Section V. Engineering Operations and the Engagement Area

Engineers conduct a wide variety of tasks in support of the MAGTF. Tasks range from CS support to general engineering support. Engineering facilitates MAGTF maneuver by breaching, building and maintaining the barriers, bridging, expeditionary airfields, and roadways that move, sustain, and protect the force**.**

Combat Engineering enhances the MAGTFs momentum by physically shaping the battlespace. It's purpose is to allow the MAGTF to generate mass and speed while reinforcing natural battlespace restrictions in order to limit the enemy's ability to maneuver and generate tempo.

General Engineering involves activities that provide facilities, utilities, and bulk fuel for operations. General Engineering contributes to the sustainment of the MAGTF by enhancing the throughput in the area of operations.

The four functional areas of engineer effort are *mobility, countermobility, survivability, and general engineering.* While all four functional areas may be applicable to anti armor operations, survivability and countermobility are the primary engineering tasks associated with the EA. These tasks are often interrelated. Preparation of fighting positions for large equipment (e.g. tanks) or the creation of obstacles requires lead time and planning for engineers to mobilize equipment, supplies, and personnel to provide support. Commanders should involve engineers as early as possible during the planning of the EA.

For an in-depth discussion of the following subjects, see MCWP 3-17, *Engineer Operations*

4501. Definitions

The following definitions will assist the reader in understanding the four functional areas:

Obstacle. Any natural or cultural (manmade) obstruction that canalizes, delays, restricts, or diverts movement of a force. The effectiveness of an obstacle is enhanced considerably when covered by fire. Obstacles can include abatis, antitank ditches, blown bridges, built-up areas, minefields, rivers, road craters, terrain, and wire (MCRP 5-2C). There are two categories of obstacles--existing and reinforcing.

a. Existing Obstacles. Existing obstacles are already present on the battlefield and not placed there through military effort. They may be natural such as lakes or mountains, or they can be cultural such as towns or railroad embankments (FM 5-102).

b. Reinforcing Obstacles. Reinforcing obstacles are placed on the battlefield through military effort and are designed to strengthen the existing terrain to slow, stop, or canalize the enemy. They include a road crater, a log crib, or a minefield. Scatterable mines are reinforcing obstacles emplaced by various delivery systems such as artillery or aircraft. (FM 5-102)

4502. Survivability

Survivability is the creation of structures or the shaping of the battlespace that allows the force to avoid or withstand hostile environments without losing the ability to accomplish the mission. It includes all aspects of protecting personnel, weapons, and supplies. In order for the MAGTF to survive, it must be able to reduce exposure to threat

acquisition, targeting, and engagement. Engineering operations play a key role in survivability in the areas of constructing fortifications, protective obstacles, strong points, and sustainment.

a. Fortifications. Engineers construct fighting positions for combat vehicles, direct fire weapons systems, artillery, and air defense. Fortifications provide protection and build confidence in Marines so that they will be able to use their weapons and fight effectively where they otherwise could not survive.

b. Protective Obstacles. Like final protective fires, protective obstacles provide the force with a combat *edge* during the enemy's final assault that may make the difference between success and failure. Protective obstacles also are used to impose a delay or channelize an attacker. Protective obstacles may also allow the defender time to break contact and displace to another battle position. Antipersonnel and antitank mines are used to limit the ability of the assaulting force to close with the defender. These mines are sited according to terrain and are covered by defending fires. These hasty minefields are installed adjacent to a battle position and are removed when the position is no longer occupied. These are the only obstacles that can be employed outside of designated obstacle zones and belts.

c. Strongpoints. Strong points are heavily fortified battle positions which cannot be overrun quickly or bypassed easily by enemy forces. They consist of an integrated series of exceptionally well protected fighting positions, connected by covered routes, and reinforced with extensive protective obstacles. They are designed to withstand air strikes, artillery fire strikes, and mounted /dismounted assaults. The enemy can reduce them only by expending much time and overwhelming force.

