

CHAPTER 6

COMBAT TECHNIQUES OF FIRE

Technique of fire is the method of delivering and controlling fire. Each member of the machine gun crew must be trained in standard methods of applying fire, either as a crewmember or a gunner, and must perform his assigned task automatically and effectively. The simplest and most effective technique of delivering fire with the machine gun mounted on its ground or vehicular mount is to align the sights of the gun on the target and fire; this is called direct laying. At times, techniques of fire other than direct laying are more appropriate and effective. When delivering overhead fire or fire from position defilade, the gunner must use the appropriate technique.

Section I. FUNDAMENTALS

Before the machine gun can be employed to the best advantage using any firing technique, certain fundamentals must be understood and applied. These include:

- Characteristics of fire.
- Classes of fire.
- Fire control.
- Target types and methods of engagement.
- Overhead fire.
- Methods of laying the gun.
- Firing from position defilade.
- Final protective fires.

6-1. CHARACTERISTICS OF FIRE

The gunner's knowledge of his machine gun is not complete until he learns something of the action and effect of the projectiles when fired. This section discusses various characteristics of machine gun fire, including trajectory, cone of fire, and the beaten zone.

a. **Trajectory.** The trajectory is the curved path of the projectile in its flight from the muzzle of the weapon to its impact. The major factors that influence the trajectory are the velocity of the round, gravity, rotation of the round, and resistance of the air. The farther the round travels, the greater the curve of the trajectory. The highest point of the trajectory is called the maximum ordinate. This is a point approximately two-thirds of

the distance from the gun to the target. The maximum ordinate increases as the range increases (Figure 6-1).

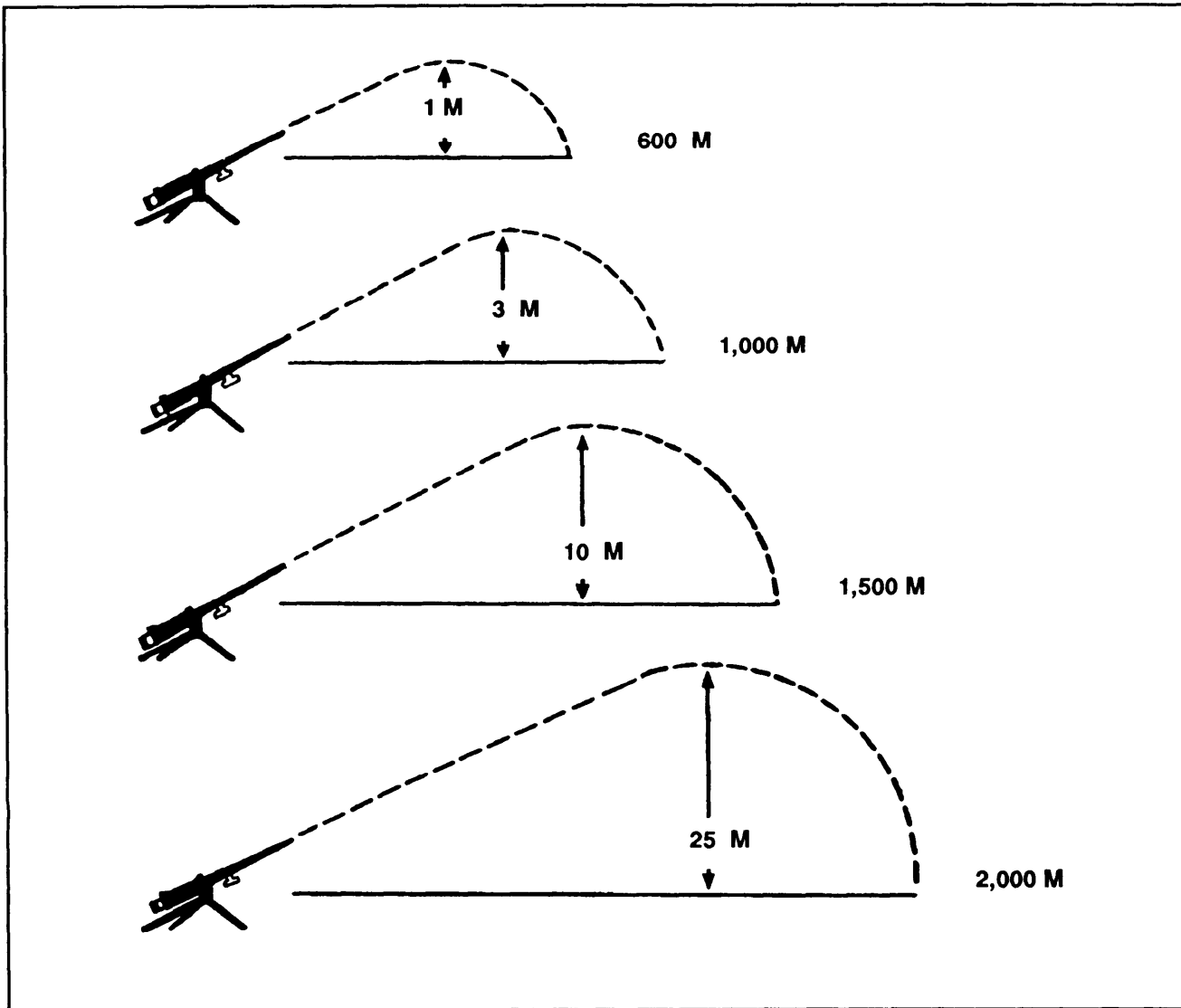


Figure 6-1. Maximum ordinates at key ranges.

b. **Cone of Fire.** When the weapon is fired automatically in bursts, all the rounds do not follow the same path. This is due to the vibrations of the gun and mount, variations in ammunition, and atmospheric conditions, which cause the rounds to follow a slightly different trajectory. This group of trajectories formed by a single burst is called the cone of fire (Figure 6-2).

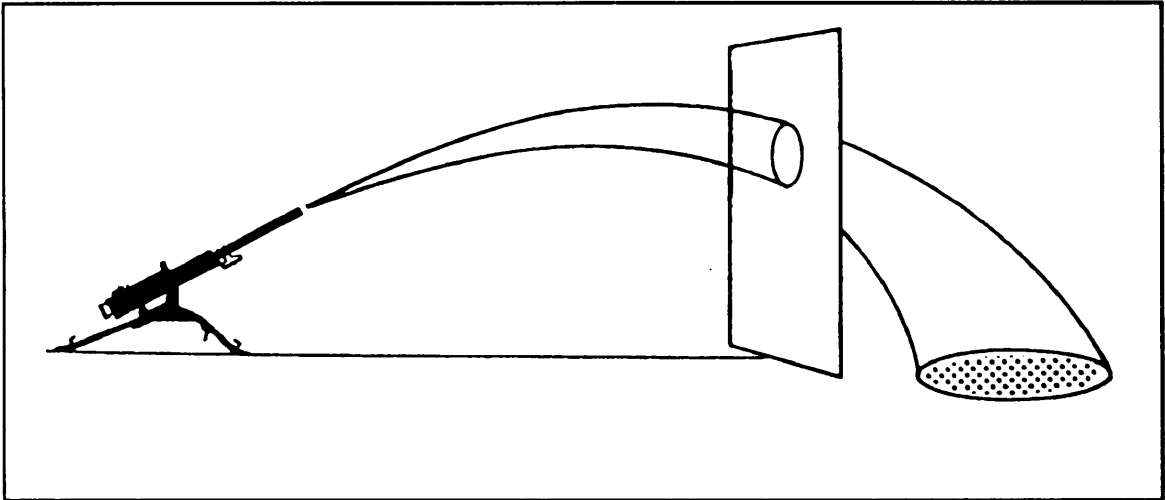


Figure 6-2. Cone of fire.

c. **Beaten Zone.** The beaten zone is an elliptical pattern formed by the cone of fire as it strikes the ground. The beaten zone is always about 2 meters in width.

(1) *Effect of range.* As the range to the target increases, the beaten zone becomes shorter and wider.

(2) *Effect of terrain.* The length of the beaten zone for any given range will vary according to the slope of the ground. On rising ground, the beaten zone becomes shorter but remains the same width. On ground that slopes away from the gun, the beaten zone becomes longer but remains the same width.

6-2. CLASSES OF FIRE

Machine gun fire is classified with respect to the ground (Figure 6-3, page 6-4), the target (Figure 6-4, page 6-5), and the gun (Figure 6-5, page 6-7).

a. Classes of Fire with Respect to the Ground.

(1) *Plunging fire.* Fire in which the angle of fall of the rounds (with reference to the slope of the ground) is such that the danger space is confined to the beaten zone, and the length of the beaten zone is materially shortened. Plunging fire is obtained when firing from high ground to low ground, when firing from low ground to high ground, and when firing at long ranges.

(2) *Grazing fire.* Grazing fire is fire in which the center of the cone of fire does not rise more than one meter above the ground. When firing over level or uniformly sloping terrain, the maximum extent of grazing fire obtainable is about 700 meters.

