to step</td>
</tr>
<tr>
<td>Dry gap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>&gt;18 m</td>
<td>Exceeds most armored vehicle launch bridges (AVLBs)</td>
</tr>
<tr>
<td>Ford</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>&gt;1.5 m</td>
<td>Cannot be forded without special equipment</td>
</tr>
<tr>
<td>Soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bearing pressure</td>
<td>&lt;8 psi</td>
<td>Hinders tracked and wheeled vehicle movement</td>
</tr>
<tr>
<td>Soil type and moisture</td>
<td></td>
<td>Affect trafficability</td>
</tr>
<tr>
<td>Slope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td>Stops most wheeled movement</td>
</tr>
<tr>
<td>45%</td>
<td></td>
<td>Delays most tank movement</td>
</tr>
<tr>
<td>60%</td>
<td></td>
<td>Stops tank movement</td>
</tr>
<tr>
<td>Vegetation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree diameter</td>
<td>20.5 cm</td>
<td>Stops wheeled vehicles</td>
</tr>
<tr>
<td>With tree spacing</td>
<td></td>
<td>Delays tracked vehicles</td>
</tr>
<tr>
<td></td>
<td>3 to 5 m</td>
<td>Delays tracked and wheeled vehicles</td>
</tr>
</tbody>
</table>

**Notes:**

1. Many terrain features can significantly slow cross-country movement even though they may not stop an individual tank. Examples of such features are ditches narrower than 2.5 m, stone walls, trees spaced closer than 25 cm, and slopes less than 45 percent.
2. The combined effect of two or more factors can create a significant obstacle at a lower value. For example, even a slight uphill slope will stop a tank from pushing over trees smaller in diameter than 25 centimeters.

**Reinforcing Obstacles**

Reinforcing obstacles are those obstacles placed on the battlefield through military effort, which are designed to extend or improve the effectiveness of existing obstacles. A reinforcing obstacle must force the enemy to react, thereby influencing his scheme of maneuver (SOM). Reinforcing obstacles are an integral part of the defensive scheme of maneuver (DSOM). The five types of reinforcing obstacles are: constructed, demolitions, mines/minefields, contamination, and expedient.
Engineers in the Defense (Continued)

Reinforcing Obstacles (Continued)

- Constructed: built by Marines and equipment, normally without the use of explosives. Generally, constructed obstacles require extensive manpower, material, equipment, and/or time. Examples include:
  - Log cribs.
  - Hedgehogs.
  - Concrete blocks.
  - Tank ditches.

- Demolitions: created by the detonation of explosives. Examples include:
  - Road craters.
  - Abatis.
  - Landslides.

- Mines/Minefields: the only reinforcing obstacle capable of killing or destroying enemy personnel and equipment.
- Contamination: nuclear or chemical in nature.
- Expedient: The potential of expedient obstacles is unlimited. By their nature, expedient obstacles substitute locally available materials and manpower for a logistical requirement.

Principles of Obstacle Employment

A commander has several options in organizing the defense. He plans his defensive scheme based upon his mission analysis and situational estimate (METT-T). Organizing the defense must be carefully matched to the terrain.

As the principal element in reinforcing the terrain to best complement the maneuver commander's plan, the engineer is responsible for developing the obstacle plan. The use of reinforcing obstacles is the principal method of terrain reinforcement (see following table). Obstacles have three primary purposes:

- Enhance the effectiveness of friendly fires.
- Delay the enemy's advance, upset his timing, disrupt and canalize his formations into designated engagement areas, and delay or destroy follow-on echelons.
- Enhance friendly economy of force measures.
Engineers in the Defense (Continued)

The table below lists examples of existing and reinforcing obstacles.

<table>
<thead>
<tr>
<th>Existing Obstacles</th>
<th>Reinforcing Obstacles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural</strong></td>
<td><strong>Cultural</strong></td>
</tr>
<tr>
<td>Drainage Features</td>
<td></td>
</tr>
<tr>
<td>• Lakes, ponds, rivers, and streams</td>
<td>• Man-made lakes, ponds, and canals</td>
</tr>
<tr>
<td>• Swamps, marshes, bogs</td>
<td>• Paddy fields</td>
</tr>
<tr>
<td></td>
<td>Blowing dams or dikes to create flooded areas</td>
</tr>
<tr>
<td>Soil and Rock</td>
<td></td>
</tr>
<tr>
<td>• Soft, slippery ground, cliffs, and outcrops</td>
<td>• Soft farmland</td>
</tr>
<tr>
<td>• Boulders</td>
<td>• Quarries, cuts in rock</td>
</tr>
<tr>
<td></td>
<td>• Pits and open-pit mines</td>
</tr>
<tr>
<td>Surface Features</td>
<td></td>
</tr>
<tr>
<td>Slopes, hills, cliffs, and mountains</td>
<td>• Embankments, cuts and fills on roads and railroads</td>
</tr>
<tr>
<td></td>
<td>• Terraces and dams</td>
</tr>
<tr>
<td>Vegetation</td>
<td></td>
</tr>
<tr>
<td>Forests, jungle</td>
<td>Cultivated or seeded forests, orchards, and hedgerows</td>
</tr>
<tr>
<td></td>
<td>Abatis</td>
</tr>
<tr>
<td>Built-Up Areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buildings, towns, fences, and retaining walls</td>
</tr>
<tr>
<td>Other: War damage, rubble, fires, snow, and ice</td>
<td>Demolished buildings, rubble, and wire obstacles</td>
</tr>
<tr>
<td></td>
<td>• Demolitions</td>
</tr>
<tr>
<td></td>
<td>• Mines/minefields</td>
</tr>
<tr>
<td></td>
<td>• Contamination</td>
</tr>
</tbody>
</table>
Engineers in the Defense (Continued)