In an anti armor defense utilizing battle positions or sectors, engineer effort is first directed toward structuring the EA and only later to the preparation of unit positions. Establishing strongpoints requires extensive engineer effort preparing the position first and only then turning to the EA.

Figure 4-30 depicts two company-sized strongpoints overlooking a platoon battle position. Note that the minefield is a protective obstacle that slows the enemy's advance long enough to allow the friendly platoon to delay from its position.

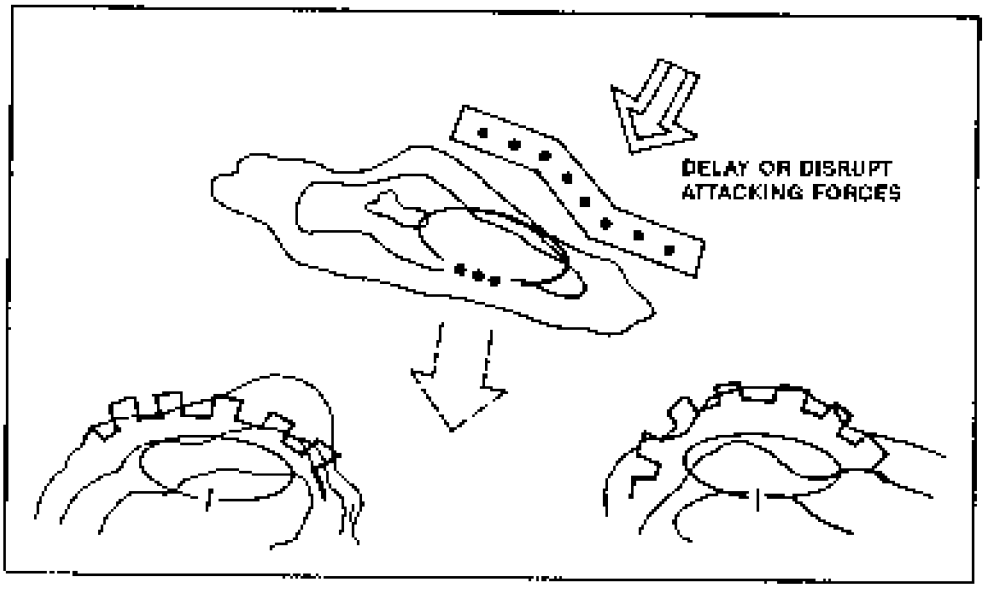

Figure 4-30. Strongpoints.

4503. Countermobility

Countermobility is the construction of obstacles and emplacement of minefields to delay, disrupt, and destroy the enemy by reinforcement of the terrain. The primary purpose of countermobility operations is to slow or divert the enemy, to increase time for target acquisition, and to increase weapon effectiveness (MCRP 5-2C).

The intent of countermobility operations is to attack the enemy's ability to execute his plan by disrupting his combat formations, interfering with his command and control, and confusing his commanders to create a vulnerability that friendly forces can exploit. The secondary intent is to destroy or disable his vehicles. This is accomplished with an integrated system of obstacles and fires.

a. Obstacle Effects. Obstacles integrated with fires are designed to produce one of four primary obstacle effects on the enemy. Obstacle effects:

(1) Drive fire and obstacle integration planning
(2) Focus subordinate fires
(3) Focus the obstacle effort
(4) Multiply the effects of firepower

All tactical obstacles produce on of the following obstacle effects--disrupt, turn, fix, or block. (MCWP 3-17)

(1) Disrupt. A tactical task or obstacle effect that integrates fire planning and obstacle effort to break apart an enemy's formation and tempo, interrupt the enemy's timetable, or cause premature commitment of enemy forces, or the piecemealing of his attack. (MCRP 5-2A) These obstacles disrupt march and assault formations, force the enemy to commit of breaching assets prematurely, and cause separation between the enemy's forward combat elements and his supply trains. A piecemeal attack is more easily defeatable.