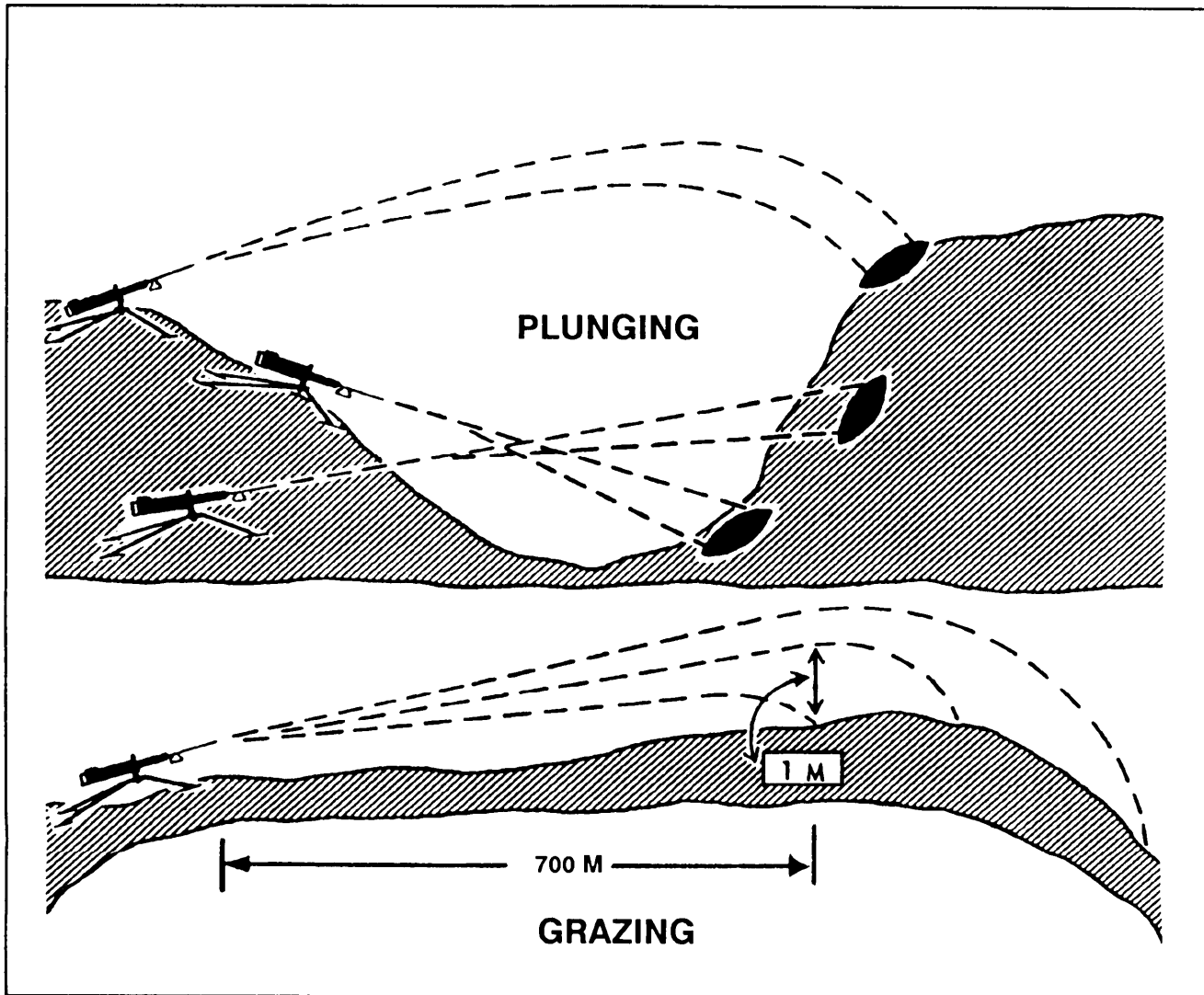


Figure 6-3. Classes of fire with respect to the ground.

b. Classes of Fire with Respect to the Target.

(1) *Frontal*. The long axis of the beaten zone is at a right angle to the long axis of the target.

(2) *Flanking*. Fire is delivered against the flank of a target.

(3) *Oblique*. The long axis of the beaten zone is at an angle (but not a right angle) to the long axis of the target.

(4) *Enfilade*. The long axis of the beaten zone coincides or nearly coincides with the long axis of the target. This class of fire is either frontal or flanking. It is the most desirable class of fire with respect to the target because it makes maximum use of the beaten zone.

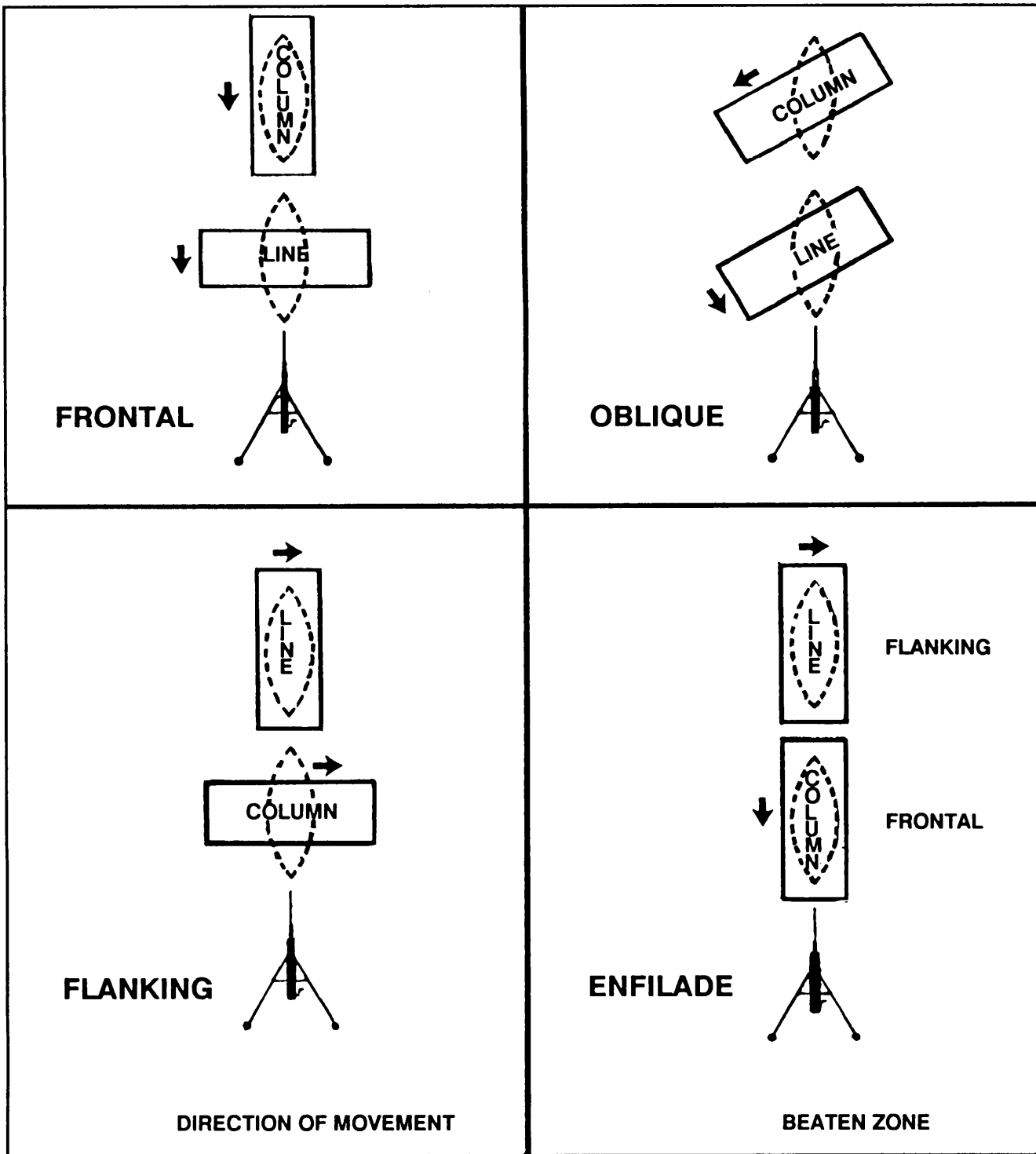


Figure 6-4. Classes of with respect to the target.

c. Classes of Fire with Respect to the Gun.

(1) *Fixed fire.* This is fire delivered on a point target with little or no manipulation needed. After the initial burst, the gunners will follow any change or movement of the target without command.

(2) *Traversing fire.* This is fire distributed against a wide target requiring successive changes in the direction of the gun. When engaging a wide target requiring traversing fire, the gunner should select successive aiming points throughout the target area. These aiming points should be close enough together to ensure adequate target coverage; however, they need not be so close as to be wasteful of ammunition by concentrating a heavy volume of fire in a small area. Two clicks on the traversing handwheel after each burst ensure coverage (2 clicks = 2 mils = constant width of beaten zone).

(3) *Searching fire.* This is fire delivered against a deep target or a target that has depth, requiring changes in elevation of the gun. The amount of elevation change depends upon the range and slope of the ground.

(4) *Traversing and searching fire.* This is fire delivered both in width and depth by changes in direction and elevation. It is employed against a target whose long axis is oblique to the direction of the fire.

(5) *Swinging traverse.* This is employed against targets that require major changes in direction but little or no change in elevation. Targets may be dense, wide, in close formations moving slowly toward or away from the gun, or vehicles or mounted troops moving across the front. The traversing slide lock lever is loosened enough to permit the gunner to swing the gun laterally.

(6) *Free gun.* This is when fire is delivered against moving targets that must be rapidly engaged with fast changes in both direction and elevation. Examples are aerial targets, vehicles, mounted troops, or infantry in relatively close formations moving rapidly toward or away from the gun position. To fire free gun on the M3 tripod mount, remove the T&E mechanism from the receiver and traversing bar and put it down. When firing swinging traverse and free gun, the weapon is normally fired at the cyclic rate of fire which is in excess of 450 rounds per minute. This consumes a lot of ammunition, and there is no beaten zone because each round seeks its own area of impact.

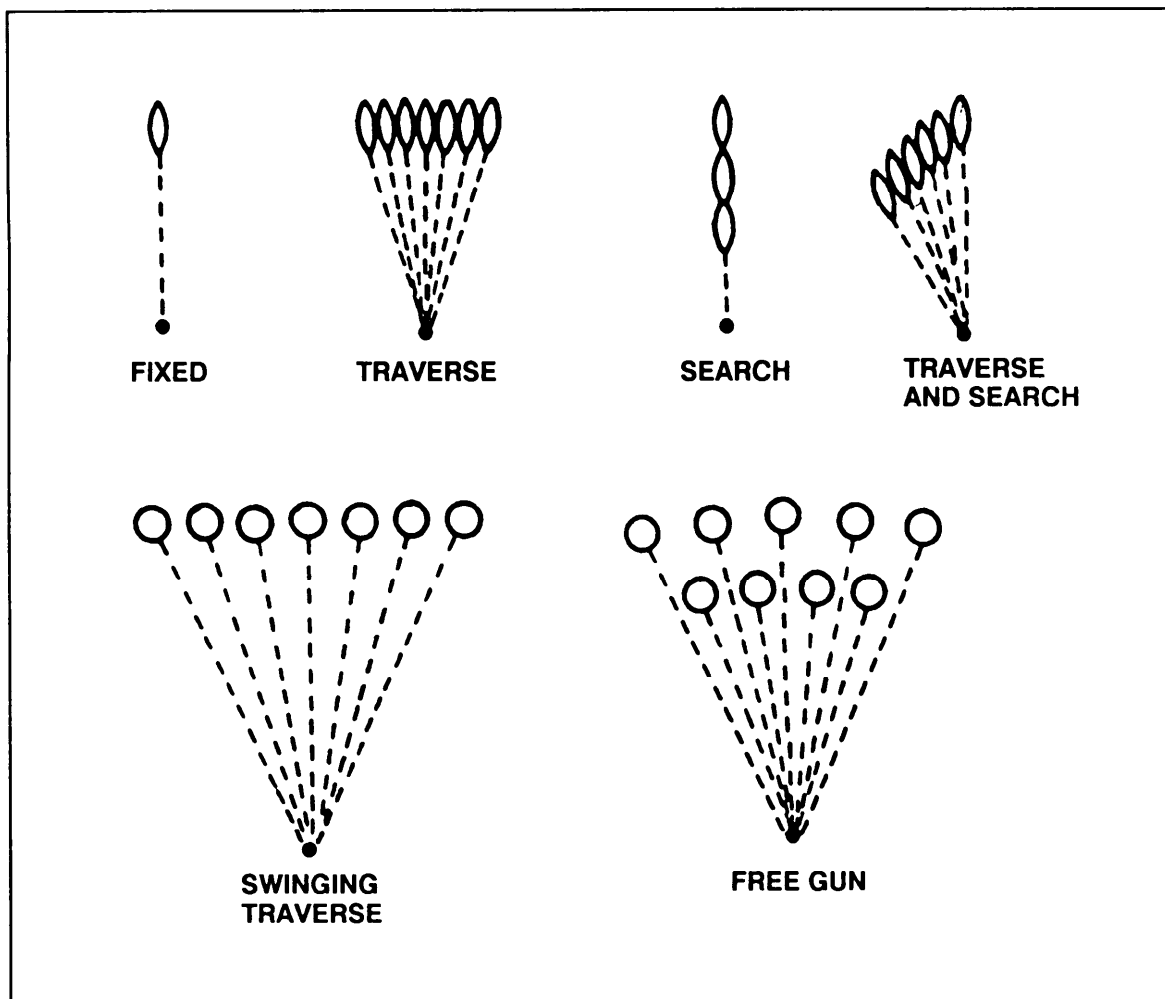


Figure 6-5. Classes of fire with respect to the gun.

