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The Human Resources Research Office is a nongovernmental agency of The George Washington University. HumRRO's mission in work performed for the Department of the Army (DA Contract 44-188-ARO-2) is to conduct research in the fields of training, motivation, and leadership.

Research By-Product

**CRITICAL COMBAT PERFORMANCES,
KNOWLEDGES, AND SKILLS REQUIRED OF THE
INFANTRY RIFLE PLATOON LEADER**

Machin-gun 7.62-mm, M60

by
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1 October 1968

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Work Unit LEAD: Work Sub-Unit I

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**HumRRO Division No. 4
(Infantry)**

**The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
operating under contract with
THE DEPARTMENT OF THE ARMY**

FOREWORD

Work Unit LEAD has as its objective the improvement of officer training in the critical skills required for effective combat leadership in small infantry platoons, and is being conducted by the Human Resources Research Office at Fort Benning, Georgia, under the sponsorship of the U.S. Continental Army Command.

In Sub-Unit I, performances, knowledges, and skills required of the leader of an infantry rifle platoon are being identified and categorized according to 41 comprehensive subject areas. This document details the requirements in the area of the machinegun 7.62-mm, M60.

The LEAD research is being performed at HumRRO Division No. 4 (Infantry), Fort Benning, Georgia. The present Director of Research of the Division is Dr. T. O. Jacobs, who is also the Work Unit Leader. Dr. Carl J. Lange was the Director of Research when the research was begun.

Military support for the study was provided by the U.S. Army Infantry Human Research Unit, Fort Benning, Georgia. LTC Chester I. Christie, Jr. is the present Unit Chief.

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Meredith P. Crawford
Director
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MACHINEGUN 7.62-mm, M60

General Considerations

Introduction

The organic machineguns of the rifle platoon (currently M60's), constitute an important element of the firepower of the rifle platoon in both offensive and defensive operations.

The distinguishing characteristics of the machinegun in comparison with the rifle and automatic rifle are:

- a. The ability to maintain sustained fire without overheating coupled with the reduced frequency of reloading.
- b. Increased efficiency of longer range fires due to the tripod support, the fact that its unit of fire is the burst, and that the firer's fatigue is reduced by the relative ease of fire delivery.
- c. The potential for delivery of prearranged indirect fire inherent in the tripod mount, and to a lesser degree the bipod mount (when its support is supplemented by field expedients).
- d. The ability to deliver grazing fire over level or uniformly sloping terrain out to 600 meters due to the flatness of the trajectory.
- e. A limited ability to fire with safety over the heads of friendly troops (overhead fire) when the gun is suitably located and tripod mounted.

Machineguns are employed to exploit as many of their favorable characteristics as the situation permits, necessitating timely arrangements, particularly in defense, to insure the availability of the tripod and of ample ammunition.

In the offense the machinegun can engage distant targets with accurate fire and can support movement and maneuver with a heavy volume of direct fire. In the assault it can furnish supporting fires from forward positions, or alternatively, accompany the assault employing tracer adjusted assault fire.

In the defense the fire of the machineguns is of primary importance. Machineguns may be positioned either singly or in pairs depending upon how the platoon's frontage can best be covered. Sited in pairs, the guns'

primary and secondary sectors of fire preferably complement each other, the primary sector of each gun being the supplementary sector of the other. When such positions are achievable, control of fire is facilitated and coverage of the combined sectors of fire can be continued when one gun is out of action.

The primary requirement of a good defensive gun position is the ability to place fire, preferably grazing, across the front of the platoon's position. At times the importance of covering a favorable hostile approach into the position may warrant siting a machinegun to cover the approach with fire. However, the short and broken fields of fire characteristic of a good hostile approach normally warrants consideration of more economical coverage by rifle and automatic rifle fire.

It is seldom that a single gun position is equally suited for both good and limited visibility defensive fires. Unfortunately, the use of separate primary positions for good and limited visibility fires cannot be depended upon since hostile employment of screening smoke may dictate limited visibility defense under conditions precluding a change in gun positions. Consequently, the primary position of a machinegun must be one well-suited for limited visibility fires even when a night position is also used. Such a position normally affords good fields for direct fire for the close defensive and final protective fires during good visibility. A temporary position can often be used for the less important delivery of any long range defensive fires required. This procedure also prevents premature detection of the primary position provided a well-understood, covered route exists to the primary position.

The IRPL controls the fires of the machineguns of the platoon through his weapons squad leader. However, the diverse nature of the tasks of the weapons squad in both the offense and the defense, frequently complicates the direct control of the guns by the squad leader. As a consequence, the precombat training of gunners and gun crews is of great importance and their individual initiative and ability to operate independently under established SOP's must be developed. Cross-training of all members of the platoon on the machinegun is also essential to ensure continued operation of the guns despite combat casualties.

Proper maintenance of the machineguns is a continued responsibility of the IRPL. Guns and ammunition must be kept clean and operational under even the most adverse conditions of weather or crew fatigue. This involves the establishment of high maintenance standards during training, combined with close supervision of such maintenance during combat.*

*For details, see TM 9-1005-223-12, "Operator and Organizational Manual, 7.62-mm Machinegun M60."

The heavy loads carried by the weapons squad during dismounted operations necessitates constant consideration. Provision of adequate ammunition during offensive operations is a constant machinegun problem, at times necessitating the detailing of rifle squad personnel to carry ammunition for the crew-served weapons in addition to their own combat loads. Wherever ammunition resupply by air or other means is well assured, the amount carried with the guns can be reduced. Under excessively adverse conditions such as when the reduced strength of the platoon or heavy jungle terrain dictates reduced loads, a suitable mix of weapons and ammunition should be found so that the weapons retained have adequate ammunition. Ammunition should be carried in the protective bandoleers as long as possible. Premature transport of exposed ammunition belts draped around the carriers' shoulders inevitably results in excessive stoppages during firing.

The responsibility of the IRPL for the delivery of effective machinegun fire in support of the platoon's combat operations makes his supervision of the precombat machinegun training of the platoon and the combat employment of the guns a primary duty of major importance.*

Scope

This paper covers the critical combat performances, knowledges, and skills required of the IRPL when using and supervising the use of the M60 machineguns of the platoon during the precombat preparation of his platoon for combat and in the combat employment of the machineguns in offensive and defensive combat under good and limited visibility conditions. It is assumed that if the IRPL masters the knowledges, skills, and performances required of his subordinates, he can instruct them in these areas and supervise their activities to ensure acceptable performance.

Closely related material will be found in the papers dealing with Squad Formations, Battle Drill, and Elementary Fire and Maneuver; Mission, Organization, and General Operation of the Rifle Platoon; Offensive Operations; Defensive Operations; Retrograde Operations; Tactical Movement; Mounted and Dismounted Platoon Combat Formations; Use of Indirect Supporting Fires; Cover, Concealment and Camouflage; and Emplacements, Shelters, Obstacles, and Fields of Fire.

Materiel

Machinegun M60 with bipod and spare barrel in case.

Machinegun M122 tripod.

Machinegun vehicular pedestal mount M4 with M142 gun mount for vehicular use.

*For details of technical training, see FM 23-67, "Machinegun 7.62-mm M60."

7.62-mm ammunition in bandoleers.

Machinegun record book.

Compass and binoculars.

Flashlight.

Fire control equipment.

Cleaning equipment including cleaning rod.

Vehicles on which weapon is mounted, especially 1/4-ton truck M151.

Battlefield Cues

Orders or instructions from superiors.

Study of maps, aerial photographs and route sketches.

Personal reconnaissance by IRPL.

Reports from patrols and security elements.

Known or suspected targets for direct fire.

Known or suspected targets for prearranged fires under limited visibility conditions.

Preparation for employment in assault.

Stoppages requiring teardown of either of the platoon's machineguns.

Situations requiring adjustment of fire based on tracer or bullet strike during direct fires.

Accidental or unauthorized fire of a platoon machinegun.

Incidents requiring command supervision such as failures to engage, unduly long bursts, failure to cease fire, etc.

Unsafe acts or conditions observed during firing.

Threat of capture of the M60 and accessories.

Performances, Knowledges, and Skills

1. THE IRPL WILL ENSURE THAT HIS PLATOON IS PREPARED TO EFFECTIVELY MAINTAIN AND HANDLE THE M60 MACHINEGUN IN COMBAT UNDER ALL CONDITIONS OF VISIBILITY AND TERRAIN.

He will : ensure that all members of the platoon are qualified in the general disassembly and assembly of the eight major groups and/or subassemblies of the M60 machinegun and in checking for correct assembly under field conditions including limited visibility.* 1

: ensure that all members of the weapons squad and additional selected platoon personnel are qualified in the detailed disassembly and assembly of the operating group, trigger housing group, barrel group, and receiver group, and that all personnel are fully indoctrinated that the stock and buffer groups must not be disassembled.* 2

He must : know that disassembly and assembly of the gas system and adjustment of the range plate must be kept to the necessary minimum to avoid undue wear of these parts. 3

: know that continued disassembly and assembly of a machinegun results in wear of the working parts, necessitating that training involved must be carefully conducted without use of undue force. 4

He will : ensure that all members of the platoon possess a practical working knowledge of the operation of the M60 machinegun* to include proper procedure for: 5

- a. loading.
- b. unloading.
- c. clearing gun after unloading to include check that:
 - (1) Cover, feed tray, receiver, and chamber are clear of ammunition or other objects.
 - (2) After safety is placed on "fire" position the trigger is pulled and safety then replaced on "safe."