Employment Principles of Reinforcing Obstacles

“FOCDPIG” Regardless of the type of defense employed by the tactical commander, the seven basic employment principles for reinforcing obstacles are that reinforcing obstacles are:

- **Covered by Fire.** The principal purpose of integrating obstacle location with fire is to enhance the effectiveness of these fires. *With rare exceptions, obstacles that are not covered by fire are little more than a nuisance to the enemy.*

- **Observed.** It is imperative that all reinforcing obstacles are observed in order to maximize the use of available indirect fires on the enemy. In addition, obstacles should be placed in order to maximize the max effective range of various direct fire weapons systems utilizing HAW-MAW-LAW.

- **Concealed and employed for surprise.** By varying the type, design, and location of the obstacle plan, the enemy's understanding of our defensive scheme is made more difficult.

- **Employed in Depth.** A series of simple obstacles arranged one behind the other along a probable axis of enemy advance is far more effective than one large, elaborate obstacle and forces the enemy to quickly attrite his organic engineering assets.

- **Protected by early warning and anti-handling devices.** Incorporating these assets into reinforcing obstacles amplify detection of the enemy especially during times of little or no visibility.

- **Integrated with existing and other reinforcing obstacles that cannot be easily bypassed.** It must support the maneuver commander’s plan. Reinforcing obstacles that do not accomplish one or more of the basic purposes of obstacles are of little value. Reinforcing obstacles must be planned and employed to support the tactical plan

- **Non-Geometric.** By breaking up the outline of the obstacles/defense, the enemy is in the engagement area before he realizes it. This puts the enemy into a dilemma and makes him show his flank or belly.
Engineers in the Defense (Continued)

Obstacle Types

Obstacles are classified as either:

- Protective.
- Tactical.

Obstacle Types by Battlefield Purpose

Protective Obstacles

Protective obstacles are those obstacles employed to protect the defending force from the enemy's final assault; as such, they are key components of survivability operations. Protective obstacles are:

- Close to defensive positions.
- Tied in with the final protective fire (FPF) of the defending unit.
- Emplaced by units normally without the engineers’ assistance.

Protective obstacles are normally wire entanglements and/or hasty protective minefields.
Engineers in the Defense (Continued)

Wire Entanglements  

- Tactical. Tactical wire entanglements are used to turn, fix, disrupt, or block formations well forward of the final protective line (FPL) to draw the enemy into planned engagement areas. Tactical wire is:
  - Also sited parallel to and along the friendly side of the machine gun FPL.
  - Used to influence the enemy’s SOM.

Tactical entanglements extend across the entire front of a position but are not necessarily continuous.

- Protective. Protective wire entanglements are located to prevent surprise assaults from points close to the defensive position. As in the case of all antipersonnel obstacles, protective wire entanglements are close enough to the defensive position for day and night observation but are beyond hand grenade range.

- Supplementary. Supplementary wire entanglements in front of the forward edge of the battle position are used to conceal the exact line of the tactical wire. To the rear of the forward positions, supplementary wire is used to enclose the entire defensive position by connecting the protective wire entanglements.

Legend for diagram:
- XXXXXXX = Tactical wire
- == XX == XX = Supplementary wire
- X-X-X = Protective wire

Layout of Wire Obstacles in a Defensive Perimeter
Tactical Obstacles

Tactical obstacles are those obstacles that directly affect the enemy’s ability to maneuver in a way that gives the defending force a positional advantage. Tactical obstacles are designed, sited, emplaced, and integrated with fires to produce four specific tactical obstacle effects:

- Disrupt.
- Turn.
- Fix.
- Block.

Each obstacle effect has a specific impact on the enemy's ability to maneuver, mass, and reinforce. Obstacles also increase the enemy's vulnerability to friendly fires. Obstacle effects support the friendly scheme of maneuver by manipulating the enemy in a way that is critical to the commander’s intent and scheme of maneuver. The diagram below shows the operational symbols for tactical obstacles.