Section II. FIRE CONTROL

Fire control of machine guns includes all operations connected with the preparation and actual application of effective fire on a target. It implies the-ability of the leader to-open fire at the instant he desires, to adjust the fire of the gun(s) on the target, to regulate the rate of fire, to shift from one target to another, and to cease firing. This ability to exercise proper fire control depends primarily on the discipline and the proper training of the crew. Failure to exercise fire control results in danger to friendly troops, loss of surprise, premature disclosure of positions, application of fire on unimportant targets, loss of time in adjusting fire, and waste of ammunition.

6-3. METHODS OF FIRE CONTROL

Of the several methods of controlling machine gun fire, the noise of battle will limit the use of some. Therefore, the leader must select the method or combination of methods that will best accomplish his purpose. The chain of fire control begins with the leader. He is responsible for both the technical and tactical employment of the gun and the training of the crew. He is responsible for passing on to the crewmembers all instructions and orders from his next higher leader regarding the situation and mission. He assigns sectors of fire and firing positions, designates targets to be engaged, adjusts fire, and ensures effective coverage of the targets.

a. **Oral.** Oral control is effective unless the leader is too far away from the gun crew(s), or the noise of battle makes it impossible for the gun crew(s) to hear him.

b. **Arm-and-Hand Signals.** This is an effective method when the gun crew(s) can see the leader. All crewmembers must understand the standard arm-and-hand signals used to control machine gun fire.

c. **Prearranged Signals.** These are either visual or sound signals such as pyrotechnics or blasts on a whistle. These signals should be included in the units' SOPs and must be clearly understood by all crewmembers.

d. **Personal Contact.** In many situations, the leader must move to individual crewmembers to issue orders. This method is used more than any other by small-unit leaders. The leader must use maximum cover and concealment to keep from disclosing the gun crew's position.

e. **Standing Operating Procedures.** SOPs cover actions the gun crews perform without command because they were developed and practiced during the training of the gun crews. Their application eliminates many commands and simplifies the leader's job of fire control.

6-4. TARGETS AND THEIR ENGAGEMENT

Targets presented to the machine gunners during combat will in most cases consist of enemy soldiers in various formations, which require distribution and concentration of fire. These targets have width and depth, and the application of machine gun fire is designed to completely cover the area in which the enemy is known or suspected to be. These targets may be easy to see or may be indistinct and difficult to locate.

a. When machine gun fire is under direct control of a leader, he designates the midpoint and flanks or ends of a target unless they are obvious to the gun crew(s). When a target other than a point target is engaged by two gunners, it is always divided. Each gunner applies his fire to that portion of the target corresponding to his position with relation to the other gun. Normally, each gunner engages one-half of the target;

however, gunners must be prepared to engage the entire target if necessary. Gunners continue to fire on the target until it is neutralized or until another signal is received from the leader.

b. The gunner's positions (including vehicular-mounted) should be numbered so each gunner will know which portion of a target he should engage. It should be emphasized that the positions are numbered – not the guns or gunners. To ensure that gunners react quickly and properly when they detect a target or when a target is designated by the leader, standard methods of applying fire to the various type targets are taught. These methods are the same for ground and vehicular-mounted guns. The following are the different types of targets and how they are engaged with the MG.

(1) Point targets are targets that require the use of a single aiming point. Enemy bunkers, weapon emplacements, vehicles, small groups of soldiers, and aerial targets such as helicopters or descending paratroopers are examples of point targets. A point target is engaged with fixed fire. If the target moves after the initial burst, the gun crew(s) keeps fire on the target by following its movement with the gun(s).

(2) Linear targets have sufficient width to require traversing fire and no more depth than can be effectively covered by the beaten zone. Linear targets are engaged with traversing fire.

(a) Two guns, normal division. The target is divided at the midpoint; the right gun engages the right half of the target, and the gun on the left engages the left half of the target. The point of initial lay and adjustment for both guns is at the midpoint of the target. After adjusting on the midpoint, the right gun traverses the right half of the target to include one aiming point beyond the last visible target flank and returns to the midpoint.

(b) Two guns, special division. If one portion of the target presents a greater threat than another, the target can be divided so fire is concentrated on that portion presenting the greatest threat. The special division of the target is accomplished by a subsequent fire command after firing begins. The gunners initially lay at the midpoint, regardless of the special division to be made, thus precluding confusion.

(c) One gun. A single gunner must engage the entire width of a linear target. The point of the initial lay and adjustment is on the midpoint, or that portion of the target presenting the greatest threat. The gunner traverses to either flank and then covers the remainder of the target (Figure 6-6, page 6-10).

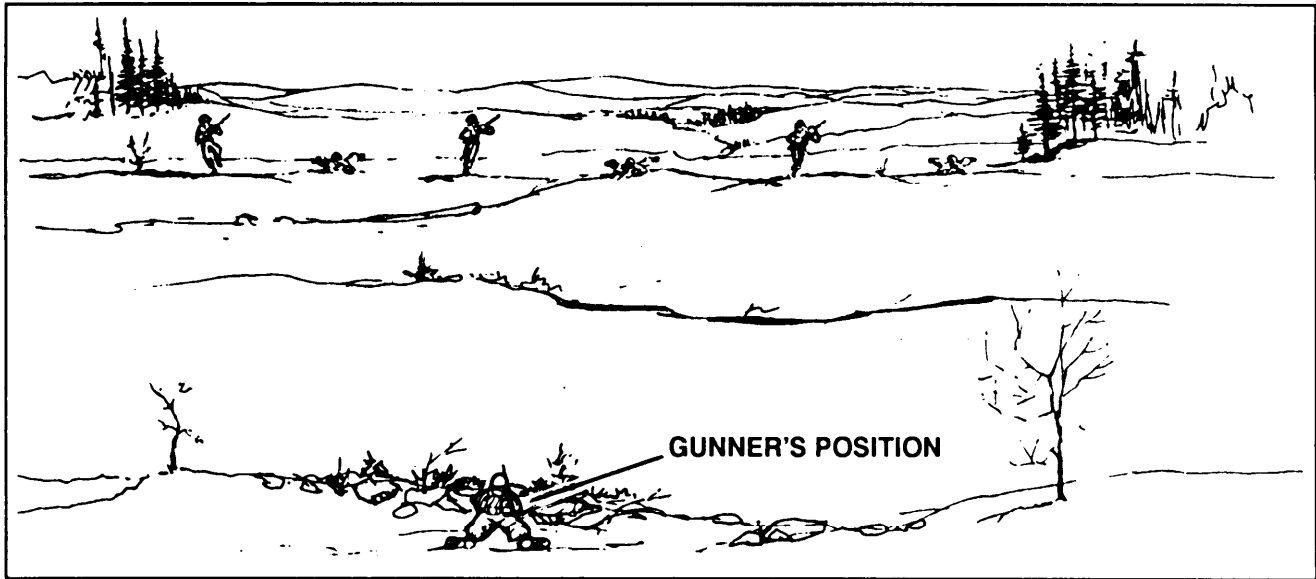


Figure 6-6. Linear target and one gun.

(3) Linear targets with depth are targets that have sufficient width to require traversing fire and depth which cannot be covered by the beaten zone. A combined change in direction and elevation (traversing and searching fire) is required to maintain effective fire on these targets (Figure 6-7). Linear targets with depth are engaged with traversing and searching fire. When range is announced, the range to the midpoint is given.



Figure 6-7. Linear target with depth.

(a) Two guns. The method of division, the point of initial lay and adjustment, and the extent of manipulation for both guns are the same as prescribed for linear targets. The gunners, however, apply enough search between each burst to ensure the center of the beaten zone is maintained at the center base of the target (Figure 6-8).

(b) One gun. A single gunner initially lays and adjusts on the midpoint of a linear target with depth unless some other portion of the target presents a greater threat. The gunner traverses and searches to the near flank, then he covers the entire target area (Figure 6-8).

(4) Deep targets have depth but very little width and can be effectively covered by searching fire (Figure 6-9, page 6-12). When the range is announced, it is given to the midpoint of the target.