*For details see Chapter 2, FM 23-67, "Machinegun 7.62-mm, M60."

(3) During mechanical training the gun is clear with bolt forward, safety on the "safe" position and cover raised.

(4) During live firing during training, in addition to the above, a cleaning rod is run through bore until the end is visible in the receiver.

He will : ensure that all members of the platoon have a practical working knowledge of the functioning of the M60 machinegun based upon the eight steps of the functioning cycle.* 6

: ensure that all members of the platoon possess a practical working knowledge of the functioning of the bipod mount to include adjustments of the bipod legs; the bipod, being an integral part of the barrel group, must not be removed at the unit level. 7

He must : ensure that all members of the platoon have a practical working knowledge of the operation and functioning of the M122 tripod assembly, to include: 8

- a. Mounting and dismounting the M60 machinegun under field conditions involving proper use of ground and cover.
- b. Operation of the pintle and platform group.
- c. Operation of the traversing and elevating mechanism under field conditions under both good and limited visibility conditions.

: ensure that all members of the weapons squad and additional selected members of the platoon have a practical working knowledge of the operation of the standard vehicular M4 pedestal mount for the M151 1/4-ton truck to include the adaptability of the M142 cradle component of this mount for use with other vehicular mounts. 9

: ensure that all members of the platoon have a practical working knowledge of the use of the weapon sights in direct fire, to include: 10

* For details see Chapter 4, FM 23-67, "Machinegun 7.62-mm, M60."

- a. Sight changes from the low 300-meter setting to the 1,100-meter setting for maximum effective range, using both the slide release and the elevating knob mechanisms.
- b. Operation of the windage mechanism in one-mil clicks through an arc of five mils on either side of zero.

He will : ensure that all members of the platoon acquire a progressive knowledge of the nomenclature of the various parts of the gun, bipod, tripod, ammunition belt and bandoleers incidental to other instruction rather than through formal memorizing of names. 11

: ensure that all members of the platoon are proficient enough in the care, cleaning, and maintenance of the M60 machinegun and its mounts and accessories, that they can take over such maintenance if a combat emergency situation so requires. 12

: ensure that all members of the weapons squad and selected additional members of the platoon become progressively familiar with those characteristics of the gun, tripod, and ammunition which may affect the weapon's tactical employment, to include: 13

a. Physical characteristics:

- (1) Weight of gun - 23 lbs.
- (2) Weight of tripod mount, complete, 19 1/2 lbs.
- (3) Ammunition types - 7.62-mm caliber ball, tracer, armor piercing,* armor piercing incendiary,* blank, and dummy.
- (4) Ammunition basic load (on crew) - 600 to 900 rounds. (gunner, assistant gunner, and ammunition bearer--when present--300 rounds each).

b. Fire control characteristics:

- (1) Maximum effective range 1,100 meters

* Armor piercing and armor piercing incendiary ammunition for the M60 are not authorized for training purposes, Appendix II, FM 23-67, "Machinegun 7.62-mm, M60."

- | | |
|---|---------------------------------|
| (2) Maximum range | 3,725 meters |
| (3) Maximum grazing fire over level or uniformly sloping terrain | 600 meters |
| (4) Sustained rate fire (change barrel every 10 minutes) | 100 rounds per minute |
| (5) Rapid rate fire (change barrel every 2 minutes) | 200 rounds per minute |
| (6) Cyclic rate fire (if sustained change barrel every minute) | 550 rounds per minute |
| (7) Fixed head space adjustment facilitates rapid change of barrels | |
| (8) Tracer burn-out point | 900 meters (approx.) |
| (9) Normal sector of fire with tripod | 875 mils
(approximately 45°) |

c. Tripod mechanism factors:

- | | |
|--|------------|
| (1) Elevation, tripod controlled | + 200 mils |
| (2) Elevation, tripod free | + 445 mils |
| (3) Depression, tripod controlled | - 200 mils |
| (4) Depression, tripod free | - 445 mils |
| (5) Traverse (on traversing mechanism) | 100 mils |

: ensure that all members of the platoon are adequately trained in the techniques of delivery of direct fire under realistic combat conditions, to include delivery of long range, close defensive fires, final protective fires, and assault fire.*

14

: ensure that all members of the weapons squad and additional selected members of the platoon are adequately trained, under realistic combat conditions, in the delivery of limited visibility prearranged fires, to include:

15

*For details see Chapter 8, FM 23-67, "Machinegun 7.62-mm, M60."

- a. Fires upon the final protective line (FPL).
- b. Principal direction of fire lines (PDFD [day]), (PDFN [night]).
- c. Fires within a selected graze fire sector (SG).*

: ensure that all members of the platoon know that:

16

- a. A misfire is the failure of a chambered round to ignite when the firing mechanism is actuated and may be due to ammunition defect or faulty mechanism; while not itself dangerous, it cannot be distinguished from a hangfire and, therefore, must be handled as a hangfire.
- b. A hangfire is a delay in the ignition of the propellant charge after the firing pin has struck the primer.
- c. A cook-off is the igniting of a round due to the heat of a very hot barrel and not due to the actuating of the firing mechanism; it may be stopped by releasing the trigger resulting in the gun stopping fire in the open bolt position.
- d. A double feed occurs whenever a round is fed into a chambered spent case or live round and may cause damage to the gun and injury to personnel.

: ensure that all members of the platoon know that immediate action is the action taken within ten seconds, including five seconds waiting time, to reduce a stoppage without investigating the cause (five minutes waiting time is required when the barrel is hot enough to cause a "cook-off").

17

: ensure that all members of the platoon know that the firing of 200 rounds within a two-minute period can result in a cook-off if the barrel has not been changed during the firing.

18

: ensure that all members of the platoon are practiced in the application of immediate action and that all members of the weapons squad are proficient in its use in accordance with this sequence:

19

*For details see Chapter 8, FM 23-67, "Machinegun 7.62-mm, M60."

- a. If a stoppage occurs, wait five seconds, retract cocking handle to rear insuring that the operating rod remains to the rear.
- b. If the round is ejected, return cocking handle to forward position, relay on the target, and attempt to fire; if the gun does not fire, it must be cleared and gun and ammunition inspected to determine the cause of stoppage.
- c. If the round is not ejected, move the safety to S (Safe) position; remove ammunition and links, and inspect the receiver, chamber, and extractor.
- d. If a round is present in the chamber, close the cover, move the safety to F (Fire) position, and attempt to fire. If the gun fires and ejects, reload, relay on target and continue to fire; if the round does not fire and the barrel is hot enough to cause a cook-off (200 rounds fired within 2 minutes on the same barrel) wait five minutes* with the bolt in the forward position; remove the round, reload, relay on target, and attempt to fire.

He will : ensure that all members of the platoon know that a malfunction of the gun is failure to function satisfactorily and that two of the common malfunctions of the M60 machinegun are sluggish operation and runaway gun. 20

: ensure that all members of the platoon can correct sluggish operation of the M60 machinegun which is usually due to excess friction caused by dirt or carbon, lack of proper lubrication or by excessive loss of gas due to a loose or missing gas port plug; to correct, clean and lubricate the gun, inspecting thoroughly for missing, broken, or burred parts which must be replaced. 21

: ensure that all members of the platoon can apply corrective action for a runaway gun which continues to fire after the trigger is released because of a worn sear, worn sear notch, or because of recoil too short for the sear to engage the sear notch; correction involves consideration of these factors: 22

- a. In all cases keep the fire on target until feeding is stopped or ammunition expended.

* Disregard the five-minute wait if the weapon is not hot enough to cause cook-off.

- b. Where the belt is nearly empty or, in assault firing with bandoleer attached to gun, continue firing until ammunition is exhausted.
- c. Where it is desirable to stop the firing to conserve ammunition or for other reasons, the assistant gunner, or lacking an assistant gunner, the gunner, can stop the feeding by one of these procedures:
 - (1) Raising the cover.
 - (2) Twisting or breaking the belt.
 - (3) Grasping the cocking handle firmly and pulling it to the rear to stop the bolt from going forward.

He must : ensure that all members of the platoon know that a stoppage is an interruption in the functioning of the gun caused by faulty action of the gun and ammunition, and that stoppages are classified by their relationship to six cycles of functioning (failure to feed, chamber, fire, extract, eject, and cock). 23

: ensure that all members of the weapons squad and selected additional platoon members are qualified in the detection of the cause of stoppages and their prompt correction under varied field conditions.* 24

: ensure that all members of the weapons squad and selected additional platoon members are qualified in the maintenance of the M60 machinegun under all conditions of climate and terrain, to include:* 25

- a. Inspection of gun, mount, accessories, and ammunition.
- b. Cleaning, including cleaning after firing.
- c. Lubricating sparingly in accordance with the climatic conditions likely to be encountered, using semi-fluid lubricating oil (LSA) under normal conditions, wherever possible cleaning first with dry cleaning solvent (SD).
- d. Under CBR conditions employing the precautions prior to contamination and decontamination procedures as described in FM 21-40.

* For details see Chapter 5, FM 23-67, "Machinegun 7.62-mm, M60."