![Operational Symbols for Tactical Obstacles](image-url)
Engineers in the Defense (Continued)

Disrupt

Disrupt effect:

- Breaks up the enemy's formations
- Causes premature commitment of breach assets
- Interrupts command and control
- Counters the enemy's initiative and synchronization to hinder him from concentrating combat power, causing a piecemeal commitment of attacking units

Turn

A turn effect manipulates the enemy's maneuver in a desired direction:

- First the obstacle must have a subtle orientation to entice the enemy to maneuver rather than breach the obstacle.
- Second, the bypass must be easily detected to entice the enemy to it.

Fix

A fix effect slows the enemy within a specified area so that he can be killed with fires. The term does not mean to stop an enemy advance but rather to give the defender time to acquire, target, and destroy the attacking enemy throughout the depth of an engagement area or avenue of approach.

Block

A block effect is designed to stop an enemy's advance along a specific avenue of approach or allow him to advance at an extremely high cost. Blocking obstacles are complex and integrated with intense fires.
Engineers in the Defense (Continued)

Obstacle Plan

An obstacle plan is a comprehensive, coordinated plan which integrates the use of tactical and protective obstacles to support a scheme of maneuver. The obstacle plan designates the following:

- Obstacle responsibilities.
- General location.
- Directed/reserve obstacles.
- Special instructions.

The obstacle plan is briefed in detail within the combat order.

Example of Engagement Area Using Tactical Obstacles
Engineers in the Defense (Continued)

**Counter-Mobility through Mine Employment**

A mine is an explosive device emplaced for the purpose of killing, destroying, or otherwise incapacitating enemy personnel or equipment. Minefields:

- Are areas of ground containing mines emplaced with or without a specific pattern.
- May contain any type, mix, or number of antitank and/or antipersonnel mines.
- Are classified by type and by purpose. The type of mines used -- conventional or scatterable.—determines the minefield type.
- Must be granted approval by the Component Commander, delegated down to the Regimental level if so desired.

Conventional minefields can be either:

- Protective.
- Tactical.
- Phony.
- Nuisance.

**Protective Minefields**

Protective minefields, like other protective obstacles, are employed to protect the defending force from the enemy's final assault. Protective minefields serve two purposes:

- To impose a delay on the attacker to allow the defender time to break contact.
- To break-up the enemy's assault to complete its destruction.

An important aspect of protective minefields is the requirement to recover them before leaving an area. Protective minefields are classified as either:

- Hasty protective minefields (HPMFs). HPMFs are used as part of a unit's defensive perimeter:
  - Mines are emplaced outside hand grenade range but within the range of small caliber weapons.
  - No anti-handling devices are used.
  - The emplacing unit picks up all mines upon leaving the area, unless enemy pressure prevents mine retrieval or the minefield is being transferred to a relieving commander.
  - The HPMF is recorded on the DA Form 1355-1-R.
Engineers in the Defense (Continued)

Protective Minefields (Continued)
- Deliberate protective minefields. Deliberate protective minefields are used to protect static assets (vital sites): logistics sites, communication nodes, depots, airfields, and permanent unit locations. The typical deliberate protective minefield is the standard pattern minefield.

Tactical Minefields
Tactical minefields, like other tactical obstacles, are employed to directly attack the enemy’s ability to maneuver and to give the defender a positional advantage over the attacker. Tactical minefields:

- May be employed by themselves or in conjunction with other types of tactical obstacles.
- Are not only used in the defense but may also be emplaced during offensive operations to:
  - Protect exposed flanks.
  - Isolate the objective area.
  - Deny enemy counterattack routes.
  - Disrupt enemy retrograde.

Phony Minefields
Phony minefields are one form of tactical minefields that are areas of ground altered to give the same signature as a real minefield and thereby deceive the enemy. Phony minefields serve two functions:

- First, they confuse the attacker’s breach decision cycle and cause him to second-guess his breach decisions.
- Second, they may cause the attacker to wastefully expend breach assets to reduce mines that are not really there.

Friendly forces must regard a phony minefield as live until the tactical situation no longer warrants maintaining the deception. Emplacing even a single live mine within a phony minefield makes a live minefield.
**Engineers in the Defense (Continued)**

**Nuisance Minefields**

Nuisance or interdiction minefields are another form of tactical minefields; they are mainly used to impose caution on enemy forces and to disrupt, delay, and sometimes destroy follow-on echelons. Once nuisance minefields are emplaced, they do not necessarily need to be covered by observation or direct fire.

**Minefield Reporting**

A minefield report is an oral, electronic, or written communication concerning mining activities, friendly or enemy. The local command specifies the exact format of the report. The emplacing unit commander submits these reports through operational channels to the operations officer of the authorizing headquarters. That headquarters integrates the reports with other unit information and disseminates them to subordinate units. The reports will be sent by the fastest, most secure means available.

**Report of Intention**

The report of intention serves as notification to a unit's higher headquarters that the unit intends to emplace a minefield. The report of intention doubles as a request when initiated at levels below those with emplacement authority.

**Report of Initiation**

The report of initiation is a mandatory report, which informs higher headquarters that emplacement has begun and the area is no longer safe for friendly movement and maneuver. The report of initiation should specify the time emplacement began and identify the location of the minefield.