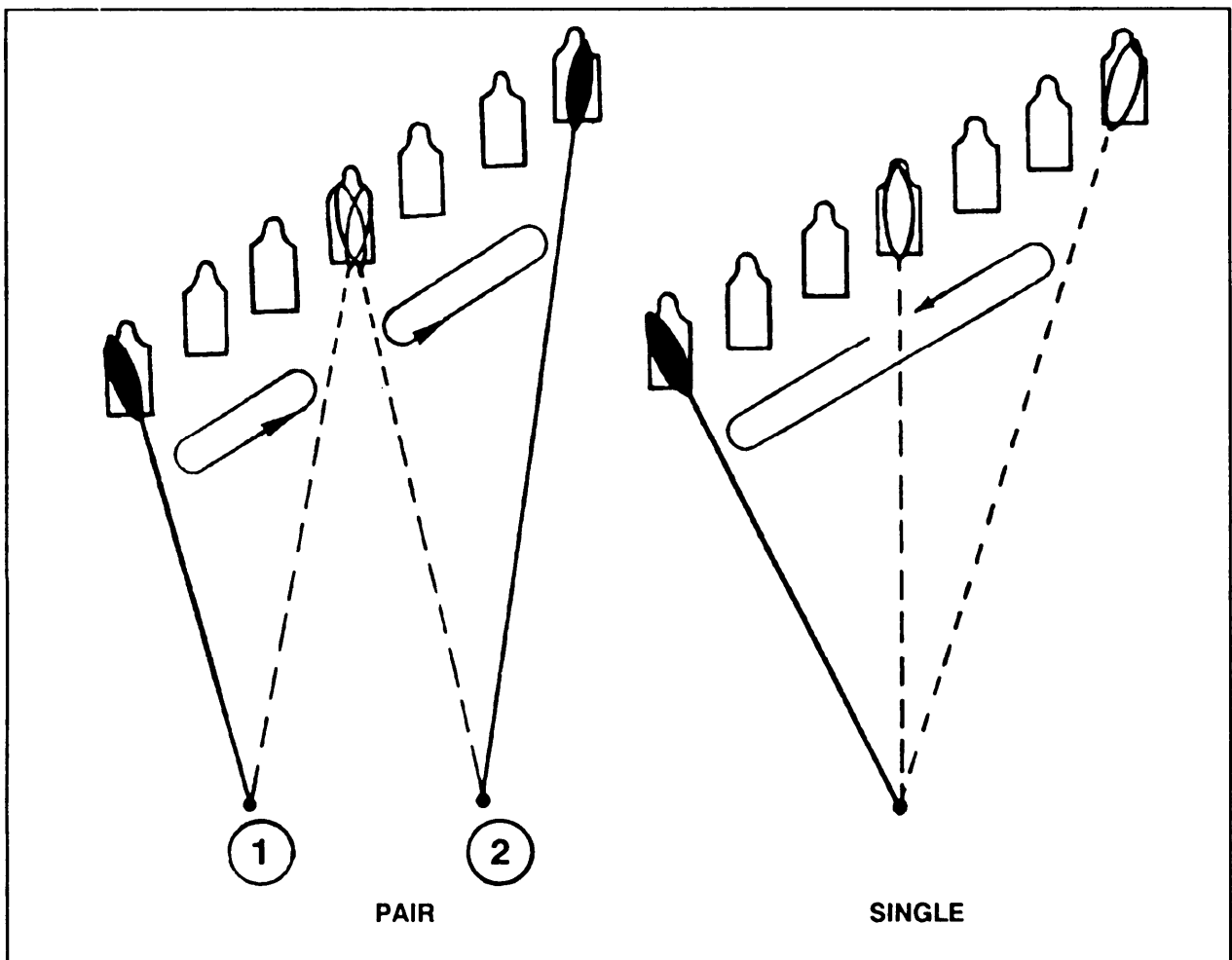


Figure 6-8. Engagement of linear targets with depth.

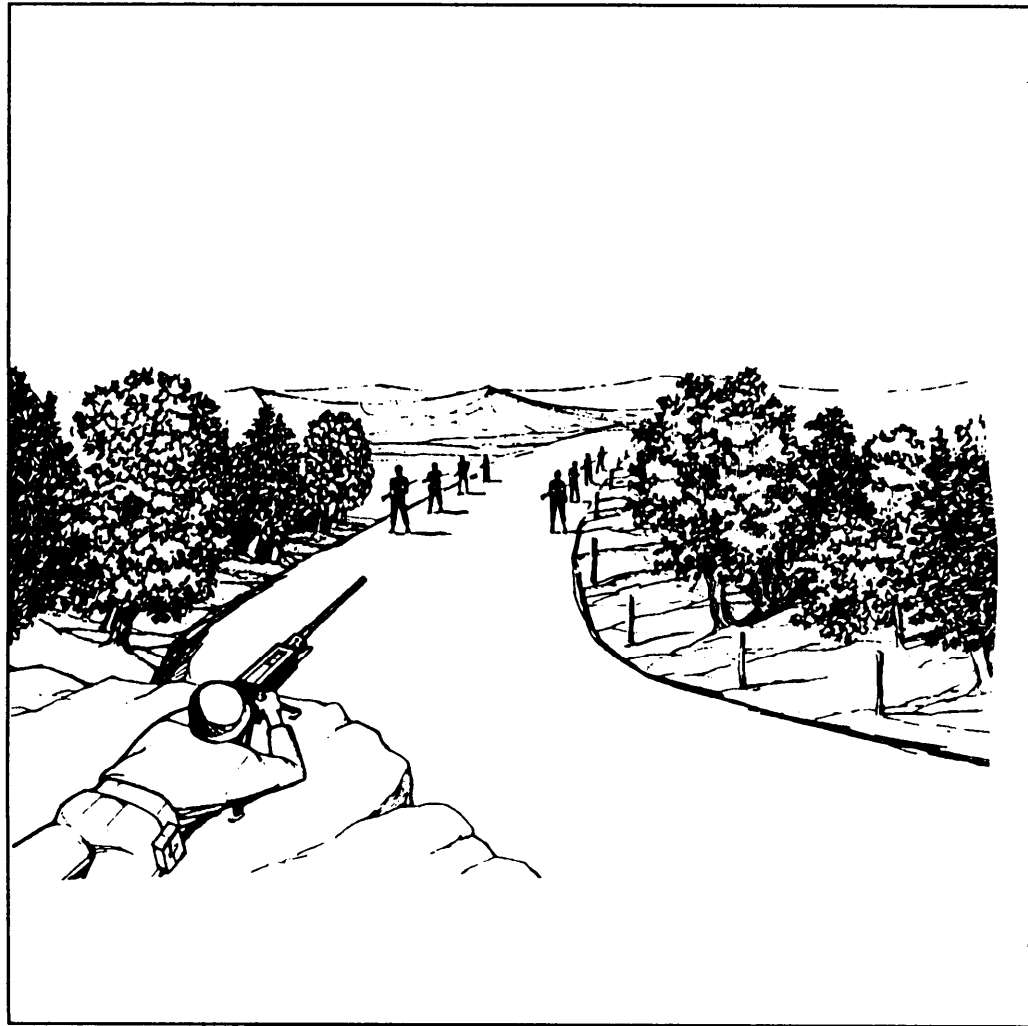


Figure 6-9. Deep target.

(a) Two guns. The point of initial lay of both guns is on the midpoint, which is also the point of division. Since enfilade fire is delivered, it is not necessary to adjust on the midpoint of the target because the long axis of the beaten zone will compensate for missing the midpoint. However, should the gunner's beaten zone be out of the lateral confines of the target, it will be necessary to adjust fires into the target area. After the initial bursts, the right gun searches to the near end of the target, and the left gun searches to the far end of the target. Both gunners then reverse their direction of search and return to the midpoint (Figure 6-10).

(b) One gun. A single gunner initially lays and fires at the midpoint of a deep target, unless another portion of the target presents a greater threat. The gunner immediately searches to the near end, then covers the entire target (Figure 6-10).

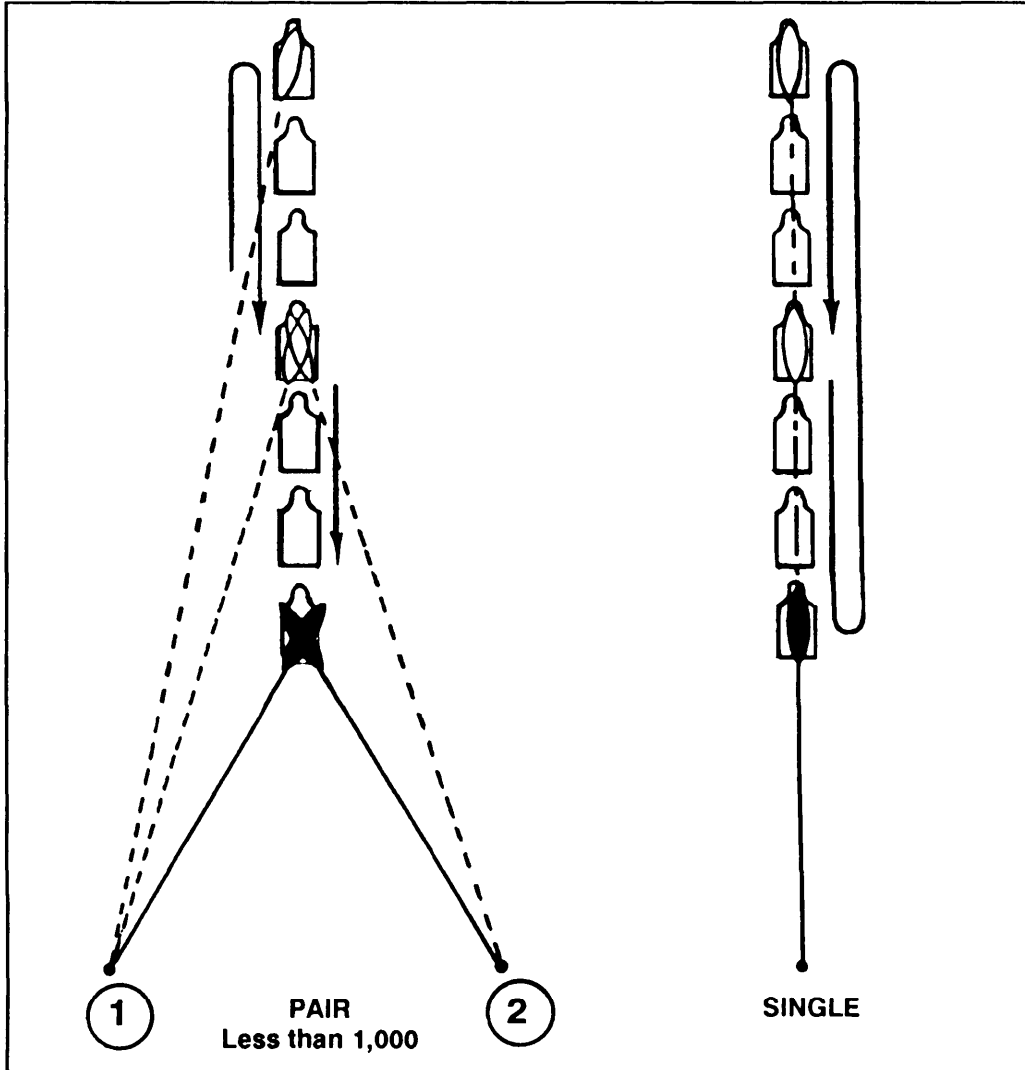


Figure 6-10. Engagement of deep targets.

(5) Area targets as discussed in this manual have considerable width and depth, and they require extensive traversing and searching fires. This type target exists when the enemy is known to be in a certain area, but his exact location is not known. A hilltop is a typical area target. The leader designates an area target by indicating to the gun crew(s) the width and depth of the target.

(a) Two guns. The target is divided at the center of mass; the right gun fires on the right half and the left gun fires on the left half. The point of initial lay and adjustment for both guns is on the center of mass. After adjusting on the center of mass, fire is distributed by determining the size of the beaten zones and applying direction and elevation changes that cause the most effective coverage of the target area. Both guns traverse and search their respective halves to the flanks, then return to the midpoint (Figure 6-11).

(b) One gun. A single gunner engages an area target by laying and adjusting on the center of mass, traversing and searching to either flank, then reversing the direction, traversing and searching to the other flank (Figure 6-11).