He will : ensure that all members of the platoon understand that capture or abandonment of the machinegun and mount in firing condition must never be permitted and that destruction under field conditions may be achieved by one or more of these means:

26

- a. Mechanical - disassemble as completely as the situation permits; using the barrel or some other suitable heavy object smash cover, feedtray, receiver group, operating group, buffer, stock, and gas cylinder.
- b. Burning - place a thermite grenade on the receiver over the bolt with the cover resting on the grenade and fire the grenade.
- c. Disposal - bury the disassembled parts in suitable holes or dump parts separately into streams, mud, snow, sumps, or latrines.
- d. Mount - smash the traversing and elevating mechanisms and the platform group; smash or bend the legs.

He must : ensure that all members of the weapons squad are qualified in all phases of crew training under field conditions, and that selected additional members of the platoon are practiced in crew training to the extent they can serve the weapon under combat conditions.*

27

: ensure that all members of the platoon know and are able to exploit these characteristics of machinegun M60 fire:

28

- a. Trajectory is the path of the bullet in flight and is almost flat to a range of 300 meters; beyond that range, the trajectory curves downward, the curve increasing with the range.
- b. Maximum ordinate is the highest point on the trajectory and occurs at approximately two-thirds of the gun-target distance with the maximum ordinate increasing with the range from approximately one meter at a range of 600 meters to six meters at a range of 1,000 meters.

*For details see Chapter 6, FM 23-67, "Machinegun 7.62-mm, M60."

- c. Cone of fire is the pattern formed by the slightly different trajectories of the rounds contained in a single burst of fire.
- d. Beaten zone is the ground area struck by the cone of fire; it is an important factor in the selection of machinegun firing positions since it is generally long and narrow in shape, though as the range increases beyond 500 meters, it becomes comparatively shorter and wider; falling ground lengthens the beaten zone, while rising ground shortens it. For additional details see Chapter 7, FM 23-67, "Machinegun 7.62-mm, M60."
- e. Center of impact is the center of the beaten zone, coinciding with the line of aim when the gun is properly zeroed.
- f. Danger space is the space between the gun and the target where the trajectory does not rise above the average height of a standing soldier (1.8 meters) and includes the beaten zone.
- g. Tactical significance: the long narrow beaten zone of a machinegun burst of fire at ranges up to 500 meters, combined with the continuous danger space of the cone of fire over level or uniformly sloping terrain up to 700 meters are of major tactical importance in the selection of machinegun positions since maximum effectiveness is achieved when the gun is sited to place the long axis of the beaten zone on the long axis of a personnel target over terrain where the danger space is continuous.

: ensure that all members of the platoon know these classes of machinegun fire to include their respective advantages and disadvantages in the selection of machinegun positions:

29

- a. Fire with respect to the ground is termed:
 - (1) Grazing when the center of the cone of fire does not rise over one meter; over level or uniformly sloping terrain a maximum of 600 meters of grazing fire can be obtained; the lethality of such grazing fire is such that it is always sought for in the selection of machinegun positions, particularly for a tactically significant final protective line (FPL) or for a sector of graze fire (SG).

- (2) **Plunging** when the danger space is practically confined to the beaten zone; such fire occurs when firing at long ranges, when firing from high to low ground, or when firing into abruptly rising ground; such fire is generally less desirable than grazing fire except in the offense when it may permit fire over the heads of friendly troops.

b. Fire with respect to the target is termed:

- (1) **Frontal** when the long axis of the beaten zone is at a right angle (perpendicular) to the target's front.
- (2) **Flanking** when delivered against the target's flank.
- (3) **Oblique** when the long axis of the beaten zone is at an angle other than a right angle to the target.
- (4) **Enfilade** when the long axis of the beaten zone coincides, or nearly coincides, with the long axis of the target; this desirable condition exists when flanking fire strikes a lineal target or when frontal fire hits a deep target, the latter a condition being seldom encountered in combat.

c. Fire with respect to the gun is termed:

- (1) **Fixed fire** when delivered against a target requiring only a single aiming point such as a point target or a target taken in enfilade where the beaten zone covers the entire target.
- (2) **Traversing fire** when distributed in width by successive changes in direction; tripod mounted changes being made in 4-to-6-mil increments on the traversing handwheel, a burst being fired after each direction change.
- (3) **Searching fire** when distributed in depth by successive changes in elevation, tripod mounted changes being made in 2-mil increments on the elevating handwheel when firing over level or uniformly sloping ground; fires delivered into rising ground require more than a 2-mil change between bursts while fire into falling ground necessitates only a single mil change; in all instances a burst is fired after each elevation change.

- (4) Traversing and searching fire when distributed in both width and depth by successive changes in direction and elevation between each burst fired; with a tripod mounted gun, changes in direction are the same as in traversing fire; however the amount of elevation change is based upon the angle of the target and the slope of the terrain.
 - (5) Swinging traverse fire when delivered against targets too wide to cover using the traversing mechanism and against targets moving so rapidly across the gunner's front that traversing fire cannot be used; to deliver, the gunner loosens the traversing slide lock lever permitting the traversing and elevating mechanism to slide freely on the traversing bar; directional changes are then made by pressing the rear of the gun; minor changes in elevation can be made using the elevating handwheel.
 - (6) Free gun when delivered from the tripod against targets moving so rapidly that rapid, major changes in laying are required which cannot be made using the mechanism, or when delivered from a vehicular mount when a series of aiming points cannot be used to better advantage; to deliver such fire the traversing slide lock lever is loosened and the traversing and elevating mechanism lifted from the traversing bar, permitting the gun to be moved freely in any direction.
- d. Fire with respect to the gun in a bipod or vehicular mount is termed:
- (1) Fixed fire when a burst or series of bursts is delivered at a single aiming point.
 - (2) Traversing, searching, or traversing and searching fire when a series of successive aiming points in the appropriate direction is selected, a burst is fired on each aiming point, and the location of the successive aiming points is modified, based upon the range and terrain, together with any obtainable observation of strike, to insure adequate target coverage, including an overlap between beaten zones.

He will : ensure that all members of the platoon are proficient in determining range by use of appropriate techniques such as:

30

- a. The 100-meter Unit of Measure.
- b. Halving technique for distances over 500 meters.
- c. Required adjustments for range estimates over various types of slope.
- d. Appearance of objects technique based upon use of frequently encountered objects of known dimension such as an individual in various combat postures, windows or doorways. Used out to 500 meters.
- e. Ranging fire at estimated ranges to verify the range or correct it; with the tripod mounted gun, once the burst is correctly on target, the correct range to the target is obtained by resetting the rear sight slide so the new line of aim is on the target.
- f. Where the situation permits the "crack and thump" technique of determining range, utilizes the time in seconds between the crack of the arriving bullet and the subsequent duller thump of the enemy weapon's firing; the count should be audible and as rapid as possible to reach a speed of five counts a second. The number reached is the range in hundreds of meters and can then be used as a range estimate to the enemy firer.

He must : ensure that all members of the platoon are proficient in lateral distance measurement by means of the finger measurement method to include:

31

- a. Proper fully extended position of the arm and hand.
- b. Sighting, using one eye, to align edge of one flank of object to be measured with corresponding finger as the basis for a finger measurement.
- c. Filling space between the two extremes of the measured object with adjacent fingers.
- d. Determining extent of measured object in terms of number of included fingers.*

* For details see Chapter 7, FM 23-67, "Machinegun 7.62-mm, M60."

: ensure that all members of the weapons squad and selected additional members of the platoon are proficient in lateral distance measurement in terms of one-mil clicks of the traversing handwheel when the gun is mounted on tripod.*

32

He will : ensure that all members of the weapons squad and selected additional members of the platoon are proficient in determining the safety limits for the delivery of overhead fire from tripod mounted machine-guns:

33

- a. Terrain and visibility must favor, in that overhead fire cannot be delivered over level or uniformly sloping terrain, nor in any case at a distance greater than 850 meters.
- b. The safety limit can be determined using binocular observation, normally by the squad leader, of the fire with relation to the feet of the advancing friendly troops.
- c. When the gun is accurately zeroed and the range to the target is known and is within 350 to 850 meters, the safety limit can be determined by the gunner's rule involving:
 - (1) The range to target is set on the rear sight.
 - (2) The gun is then laid to hit the target.
 - (3) The rear sight slide is next raised to 1,100 meters.
 - (4) Using the elevating handwheel, the muzzle of the gun is depressed 10 mils (clicks).
 - (5) Looking through the sights, the point where the line of aim strikes the ground is noted as an imaginary line through this point, parallel to the target, marks the safety limit at which fire must be lifted or suspended when the feet of the advancing troops reach it.
 - (6) The range to target is then reset on sight, gun relaid on target, and readied to fire.

* For details see Chapter 7, FM 23-67, "Machinegun 7.62-mm, M60."

: ensure that all members of the weapons squad and selected additional members of the platoon consider the following safety measures before delivering overhead fire:*

- a. The tripod mount is firmly emplaced.
- b. The depression stops are used to prevent the muzzle of the gun from being accidentally lowered below the safety limit, once this limit is determined.
- c. Overhead fire is not delivered through trees or any other obstruction likely to deflect the bullets.
- d. Commanders of friendly troops over whose heads fire is to be delivered are so informed.
- e. All gun crew members are aware of the ground location of the safety limit.
- f. The gun-target range is within the required limits of over 350 meters and less than 850 meters.
- g. Gun barrels used do not have excessive muzzle blast or other indications that they are badly worn.

