

Field Manual Condensed (FMC) 23-22

Machine Gun Tactics and Employment

Falcon, United Operations
<http://www.unitedoperations.net/>

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1. Characteristics of Fire

1-1. CONE OF FIRE

The cone containing all possible trajectories of rounds fired from the machine gun. Variation within the cone of fire is caused principally by the mechanical operation of the machine gun and atmospheric conditions.

1-2. BEATEN ZONE

The area defined by the impact of rounds on the ground or target. The shape and size of the beaten zone are determined by the slope of the terrain.

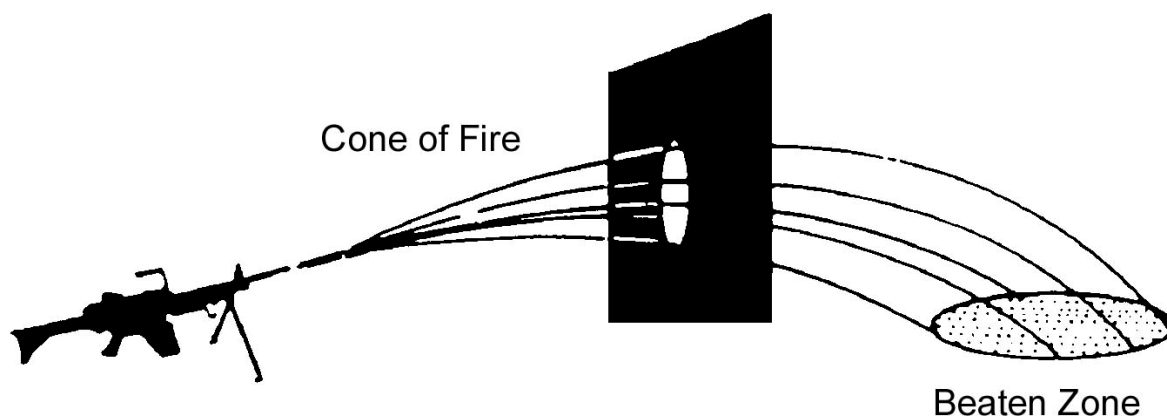


Figure 1-1

1-3. DANGER SPACE

The danger space is the space in between the gun and the target where the bottom of the cone of fire does not rise above 1.8m above the terrain.

2. Classes of Fire

2-1. WITH RESPECT TO THE GROUND

Fire with respect to the ground includes grazing and plunging fire.

1. **Grazing Fire.** Grazing fire occurs when the center of the cone of fire does not rise more than 1 meter above the ground. When firing on level or uniformly sloping terrain, the gunner can obtain a maximum of 600 meters of grazing fire.
2. **Plunging Fire.** Plunging fire occurs when the danger space is confined to the beaten zone. Plunging fire also occurs when firing at long ranges, from high ground to low ground, into abruptly rising ground, or across uneven terrain, resulting in a loss of grazing fire at any point along the trajectory.