(2) Turn. A tactical obstacle effect that integrates fire planning and obstacle effort to divert an enemy formation off one avenue of approach to an adjacent avenue of approach or into an EA. (MCRP 5-2A) Turning obstacles move and manipulate the enemy by enticing or forcing him to move in a desired direction, splitting his formation,canalizing him, or by exposing his flank.

(3) Fix. A tactical obstacle effect that integrates fire planning and obstacle effort to slow an attacker within a specified area-- normally an EA. (MCRP 5-2A). In delaying operations, fixing obstacles generate the time necessary for the delaying force to break contact and disengage or move to subsequent positions.

(4) Block. An obstacle effect that integrates fire planning and obstacle effort to stop an attacker on a specified avenue of approach or to prevent an enemhy from exiting an engagement area. Blocking obstacles stop an attacker along a specific avenue of approach. (MCRP 5-2A) Obstacles never, by themselves, serve to block an enemy force. Rather, blocking obstacles are complex, employed in depth, and integrated with fires in order to prevent the enemy from proceeding

b. Individual Obstacles. There are four general categories of individual tactical obstacles. The individual obstacles are those in obstacle groups, directed obstacles, reserve obstacles, and situational obstacles.

(1). Individual obstacles in obstacle groups. Individual obstacles are tailored to the obstacle group effect and the threat, For example, minefield densities, composition, pattern, depth, and frontage have specific norms for achieving the disrupt, turn, fix, and block obstacle effect. When employed, tank ditches are used to complement turning and blocking obstacle groups. Leaders ensure individual obstacle siting is consistent with the obstacle group's intent and integrated with weapons systems covering the engagement area.

(2) Directed and reserve obstacles. A directed obstacle is an obstacle directed by a higher commander as a specified task to a subordinate unit. A reserve obstacle is an obstacle for which the commander restricts the execution authority. The commander usually specifies the unit responsible for obstacle emplacement, handover, and execution. The commander must clearly identify the conditions under which the obstacle is to be executed.

(3) Situational obstacles. A situational obstacle is a tactical, obstacle-emplacement capability held in reserve. Execution is triggered by friendly actions, enemy actions, or a combination of the two. Reserve obstacles and situational obstacles are different. A situational obstacle can be shifted to different locations, whereas a reserve obstacle is located at a specific key location. A situational obstacle must be within the executing maneuver unit's obstacle control measure.

Situational obstacle contain the three components of obstacle intent (obstacle effect, a target, and a relative location) and require integration into the decision support template to be executed effectively. The plan must identify the trigger action and execution criteria at a specific decision point and the necessary subunit instructions to emplace and cover the obstacle. There are three possibilities for employing situational obstacles; the first is to plan and execute the obstacle at the highest level of command; the second is to identify the obstacle intent and allocate the resources to a subordinate unit to execute; the third is to allocate the resources for a suboordinate unit to plan and execute.

c. Obstacle Control Measures. Obstacle-control measures are used to ensure subordinatres emplace obstacles that support the commander’s scheme of maneuver and do not interfere with future operations. Obstacle control measures fall into 3 categories:

(1) Obstacle Groups. Obstacle groups are one or more individual obstacles grouped to provide a specific obstacle effect. For example, three obstacles are planned to turn the enemy into the battalion’s engagement area. While each obstacle could have a different effect (fix, turn, dirupt, or block) the overall effect would turn the enemy into an engagement area.

(2) Obstacle Belts. Obstacle belts are a collection of obstacle groups that provide a specific effect. In the same way that obstacle groups use individual obstacles to achieve a desired effect, a series of groups are used to disrupt, turn, fix, or block the enemy on a larger scale. Belts also serve as a control measure to support the units scheme of maneuver. Planning and coordination with higher and adjacent units is required and ensure that obstacles don’t conflict with the higher or adjacent units obstacle plan.