He must : ensure that all members of the weapons squad and selected additional members of the platoon know that machinegun position defilade is not employed when direct laying is feasible, and that it exists when the gun and gun crew are hidden from hostile ground observation by the cover of a land mask such as a hill crest and that position defilade:

- a. May exist on the reverse side of the mask, or the forward slope of the next high ground in rear of the mask or in a ground fold or depression.
- b. Necessitates that the machinegun is not fired from position defilade unless tripod mounted due to the fire adjustment problem otherwise involved.
- c. Advantages are the cover and concealment afforded, the relative freedom of movement permitted the crew in the vicinity of the gun position, and in the supply and control problems involved, as well as in the increased difficulty of hostile detection of the position due to the reduction in the observable flash and smoke of firing.

* During training, machinegun fire must not cross at any point over the heads of friendly troops and the additional safety requirements of AR 385-63 and the local safety regulations must be observed.

- d. Disadvantages include the difficulty of engaging rapidly moving ground targets under conditions where adjustment of fire is made through an observer, coupled with the fact that targets close to the mask cannot be engaged.

He will : ensure that all members of the platoon know that there are three degrees of position defilade:

36

- a. Partial defilade exists when a mask provides the gun and crew some protection from enemy direct fire and the gunner can still engage the target using direct laying.
- b. Maximum position defilade exists when the gun is at the lowest point on the slope from which it can engage the target; the position thus affording good cover, while lacking flexibility in engaging new targets.
- c. Minimum position defilade exists when the gun is at the highest point on a slope at which position defilade can be obtained.

: ensure that all members of the weapons squad and selected additional members of the platoon are proficient in establishing mask clearance for position defilade fire to include:

37

- a. The mask being 300 meters or less from gun position, place the 300-meter sight setting on the rear sight, lay on the top of the mask, then add three mils (clicks) of elevation using the elevating handwheel.
- b. The mask being over 300 meters from the gun position, place the range setting to the mask on the rear sight then add three mils (clicks) of elevation.
- c. The resultant barrel elevation obtained under a and b constitutes the minimum mask clearance; where the slope of the mask is unchanged, the same clearance can be used for the entire sector of fire, otherwise, separate clearances may be required for each target.

: ensure that all members of the weapons squad and selected additional members of the platoon are proficient in laying the machinegun for direction from position defilade by an observer who can see both gun and target from a position in rear of the gun, on the gun-target line by:

38

- a. Directing the gunner to align the gun for direction (shifting the mount if necessary) until the gun is aligned upon the target with the range to hit the target upon the sight.
- b. The gunner then selects a landmark or other visible aiming point at a greater range and higher elevation than the target.
 - (1) If the aiming point is on the gun-target line, the gun is aligned for direction.
 - (2) If the aiming point is not on the gun-target line, the observer measures the offset angle using his binoculars or any other means available and announces the angle to the gunner who then lays off this angle on the traversing hand-wheel; for example, the target being 10 mils left of the aiming point, the gun, after laying on the aiming point, is traversed left 10 mils.

He must : ensure that all members of the weapons squad and additional selected members of the platoon are proficient in laying the machinegun for elevation from position defilade by an observer who can see both gun and target from a position in rear of the gun on the gun-target line, who measures the vertical angle from the aiming point down to the base of the target using the binoculars or other means available; the gunner being laid on the gun-target line for direction is then directed to depress the gun muzzle the number of mils measured; for example, "drop 10" (mils). 39

He will : ensure that all members of the weapons squad, all platoon NCO's and additional selected members of the platoon are proficient in controlling machinegun fire from the observer's position in position defilade based upon observation of tracer or bullet strike with relation to the target, announcing required adjustments in terms of clicks (mils) right or left and/or up and down; for example, "Right two, drop one." 40

He must : ensure that all members of the platoon are proficient in the preparation of both individual foxholes and open horseshoe gun emplacements and in the progressive improvement of such field fortifications to the extent the situation permits. 41

: ensure that all members of the platoon are proficient in the utilization of existing natural and of artificial obstacles protecting their positions. 42

: ensure that all members of the platoon are appropriately qualified in the various techniques of fire control, to include the issuance and execution of instructions, to include:*

43

- a. Appropriate fire commands given orally, by arm-and-hand signals, prearranged visual or sound signals, including pyrotechnic or whistle blasts, SOP's and the personal contacts most often used in combat where the leader moves to the individual concerned, using cover and concealment to avoid detection.
- b. The content of the fire command, utilizing as many of the six essential elements of a fire order (alert, direction, description, range, method of fire, command to open fire) as the situation and the conditions of combat permit; complete fire commands in the noise and confusion of combat are often impracticable, making abbreviated informal directions normally more appropriate.
- c. The use of tracer to designate the target location while effective is often precluded by the requirement for surprise; however, the pointing method of aiming the machinegun at each extremity of the target, the gun being properly laid, can often be used as a substitute, the leader moving in turn to each gun, permitting the gunner to verify each laying in turn before another portion of the target or a new target is pointed out.

: ensure that all members of the weapons squad and selected additional members of the platoon are qualified in the adjustment of fire by subsequent fire commands involving these procedures:

44

- a. The fire controller as well as the gunner constantly observes the target and endeavors to see the bullet strike or the tracer flight in relation to the target.
- b. The gunner may adjust fire on his own initiative; failing this, the leader promptly corrects the gunner by an oral or signalled change, the latter being passed to the gunner by his assistant.

*For additional details see Chapter 7, FM 23-67.

- c. Directional adjustments are given first, followed by elevation, using, for example, these terms for direction: "Right one zero," or "Left five;" for elevation, "Add five," or "Drop one five," the corrections being always in mils when the gun is on tripod; for bipod or vehicular mounts, corrections are given in the same format but the change desired is given in meters.
- d. Where the gunner is in doubt about any element of the fire command, he repeats the doubtful element to the leader with a rising inflection of voice if oral orders are being used; otherwise, by a prearranged signal for repeat in which case the entire order is repeated by the leader.
- e. The use of SOP's are of major value in fire control; in addition to the prescribed SOP's, such as the "Search-Fire-Check," the "Rate of Fire," and the "Mutual Support," additional SOP's can be agreed upon within units to aid in the fire control problem.
- f. The use of arm-and-hand signals is also of value when visibility permits their use, particularly the pointing indication of gun or person who is signaled preliminary to a signal, the signal given by the assistant gunner when the gun crew is ready to fire, and the signals to fire faster, slower, or to cease or suspend firing given preliminary to correction in direction or range; additional prearranged signals are desirable; as examples, "Change barrels," "New mission," or "Check safety."*

He will : ensure that all members of the weapons squad and selected additional members of the platoon are proficient in target engagement employing direct laying, to include these general practices:

45

- a. Where practicable, the leader should designate the mid-point and flanks or end of a target unless these are obvious to the gunner.
- b. To promote understanding of target coverage, the right hand gun position facing toward the target is called the right gun, the other gun, the left gun.

*For additional signals see FM 21-60, "Visual Signals."

- c. Targets having width when engaged by two guns are divided between guns, each gun covering that portion corresponding to the gun's position with relation to the other gun.
- d. Targets having depth when engaged by two guns are divided between guns and engaged as linear targets; when the target depth exceeds the length of the beaten zone and search is required, the right gun covers the near half and the left gun the far half of the target, the initial laying of each gun being the target center.
- e. If it becomes necessary, as when one gun is out of action, the remaining gun, under SOP, covers the entire target increasing its rate of fire to maintain the desired effect.

He must : ensure that all members of the weapons squad and selected additional members of the platoon are proficient in their distribution of fire upon combat-type targets, to include engaging:

46

- a. Point targets with fixed fire, fire being maintained upon the target if it moves to insure continued coverage.
- b. Linear targets, employing traversing fire in which:
 - (1) Two guns normally engage the mid-point initially, the right gun traversing right over its half of the target, the left gun traversing left over its portion.
 - (2) Fire can be concentrated on that portion of a target presenting a greater threat by dividing the target unevenly in subsequent fire commands after the initial fire opens.
 - (3) A single gun engages the entire target with the initial laying at the mid-point or that portion of the target presenting the greatest threat; traverse is then in either direction to a flank and then in reverse direction to the opposite end.

- (4) A reference point may be used to point out a vague target to the gunner(s), the leader determines the center mass of the target and measures and announces the number of mils or finger measurements required to permit each gunner to lay on the center point, while aiming at the reference; the reference selected should preferably be on line with target and may be within or adjacent to it.
- c. Deep targets with searching fire, the initial laying being at the mid-point with the announced range and:
- (1) Where the beaten zone covers the entire target, search is unnecessary; where search is required, the right gun searches down over the near half of the target and the left gun searches up, covering the far half; both guns then reverse direction and search back to the mid-point.
 - (2) Where only one gun is available and search is required, the initial laying is at the mid-point, unless another portion of the target is more critical; the search then covers the near portion of the target and then back to the far end of the target.
 - (3) A reference point may be used to designate the center mass of an indistinct deep target in the same manner as for a linear target, except that the extent of the target is given in meters in both directions from the center point; for example, "Short 100, over 100."

He will : ensure that all members of the weapons squad and selected additional members of the platoon are proficient in utilizing the proper rate of fire under combat conditions to achieve effective and economical coverage of target and as an aid in determining when a barrel change is required to avoid overheating; under these conditions:

47

- a. Sustained fire is 100 rounds per minute in six-to-nine-round bursts at four-to-five-second intervals; in combat, fire below the sustained rate may be employed after fire superiority has been attained and thereafter maintained at a rate which suppresses hostile fire with minimum ammunition expenditure.