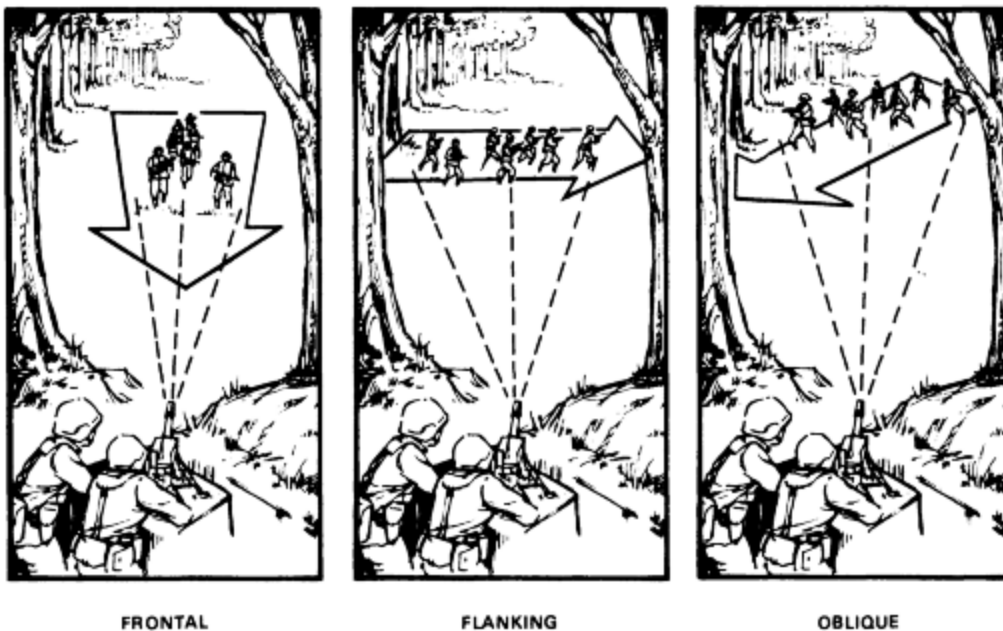


Figure 2-1

2-2. RESPECT TO TARGET

Fire with respect to the target includes frontal, flanking, oblique and enfilading fires.

1. **Frontal Fire.** Frontal fire is fire against a target parallel to the targets front or direction of movement.
2. **Flanking Fire.** Flanking fire is fire directed perpendicular to the targets front or direction of movement.
3. **Oblique Fire.** Oblique fire is fire directed neither perpendicular or parallel to the targets front or direction of movement.
4. **Enfilade Fire.** Enfilade fire is fire directed along the long axis of an enemy target.



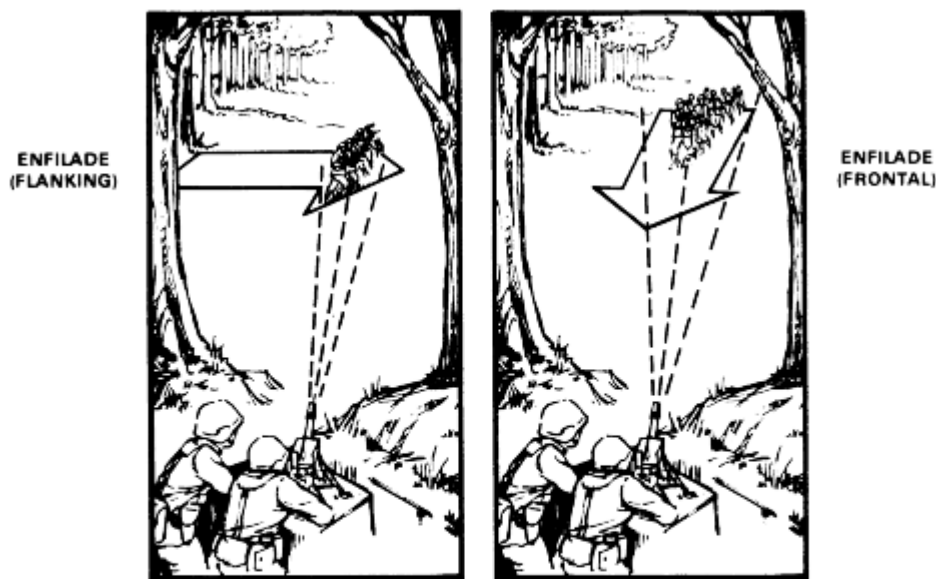


Figure 2-2

2-3. WITH RESPECT TO THE MACHINE GUN

Fire with respect to the ground includes fixed, traversing, searching, and traversing and searching, and free-gun fires.

1. **Fixed Fire.** Fixed fire is fire delivered against a point target when the depth and width of the beaten zone covers the target. Fixed fire also means only one aiming point is necessary to provide coverage of the target.
2. **Traversing Fire.** Traversing fire is fire distributed in width by successive changes in direction. The gunner selects successive aiming points throughout the width of the target. These aiming points must be close enough to ensure adequate coverage but not so close as to waste ammunition.
3. **Traversing and Searching Fire.** Traversing and searching fire is fire distributed in width and depth by successive changes in direction and elevation. Combining traversing and searching provides good coverage of the target. Adjustments are made in the same manner as described for traversing and searching fire.
4. **Free-Gun Fire.** Free-gun fire is fire delivered against targets requiring rapid major changes in direction and elevation that cannot be applied with the T&E mechanism. To deliver this type of fire, the gunner removes the T&E mechanism from the traversing bar on the tripod, allowing the weapon to be moved freely in any direction.