**Report of Completion**

The report of completion is usually an oral report to the authorizing commander that the minefield is complete and functional. The report of completion is followed as rapidly as possible by the completed DA Form 1355 (Minefield Record) or DA Form 1355-1-R (Hasty Protective Minefield Record).
**Engineers in the Defense (Continued)**

### Additional Reports

- **Progress report.** During the emplacing process, the commander may require periodic reports on the amount of work completed.
- **Report of transfer.** The responsibility for a minefield is transferred from one commander to another in a report of transfer. This report, signed by both the relieved and relieving commander, includes a certificate stating that the relieving commander was shown or otherwise informed of all mines within the commander's zone of responsibility. The report of transfer is sent to the next higher commander who has authority over both relieved and relieving commanders.
- **Report of change.** The report of change is made immediately upon any change or alteration made in a previously reported minefield and is sent to the next higher commander. It is then sent through channels to the headquarters that keeps the written mine record. The commander responsible for surveillance and maintenance of the minefield makes the report of change.

### Family of Area Scatterable Mines (FASCAM)

FASCAM refers to the entire inventory of scatterable mines used by United States military forces. Scatterable mines:

- Are laid without regard to classical pattern.
- Are designed to be delivered or dispensed remotely by aircraft, artillery, missile, or ground dispenser.
- Have a limited active life; self-destruct after their life has expired. The duration of the active life varies by the type of mine and delivery system.

Scatterable mine systems enable the tactical commander to emplace minefields in enemy-held or contaminated territory or in other areas where it is impossible to emplace conventional minefields. Some systems allow for rapid emplacement of minefields in friendly areas. As with all minefields and obstacles, scatterable minefields are an engineer responsibility.
## Engineers in the Defense (Continued)

**Family of Area Scatterable Mines (FASCAM) (Continued)**

Based on the tactical plan, the maneuver commander's staff engineer determines the:

- Location.
- Size.
- Time.
- Density of the minefield

With this information and thorough understanding of available systems, the engineer recommends the type minefield to be emplaced (conventional or scatterable). If a scatterable minefield is selected, the engineer recommends the delivery system and coordinates with the appropriate staff officers.

**General Capabilities**

- **Speed.** Scatterable mines can be emplaced more rapidly than conventional mines to adjust for a changing battlefield.

- **Increased mobility.** Upon expiration of the self-destruct time, the minefield is cleared; the commander can move through an area that was previously denied enemy or friendly forces.

- **Efficiency.** Scatterable mines can be emplaced by a variety of delivery methods. Extensive manpower, equipment, or tonnage is not required for their emplacement as they are much smaller and lighter than their conventional mine counterparts.

- **Increased lethality.** Most scatterable AT mines utilize a self-forging fragment (SFF) warhead designed to produce a K-Kill. Scatterable AP mines are tripwire activated and utilize a blast/fragmentation type kill mechanism.
Engineers in the Defense (Continued)

Limitations

- Coordination. Extensive coordination is the chief limitation of scatterable mines. Being that it is a very dynamic weapon, great care must be taken to ensure that proper coordination is made with all higher, adjacent, and subordinate units. All affected units must be notified of the location and duration of scatterable minefields to prevent friendly casualties.

- Cost. Due to their sophisticated design, scatterable mines are much more expensive than conventional mines. The efficiency of scatterable mine systems over conventional mines offsets much of their higher cost.

- Visibility. Because of their means of delivery, scatterable mines will lay exposed on the surface of the ground. However, given their relatively small size and natural colorings, together with the limited visibility and intense activity on the modern battlefield, this problem does not impose a significant limitation to their effectiveness.

Presidential Decision Directive (PDD)

Per presidential decision directive,

- Hand emplaced AP mines are no longer authorized.
- FASCAM (self destruct) and AT mines are allowed.
Engineers in the Offense

"While riflemen and machine gunners opened a rain of fire against the strongpoint’s firing ports, this small band raced across the sand and up the steep slope. The Japanese knew they were in great danger. Scores of them poured out of a rear entrance to attack the Marines on top. Bonnyman stepped forward, emptied his carbine into the onrushing Japanese, then charred them with a flame-thrower. He was shot dead; his body rolling down the slope, but his men were inspired to overcome the Japanese counterattack. The surviving engineers rushed to place explosives against the rear entrances."

--- Across the Reef: The Marine Assault of Tarawa

In offensive operations, engineers normally work and fight well forward with the maneuver elements as an integral part of the combined arms team. Decentralization of control is required to provide necessary close engineer support to forward elements in offensive operations. Therefore, combat engineers are best employed in direct support roles with attachment of appropriate engineer elements to specific supported units as dictated by mission.

The combat engineer squad is the smallest unit assigned direct support missions and must be at least as mobile and survivable as the unit they are supporting.

**Combat Engineer Employment in the Offense**

The primary role of engineers in offensive operations are to:

- Ensure uninterrupted movement of friendly forces maintaining momentum of the attack.
- Provide flexibility to the supported maneuver unit.
- Degrade the enemy’s ability to maneuver.