- b. Rapid fire is 200 rounds per minute in six-to-nine-round bursts at two-to-three-second intervals; ground targets are initially engaged at the rapid or even a higher rate of fire to gain fire superiority.
- c. A barrel change is desirable after firing at the sustained rate for ten minutes, or after firing at the rapid rate or faster for one minute.
- d. The cyclic rate of fire is the maximum number of rounds which can be expended in one minute if continuous fire were practicable and for the M60 machinegun is 550 rounds per minute.
- e. Aerial targets are engaged at the maximum rate of fire attainable considering stoppages and the necessity to reload; solid tracer is used when available to facilitate adjustment of fire; from the tripod or vehicular mount, a free gun is used; otherwise, the gunner uses the hip firing position in all instances employing an estimated lead to achieve hits.

: ensure that all members of the weapons squad and selected additional members of the platoon are proficient in employing the M60 machinegun in assault fire under combat conditions where:

48

- a. Such employment is appropriate, as when fire superiority has been previously gained, or when no other use of the guns is preferable as, for example, in a night assault.
- b. Firers are able to adjust fire without use of the sights based upon observation of tracer fire and, where visibility permits, by observation of bullet strike.
- c. Firers are able to select and use the appropriate firing position employing the sling over the shoulder to support the weapon's weight and:
 - (1) The hip position in nine-round bursts when rate of movement is not important and heavy volume of fire desired.
 - (2) The shoulder position in six-round bursts when rate of movement is not important but accuracy of fire is required and at the longer ranges for assault fire.

- (3) The underarm position in short bursts each time left foot strikes the ground when rapid movement and heavy volume of fire are required, as in final closing with the enemy.

He must : ensure that all members of the weapons squad and selected additional members of the platoon are proficient during assault fire delivery in:

49

- a. Maintaining alignment by guiding upon a designated base man, using visual observation assisted by sensing the location of adjacent muzzle flashes.
- b. Rapid movement, without stopping, to the degree consistent with the need to fire accurately and maintain alignment.
- c. Reloading while moving, both when the gunner and the assistant gunner work as a team and when the gunner must reload unaided.
- d. Proper distribution of fire over the platoon's objective, giving priority to hostile automatic weapons while avoiding endangering friendly troops.
- e. Keeping the fire low, avoiding the tendency to fire high by deliberate bold depression of the muzzle when firing so that any required adjustment is upward, based upon observation of tracer or bullet strike.

: ensure that all members of the platoon understand the military technical terms employed in tactical operations, including these terms pertaining to machinegun tactical employment: displacement by crews, primary gun position, alternate gun position, supplementary gun position, long-range machinegun fires, close defensive machinegun fires, final protective line (FPL), sector of fire, sector of graze (SG), principal direction of fire day (PDFD), principal direction of fire night (PDFN), and area of graze (AG).*

50

He will : ensure that all members of the weapon squad and selected additional members of the platoon are proficient in limited visibility target detection and identification under varying conditions of natural and artificial illumination, and in operating under the modifications in fire control and target engagement necessitated by these conditions to include:

51

*For details see Chapter 9, FM 23-67, "Machinegun 7.62-mm, M60."

- a. Knowledge that ability to detect target types under limited visibility conditions is confined to:
 - (1) Enemy personnel in squad or platoon formation affording generally linear targets occasionally possessing some depth; at short ranges, personnel may be visible, but at longer ranges only indications such as the muzzle flash of automatic weapon fire may be visible, and in any case, complete determination of size and location of flanks may be questionable.
 - (2) Supporting automatic weapons and assaulting enemy to be engaged as point targets.
- b. Practice in overcoming the difficulties of fire control under conditions requiring increased initiative by gunners to include:
 - (1) Engagement of visible targets without command under prearranged SOP's, continuing fire only until neutralized.
 - (2) Engagement of other targets only when ordered.
 - (3) Identification of obscure targets through observation of tracer fire by adjacent weapons.
- c. Use of solid tracer to facilitate target designation and adjustment of fire.
- d. Adjustment based upon low impact adjusted upward to target to overcome tendency to fire high.
- e. Practice in the employment of the various aids to vision under limited visibility conditions, to include artificial illuminants, infrared and image intensification devices.

: ensure that all members of the weapons squad and selected additional members of the platoon are proficient in the use of the simplified fire distribution methods required by limited visibility conditions and based upon the premises that no attempt is made to divide the target between two machineguns and that the extent of the target is left to the gunner's judgment; therefore with:

52

- a. **Linear targets:** the gunner lays on what he considers the center of the target, traversing across what he estimates to be the entire target, beginning his traverse in either direction; with the gun on tripod, swinging traverse is employed with the beaten zone maintained on the base of the target; with the bipod mounted gun a series of selected aiming points is used to traverse rapidly back and forth across the target, adjusting fire by observation of tracers.
- b. **Linear targets possessing depth:** engage as a linear target except that an appropriate search is combined with each traverse change, the near portion of the target being engaged first.
- c. **Deep targets:** the gunner lays on initially what he considers to be the center of mass of the target, searching down to its estimated near end, then up to include the entire target; with the tripod mounted gun the elevating handwheel is used, where rapid lateral adjustments may be required, the traversing slide is loosened to permit a few mils of traverse to either side of the search by the application of shoulder pressure to the stock; with the bipod mounted gun, the search is made by use of successive aiming points.

He must : ensure that all members of the platoon understand the types of point targets which may be encountered under limited visibility conditions and that they are practiced in engaging them to include:

53

- a. **Enemy automatic weapons:** normally identified as to location by their muzzle flashes; sights are modified by use of field expedients to facilitate weapon alignment for direct fire in heavy volume, adjusted by observation of tracers.
- b. **Assaulting enemy personnel:** in the final stages of an enemy assault, when fire is suspended upon the FPL, either because of close attack of the gun crew or the lack of further targets on the FPL, visible personnel may be engaged using a free gun with the tripod mounted gun or by pointing fire.

He will : ensure that all members of the weapons squad and selected additional members of the platoon are practiced in these field expedient modifications of the M60 machinegun sights and the employment of the modified sight in the engagement of muzzle flash targets, to include:

54

- a. Field expedient modification. Mark or securely wrap any portion of the rear sight and the front sight post with luminous or white paint, or white tape or with pliable metal strips properly painted.
- b. Sight alignment in use. Align the front and rear sight markings just below the center of mass of the observed muzzle flash keeping aim low and adjusting upward using tracer.

He must : ensure that all members of the platoon understand the importance of preplanned fires in a defense under limited visibility conditions, and that, in view of the limited potential of direct fires under these conditions, especially when created by smoke or fog, a defender is essentially helpless unless he has utilized good visibility to prepare an effective limited visibility defense based largely upon pre-planned fires, both organic and supporting, integrated with the use of obstacles and mines.

55

: ensure that all members of the platoon are able to select and utilize target areas of tactical significance for machinegun fire under limited visibility conditions, especially those areas suitable for grazing fire where the flat trajectory and deep beaten zone of machinegun fire can be sited over level or uniformly sloping terrain to achieve:

56

- a. Maximum graze - to ascertain, set the rear sight at 600 meters, select a ground level target estimated to be 600 meters distant, lay, fire and adjust fire upon it; fire along this line will not rise more than one meter above the ground except where dips or depressions exist from the level or uniform slope.
- b. Maximum obtainable graze over irregular terrain - where, because of a major break in the slope of the terrain short of 600 meters it is apparent that the maximum graze cannot be obtained, place the estimated range to the break in question upon the rear sight and lay, fire, and adjust upon a ground level aiming point at the elevation break, adjust the rear sight, without disturbing the barrel elevation, upon the break to obtain its true range, and record the direction and elevation data for use; the resultant cone of fire will be below one meter at its maximum elevation and, if the range in question is under 400 meters, grazing fire will not rise above the height of a crawling man.

He will : ensure that all members of the weapons squad and selected additional members of the platoon are able to determine the actual extent of grazing fire along a final protective line by identifying areas of dead space where graze does not exist because of streams, ravines, terrain depressions, or even large shell craters, by both these methods, preferably using the first when the situation permits:

57

- a. Walking the FPL in question. After the gun is finally laid for direction and elevation, one member of the gun crew walks the line while the gunner looks through his sights; whenever the person's waist (or knees, if a crawling graze is to be obtained) falls below the point of aim, dead space exists; the extent and location of all dead space should be recorded on the range card and provision made to cover any important dead space by curved trajectory fire.
- b. Observation of the flight of tracer ammunition from behind or to the flank of the gun position will also permit judgmental determination of where dead space exists.

He must : ensure that all members of the weapons squad and selected additional members of the platoon know that wherever, within a sector of fire, an extent of level or uniformly sloping terrain exists, it can be covered by lethal grazing fire during good or limited visibility using a pre-laid barrel elevation combined with directional alignment based upon either visual observation or sound or other target indications and that:

58

- a. The lateral extent within which a fixed single barrel elevation will achieve grazing fire is termed a sector of graze and should be marked by stakes or other expedient means placed to indicate the lateral traverse of the barrel.
- b. The maximum graze attainable with a sector of graze fire is 600 meters, but usually is much less, forming an irregular range pattern depending upon the existing terrain and the desired graze elevation; thus, if a graze extending only to 200 to 300 meters is acceptable the amount of dead space existing can be greatly reduced while the maximum height of the cone of fire will include crawling men.