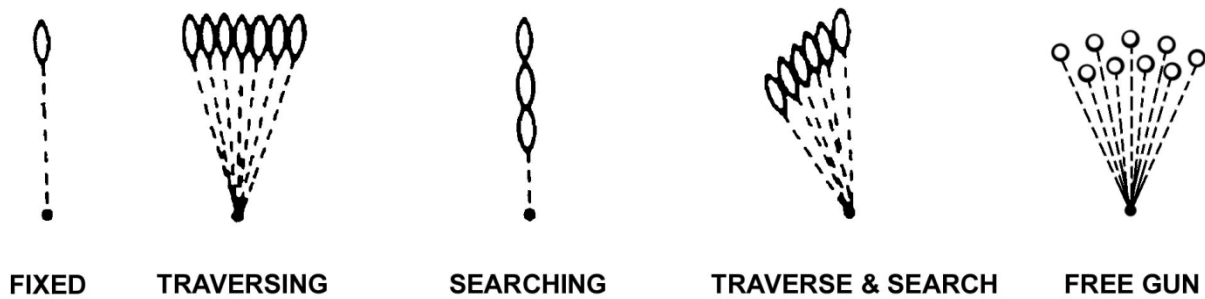


Figure 2-3

3. Predetermined Fire

3-1. TERMONOLOGY

1. **Sector of Fire.** A sector of fire is an area to be covered by fire that is assigned to an individual, a weapon, or a unit. Gunners are normally assigned a primary and a secondary sector of fire.
2. **Final Protective Fire.** An FPF is an immediately available prearranged barrier of fire to stop enemy movement across defensive lines or areas.
3. **Final Protective Line.** An FPL is a predetermined line along which grazing fire is placed to stop an enemy assault. An FPL becomes the machine gun's part of the unit's final protective fires.
4. **Principal Direction of Fire.** A PDF is a direction of fire assigned priority to cover an area that has good fields of fire or has a likely dismounted avenue of approach. It also provides mutual support to an adjacent unit. Machine guns are sighted using the PDF if there is no FPL no unengaged targets.
5. **Dead Space.** Dead space is an area where the cone of fire of a machine gun is forced to pass above the ground by at least 90cm by terrain. Dead space cannot be effectively engaged by a machine gun with direct fire.



Figure 3-1

6. **Primary Sector of Fire.** The primary sector of fire is the area to be covered by an individual or unit.
7. **Secondary Sector of Fire.** The secondary sector of fire is the same area covered by the same individual or unit after it has moved to a different location.

3-2. DISTANCE

Determining the distance to the target is vital to actually engaging targets. There are several methods.

1. **Laser.** Lasers are the preferred means of determining range. When a laser is used, distance may be determined to the nearest 10 meters. This ability might not always be present.
2. **Flash-to-Bang.** When it is necessary to verify distance, the flash-to-bang technique is helpful. Sound travels at a speed of approximately 350 meters per second. Use the following equation:

$$\text{Elapsed time between impact and sound} \times 350 = \text{Distance}$$

Multiply the number of seconds between round impact (flash) and when the sound reaches the observer (bang) by 350 meters. The answer is the approximate number of meters between the observer and the round. (This procedure can also be used to determine the distance to enemy weapon muzzle flashes.)

This method is fairly inaccurate.

3. **Estimation.** In the absence of a more accurate method of determining distance to a target, the observer must estimate distance. The degree of accuracy in this method depends on several factors, such as terrain relief, time available, and the experience of the observer. Generally, the longer the observer remains stationary, the better he can use this technique. Some methods of estimating distance are discussed below.
 - a. Mental estimation can be made by use of a known unit of measure. For longer distances, the observer may have to progressively estimate distance. To do this, he determines the number of units of measure (for example, 100 yards) to an intermediate point and doubles the value.
 - b. The observer should consider the following effects of estimating distances:

Object appears nearer:

 - When in bright light.
 - When the observer is looking down from a height.
 - When the observer is looking over a depression, most of which is hidden.
 - When the observer is looking down a straight feature, such as a road.