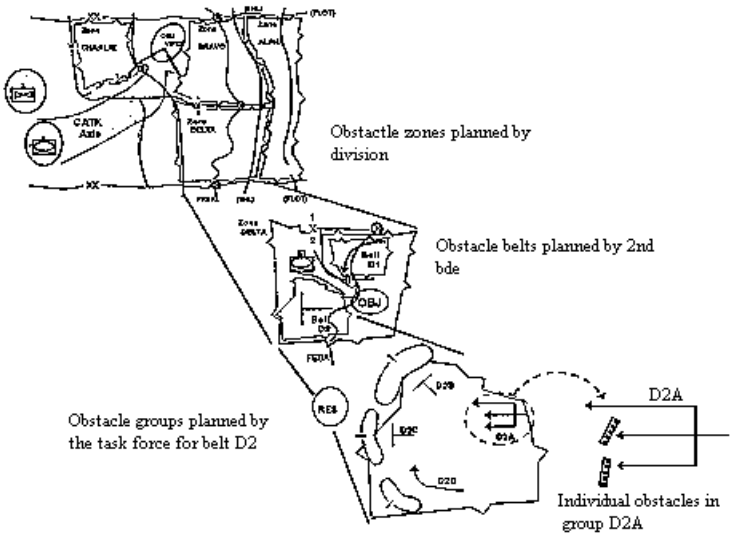

Figure 4-32. Obstacle Belts.

(3) Obstacle Zones. Obstacle zones are used in the plans of division or MEF and are composed of a group of obstacle belts. Obstacle zones are based on subordinate unit areas of operation and are planned so they do not impede future operations.

4504. Existing Obstacles

All ground movement, friendly or enemy, is governed by the existing obstacles whether they are natural or cultural (man-made). The commander can greatly control the enemy's movement by using the existing obstacle inherent in the terrain and by strengthening and extending these through the creation of reinforcing obstacles. This section will address some specific types of existing obstacles.

a. Drainage Features. Drainage or surface water features include rivers, streams, canals, lakes, ponds, marshes, swamps, and bogs. Such features are obstacles whenever the water becomes deep or turbulent or the wetness makes soil conditions degrade crosscountry movement. A river over 150 meters wide and over l or 2 meters deep is a major obstacle; however, the presence of bridges and fords may limit its obstacle value. River bottom soil trafficability, water current speed, and slope of the and soil composition of embankments are key determinants of vehicular ability to traverse water obstacles. Most tanks, APCs, and IFVs can ford water 3 to 5 feet deep. Trucks can normally ford about 3 feet of water.

b. Soil. Soil trafficability, especially when considered in conjunction with climatic conditions, is a very important factor in evaluating cross-country movement. Normally, soil trafficability affects wheeled support vehicles more than armored vehicles. A tank has a very low ground pressure, normally 8 to 12 pounds per square inch, which allows it to move on soft soil easier than trucks (See fig. 4-33).