**Battlefield Functions in the Offense**

Engineer battlefield functions in the offense are the same as in other military operations. Engineers perform the following battlefield functions:

- Mobility.
- Survivability.
- Counter-Mobility.
- General Engineering.
Engineers in the Offense (Continued)

Mobility

Mobility is the key to successful offensive operations. Its major focus is to enable friendly forces to maneuver freely on the battlefield. Mobility missions in the offense are:

- Engineer reconnaissance. Often necessary for reliable mobility information about the area over which the force is planning to advance. This reconnaissance must be made prior to friendly movement, since the information gained provides a basis for the estimate of engineer personnel, supplies, and equipment necessary to support the operation as well as the ability of the force to move in a certain area.

- Expedient/hasty road repair. Repair of minor combat damage to existing combat roads and trails. Follow-on forces in a general engineering role would handle extensive damage.

- River crossings. River crossings are among the most critical, complex, and vulnerable combined arms operations. River crossings will be conducted using assault or standard bridging equipment.

- Construction of landing zones (LZs)/forward arming and refueling points (FARPS). Helicopter-borne operations will require combat engineer support to clear landing zones and to construct FARPs.

- Construction and maintenance of expeditionary airfields. Engineers are organized and equipped to construct, repair, and maintain expeditionary airfields. They are equipped to construct these airfields in locations such as abandoned or existing airfields, highways, or reasonably level terrain with suitable soil conditions that require a minimum of construction effort.

- Obstacle breaching. The most recognized mission of engineers in the mobility functional role. Engineer support is needed to breach an obstacle any time a maneuver unit cannot by itself overcome an obstacle without affecting forward momentum.
Engineers in the Offense (Continued)

Survivability

During offensive operations, use of multiple routes, dispersion, highly mobile forces, and wise use of terrain are the best ways to ensure survivability. In addition, the use of protective measures decreases the lethality of enemy firepower. Engineer expertise, manpower, material, and equipment assist units to improve survivability through:

- Construction of fighting and protective positions. Whenever maneuver units halt, engineers build and improve as many protective positions as possible. These positions should be constructed expeditiously and utilize existing terrain when possible.

- Assistance in camouflage and deception. Engineers install phony equipment and emplace phony minefields as part of a unit's camouflage and deception plan. Observation of both engineer equipment and work transmits a specific message of build up activity to the enemy, thereby contributing to the false intelligence picture.

Counter-Mobility

While mobility of the force is the first priority in offensive operations, counter-mobility operations are vital to help isolate the battlefield and protect the attacking force from enemy counterattacks. Obstacles will be used in offensive operations to:

- Block or inhibit enemy movement. Obstacles can:
  
  o Help secure the flanks and rear of the attacking force during the initial phases of the attack.
  o Also impede enemy counterattacks by preventing the enemy from reinforcing weak areas under attack and denying the use of critical routes.

- Concentrate combat power. Obstacles enable friendly forces to control or defend an area with fewer men and assets (economy of force), thus making more combat power available for the main effort (ME).

Obstacle employment must be coordinated to prevent any interference with mobility requirements of the attacking force.
Engineers in the Offense (Continued)

General Engineering During offensive operations, the focus of general engineering is the sustainability of the force, ensuring that combat support and combat service support functions are able to remain as close as possible to maneuver units by:

- Replacing assault and tactical bridging with semi permanent fixed bridging.
- Improving and maintaining lines of communication (LOC) and main supply routes (MSRs).
- Constructing support facilities.
- Constructing forward airfields and airfield support facilities.
- Clearing minefields and other obstacles.

Mobility Through Obstacle Breaching Obstacle breaching is the employment of a combination of tactics and techniques to project combat power to the far side of an obstacle. Breaching is a synchronized combined arms operation under the control of the maneuver commander. To understand breaching theory and breaching tactics requires knowledge of key terms defined in the table below.

<table>
<thead>
<tr>
<th>Key Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstacle reduction</td>
<td>The physical creation of a lane through or over an obstacle. The lane can be created by making or finding a way through the obstacle.</td>
</tr>
<tr>
<td>Obstacle clearing</td>
<td>The total elimination or neutralization of an obstacle. Clearing operations are not conducted under fire and are usually conducted by follow-on engineer forces.</td>
</tr>
<tr>
<td>Proofing</td>
<td>Verifying that a lane is free of mines by passing a mine roller or other mine-resistant vehicle through as the lead vehicle. Proofing should be done when time, threat, and mission allow.</td>
</tr>
<tr>
<td>Marking`</td>
<td>A good marking system allows a force to quickly pass through a breached lane thereby maintaining momentum, giving confidence in the safety of the lane, and helping to prevent casualties.</td>
</tr>
<tr>
<td>“Bulling through”</td>
<td>Not a breaching operation, but a desperate decision made when a commander must react immediately to extricate his force from an untenable position within an obstacle and no other breaching operations are possible.</td>
</tr>
<tr>
<td>Bypass</td>
<td>A route that avoids the obstacle. When a unit bypasses an obstacle, it physically changes its direction of movement to avoid the obstacle.</td>
</tr>
</tbody>
</table>
### Engineers in the Offense (Continued)