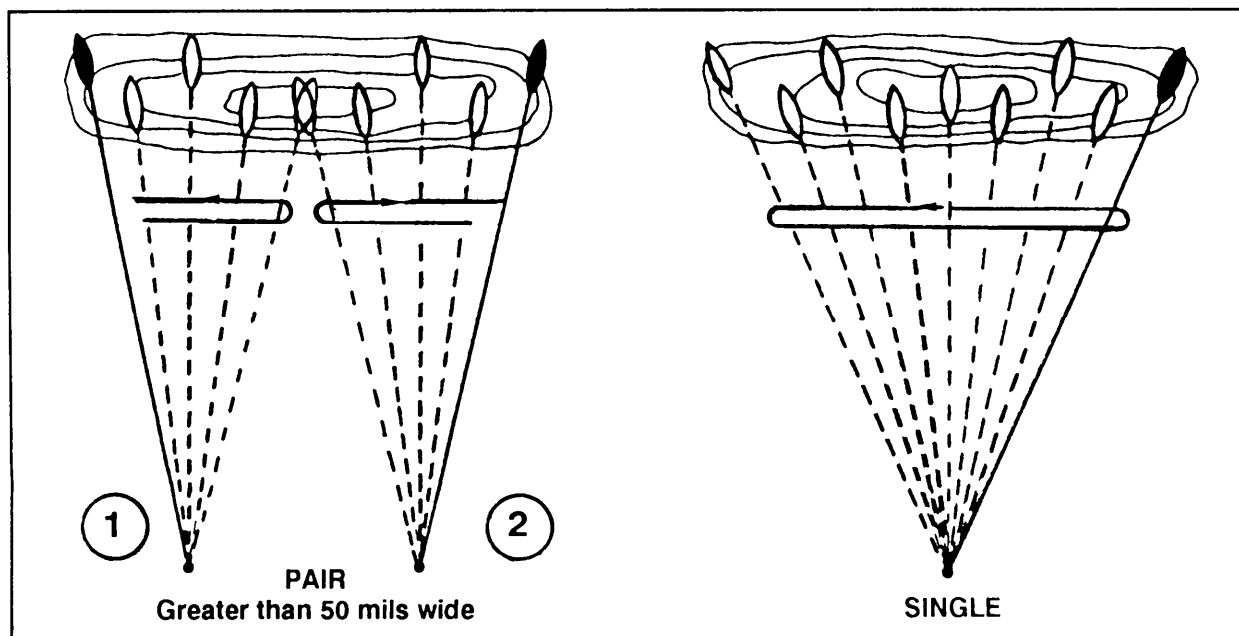


Figure 6-11. Engagement of area targets (objective).

NOTE: After the target is engaged in whatever formation it is in, the configuration of that target will change. The gunner must be trained to compensate for this change and still place effective fire on the target.

6-5. OVERHEAD FIRE

Overhead fire is fire delivered over the heads of friendly troops. A machine gun on a tripod is capable of delivering this type of fire because of the small and uniform dispersion of the cone of fire. In the attack, the

use of overhead fire permits the machine gun to support the advance of rifle units. Sectors of fire allow the trainers to plan safe training while still incorporating the combat realities of overhead fires.

a. **Minimum Clearance.** The center of the cone of fire must clear the heads of the friendly troops by a prescribed distance (Figure 6-12). This distance, known as minimum clearance, is found by adding together the following elements:

- The height of a standing man, taken as 1.8 meters.
- Half the vertical dimension of the 100-percent cone of fire at the range to the troops.
- A margin of safety equal to the vertical distance which extends a 5-mil angle at the gun or 3 meters, whichever is greater.
- An additional allowance to compensate for a 15-percent error in range determination.

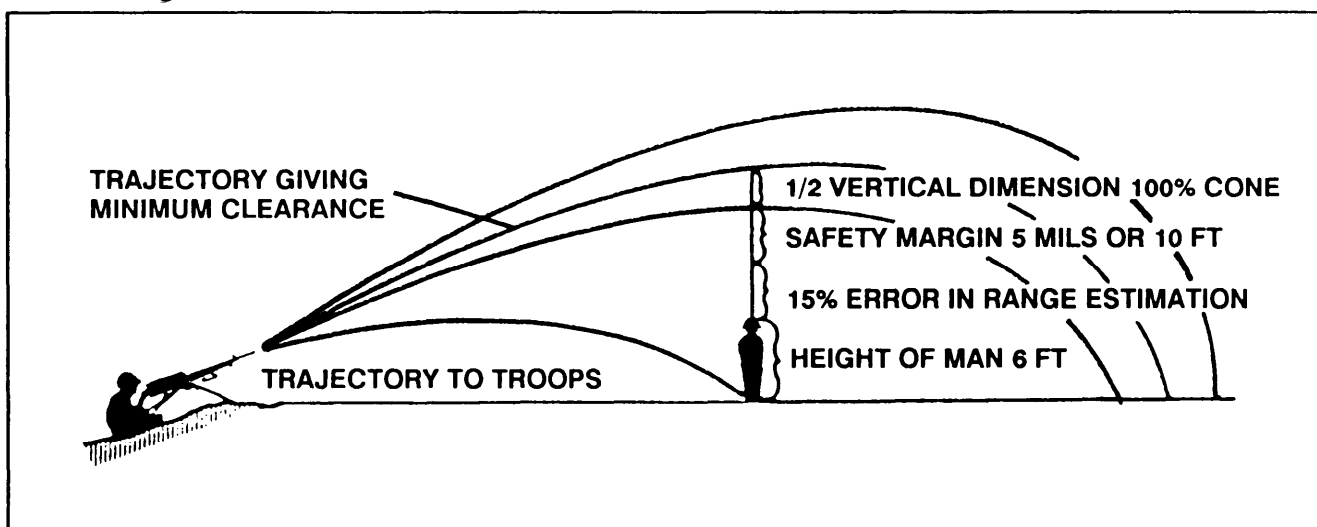


Figure 6-12. Components of minimum clearance.

b. **Safety Angles.** To obtain this minimum clearance, the gun is elevated so that the center of the cone of fire is raised from the feet-of the friendly troops to maintain clearance above their head. The amount of this elevation change is known as the safety angle. When the gun is fired from the tripod with the required safety angle, the center of impact determines the shortest range at which fire can be delivered over the heads of friendly troops. The range from the gun to the point of strike is called the corresponding range. When the ground is level or uniformly sloping between the gun and the target, the corresponding range for the safety angle used is obtained by converting the angle of elevation expressed in mils into range.

c. **Conditions.** Overhead fire is used only when the following conditions have been met:

- (1) The safety limit has been determined and has been identified on the ground.
- (2) The gun mount is firmly seated.
- (3) Friendly troops have been notified, if at all possible, that fire is to be delivered over them.
- (4) The rate of fire does not exceed 40 rounds per minute.
- (5) The gun barrel is not badly worn. This condition is indicated by excessive muzzle blast.

d. **Uneven Terrain.** Level or uniformly sloping ground is seldom found in the field. This limits the use of firing tables and corresponding ranges in determining the limit of troop safety. In lieu of firing tables, a rule of thumb has been devised to give the gunner a simple method of checking for troop safety.

(1) The gunner's rule can be applied when the friendly troops are at least 350 meters in front of the gun position, and the range to the target is 850 meters or less (Figure 6-13).

(a) Lay the gun on the target with the correct sight setting to hit the target.

(b) Without disturbing the lay of the gun, set the rear sight at a range of 1,600 meters.

(c) Look through the sights and notice where the new line of aim strikes the ground. This is the limit of troop safety. When the feet of the friendly troops reach this point, fire must be lifted or shifted.

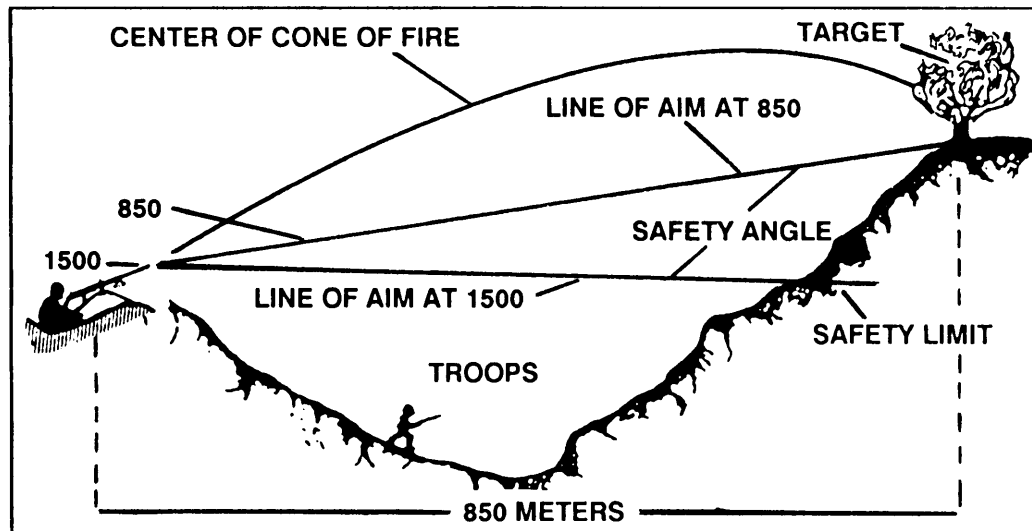


Figure 6-13. Application of gunner's rule.

(2) When the range to the target is greater than 850 meters, overhead fire should be delivered only in an emergency and then only out to a range in which either the tracers or the strike of the bullets can be seen by the gunner. In this situation the leader's rule applies (Figure 6-14).

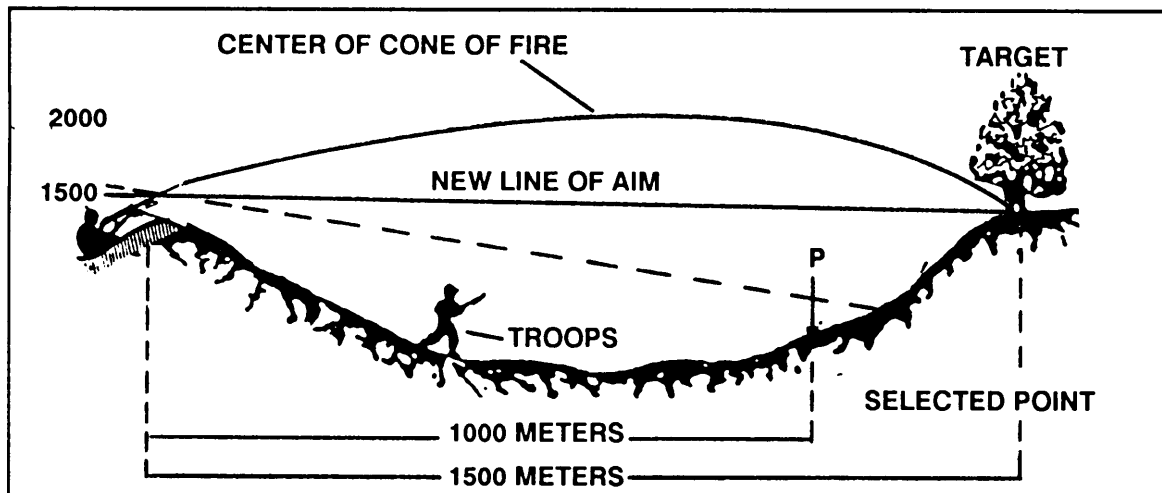


Figure 6-14. Application of leader's rule.