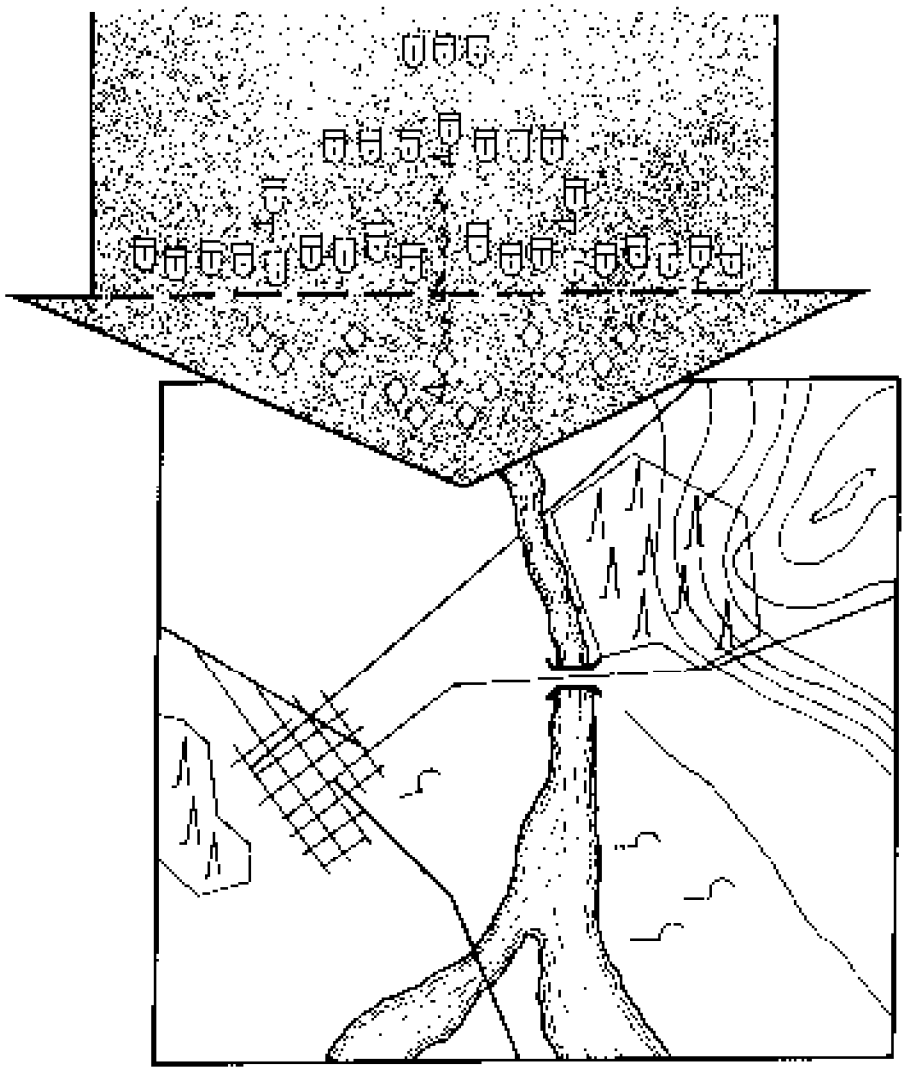

Figure 4-33. Armored Unit Approaches Obstacle.

c. Slope. Slope is the inclined surface of a hill, mountain, ridge, or any other part of the earth's land surface. Short vertical slopes, or *steps* higher than 1 foot will slow wheeled vehicles, 4 foot *steps* will stop most armored vehicles. In evaluating terrain for cross-country movement, slopes of 45 percent (about 24 degrees) is commonly used as the reasonable upper limit for tanks and 30 percent (about 17 degrees) for trucks.

d. Vegetation. Forest vegetation is the primary concern in cross-country vehicular movement. Forests with trees 20 to 25 centimeters (8 to 10 inches) in diameter are tank obstacles, and 5 centimeters (2 inches) stands will stop most wheeled vehicles.

e. Cultural Features. Cultural features are the works of man such as stone walls, hedgerows, dikes, canals, embankments, cuts, fills, and built-up areas. The obstacle value of a cultural feature depends on its size or extent,

location, and construction. The natural obstacle value of built-up areas can be readily reinforced, and those which are properly located to control approaches or key terrain can be developed into formidable strongpoints.

Though the prcvious terrain considerations have focused on the tank as a measure of an individual obstacles value, the primary concern by MAGTF commanders and their subordinates is the effect of terrain on a combined arms formation, not individual tanks.

4505. Reinforcing Obstacles

There are a multiple number of reinforcing obstacles that the commander can use to knit together, strengthen, and extend the existing obstacles. These options allow the commander to change the military characteristics of the terrain to fit his tactical plans and to disrupt those of his enemy. Reinforcing obstacles can be broadly categorized as the following:

- Demolition obstacles.
- Constructed obstacles.
- Land mines.
- Contamination.
- Expedient obstacles.