- c. The methods for obtaining the extent of graze fire existing within a graze sector of fire are the same as for a final protective line except that it may be necessary to select and test for dead space along several lines because of possible variations in the dead space.
- d. Where protective wire and mines exist forward of the platoon position, it will often be desirable to site the graze elevation within the graze sector of fire to sweep just through or in front of the protective wire thus increasing the difficulty of enemy penetration of the obstacle, accepting any resultant shortening of graze fire.

He will : ensure that all members of the weapons squad and selected additional members of the platoon are qualified in the techniques of laying the tripod mounted machine-gun to engage preselected limited visibility targets, to include:

59

- a. Direction and elevation readings taken and recorded during good visibility from the same tripod position are prerequisite and are measured on the traversing bar and traversing and elevating mechanisms in mils.
 - (1) Position the traversing mechanism by turning the traversing handwheel toward the gunner's body as far as it will go, then turn it away two complete revolutions (50 clicks), (check the traversing handwheel scale before and after the two revolutions to insure the same reading is aligned with the zero index); in limited visibility the traversing mechanism can be thus positioned by turning the traversing handwheel toward the gunner's body as far as it will go, and then turning it away two revolutions (50 clicks).
 - (2) Lay the gun for direction on a final protective line by locking the traversing slide on either the right or left extreme of the traversing bar, depending upon the side of the sector of fire on which the FPL is; pick up the rear legs of the tripod and shift the tripod until the gun muzzle points along the FPL.
 - (3) If no FPL has been assigned, lay the gun on the center of the primary sector, in which case, lock the left edge of the traversing slide on the "0" graduation on the traversing bar since the left edge of the traversing bar slide is always used as the index; pick up the rear legs of the tripod and shift the tripod until the gun muzzle is laid on the center of sector.

- (4) Once the gun is laid for direction, insure greater stability and prevent its accidental movement by emplacing the tripod firmly by digging in the shoes or placing filled sandbags on the tripod legs.
 - (5) Direction readings are obtained and recorded to all targets within the primary sector of fire, the direction of the final protective line not being recorded since the traversing slide is positioned either to the right or left of the traversing bar, loosen the traversing slide lock lever and align the gun upon the desired point, then tighten the lever and take the direction reading from the scale on the traversing bar, record the number of mils from zero and the direction indicated by the muzzle of the weapon; with a linear target, traverse to the opposite flank, using the traversing handwheel, counting the number of clicks (mils) to determine the target's width; the traversing mechanism must be repositioned before moving to another target.
 - (6) The elevation reading is taken before moving to each new target by laying the gun upon the base of the target, and taking the elevation reading as a combination reading of the upper elevating screw and plate and the elevating handwheel scale, in that order, recorded separated by a slash; for example, as a -50/3 since the first used scale reads in 50-mil increments from minus 200 mils to plus 200 mils; these readings are good only on the mechanism taken and cannot be transferred to another mechanism.
- b. Wherever the situation permits, prearranged firing data should be based upon adjusted fire upon the target during good visibility; when this is not possible, the "dry fire" method can be used, data being obtained (using the estimated range in good visibility) by laying upon the target base then taking and recording the direction and elevation readings; the resultant data is only as valid as the range estimation unless fire can be adjusted.

He must : ensure that all members of the weapons squad and selected additional members of the platoon are qualified in the use of the following techniques of laying the machinegun to engage limited visibility targets employing field expedient procedures, either in conjunction with the traversing and elevating mechanism method, or as a substitute when the tripod is lacking as in a secondary sector; these field expedient methods may be used alone or in combination with each other and when a gun crew is replaced by another, the field expedient setup must be fully explained to the new crew:

60

a. Aiming stake technique: usable when lights cannot be used at the gun position but sufficient visibility exists to observe the positioned aiming stakes:

- (1) Raise the rear sight slide to its uppermost position.
- (2) Place a strip of luminous tape or luminous paint at least halfway up on the front sight post and similarly mark an aiming stake with a strip of luminous tape or luminous paint.
- (3) With the gun laid on the base of the target for elevation and direction, the gunner directs the placing of the stake one or two meters forward of the muzzle aligning the two luminous markings with his head slightly to the right of his normal position so that the front sight post appears in the left corner of a rectangle formed by the rear sight slide and the rear sight leaf; elevation is marked by driving the stake until, with the two luminous markings aligned for direction, the top of both markings appear level; the gunner must maintain the same position and grip throughout the procedure and subsequently, while engaging the target in limited visibility, use the same head position and sight picture.

b. Base stake technique: usable in all conditions of visibility with a minimum of additional material, it is used to define sector of fire limits and for the laying for the FPL or other target which might exist along a primary or secondary sector limit; during good visibility:

- (1) Lay the gun to mark the sector of fire limits: Lay the gun for direction along one sector limit and drive a stake to firmly contact the outer edge of the folded bipod legs, taking up any play of the legs against the barrel; repeat the procedure for the opposite sector limit.
- (2) Lay the gun to engage an FPL: with the gun against the appropriate sector limit stake, drive the stake so that its top is just under the gas cylinder extension, allowing two or three mils depression between cylinder and stake to facilitate small search to cover terrain irregularities.

- (3) Lay the gun to engage other targets: use the procedure in (2) above, except that the stake is driven to contact the gas cylinder extension permitting no depression of the barrel; in a secondary sector, when the traversing and elevating mechanism is removed, use the same procedure as above except that an additional stake is driven just inside the sector limit stake, until it contacts the gas cylinder extension to mark the desired elevation.
- c. Notched stake or tree crotch technique: used when the machinegun is bipod mounted under all conditions of visibility to engage selected targets or to define sector limits; requires a minimum of additional equipment:
- (1) With the gun laid to hit the desired target or to mark a sector limit, the weapon stock is placed in the rests of firmly emplaced notched stakes or tree crotches.
 - (2) Shallow trenches or grooves are dug to permit rotation of the bipod feet if more than a single target is to be engaged.
 - (3) The laying for direction and elevation is checked and adjusted as required, wherever possible adjusting by fire upon targets.
 - (4) Care is required to use the same firing position and weapon hold while firing.
- d. Horizontal log or board technique: used with the bipod or tripod to mark sector limits and provide for fire delivery within a sector of graze fire in all conditions of visibility; lateral limits of the sector of fire can be marked by stakes positioned as previously described.
- (1) The weapon being bipod mounted, a sturdy log or board is firmly positioned beneath the stock of the weapon so that the stock can slide freely across the horizontal support; shallow trenches or grooves are dug for the bipod feet to allow the feet to move freely as a pivot point; the bipod legs are then carefully adjusted to achieve the desired graze elevation.

- (2) Sector limits or the direction of specific targets within the sector are marked by notching the horizontal board or log or by placing peg type stops in it.
- (3) The same bipod firing position and grip used in prearranging the fire must be used in all firing.
- (4) When the weapon is tripod mounted, the horizontal log or board is positioned beneath the barrel so that the barrel, when resting on the support, will be correctly laid to achieve the desired graze fire.

He will : ensure that all members of the weapons squad and selected additional members of the platoon are qualified to prepare and use a machinegun range card, both for prearranged fire delivery and as an aid in direct fire, to include:

61

- a. Knowledge that a range card is a record of firing data necessary to engage preselected target areas within a given sector of fire during periods of limited visibility, that it also serves as an aid and reference in the engagement of direct fire targets, and if properly prepared assists in the preparation of the platoon fire plan.
- b. Knowledge that range card preparation is a responsibility of the gunner assisted by the squad leader and crew members, and is prepared in duplicate, one copy being kept at the gun position, the other copy sent to the platoon leader; to be of value to the platoon leader, the gun position should be located by direction and distance or by rectangular coordinates from a ground landmark which also appears on the map in use by the platoon.
- c. Knowledge that a range card consists of two parts, a sketch (not necessarily to scale) of the sector of fire containing rough drawings of targets, and a six column data section containing this necessary firing data to permit limited visibility engagement of the targets in question in this order from left to right:
 - (1) Target No. (for identification).
 - (2) Direction.
 - (3) Elevation.

- (4) Range.
- (5) Description.
- (6) Remarks.

He must : ensure that all members of the weapons squad and selected additional members of the platoon are qualified to select and lay out target areas within a given sector of fire under good visibility conditions preparatory to obtaining and recording prearranged firing data thereto in accordance with these procedures:

62

- a. The sector of fire is studied in good visibility to select limited visibility target areas and assign priorities; the final protective line is then selected, if not already assigned, and provided that a tactically significant FPL exists; if selected, it normally becomes one side of the primary sector of fire.
- b. The principal direction of fire day and the principal direction of fire night are then selected, in that order, and the flanks of each of these areas marked for identification.
- c. A sector of graze fire, if one exists, is then marked out to indicate its respective flanks.
- d. Other tactically significant target areas within the primary sector of fire are then selected.
- e. Target areas are then numbered to facilitate identification and subsequent inclusion on the range card so that:
 - (1) The final protective line (FPL), if assigned, becomes target number 1.
 - (2) The principal direction of fire day and principal direction of fire night become targets number 2 and 3, respectively, except in the absence of a FPL they are numbered as No. 1 and No. 2 and in any case, referred to as "PDFD" and "PDFN" on the range card.
 - (3) The remaining targets within the primary sector of fire are then numbered in accordance with their respective tactical priority.