The platoon or section leader uses the leader's rule only when the target is greater than 850 meters. The rule is as follows:

- (a) Select a point on the ground where it is believed friendly troops can advance with safety.
- (b) Determine the range to this point by the most accurate means available.
- (c) Lay the gun on the target with the correct sight setting to hit the target.
- (d) Without disturbing the lay of the gun, set the rear sight to 1,600 meters, or the range to the target plus 500 meters, whichever is greater. Under no conditions should the sight setting be less than 1,500 meters.
- (e) Note the point where the new line of aim strikes the ground.
 - If it strikes at the selected point, that point marks the limit of safety.
 - If it strikes short of the selected point, it is safe for troops to advance to the point where the line of aim strikes the ground and to an unknown point beyond. If it is desired to fire after friendly troops advance farther than the point where the line of aim strikes the ground, this farther point is determined by testing new selected points until the line of aim and the selected point coincide.

- If it clears the selected point, it is safe for the troops to advance to the selected point and to an unknown point beyond. If it is desired to have troops advance beyond the selected point, this farther point must be determined by testing new selected points until the line of aim and the selected point coincide. This point marks the line of safety.

e. **Precautions.** The following safety precautions *must* be observed in delivering overhead fire.

- (1) Firmly emplace the tripod mount.
- (2) Use depression stops to prevent the muzzle of the gun from accidentally being lowered below the safety limit.
- (3) Do not deliver overhead fire through trees.
- (4) Inform commanders of friendly troops when fire is to be delivered over their heads.
- (5) Ensure that all members of the gun crew(s) are aware of the safety limit.
- (6) Do not deliver overhead fire if the range from the gun to the target is less than 350 meters or more than 850 meters.
- (7) Do not use a barrel that has excessive muzzle blast or is otherwise determined to be badly worn.
- (8) Do not lay machine guns so their fire will cross at any point over the heads of friendly troops.

6-6. DEFILADE POSITIONS

To achieve maximum effectiveness, the machine gun must be employed using the technique of direct lay; however, at times it may be desirable to employ guns from defilade positions.

a. **Full Defilade.** A machine gun is in defilade when the gun and its crew are hidden from enemy ground observation by a land mass such as the crest of a hill. The position may be on the reverse side of the crest or the forward slope of the next higher ground (Figure 6-15). The gun must fire up and over the hill. Fire must be observed and adjusted by a crewmember who can observe the target from a position on a flank or to the rear of the gun (on higher ground). A defilade position allows little opportunity to engage new targets.

b. **Partial Defilade.** A machine gun is in partial defilade when a mask (usually the crest of a hill) provides the gun and gunner with some protection from enemy direct fire, but the gunner is able to engage the target using direct laying techniques. The gun is far enough up the slope so that the gunner can see the target through the sights but the lower portion

of his body and lower portion of the gun are protected by the mask. Partial defilade positions are desirable when a fire mission cannot be accomplished from a defilade position.

c. **Advantages.** The gun and crew have cover and concealment from direct fire weapons. The crew has some freedom of movement in the vicinity of the gun position, and control and supply are facilitated. The characteristic smoke and flash of the gun are partially concealed from observation.

d. **Disadvantages.** Rapidly moving ground targets are not easily engaged because adjustment of fire must be made through an observer. Targets close to the mask usually cannot be engaged, and it is difficult to secure grazing fire for a final protective line.

e. **Position Selection.** The fire unit leader selects the location of the gun position. To select a position in partial defilade, he moves up the reverse side of the slope until he has the target in view above the mask when sighting at the height of the gunner's eye. To select a position in maximum defilade, he estimates the lowest point below the mask at which the gun can still engage the target without danger of hitting the mask.

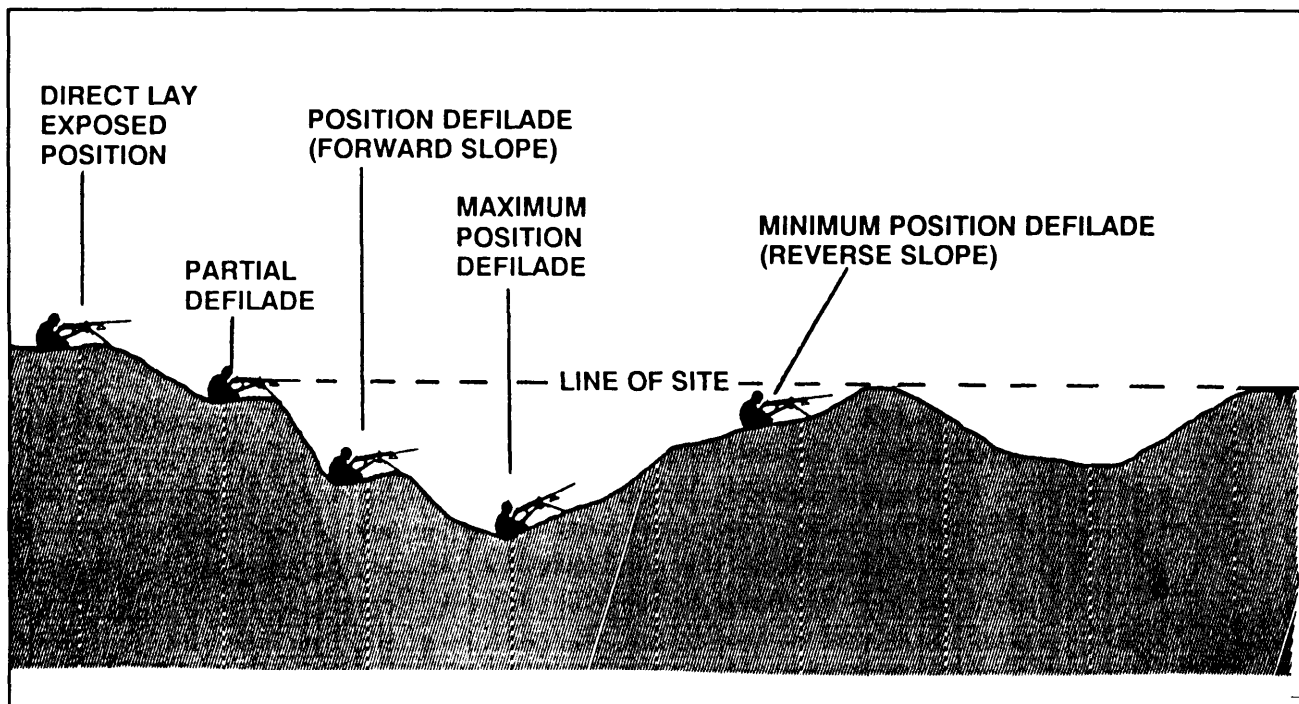


Figure 6-15. Minimum and maximum position defilade, partial defilade, and direct lay areas.

6-7. METHODS OF LAYING THE GUN FOR DEFILADE FIRING

The essential elements in engagement of a target from defilade position are direction, elevation, mask clearance, and adjustment of fire.

a. **Direction.** An observer places himself on the gun-target line in a position from which he can see the gun and the target. He aligns the gun approximately by having the gunner shift the mount. The gunner then loosens the traversing slide lock lever and, as directed by the observer, moves the gun right or left until it is aligned on the target; he then clamps it in that position. A prominent landmark, visible to the gunner through his sights, is selected as an aiming point. An aiming point on the gun-target line and at an equal or greater range than the target is desirable. However, an aiming point on the mask may be used. If the aiming point is on the gun-target line, the gun is laid on the aiming point and is thereby aligned for direction. If the aiming point is not on the gun-target line, the deflection is measured by binoculars or compass. This measured deflection is laid off with the gun.

b. **Elevation.** An aiming point visible from the gun position is selected (preferably a point at a greater range and at a higher elevation than the target) and the range to the target is determined. The leader, using binoculars, measures the vertical angle in mils from the aiming point to the base of the target. He then lays the gun on the aiming point with the sight set to hit the target. He directs the gunner to manipulate the gun through the number of mils measured. For example, in Figure 6-16, the range to the target is 1,300 meters. The angle read with the binoculars from the aiming point down to the base of the target is 12 mils. The sight is set at 1,300 meters, the gun laid on the aiming point, and the muzzle depressed 12 mils. If the aiming point is off the gun-target line, deflection in mils may be taken with the rear sight windage screw knob if it is not over 5 mils; otherwise, the deflection must be taken up on the traversing handwheel.

c. **Mask Clearance.** After the gun has been laid, determine if the entire cone of fire will clear the mask.

(1) *Visual method.* When the range to the mask is not more than 450 meters, mask clearance exists when the axis of the bore is elevated 7 mils or more above the gun-mask line. Mask clearance can be checked after the gun has been laid on the target by depressing the muzzle of the gun 2 mils and sighting along the bottom of the receiver and the barrel support. If this line of sight clears the mask, the clearance exists. Elevate 2 mils before firing.

(2) *Firing tables method.* Determine the range to the mask and obtain the corresponding angle of elevation for mask clearance from the firing

tables. The range corresponding to the angle of elevation is set on the gun sight. If the line of aim through the sight clears the mask, the clearance exists.

d. **Adjustment of Fire.** Under field conditions, even the most practical methods of laying the gun on the target quickly do not always result in the initial burst being on the target. For this reason, adjustment of fire on the target is essential. Creeping fire should be avoided. (See paragraph 6-10 for details on adjustment of fire.)

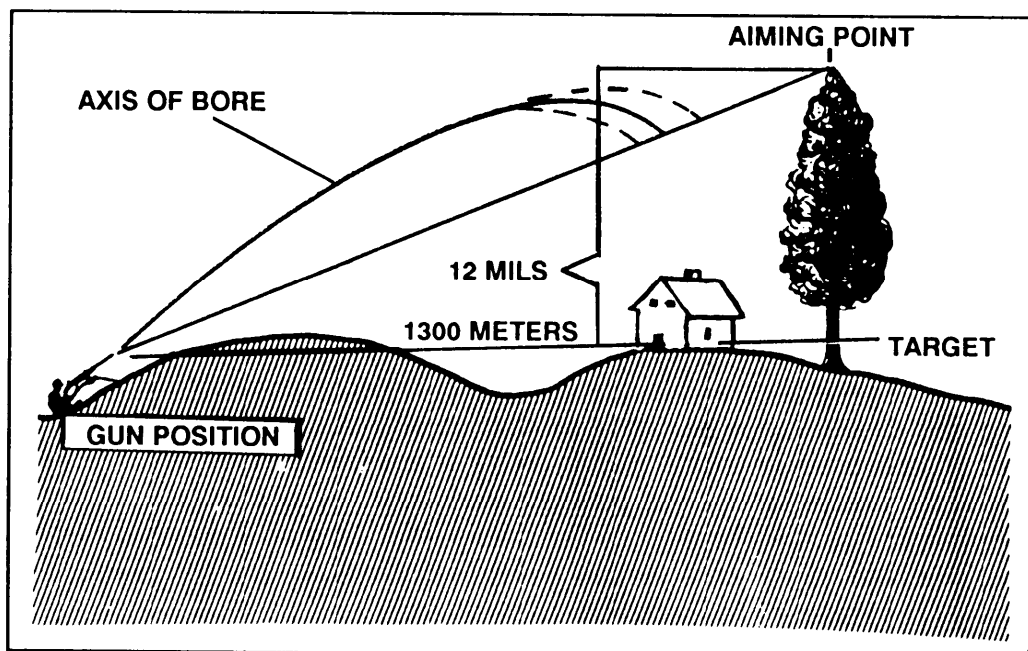


Figure 6-16. Aiming point method.