These categories are not mutually exclusive--some obstacles appear in more than one category and some (such as mines) are commonly used to strengthen others

a. Demolition Obstacles. These are obstacles created by the detonation of explosives. Demolition obstacles include:

- Removal or destruction of a useful structure or cultural features such as demolishing a bridge or tunnel, or the crate ring of a road, highway, railroad, or airfield runway or taxiway.

- Effects of demolishing existing structures, cultural features, or trees. Some examples would be the debris or rubble from demolition of structures of all types, the flooding from destruction of a dam, or an abates.

- Earth or rock that has been moved by the use of explosives. Examples would be the creation of large craters and ditches.

For more detailed information about demolitions, see MCRP 3-17A, ENGINEER FIELD DATA.

b. Constructed Obstacles. Constructed obstacles include a wide variety of obstacles ranging from hastily cut tank ditches to extensive concrete and steel obstacles such as *dragons teeth.* In this category are obstacles constructed of barbed wire or barbed tape, including standard double apron and four strand fences, concertina fences, low wire and tangle foot, and randomly placed wire entanglements. It also includes timber obstacles such as log cribs and hurdles, log posts, and non explosively constructed abates. The tank ditch is a very effective obstacle used with anti armor weapons. It is not exceptionally labor intensive, since the 621 B Scraper Tractor and the D-7G Dozer are utilized (See fig. 4-34).

c. Land Mines. Mines can be employed miles ahead of the FLOT to disrupt, fix, turn or block the momentum of the enemy without endangering friendly forces. Unlike other obstacles that can only assist weapon systems in

inflicting casualties, mines are themselves effective killers or destroyers of enemy armored vehicles. Psychologically, mines can unnerve a force by creating uncertainty, low morale, and even unwillingness to fight. The general categories of land mines are **Conventional Mines** and **Family of Scatterable Mines (FASCAM**).

Conventional Mines. Conventional landmines consist of a small amount of high explosives contained in a metallic or nonmetallic casing fitted with a fuse and/or a firing device for actuation by enemy vehicles or personnel. The general types of conventional mines are:

(1) Antipersonnel mines
(2) Antitank mines
(3) Chemical mines
(4) Anti-helicopter Mines

Family of Scatterable Mines(FASCAM) are air, artillery, mechanical or hand emplaced. They can be either antipersonnel or antitank mines. FASCAM provides the commander with a vastly expanded capability to used mines. Scatterable mines have the advantages of increased speed of emplacement, reduced logistical burden per mine, and increased effectiveness (See fig. 4-35).