<table>
<thead>
<tr>
<th>Breaching Tenets</th>
<th>Successful breaching operations are characterized by application of the following breaching tenets:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Intelligence.</td>
</tr>
<tr>
<td></td>
<td>• Breaching fundamentals.</td>
</tr>
<tr>
<td></td>
<td>• Breaching tactics.</td>
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<tr>
<td></td>
<td>• Mass.</td>
</tr>
<tr>
<td></td>
<td>• Synchronization.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intelligence</th>
<th>A commander needs to &quot;see the battlefield&quot; to be successful. In operations where enemy obstacles can interfere with friendly maneuver, obstacle intelligence (OBSINTEL) becomes a priority. As the experts on obstacles, combat engineers should be incorporated with other human intelligence gathering forces to conduct engineer (obstacle) reconnaissance. Specific OBSINTEL requirements include:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Obstacle location.</td>
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<tr>
<td></td>
<td>• Obstacle orientation.</td>
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<tr>
<td></td>
<td>• Presence of wire.</td>
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<tr>
<td></td>
<td>• Gaps and bypasses.</td>
</tr>
<tr>
<td></td>
<td>• Minefield composition:</td>
</tr>
<tr>
<td></td>
<td>• Conventional or scatterable.</td>
</tr>
<tr>
<td></td>
<td>• Types of mines.</td>
</tr>
<tr>
<td></td>
<td>• Depth.</td>
</tr>
<tr>
<td></td>
<td>• Anti-handling devices.</td>
</tr>
<tr>
<td></td>
<td>• Location of enemy direct-fire weapons.</td>
</tr>
</tbody>
</table>
Engineers in the Offense (Continued)

Breaching Fundamentals

The breaching fundamentals are the actions that must be applied to ensure success when breaching against a defending enemy. SOSR is the acronym for breaching fundamentals, which are to:

- **Suppress.** Suppression is the focus of all available direct and indirect fires on enemy personnel, weapons, or equipment to prevent effective fires on friendly forces. The purpose of suppression is to protect forces reducing and maneuvering through the obstacle and to soften the initial foothold. Suppressive fires in sufficient volume, a 3:1 minimum ratio, serve to isolate the breach site.

- **Obscure.** Obscuration hampers enemy observation and target acquisition and conceals friendly activities and movement. It may be employed to protect obstacle reduction, passage of assault forces and deployment of forces in assault formations.

- **Secure.** The force secures the breaching site to prevent the enemy from interfering with obstacle reduction and passage of the assault force through the lanes created. Identifying the extent of enemy defenses is critical before selecting the appropriate technique to secure the breach. In general, enemy tactical obstacles are secured by fire and protective obstacles are secured by force.

- **Reduce.** Once the other breaching fundamentals have been applied and become effective, obstacle reduction to create lanes through or over the obstacle begins. The number and width of lanes varies with the situation and type of breaching operation. The lanes must be sufficient to allow the force to cross and accomplish the mission.

Breaching Tactics

The commander organizes the force with the necessary assets to accomplish SOSR breaching fundamentals quickly and effectively.
**Engineers in the Offense (Continued)**

**Breaching Tactics** (Continued)

- **Support force.** The support force's primary responsibility is to eliminate the enemy's ability to interfere with the breaching operation. Suppression is critical for a successful breach; therefore, the first priority of force allocation is the support force. A ratio of 3:1 against the enemy in direct and indirect weapons is generally required for a deliberate breach. For a hasty breach, a ratio of 2.5:1 is required. The support force is responsible for:
  
  - Isolating the battlefield with fires and suppressing enemy fires covering the obstacle.
  - Massing direct and indirect fires to fix the enemy in position and to destroy any weapons that are able to bring fires on the breaching force.
  - Control obscuring smoke to prevent enemy-observed direct and indirect fires.

- **Breach force.** The breach force's primary mission is to create lanes that enable the attacking force to pass through the obstacle and continue the attack. It is also responsible for marking the lanes and entry points to speed passage of the assault units and follow-on forces. In deliberate and in-stride breaching operations, the breach force is a combined arms force of engineers, breaching assets, and enough maneuver force to provide local security. The breach force must be capable of suppressing enemy positions that the support force cannot effectively observe and suppress. The breach force must be capable of creating a minimum of one lane for each assault company or two lanes for a mechanized task force. Ideally, the breach force wants a minimum 50 percent redundancy in its equipment and organization to account for the heavy casualties that are usually expected in breaching operations. After reducing the obstacle, the breach force may be required to secure a lodgment on the far side for deployment of the assault force into an assault formation.