6-8. FINAL PROTECTIVE FIRES

These are types of fire that are placed on a predetermined line along which grazing fire is placed to stop an enemy assault. This fire is fixed in direction and elevation; however, a few roils of search are employed during firing to compensate for irregularities in the terrain. FPLs are always laid in using the extreme left or right of the tripod, causing the T&E to move to the extreme left or right on the traversing bar. The FPFs can be delivered in any visibility conditions. When terrain permits, final protective lines are assigned to machine guns along the forward line of troops as a part of the FPFs of the defending unit. The signal used to call for FPFs is normally prescribed in the company operation order. The

authority to call for these fires may be delegated to the platoon leader of a forward rifle platoon. Final protective fires are ceased on order.

a. **Signals.** Arm-and-hand signals, voice commands, or pyrotechnic devices may be used in calling for these fires.

b. **Rates of Fire.** When firing FPFs, the rapid rate of fire is used unless it is obvious that a different rate is necessary to accomplish the mission. When engaging other preselected target areas, the rapid rate of fire is used until commanded to cease fire.

6-9. APPLICATION OF FIRE

To be effective, machine gun fire must be distributed over the entire target area. Improper distribution of fire results in gaps which allow the enemy to escape or use weapons against friendly positions without effective opposition.

a. The method of applying fire to a target is generally the same for either a single gun or a pair of guns. Direct laying is pointing the gun for direction and elevation so that the sights are aligned directly on the target. Fire is delivered in width, depth, or in a combination of the two. To distribute fire properly, the gunners must know where to aim, how to adjust their fire, and the direction to manipulate the gun. The gunner must aim, fire, and adjust on a certain point of the target. Binoculars may be used by the leader to facilitate fire adjustment.

b. The gunner ensures throughout his firing that the center of the beaten zone is maintained at the center base of the target for maximum effect from each burst of fire. When this is done, projectiles in the upper half of the cone of fire will pass through the target if it has height, and the projectiles in the lower half of the beaten zone may ricochet into the target (Figure 6-17).

c. The gunner must move his beaten zone in a certain direction over the target. The direction depends on the type of target and whether the target is engaged with a pair of guns or a single gun. When engaging targets other than point targets with a pair of guns, the targets are divided so that fire is evenly distributed throughout the target area. Fire delivered on point targets or a specific area of other target configurations is called concentrated fire.

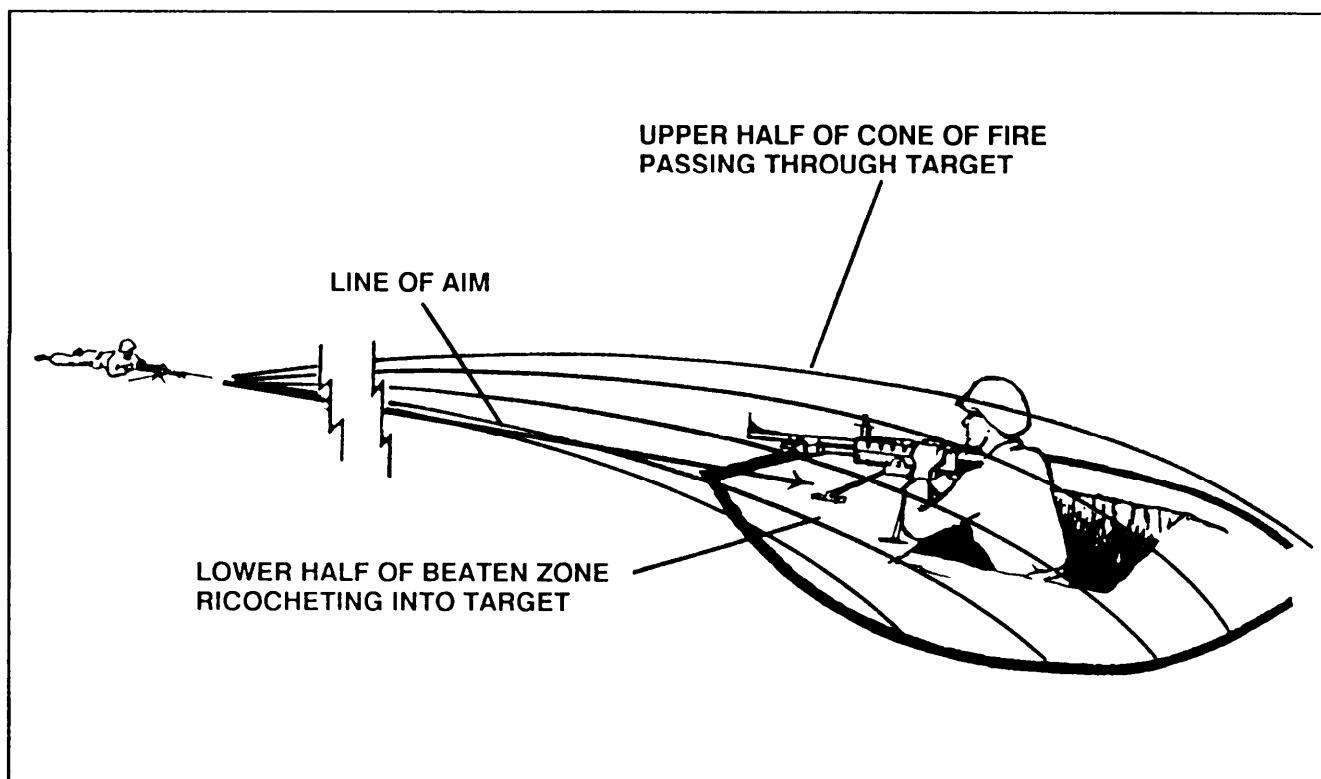


Figure 6-17. Line of aim and placement of center of beaten zone on target.

6-10. FIRE ADJUSTMENT

Machine gun fire is adjusted by observing the strike of the rounds, observing the flight of tracers, frequently re-laying the gun, or by a combination of these. Adjustment by observation of fire is the most important element of fire control if it is bold, aggressive, rapid, and continuous throughout the action.

a. The gunner is trained to observe and adjust his gun's fire without command. He is trained to anticipate the action of the enemy after the initial burst, and is prepared to shift his fire to cover any change in formation or movement of his target. If the gunner fails to accomplish this, the fire unit leader must promptly correct him by announcing or signaling subsequent fire commands. This responsibility to adjust fire continues through the chain of commands.

b. When subsequent fire commands are given, the gunner makes the required corrections and continues to engage the target without any further command to fire. If the gun is fired on the tripod mount, subsequent commands are given to make changes in direction, elevation,

and the rate of fire. These changes are given orally as SHIFT RIGHT, SHIFT LEFT, ADD, or DROP. (For arm-and-hand signals see FM 21-60.) When making these announced changes, mils may be used to indicate the amount of desired shift; for example, SHIFT RIGHT 5 or SHIFT LEFT 7. When making changes in elevation, roils are not used, as it is normally difficult to determine just how high or low the center of the beaten zone is striking the ground in relation to the target.

(1) *Observation.* When firing on the 10-meter range, the strike of the bullets is visible on the target. When firing at greater distances, the strike of the bullets on the ground may cause dust to rise, which is visible to the gunner; however, during wet weather the strike cannot always be seen. In this event, the tracers will allow the gunner or crew leader to note the strike of the burst in relation to the target.

(2) *Adjustment.* Using the mil relation, one click of the traversing handwheel or elevating handwheel moves the strike of the bullet 1/2 inch on the target at a range of 10 meters.

(a) When firing on the 10-meter range, adjust by moving the shot group a required number of centimeters vertically or horizontally until the center of the group is on the aiming paster. Should the gunner's initial burst strike the target 2 centimeters to the left and 3 centimeters below the aiming paster, he adjusts his fire by traversing right 4 clicks and elevating 6 clicks before firing again.

(b) When firing on field targets, adjust by moving the burst into the target. One click (roil) on the traversing handwheel will move the strike 1/2 meter at 500 meters or 1 meter at 1,000 meters; however, the distance 1 click (roil) in the elevating handwheel will move the strike depends on the range to the target and the slope of the ground. The gunner determines the number of roils necessary to move the center of the strike into the target, and he manipulates the gun the required number of roils. This does not require the use of sights. For example, should the gunner fire on a target at 500 meters and observe the strike 10 meters to the right of the target and short about 50 meters, he would traverse the gun to the left 20 clicks (roils) and add one or more clicks (roils), depending on the slope of the ground.

(c) The gunner may use the adjusted aiming point method to adjust the fire. In this method the gunner must use his sights. He selects an aiming point that will place the next burst on the target. For example, should the gunner fire on a target at 500 meters and estimate that the strike is 20 meters short and 10 meters to the right of the target, he would rapidly select an aiming point approximately 20 meters beyond the target and 10 meters to the left of the target, lay on that aiming point, and fire.

6-11. ANTI-AIRCRAFT GUNNERY

The MG can provide units with a self-defense capability against hostile low-flying, low-performance aircraft. These guns are employed in the air defense role as part of the unit's local defense. The MGs are not components of an integrated and coordinated air defense system. Unless otherwise directed, hostile aircraft within range of the gun (about 800 meters maximum effective range) should be engaged. The decision will be made by the commander. Typical targets are surveillance, reconnaissance, and liaison aircraft; troop carriers; helicopters; and drones.

a. **Engagement and Employment.** The mission is to impose maximum attrition upon the attacking enemy, such as low-flying, low-performance aircraft. Employment of MGs used for air defense is guided by the following defense design factors:

- Defense design should produce an equally balanced defense that is effective in all directions, unless a forced route of approach exists.
- Machine guns should be sited so that the maximum number of targets can be engaged, continuous fire can be delivered, and the most likely routes of approach are covered.
- Machine guns used to defend march columns should be interspersed in the convoy, with emphasis on the lead and rear elements (Figure 6-18).