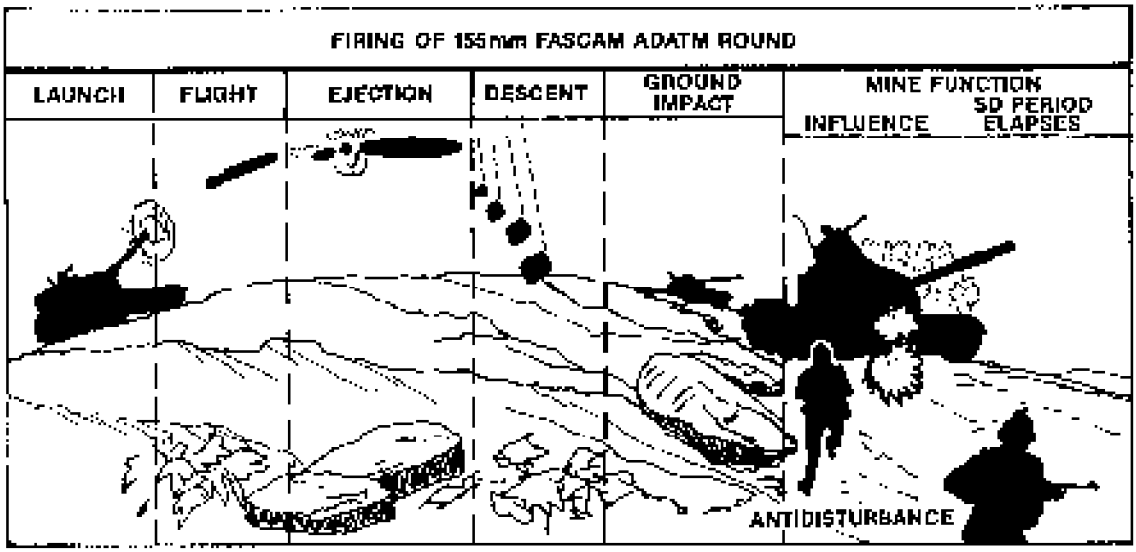

Figure 4-35. FASCAM.

In addition to minefields of widely varying dimensions and densities, mines are used in smaller numbers to--

· Temporarily protect unit positions.

· Strengthen existing obstacles.

· Make other reinforcing obstacles more difficult to breach.

· Mine fords and approaches to streams.

· Block roads or other narrow gaps.

· Close gaps and lanes in large minefields or other linear obstacles.

d. Contamination. Contamination can be nuclear or chemical in nature. Clearly, it is more effective against dismounted infantry than mechanized forces. Nuclear and chemical contamination are both difficult to predict and control because they are largely dependent on winds for placement and subject to weather and other environmental factors. Their usefulness is limited. Should unexploded ordnance or mines be suspected of containing contaminating materials, commanders should notify Explosive Ordnance Disposal. For more informations see MCWP 3-17.2 MAGTF EOD.

e. Expedient Obstacles. Expedient obstacles offer an almost unlimited potential for use. All types of nonstandard log obstacles can be built, the complexity depending on the time and manpower available. Bulldozers can be used to push over selected trees to make an abatis or push boulders into a road to block tanks. The wreckage of destroyed towns, cities, or industrial areas offers a rich storehouse of materials to be used in making expedient obstacles.

4506. Obstacle Employment Principles

The following principles govern the employment of obstacles to maximize their effect as combat multipliers:

a. Reinforcing Obstacles Are Integrated With Observed Fires. The principal purpose of integrating obstacle locations with fires is to enhance the effectiveness of those fires. The obstacle serves to develop the target in a predetermined position, thus increasing the hit probability of the fires (See fig. 4-36).

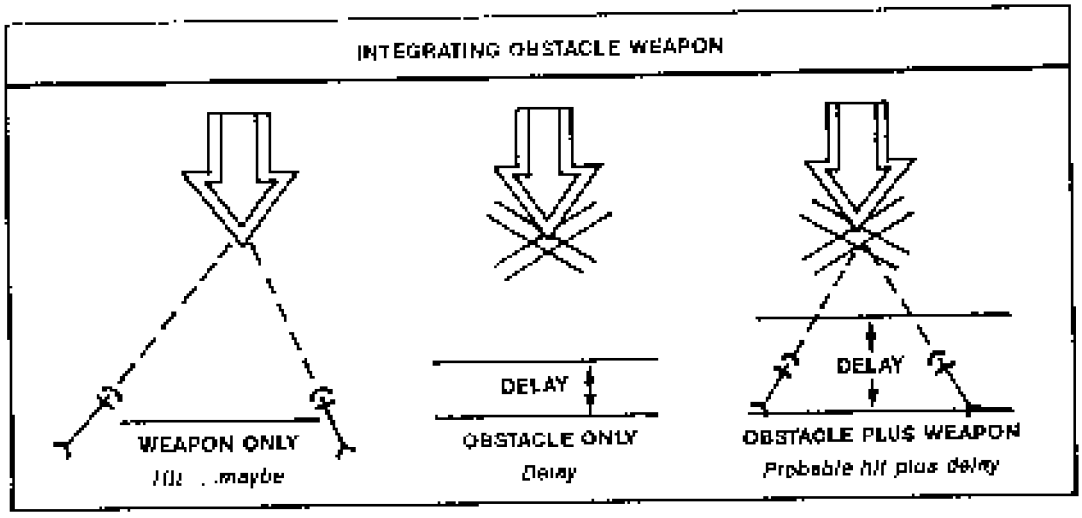

Figure 4-36. Obstacle/Weapon Integration.