- (4) Targets in the secondary sector of fire are next selected and marked for identification in the sketch portion of the range card.

He will : ensure that all members of the weapons squad and selected additional members of the platoon are qualified to prepare machinegun range cards for primary and supplementary gun positions involving these procedures:*

63

- a. Divide the range card into an upper and a lower half, the upper half for the sketch section, the lower for the data section of the card.
- b. In the sketch section draw in the basic symbol for the machinegun in the lower center part, oriented in its position for the center of the primary sector of fire.
- c. If a FPL is assigned, extend the machinegun symbol to include the FPL and the grazing fire that can be obtained.
- d. Sketch in the limits of the primary sector of fire (provided the sector does not contain a FPL); data is not recorded in the data section for sector limits along which no target exists.
- e. Sketch in the limit of the secondary sector of fire which does not border the primary sector.
- f. Sketch in and label appropriately, friendly positions located in the vicinity of the sector of fire along the forward edge of the battle area (FEBA) which require consideration in the delivery of fire.
- g. With the card oriented in the direction of the FPL or the center of the primary sector of fire, using a compass, draw a magnetic north arrow from the base of the machinegun symbol pointing in the direction of the magnetic north.
- h. Select a prominent terrain feature recognizable on the ground from the gun position, and also shown upon the map in use; measure both the distance in meters and the magnetic azimuth from the selected feature to the gun position; draw in this line in an appropriate direction on the sketch, placing arrow points on the line to indicate the direction in which the azimuth was measured; where no prominent landmark is available, indicate the location of the gun position by means of an 8-digit coordinate.

* For further details see Chapter 8, FM 23-67, "Machinegun 7.62-mm, M60."

- 1. Record the number of the gun position, unit designation, to include company and the date in an appropriate corner of the sketch portion (show no designation above company for security reasons).**

- j. With the gun mounted on tripod, and under good visibility, take and record data to each of the target areas marked in accordance with this priority:**
 - (1) With the traversing and elevating mechanism zeroed, the machinegun is laid on the FPL, if assigned, then the extent of grazing fire along this line is determined by one of the previously described procedures; on the sketch portion of the card extend the machinegun symbol in the direction of the FPL to include the grazing fire obtainable, marking the end of the line with an arrowhead; the extent of actual graze is then drawn in by thickening or shading the line to indicate the precise locations where graze exists, leaving the dead space areas indicated by the unthickened line; at right angles to the line and at the points in question, write in the ranges in meters to the near and far ends of any dead space, and to the far end of the achievable graze fire; determine and record the magnetic azimuth of the FPL, writing in on the sketch parallel to the FPL line and on the opposite side from the ranges; record all this data in the appropriate columns of the data sheet numbered as number 1.**

 - (2) Using the gun to obtain data, draw in on the sketch the PDFD and the PDFN and record direction and elevation data to engage them on the data sheet; appropriately identify by target number and description as PDFD or PDFN in column 5 of the data sheet; and identify on the sketch by appropriate target number, each enclosed in a circle.**

 - (3) If a sector of graze fire (SG) exists, determine the elevation data required to achieve the desired graze and the direction data in terms of mils right or left of the zero direction reading on the FPL or PDFD, as the case may be; record this data in the proper columns of the data sheet and number the SG target in accordance with its priority, normally right after the principal directions of fire.**

- (4) Using the gun sights, measure and obtain data to all other targets in the primary sector of fire; sketch in each in its appropriate position in the sketch with its target number encircled in the target location but without pictorial representation in some cases where no appropriate symbol is feasible; fill in the necessary data on the data sheet, including a brief description such as "hedgerow" or "house" in the description column.
- (5) Preselected targets in the secondary sector of fire are drawn in on the sketch but ranges to these targets are not recorded below the symbol; data to engage such targets are recorded in the data section.
- (6) When field expedient methods are used to engage targets, replicas of the field expedients are sketched above the drawing of the target and the word "stake," with its number, is written in the data section under "Remarks."

2. THE IRPL WILL CONTROL AND SUPERVISE THE FIRE OF THE PLATOON'S MACHINEGUNS DURING OFFENSIVE COMBAT UNDER ALL CONDITIONS OF VISIBILITY, WEATHER, AND TERRAIN.

He will : ensure during tactical movement that the machinegun crews are protected to the extent possible by the platoon formation, coupled with the constant readiness for action of the gun crews utilizing both prearranged SOP's and fragmentary orders including:

64

- a. Whenever the situation permits, an advance of the guns by bounds from position to position, preferably maintaining one gun in position protecting the movement of the other.
- b. Where the gun crews move on foot within the platoon formation, that at least one rifle squad precedes the gun's movement, and in close country that each gunner is prepared for immediate action, using a gun sling to facilitate immediate fire employing appropriate underarm or hip firing position.
- c. During foot movement, maintenance of 360° close-in surveillance under a unit SOP which provides for individual sectors of responsibility.

- d. At halts, except brief march halts or where otherwise ordered, that both guns are emplaced to protect the platoon position; and that at least one man is alert at each gun position maintaining the surveillance required for the specific position.
- e. When practical during mounted movement, guns should be mounted; when not, guns and crews should be situated to facilitate rapid unloading.
- f. During foot movement in extremely difficult terrain, maintain an effective gun-ammunition mix, reducing the number and type of crew-served weapons carried to achieve the best possible combination of weapons and ammunition for the specific situation confronted; insure that weapons not taken forward are left in a carefully selected area, either hidden or safeguarded and retrieved as soon as the situation permits.

He must : during all tactical movement observe constantly for favorable gun positions, assisted by the weapons squad leader and the machinegunners; where the terrain permits, selecting a new tentative position as each previous tentative position is reached without hostile contact. 65

: during all reconnaissance for positions, the situation permitting, include the weapons squad leader in the platoon reconnaissance party, giving due consideration to his recommendations for firing missions and gun positions; when the weapons squad leader is not included in the reconnaissance, afford a high priority to the selection of missions and positions for the machineguns in the personal reconnaissance. 66

: during company and larger unit operations, keep the weapons squad leader informed of the locations and missions of other company and supporting crew-served weapons, including mortar and artillery fire missions designed for platoon support. 67

: during the occupation of firing positions to support offensive operations, keep gun crews and guns under cover until their firing positions have been selected, considering always whether maintenance of secrecy requires last minute occupation of gun positions exposed to hostile observation. 68

He will : in selecting machinegun positions and firing missions to support offensive operations during good visibility, consider, in turn: 69

- a. The targets which must be engaged to best support the movement or maneuver of the rifle squads.
- b. Any potential firing positions with adequate observation of targets and fields of fire permitting:
 - (1) Fire support employing flanking fire ahead of the rifle squads' advance to the objective, with the consequent ability to support the attack during the critical assault.
 - (2) Sufficient elevation to safely deliver tripod mounted overhead fire covering the rifle squads' movement for an acceptable distance toward the objective; (the limitations of the M122 mount for overhead fire necessitate caution in employing overhead fire and require optimum firing position and conditions).
- c. Where acceptable direct fire positions to support the initial attack are lacking, consider:
 - (1) Positions forward of the L/D which could be occupied early as the advance progresses and thereafter afford opportunity to support the attack for an acceptable distance.
 - (2) Position defilade locations permitting fire support, utilizing nearby observation to control the fire warrant consideration, particularly where heavy hostile fire, which could prematurely neutralize the gun's fire, is anticipated.
- d. Lacking suitable positions to support the attack, consider these alternatives:
 - (1) Inclusion of the machineguns in the assaulting force, either to deliver assault fire, or to occupy close-up positions from which to cover the final assault.
 - (2) When other supporting fires are ample and strong hostile counterattack of the objective probable, the machineguns may be held well forward under cover, prepared to move forward rapidly to cover the consolidation on the objective with flanking fire.

He must : in selecting primary positions for machinegun support of offensive operations, consider these additional factors:

70

- a. The fires of other supporting weapons as they influence the location of the machineguns in the achievement of the most efficient overall fire support.
- b. Avoidance of a gun position which, though excellent, is isolated and consequently conspicuous and likely to draw heavy hostile fire; a less desirable, nearby position just outside the fires upon the conspicuous location may well survive to deliver adequate supporting fire.
- c. Selection of at least one alternate position from which the targets assigned each machinegun can be engaged; the position should be outside the area likely to be included in hostile fires upon the primary position.
- d. The difficulties of occupying and supplying a forward slope position under hostile observation must be weighed against the relative effectiveness of a less desirable position.
- e. Where the tasks assigned the machineguns and the antitank weapons of the weapons squad are separated by a distance precluding direct control of both elements by the squad leader, decision governing the control of the weapons is essential; in general, the squad leader remains with the weapons having the more important or the more difficult role; the platoon sergeant devoting increased attention to the other weapon crews.
- f. Once position areas are selected, provision must be made for:
 - (1) Routes to the gun positions and, where forward displacement is contemplated, for routes forward to new position areas, including, when visibility permits, to the platoon objective.
 - (2) Ammunition supply, including how to place sufficient ammunition on the initial position, and, where forward displacement is planned, how to supply the forward positions; ammunition supply is a critical problem for machineguns in dismounted offensive operations, so the use of riflemen to carry machinegun ammunition to designated locations may be required or aerial or armored vehicle resupply planned.