- When the observer is looking over water, snow, or a uniform surface such as a cultivated field.
- When the background is in contrast with the color of the object.

Object appears more distant:

- When it is in poor light or in fog.
- When only a small part of the object can be seen.
- When the observer is looking over a depression, most of which is visible.
- When the background is similar in color to that of the object.

When estimating the observer can and should use the map to verify estimated ranges against known landmarks such as groups of trees or wood lines.

4. **Binocular mil markings.** Distance can be estimated by using known dimensions of vehicles and the mil relation formula ($R=(W*1000)/m$). By applying the width of a vehicle appearing perpendicular to an observer as the lateral distance (W) and measuring the width in mils (m), the distance (in km) can be determined by solving the formula for range (R). This data, when compared with map data, will help an observer estimate distance.

EQUIPMENT	DIMENSIONS (IN METERS)	
	SIDE VIEW	FRONT VIEW
Tank (T-62) (T-72)	6.6 6.9	3.3 3.6
Reconnaissance vehicle (BRDM-2) (BTR-60)	5.7 7.2	2.4 2.8
Armored personnel carrier (BMP)	6.8	2.9
Air defense weapons (ZSU 23-4)	6.5	3.0

Table 3-1

3-3. LATERAL DISTANCE

In addition to estimating range accurately, the gunner needs a quick method of measuring lateral distance (right or left) from a reference point to a target.

1. **Weapon/Binocular mil markings.** Weapon sights, binoculars and some tripods are marked or are able to be adjusted by mils. 1 mil and is equivalent to 1 meter at 1,000 meters, or half a meter at 500 meters. By measuring the lateral distance in mils a quick determination of lateral distance in meters can be made or vice versa.

2. **Fingers.** A measurement of the apparent lateral distance in finger widths can be made to easily communicate lateral distance displacements to other team members in the vicinity. Measurements should be made at arms length.
3. **Angle.** The compass can be used to determine the approximate angle subtended between two points. This angle will be similar for other team members in the vicinity.

3-4. RANGE CARDS

A range card provides a record of firing data and aids defensive fire planning. Its use enhances fire control and rapid engagement of predetermined targets. It is also used in estimating ranges to other targets within the sector of fire.

1. **Weapon Symbol.** The weapon symbol defines the weapon system that is being employed.

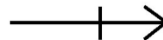


Figure 3-2

2. **Sector of Fire.** The sector of fire defines the left and right arcs of the weapons engagement area. The limits of the sector of fire are drawn as dashed lines to the maximum effective range of the weapon system.
3. **PDF/FPL.** Defines the principal direction of fire or final protective line. If the FPL is assigned it becomes either the left or right edge of the sector of fire. The weapon symbol is drawn along the FPL. The extent of grazing fire is determined. A shaded blade is sketched on the inside of the FPL to represent brakes in the extent of the grazing fire due to dead space. The ranges to the near and far edges of the dead space are recorded above the FPL, and the extent of the grazing fire is recorded along the FPL. The magnetic azimuth of the FPL is determined and recorded below the shaded blade representing the FPL. The elevation reading and other data are recorded in the data section.
4. **Predetermined Targets.** Predetermined targets are sketched at their appropriate places and numbered. Range, description, azimuth, and the number label of predetermined targets are recorded in the data fields.
5. **Dead Space.** Denotes areas of dead space both in the sector of fire and along the PDF/FPL. The outline of the dead space is sketched and filled with a diagonal hash.
6. **Magnetic North Arrow.** Reference for cardinal directions.