b. Reinforcing Obstacles Are Integrated With the Scheme of Maneuver. Mutually supporting obstacles and groups of obstacles are sited so as to stop or delay the enemy and to attempt to divert or lead him into previously selected kill zones. Secondly, obstacles must allow for the friendly scheme of maneuver through the use of gaps (space between barriers/obstacles) and lanes (routes through obstacles) (See fig. 4-37).

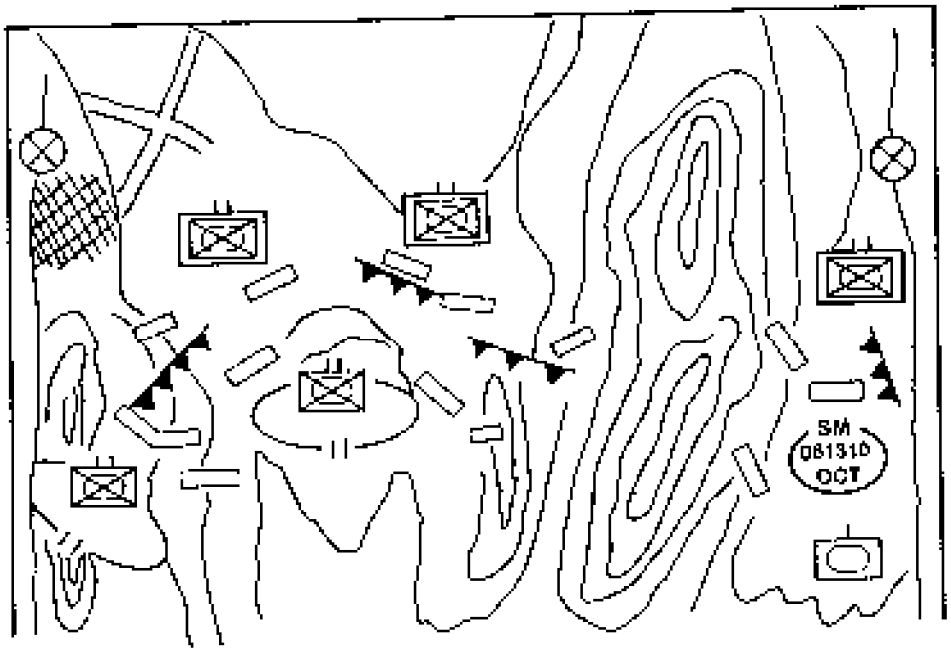

Figure 4-37. Supporting the Maneuver Commander's Plan.

c. Reinforcing Obstacles Are Integrated With Existing Obstacles and Other Reinforcing Obstacles. Reinforcing obstacles are sited to take the maximum advantage of natural and cultural obstacles. Reinforcing obstacles are integrated with each other to assure that probable bypass routes are closed. For example, destruction of a major highway through a wooded area is largely ineffective if any nearby road or opening that offers a ready bypass route is left open.

d. Reinforcing Obstacles Are Employed in Depth. A series of simple obstacles arranged one behind the other along a probable axis of advance is far more effective than one large, elaborate obstacle. Obstacles must be far enough apart that each will require a new deployment of the enemy's counter obstacle forces and equipment.

e. Reinforcing Obstacles Are Employed for Surprise. A defender can retain a degree of initiative even when defending by using obstacles so as to obtain surprise. Scatterable mines permit rapid mining anywhere in the battle area, confronting the attacker with a completely new situation almost instantly. Also, sudden detonation of concealed obstacles in front of the attacking enemy or within his formations produces surprise.