- **Assault force.** The assault force's primary mission is to destroy or dislodge the enemy from the far side of the obstacle; it secures the far side of the obstacle by physical occupation. The assault force must be sufficient in size to seize objectives that eliminate fires on the breaching site. Combat power is allocated to the assault force to achieve a 3:1 ratio on the assault objective.
Engineers in the Offense (Continued)

Mass

Breaching is conducted by rapidly applying concentrated force at a point or place to crack the obstacle and rupture the defense. Massed combat power is directed against an enemy weakness. Achieving necessary mass for the assault requires the breach force to open enough lanes through the obstacle to permit rapid passage and the buildup of forces on the far side.

Synchronization

Breaching operations require precise synchronization of the SOSR breaching fundamentals by support, breach, and assault forces. Failure to synchronize effective suppression and obstruction with the obstacle reduction and assault can result in rapid, devastating losses of friendly troops in the obstacle or in the enemy's kill zone.

Breaching Operations

Breaching operations make maneuver possible in the face of enemy obstacle efforts. Since obstacles may be encountered anywhere, maneuver forces integrate breaching operations into all movement plans. The different types of breaching operations possible are In-stride and Deliberate breaches.

- In-Stride Breach. Maneuver units use in-stride breach to quickly overcome unexpected or lightly defended tactical obstacles. In-stride is:
  - An extremely rapid technique using standard actions on contact to seize and maintain the initiative
  - A decentralized, independent breaching operation that relies on well-rehearsed immediate action drills

The commander planning for an in-stride breach must consider missions for his maneuver and engineer forces that allow quick transition to a deliberate breach should attempts at an in-stride breach fail. A commander is driven to organize his force for an in-stride breach when:

- An unclear situation makes it necessary for several lead subordinate units to be capable of independent breaching operations to accomplish the mission.
- The enemy defense is so weak that the forces necessary to support, breach, and assault can be reasonably task organized into a subordinate unit and do not require the maneuver of other subordinate units to adequately suppress, secure, or reduce the obstacle.
Engineers in the Offense (Continued)

Breaching Operations (Continued)

- **Deliberate Breach.** A deliberate breach is a scheme of maneuver specifically designed to cross an obstacle to continue the mission. Characterized by thorough reconnaissance, detailed planning, extensive preparations, and explicit rehearsals, the deliberate breach is centrally planned and executed. Units conduct a deliberate breach when:
  
  - The unit fails an attempted in-stride breach of enemy tactical obstacles.
  - Force allocation ratios indicate that a confirmed enemy situation is beyond the capabilities of a subordinate unit.

Obstacle Reduction Techniques

Obstacle reduction techniques are the means by which lanes are created during breaching operations. Breach forces will seldom employ only one technique against any single obstacle. The techniques are:

- **Mechanical.** Involve the use of mine plows, mine rollers, bulldozers, bridging equipment, fascines, or any other heavy equipment assets.
- **Explosive.** Use the overpressure produced by the detonation of the explosives to activate single-impulse mines. Explosive means include both mounted and hand-emplaced explosive techniques.

Mounted systems include the M58 mine-clearing line charge (MICLIC) or the Mk1 triple-shot Amphibious Assault Vehicle (AAV), which consists of three MICLICs mounted in the rear of the AAV.

Manual systems are the Bangalore torpedo, the APOBS (antipersonnel obstacle breaching system), and any other type of hand-emplaced explosive charge.

Additionally, fuel air explosives (FAE) delivered by aircraft or artillery can also be used against minefields.

- **Manual.** Include probing, grappling hooks, bolt cutters, assault ladders, and any other expedient method that may be used to breach the obstacle.
- **Electronic.** Through the use of mine detectors.
Engineers in the Offense (Continued)

Steps for Conducting a Breach

A sample execution matrix for a Marine Air-Ground Task Force (MAGTF) conducting a deliberate breach is provided in the table below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Element</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Indirect fire and offensive air support provide suppression.</td>
<td>Support force</td>
<td>Ground units within support force move to overwatch positions.</td>
</tr>
<tr>
<td>2</td>
<td>Ground units in support force provide direct suppressive fire.</td>
<td>Support force</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Breach and assault forces move into position.</td>
<td>Breach force, Assault force</td>
<td>Breach and assault forces prepare to execute tasks.</td>
</tr>
<tr>
<td>4</td>
<td>Smoke obscures enemy view of breach site.</td>
<td>Support force</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Obstacles are reduced and cleared lanes are marked.</td>
<td>Breach force</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Suppressive fire shifts beyond objective.</td>
<td>Support force</td>
<td>Coordinated with assault force.</td>
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<tr>
<td>7</td>
<td>Assault force attacks through breached lane.</td>
<td>Assault force</td>
<td></td>
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<tr>
<td>8</td>
<td>Breached lanes handed off to follow-on forces.</td>
<td>Breach force</td>
<td>Can also be done by support force.</td>
</tr>
<tr>
<td>9</td>
<td>Resupply.</td>
<td>As required</td>
<td></td>
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<tr>
<td>10</td>
<td>Reorganize to continue mission</td>
<td>As required</td>
<td></td>
</tr>
</tbody>
</table>
## Obstacle Breaching Table