STANDARD RANGE CARD For use of this form see FM 7-8 The proponent agency is TRADOC.					
SQD <u>2</u> PLT <u>1</u> CO <u>C</u>	May be used for all types of direct fire weapons.				 MAGNETIC NORTH
DATA SECTION					
POSITION IDENTIFICATION				DATE <u>8 AUG 94</u>	
WEAPON <u>M60 #1</u>			EACH CIRCLE EQUALS <u>100 METERS</u>		
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1		+50/3	600		FPL
2	R350°	+50/45	600		LONE TREE
3	L300°	0/20	650		TRAIL JUNCTION
REMARKS:					

DA Form 5517-R, FEB 86

Figure 3-3

4. Application of Fire

4-1. TYPES OF TARGETS

1. **Point Targets.** Point targets require the use of a single aiming point. Examples of point targets are enemy soldiers, bunkers, weapons emplacements, and lightly armored vehicles. Fixed fire is delivered at point targets.
2. **Area Targets.** Area targets may have considerable width and depth and may require extensive traversing and searching fire. These include targets in which the exact location of the enemy is unknown. The following are varieties of area targets
 - a. *Linear Targets.* Linear targets have sufficient width to require successive aiming points. The beaten zone effectively covers the depth of the target area. Traversing fire is delivered at linear targets.



Figure 4-1

- b. *Deep Targets.* Deep targets require successive aiming points. Searching fire is delivered at deep targets.



Figure 4-2

- c. *Linear Targets with Depth.* Linear targets with depth have sufficient width requiring successive aiming points in which the beaten zone does not cover the depth of the target area. A combined change in direction and elevation is necessary to effectively cover the target with fire. Traversing and searching fire are delivered at linear targets with depth.

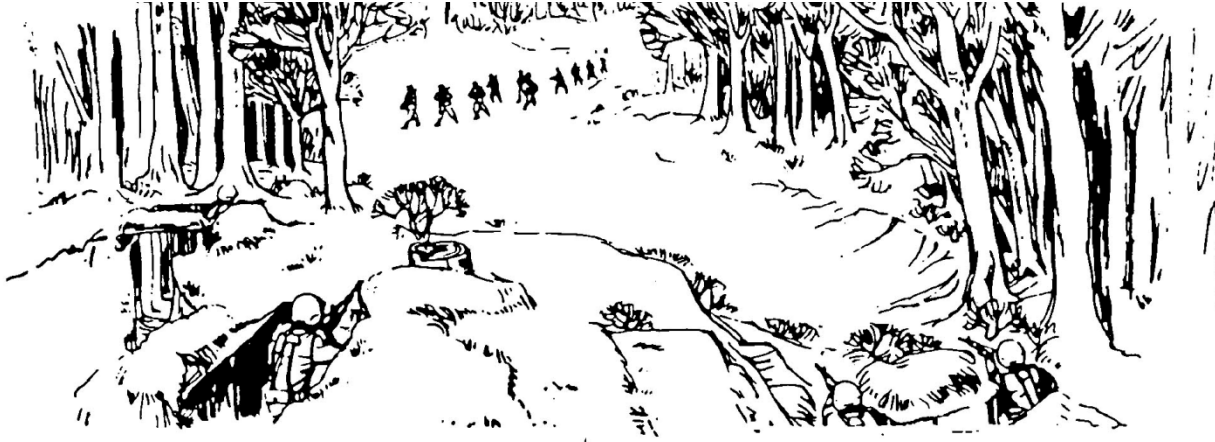


Figure 4-3

4-2. RATES OF FIRE

The size and nature of the target determine how the gunner applies his fire. He must manipulate the machine gun to move the beaten zone throughout the target area. The rate of fire must be controlled to adequately cover the target but not waste ammunition or destroy the barrel.

1. **Normal (Sustained) Rate of Fire.** Sustained fire for the M249 is 85 rounds per minute in bursts of 3 to 5 rounds; the M240 is 100 rounds per minute in bursts of 6 to 9 rounds. The gunner pauses 4 to 5 seconds between bursts.
2. **Rapid Fire.** Rapid fire for the M249, and M240 gunner is 200 rounds per minute in bursts of (6 to 8 M249) 10 to 12 rounds. The gunner pauses 2 to 3 seconds between bursts. This procedure provides for an exceptionally high volume of fire, but for only a short period.
3. **Cyclic Fire.** Cyclic fire uses the most ammunition that can be used in 1 minute. The cyclic rate of fire with the machine gun is achieved when the trigger is held to the rear and ammunition is fed into the weapon uninterrupted for one minute. Normal cyclic rate of fire for the M249 is 850 rounds and for the M240 it is 650 to 950 rounds. This procedure provides the highest volume of fire that the machine gun can fire, but is highly ammunition intensive, and should be fired in combat under emergency conditions only.