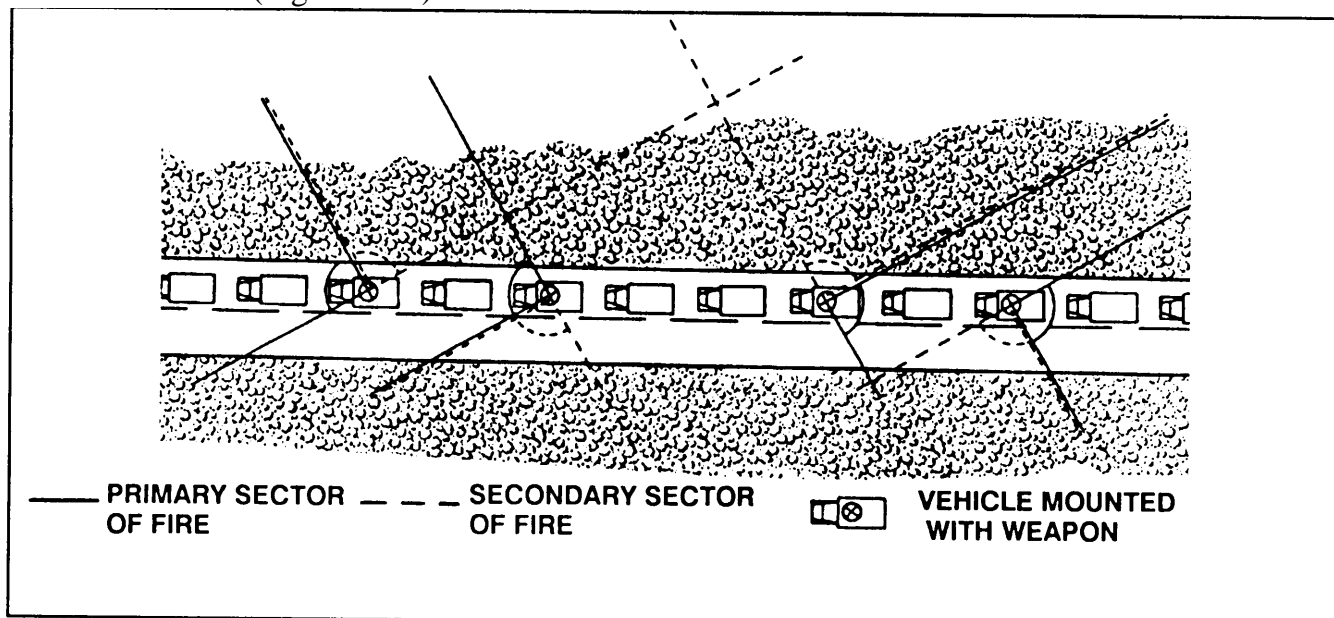


Figure 6-18. March column with four MGs (added).

b. **Target Selection and Engagement Control.** These actions depend upon visual means. The sites selected for the guns must provide maximum observation and unobstructed sectors of fire. Units furnished MGs in sufficient numbers should site them within mutual support distances of 90 to 360 meters. Each gun is assigned a primary and secondary sector of fire. Weapon crews maintain constant vigilance in their primary sectors of fire, regardless of the sector in which the guns are actually engaged.

Section III. LIMITED VISIBILITY CONDITIONS

The machine gun is provided with a stable tripod mount, M3, and a traversing and elevating mechanism. By manipulating the T&E mechanism, gun crews can record target data during good visibility and engage the same targets in poor visibility. This section provides guidance on machine gun firing techniques and terms used during limited visibility, which includes darkness, smoke, fog, rain, or snow.

6-12. DIFFICULTIES

Crewmembers encounter difficulties while defending during limited visibility, which preclude the use of many of the daylight techniques of engaging targets.

a. During limited visibility, the machine gunner's sector of responsibility cannot be observed in depth; therefore, targets are difficult or impossible to detect.

b. Visibility may be so limited that the leader cannot control the fires of his guns by selecting and directing fire on targets as he would during good visibility. Oral commands are not dependable, arm-and-hand signals may not be seen, and personal contact with the gunner is difficult.

c. At night, machine gunners have a tendency to fire indiscriminately at noises and suspected enemy locations.

To overcome these difficulties, special techniques must be developed for engaging targets and delivering preplanned fires by the use of range cards. (See Appendix E.)

6-13. TERMINOLOGY

The following terms must be familiar to MG crews for them to complete their missions in poor visibility.

a. **Sector of Fire.** An area (to be covered by fire) assigned to an individual or unit. Machine guns are normally assigned two sectors of fire, a primary and a secondary sector.

b. **Final Protective Line.** A predetermined line along which grazing fire is placed to stop an enemy assault. The FPL is fixed as to direction and elevation; however, a few roils of search are employed during firing to compensate for irregularities in the terrain. The FPL can be delivered regardless of visibility conditions. The FPL is always the inner limit of the primary sector, which is assigned close to the forward line of troops area. When terrain permits, FPLs are assigned to machine guns along the **FLOT** as a part of the final protective fires of the defending unit.

c. **Principal Direction of Fire.** A PDF is a priority direction of fire that marks a specific area assigned to a weapon. This area may extend from the gun position to the maximum effective range of the weapon and therefore is not fixed for elevation. Visible targets appearing in the PDF take priority over targets that may appear elsewhere in the sector. A PDF may be assigned to cover an area that provides good fields of fire, is a likely avenue of foot approach, or mutually supports an adjacent unit.

d. **Sector of Graze.** A wedge-shaped area formed by assigned sector limits that afford grazing fire (one meter high, maximum) from the muzzle of the weapon to the first major break in the terrain. The sector of graze is fired using swinging traverse in the primary sector of fire. It can be fired in the secondary sector in conjunction with field expedients by freeing the T&E mechanism and using the mount as a pivot. A sector of graze can be delivered regardless of the condition of visibility.

e. **Area of Graze.** This is an area, other than the sector of graze, within a sector of fire that is covered by grazing fire. Grazing fire need not be continuous from the muzzle of the weapon to the area over which grazing fire is desired.

6-14. TARGET ENGAGEMENT

A gunner's ability to detect and identify targets during limited visibility will vary, depending upon the amount of natural and artificial light and the types and numbers of sensors used. All tracer ammunition allows a gunner to more effectively engage visible targets during limited visibility; it should be used when possible. Gunners must be trained to fire low initially and adjust up when engaging targets during limited visibility. This helps them overcome the tendency to fire high during these conditions. The types of point targets machine gunners will be concerned with during limited visibility, particularly at night, are enemy automatic weapons and assaulting enemy personnel.

a. Point targets such as automatic weapons may be identified during limited visibility by their muzzle flashes. To effectively engage these

targets, fire should be delivered in a heavy volume and adjusted by observing the tracer stream.

b. During the final stage of an enemy assault, machine guns normally fire at personnel on an FPL; they may be assigned a PDF. Both are considered as final protective fires and should be planned for and coordinated as such. If individual enemy soldiers are observed in the proximity of the gun position, they must be neutralized by someone other than the machine gunner (by the other crewmembers or by security forces of the supported unit). The FPFs are fired according to the order or SOP, and the machine gunner is not allowed to stop firing them except in accordance with those orders or SOP.

6-15. FIRE CONTROL

During limited visibility, the leader cannot direct the fires of his guns as effectively as with good visibility. Consequently, initiative is required of the gunners. When targets within their sectors become visible to gunners, they must engage such targets without command and continue to fire until the targets have been neutralized. Gun crews engage targets only when they can identify them, unless ordered to do otherwise. For example, if one gunner detects a target and engages it, the other gunners will observe the area in which fire is being placed. They will add their fire only if they can identify the target or are ordered to place fire in the area.

6-16. PREPLANNED FIRES

In addition to engaging appropriate visible targets, the gunner must be able to deliver preplanned fires during limited visibility. These fires are used to cover target areas of tactical significance (such as routes, avenues of approach, anticipated enemy supporting weapons positions, and probable enemy assault positions) and to establish sectors of graze and final protective lines. For maximum effect in all preplanned target areas, grazing fire should be obtained when possible.

a. **Obtaining Maximum Extent of Grazing Fire Over Level or Uniformly Sloping Terrain.** The machine gunner sets the rear sights at 700 meters; selects a point on the ground, which he determines to be at a range of about 700 meters; and lays, fires, and adjusts on this point. If the gunner cannot obtain 700 meters of grazing fire because of a major break in the ground at a range of less than 700 meters, he places the range to the break on his sight and lays, fires, and adjusts at that point.

b. **Determining the Extent of Grazing Fire on the Final Protective Line.** The extent of grazing fire on the FPL is determined using the techniques described above. Any intermediate breaks in the terrain along

this line that cannot be covered by grazing fire from a gun firing along the line is considered dead space.

c. **Determining the Extent of Grazing Fire in the Sector of Graze.** The ranges to the extent of grazing fire in a sector of graze are determined by observing the terrain and by observing the tracer stream from behind or from a flank of the gun position. Normally, the extent of grazing fire within this area will be much less than on an FPL and will form an irregular pattern.

d. **Determining the Amount of Grazing Fire in an Area of Graze.** The same procedures used in paragraph 6-8a are used in determining the extent of grazing fire in an area of graze. The ranges to areas of grazing fire are determined by observing the flight of tracer ammunition from behind or from the flank of the gun position. The gunner determines the lateral extent of areas of graze by selecting and engaging successive aiming points in the area believed to afford grazing fire, using the same range setting as when determining the range to the extent of grazing fire.

6-17. NBC CONSIDERATIONS

During this phase of training, the gunner is introduced to firing the machine gun while in MOPP, keeping in mind that engagement of some targets in MOPP is a qualification requirement. Firing weapons is only part of the overall NBC training. Soldiers must first be familiar with the NBC equipment, its use, and proper wear before they progress to learning the techniques of MOPP firing. Although there is no different technique required to fire the MG, there are certain fundamentals that may be slightly impaired.

a. **Immediate Action.** Under normal conditions, a gunner should be able to clear a stoppage in two to four seconds; however, under full MOPP, this may take a few seconds longer. Dry-fire practice under these conditions is necessary to reduce time and streamline actions. When practicing with the hood/mask and gloves, care must be taken not to snag or damage the gloves or dislodge the hood/mask during movement. Trainers should apply immediate action to a variety of stoppages during dry fire until the gunners are able to instinctively do it without compromising their NBC environment.

b. **Target Detection.** Techniques and principles of target detection and target acquisition still remain valid during NBC conditions, but considerations must be made for limiting factors imposed by MOPP equipment. For example, vision is limited to what can be seen through the mask's lens/faceplate. Peripheral vision is severely restricted. The lens/faceplate may be scratched or partly fogged, thus further restricting

vision. Gunners requiring corrective lenses must be issued insert lenses before training. Scanning movements may be restricted by the hood/mask. Any of these factors could adversely affect the gunner's ability to quickly and accurately detect targets. Extra skill practice should be conducted.

c. **Efficient Performance.** The trainer must keep in mind that although movements are slowed, tasks take longer, and function checks, loading, unloading, and cleaning are affected by MOPP, it is a must that the gunner avoid damaging MOPP gear and risk possible exposure to lethal agents. Because of the great difference between no MOPP and MOPP4, gunners must be trained in all aspects of operation and maintenance of the weapon while practicing at the highest MOPP level. Only through repeated training and practice can the soldier be expected to perform all tasks efficiently.