<table>
<thead>
<tr>
<th>Resources Available</th>
<th>Obstacle Encountered</th>
<th>Minefield 4 M Lane</th>
<th>AT Ditch/ Road Crater</th>
<th>Steel Obstruction</th>
<th>Walls</th>
<th>Abatis</th>
<th>Log Obstacle</th>
<th>Bunker</th>
<th>Rubble</th>
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<tbody>
<tr>
<td>Grapnel Hook</td>
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<td>Surface</td>
<td>Buried</td>
<td>Wire</td>
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<tr>
<td>Pioneer Kit</td>
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<td>Chain Saw</td>
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<td>Probe</td>
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<tr>
<td>Mine Detector/Probe</td>
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<td>Blade (Dozer/ACE)</td>
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<td>AVLB</td>
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<td>Towed Assault Bridge</td>
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<td>Mine Roller</td>
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<td>Mine Plow</td>
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<td>Direct Fire</td>
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<td>Soft Material</td>
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<tr>
<td>Fascines</td>
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<td>Lumber</td>
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</tbody>
</table>

Legend:
Desirability of Employment Scale:  
1 = Most desirable  
10 = Least desirable

*Probe and/or mine detector combination are used together with the grapnel hook for explosive minefield breaching.
Summary

During most offensive operations, demand for combat engineer support will exceed available resources. Maneuver commanders, with the advice of their engineer commanders, must prioritize the engineer effort. Combat engineer support, like other ground support assets, is task-organized in response to the anticipated threat and mission of the supported unit.

References

<table>
<thead>
<tr>
<th>Reference Number or Author</th>
<th>Reference Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM 20-32</td>
<td>Mine/Countermine Operations</td>
</tr>
<tr>
<td>MCWP 3-31.2</td>
<td>Mine Warfare</td>
</tr>
<tr>
<td>MCWP 3-17.3</td>
<td>MAGTF Breaching Operations</td>
</tr>
<tr>
<td>FM 5-100</td>
<td>Engineers in Combat Operations</td>
</tr>
<tr>
<td>FM 5-101</td>
<td>Mobility</td>
</tr>
<tr>
<td>FM 5-102</td>
<td>Countermobility</td>
</tr>
<tr>
<td>FM 5-103</td>
<td>Survivability</td>
</tr>
<tr>
<td>FM 5-34</td>
<td>Engineer Field Data</td>
</tr>
<tr>
<td>MCWP 3-17</td>
<td>MAGTF Engineer Operations</td>
</tr>
</tbody>
</table>
### Glossary of Terms and Acronyms

<table>
<thead>
<tr>
<th>Term or Acronym</th>
<th>Definition or Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAV</td>
<td>Amphibious Assault Vehicle</td>
</tr>
<tr>
<td>APOBS</td>
<td>Anti-personnel obstacle breaching system</td>
</tr>
<tr>
<td>AVLB</td>
<td>Armored vehicle launch bridge</td>
</tr>
<tr>
<td>DSOM</td>
<td>Defensive scheme of maneuver</td>
</tr>
<tr>
<td>FAE</td>
<td>Fuel air explosives</td>
</tr>
<tr>
<td>FARPS</td>
<td>Forward arming and refueling points</td>
</tr>
<tr>
<td>FASCAM</td>
<td>Family of area scatterable mines</td>
</tr>
<tr>
<td>FOCDPIG</td>
<td>Acronym to help recall the employment principles of re-enforcing obstacles: Fire, Observed, Concealed, Depth, Protected, Integrated, and Geometric</td>
</tr>
<tr>
<td>FPF</td>
<td>Final protective fire</td>
</tr>
<tr>
<td>FPL</td>
<td>Final protective line</td>
</tr>
<tr>
<td>HPMF</td>
<td>Hasty protective minefield</td>
</tr>
<tr>
<td>LOC</td>
<td>Lines of communication</td>
</tr>
<tr>
<td>LZ</td>
<td>Landing zone</td>
</tr>
<tr>
<td>MAGTF</td>
<td>Marine Air-Ground Task Force</td>
</tr>
<tr>
<td>ME</td>
<td>Main effort</td>
</tr>
<tr>
<td>MEDEVAC</td>
<td>Medical Evacuations</td>
</tr>
<tr>
<td>METT-T</td>
<td>Mission, Enemy, Terrain and weather, Troops ad support available – Time available</td>
</tr>
<tr>
<td>MICLIC</td>
<td>Mine clearing line charge</td>
</tr>
<tr>
<td>MSR</td>
<td>Main supply route</td>
</tr>
<tr>
<td>OBSINTEL</td>
<td>Obstacle Intelligence</td>
</tr>
<tr>
<td>PDD</td>
<td>Presidential Decision Directive</td>
</tr>
<tr>
<td>SFF</td>
<td>Self-forging fragment</td>
</tr>
<tr>
<td>SOM</td>
<td>Scheme of maneuver</td>
</tr>
<tr>
<td>SOSR</td>
<td>Acronym to help recall the fundamentals of obstacle breaching: Suppress, Obscure, Secure, and Reduce</td>
</tr>
</tbody>
</table>

### Notes