4-3. TARGET ENGAGEMENT

The method of target engagement is dependent on the type of target presented, and the number of weapons engaging.

4-3-1. SINGLE GUN

1. **Point Target.** When engaging a point target, the gunner uses fixed fire. If the target moves after the initial burst, the gunner adjusts fire onto the target by following its movement.
2. **Area Fire.** When engaging an area target, the gunner fires in the center of mass, then traverses and searches to either flank. Upon reaching the flank, the gunner reverses direction and traverses and searches in the opposite direction.

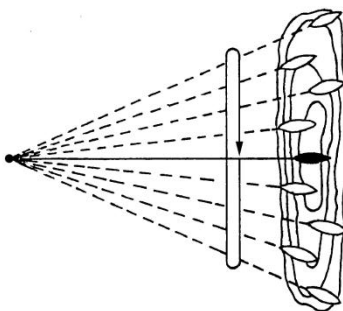


Figure 4-4

3. **Linear Target.** When engaging a linear target, the gunner traverses the machine gun to distribute fire evenly onto the target. The gunner must cover the entire width of a linear target. The initial point of aim is on the midpoint. The gunner then manipulates to cover the rest of the target. If a linear target is hard to identify, the gunner may engage the target by using a reference point. When this method is used, the assistant gunner or a leader determines the center of mass of the target and announces the number of meters from the reference point that will cause the gunner to aim on the center of mass. The reference point may be within or adjacent to the target. However, the reference point should be on line with the target for the best effect.
4. **Deep Target.** When engaging a deep target, the gunner must use searching fire. If the range is announced, the gunner initially aims on the midpoint of a deep target unless another portion of the target is more critical or presents a greater threat. The gunner then searches down to one aiming point in front of the near end and back up to one aiming point beyond the far end. If a deep target is hard to identify, use the reference points to designate the center of mass.
5. **Linear Target With Depth.** When engaging a linear target with depth, the gunner uses traversing and searching fire. He begins engagement at the midpoint of the target unless another portion of the target is more critical or presents a greater

threat. He traverses and searches to the near flank, then back to the far flank. When engaging hard-to-identify linear targets with depth, he designates the flanks and midpoint with rifle fire.

6. **Interdiction Fires.** If engaging a target that is moving towards cover or out of view the gunner may employ fires ahead of the target between the target and their destination to interdict their movement.

4-3-2. PAIR OF GUNNERS

1. **Area Fire.** When using a pair of machine guns to engage area targets, the gunner on the right fires on the right half, and the gunner on the left fires on the left half. The point of initial aim and adjustment for both gunners is on the midpoint. After adjusting fire on the center of mass, both gunners distribute fire by applying direction and elevation changes that give the most effective coverage of the target area. The right gunner traverses to the right, applies the necessary amount of search, and fires a burst. He traverses and searches up and down until the right flank of the area target has been reached. The left gunner traverses and searches to the left flank in the same way. Both gunners then reverse the direction of manipulation and return to the center of mass, firing a burst after each combined direction and elevation change.
2. **Linear Target.** When using a pair of machine guns to engage a linear target, the target is divided at midpoint with the gunner on the right of the target firing on the right half, and the gunner on the left of the target firing on the left half.
 - a. *Equal Engagement.* Both gunners aim on the midpoint initially. After adjusting on the midpoint, the gunner on the right traverses right, firing a burst after each change in direction until the rounds reach one aiming point beyond the right flank to ensure complete target coverage. The gunner on the left traverses to the left flank in the same way the gunner on the right did. Both gunners then reverse their directions and return to the midpoint.
 - b. *Unequal Engagement.* If one part of the target is a greater threat, fire can be concentrated on the greater threat by dividing the target unevenly. This special division of the target is done with fire commands. To preclude confusion, the gunners initially aim on the midpoint regardless of the special division to be made.
3. **Deep Targets.** When using a pair of machine guns to engage a deep target, the initial point of aim is also on the midpoint for both gunners. Normally, the gunner on the right has the near half and the gunner on the left has the far half. Since enfilade fire is being used, they do not adjust on the midpoint of the target, because the long beaten zone compensates for any range errors. After the initial burst, the gunner on the right searches down to one aiming point in front of the near end of the target, and the gunner on the left searches up to one aiming point beyond the far end. Both gunners then reverse their direction of search and return to the midpoint

4. **Linear Target With Depth.** When using a pair of machine guns to engage a linear target with depth, the initial point of aim and the extent of manipulation for both gunners is the same as those prescribed for linear targets.
5. **Talking Guns.** When employed in pairs machine guns should fire in alternating bursts to effect continuous fires on the target. Crews should also take care to stagger their reloads so at least one gun is always engaging the target.

5. FIRE CONTROL

5-1. FIRE COMMANDS

A fire command is given to deliver effective fire on a target quickly and without confusion. When a leader decides to engage a target that is not obvious to the weapon team, the leader must provide them with the information they need to effectively engage the target. There are six elements in the fire command for the machine gun: alert, direction, description, range, method of fire, and command to open fire. The gunners acknowledge each element of fire command as it is given.

1. **Alert.** This element prepares the gunners for further instructions and denotes which weapon system the fire command is intended for.
2. **Direction.** This element indicates the general direction to the target and may be given in one or a combination of the following methods.
 - a. *Orally.* The leader orally gives the direction to the target in relation to the position of the gunner (for example, FRONT, LEFT FRONT, RIGHT FRONT).
 - b. *Pointing.* The leader designates a small or obscure target by pointing with their finger or aiming with a weapon. When the leader points with his finger, a soldier standing behind him should be able to look over his shoulder and sight along his arm and index finger to locate the target. When aiming his weapon at a target, a soldier looking through the sights should be able to see the target.
 - c. *Tracer Ammunition.* Tracer ammunition is a quick and sure method of designating a target that is not clearly visible. When using this method, the leader should first give the general direction to direct the gunner's attention to the target area.
 - d. *Reference Points.* Another way to designate obscure targets is to use easy-to-recognize reference points. All leaders and gunners must know the features and the phrase being used to describe them. When using a reference point, the word "reference" precedes its description (for example, REFERENCE: RED-ROOFED HOUSE). This is done to avoid confusion. The general direction to the reference point should be given. Adjustments may be made off of known reference points (for example, REFERENCE: RED-ROOFED HOUSE, LEFT TO HAYSTACK, LEFT TO BARN).

3. **Description.** The target description creates a picture of the target in the minds of the gunners. To properly apply their fire, the soldiers must know the type of target they are to engage. The leader should describe it briefly. If the target is obvious, no description is necessary.
4. **Range.** The leader always announces the estimated range to the target. The range is given, so the gunner knows how far to look for the target and what range setting to put on the rear sight. Range is announced in meters; however, since the meter is the standard unit of range measurement, the word "meters" is not used. With machine gun's, the range is determined and announced to the nearest hundred or thousand (in other words, THREE HUNDRED, or ONE THOUSAND).
5. **Method of Fire.** This element includes manipulation and rate of fire. Manipulation prescribes the class of fire with respect to the weapon. It is announced as FIXED, TRAVERSE, SEARCH, or TRAVERSE AND SEARCH. Rate controls the volume of fire it is announced as SUSTAINED (NORMAL), RAPID, and CYCLIC. Normally, the gunner uses the sustained rate of fire.
6. **Command to Open Fire.** When fire is to be withheld so that surprise fire can be delivered on a target or to ensure that all gunners open fire at the same time, the leader may preface the command to commence firing with AT MY COMMAND or AT MY SIGNAL. When the gunners are ready to engage the target, they report READY to the leader. The leader then gives the command FIRE at the specific time desired.

Fire Command Examples:

MG FRONT RIGHT RUNNER 300

MACHINE GUN ONE FRONT LEFT ON MY TRACE ENEMY SQUAD 600 TRAVERSE

MG ONE MG TWO FRONT ENEMY PLATOON IN OPEN 500 TRAVERSE AND SEARCH RAPID RATE ON MY COMMAND

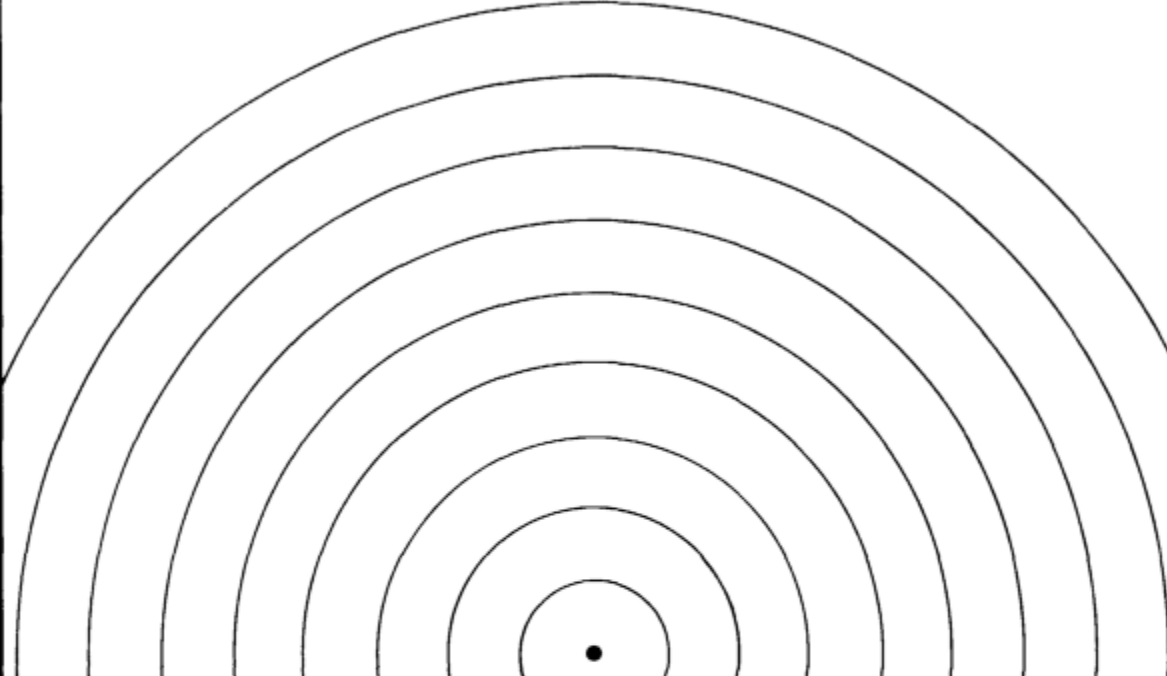
5-2. FIRE ADJUSTMENTS

A fire adjustment is a change in the fire command given by the assistant gunner or a leader; adjustments are used to bring the gunners fire onto the target. The primary duty of the assistant gunner while the gunner is engaging a target is to provide the gunner with precise, accurate and quick adjustments. Adjustments for direction and elevation with the machine gun are always given in meters. Direction adjustments are given first (for example, RIGHT ONE ZERO METERS or LEFT FIVE METERS). Adjustment for elevation is given next (for example, ADD FIVE METERS or DROP ONE FIVE METERS). Upon taking the target under effective fire the adjuster should inform the gunner (for example, ON TARGET).

NOTE: Adjustments to a new target should be given as a new fire command.

APPEDIX A

A-1. RANGE CARD

STANDARD RANGE CARD For use of this form see FM 7-8. The proponent agency is TRADOC					
SQD _____ PLT _____ CO _____	May be used for all types of direct fire weapons.				MAGNETIC NORTH
					
DATA SECTION					
POSITION IDENTIFICATION				DATE	
WEAPON				EACH CIRCLE EQUALS _____ METERS	
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					

DA FORM 5517-R, FEB 86

Figure A-1