He will : use daylight to the maximum for reconnaissance and planning for offensive operations, coupled with the use of timely warning or fragmentary orders to the machinegun crews to facilitate their preparations concurrently with leader reconnaissance and planning.

71

: issue the platoon order, whenever possible, at a vantage point overlooking the area of platoon operations; otherwise, use an improvised terrain model or a large sketch to better orient the recipients; in every case:

72

- a. Orient the platoon area with reference to the north.
- b. Indicate likely or dangerous hostile position areas.
- c. Point out the location of the machinegun positions relative to the other elements of the platoon and adjacent units.
- d. Point out the primary and alternate routes into the positions.
- e. Point out the location of aid station or point for collection of casualties.

: ensure that orders to the machinegun elements for an offensive operation include, in addition to the normal information in the operation order, these technical elements as a minimum:

73

- a. Gun position areas and routes thereto and any future displacements envisaged.
- b. Fire missions, including any details considered essential about type of fire, ammunition expenditures, type gun positions desired as to use of tripod, improvement of position, etc., and instructions on opening and suspending fires.
- c. Command and control details, including any changes in SOP's, prearranged signals, command setup for weapons squad and CP location.
- d. Administrative details, especially ammunition supply.

: prior to operation, conduct a final check of machine-gun dispositions and readiness to support the attack noting especially that:

- a. Guns are properly emplaced and located to deliver fire on assigned targets; and, time permitting, that preparations have been made for prearranged fires in event of reduced visibility, including preparation of range cards.
- b. Gun positions have been improved to extent time and maintenance of secrecy permits, to include:
 - (1) Camouflage and concealment of positions.
 - (2) Wet sandbags or dampened ground in position to reduce muzzle blast.
 - (3) Individual cover for crews.
- c. Orders are understood by all involved, to include critical details as to local security, opening and suspending types of fire to be employed, distribution of fire on targets, check of troop safety, presence of essential equipment, and communication arrangements.
- d. Specific duties have been assigned to the platoon sergeant to best complement the duties which the IRPL intends to perform personally, considering particularly important details which, though separated from the overall operations of the platoon are critical to the operation of the machineguns, such as:
 - (1) Supervision of the operations of either the machineguns or the antitank weapons if separated to the extent that the weapons squad leader cannot effectively control both.
 - (2) Ammunition supply and resupply.
 - (3) Control of the fire support element including the machineguns when the IRPL accompanies the maneuver element and the fire support task is separated and/or complicated.

: ensure that all members of the platoon know that limited visibility offensive operations, other than night operations, are frequently undertaken to offset strong hostile firepower, to achieve surprise, or to overcome a strong defensive position preparatory to further offensive operations and, as a consequence, machineguns in such operations must be ready to maintain the fire support of the machineguns in the event of sudden reduced visibility caused by smoke, fog, or torrential rains.

75

: ensure that all members of the platoon know that machineguns cannot employ their firepower effectively in limited visibility except from firing positions occupied during good visibility during which data for prearranged fires have been taken in sufficient detail to permit laying the guns for both elevation and direction; lacking prearranged fire data for guns positioned in good visibility machineguns can be employed only:

76

- a. For short range direct fire out to limit of visibility when artificial illumination is lacking.
- b. For direct fire based on observation of solid tracer or a high ratio of tracer to ball ammunition under conditions of limited visibility or artificial illumination.
- c. For grazing fire across a position when any aiming aid such as a carefully guarded light can be positioned for use as an initial aiming point for the direction and elevation of the gun.
- d. For limited visibility offensive operations to go into positions to cover the consolidation with flanking fire at first light or with artificial aids to visibility during limited visibility.

: ensure that all members of the platoon know that artificial illuminants, infrared or light amplification sights are ineffective under limited visibility conditions created by screening smoke, fog, or torrential rain, and that screening smoke may be employed by either the offense or the defense to disarrange the opposition's operations, necessitating that wherever possible prearranged fire data is taken for all important fire missions in the offense.

77

He must : ensure that all members of the weapons squad know that during temporary early machinegun protection of the organization and consolidation of an objective, they must:

78

- a. Move rapidly to and occupy positions which furnish good fields of flanking, grazing fire protecting the consolidation and realize that such positions are:
 - (1) Usually located well forward and to the flanks of the platoon position where the guns can be sited across the platoon's front along a level or uniformly sloping portion of the forward or reverse slope occupied by the platoon.
 - (2) Occasionally located in a forward salient within the platoon position from which both guns can fire in opposite directions to cover the platoon's front; under this condition, supplementary positions from which each gun can reinforce or take over the fires of the other gun can sometimes be obtained.
 - (3) Exposed and can usually exist only temporarily until the defensive position is prepared, necessitating that reconnaissance for the final primary positions be conducted immediately after the objective is taken, and where possible, due to their importance, that these final positions be prepared while the forward positions are still occupied by personnel specially detailed for this task.
 - (4) Exposed and thus likely to incur severe casualties which will make the small machinegun crews inoperable, necessitating that the IRPL insure timely replacement of machinegun crew casualties to keep the machineguns operational as a platoon first priority.

He will : during movement in limited visibility offensive operations:

79

- a. Maintain the machinegun crews in squad column or column of file formation at not more than limit of visibility distance between individuals except when visibility is so restricted that touch contact extended by belt or rope expedients becomes essential.

- b. Extend visibility distance between individuals by use of luminous or white markings on rear of helmet or clothing.
- c. Wherever possible, precede movement of the gun crews by guides familiar with the positions to be occupied.
- d. Locate the machinegun crews in the platoon formation either:
 - (1) In a location which will facilitate deployment into line when they are to employ assault fire as part of the assault.
 - (2) In a protected, separated location which will facilitate occupation of gun positions when their mission is fire support from forward positions.

: where surprise is sought in night attack through machinegun prearranged fires supporting the attack, in the event the attack is discovered, ensure that:

80

- a. The guns are properly emplaced with all safety precautions such as barrel depression blocks to guard against low fire.
- b. Dependable communications or arrangements exist governing if and when the guns are to fire.
- c. Command control arrangements are the best achievable as to personnel involved and alternatives available.

: during all foot movement in offensive operations arrange to minimize loads upon crew-served weapons personnel by:

81

- a. Arranging for planned resupply at specified times and locations to include, in addition to routine resupply, desirable items too heavy to carry such as food and water, machinegun tripods and ammunition, heavy engineer tools and equipment for preparation of positions, Claymores and warning devices, concertina wire, flares, sandbags, medical equipment, etc.
- b. Coordinating such resupply with arrangements for medical evacuation.

- c. Including a provision for aerial pickup of heavy and surplus equipment prior to further movement.

He must : during an attack of any built-up area such as a village, town, city, or any group of buildings, utilize the platoon's machineguns in this manner:

82

- a. Initially position the guns to support with fire the initial approach of the rifle squads to seize a foothold on the edge of the built-up area which, once seized, denies the defenders their intended fields of fire covering the approaches.
- b. Once a platoon foothold is established, move the guns to positions well forward in the built-up area from which they can place fire upon areas resisting the rifle squads' movement; preferably located to also permit grazing fire down streets or other open areas where hostile movement might occur.
- c. As the advance of the rifle squads progresses through the areas, displace the machineguns, using covered routes, to new forward positions chosen in advance by reconnaissance.
- d. As the built-up area is cleared and its extremities organized for defense, the machineguns move to cover the consolidation and reorganization.

He will : during an attack of a fortified area, employ the machineguns against specially selected targets, where possible after rehearsal and detailed preparation for the attack, using the guns either:

83

- a. As part of the fire support element to neutralize with precision fires from carefully selected positions, the fire from selected enemy bunkers or other located enemy positions positioned to deliver fire on the planned maneuver; where possible, the machineguns so used should be positioned to permit close supporting fire until the objective is closed with, once the fire on the primary target is masked, the guns to shift fire to engage other targets located to fire upon the objective just taken.
- b. Or, where no more profitable employment exists, as part of the assault, to assist in neutralizing the enemy position by firepower.

He must : ensure that during river crossing operations, which are frequent in offensive operations, that the machine-guns of the platoon are employed in accordance with orders received or in the absence of orders to ensure:

84

- a. Where non-organic supporting fires are adequate, as is usual in a deliberate crossing, that the machine-guns are attached to specific rifle squads for the crossing and take position on the far side with these squads until new orders take effect.
- b. Where the crossing is a hasty one to achieve surprise and non-organic fire support is lacking, as in a detached platoon operation, that the machineguns occupy near-bank supporting positions covering the crossing, rejoining the platoon once the far bank is occupied.
- c. In any case, that precautions are taken to protect weapons and ammunition against immersion or other maintenance hazards to insure immediate readiness for far-bank action; to include that gun crews cross in separate crafts to minimize danger of loss of both guns.

3. THE IRPL WILL CONTROL AND SUPERVISE THE FIRE OF THE PLATOON'S MACHINE-GUNS DURING DEFENSIVE COMBAT UNDER ALL CONDITIONS OF VISIBILITY, WEATHER, AND TERRAIN.

He must : know that the M60 machinegun, particularly when tripod mounted, is of major importance in the defense since machinegun positions, as selected, usually exploit the favorable combat characteristics of the weapon to include its ability to:

85

- a. Produce a heavy volume of sustained fire for a prolonged period.
- b. Deliver grazing fire to 600 meters when the terrain is level or uniformly sloping.
- c. Effectively engage targets with direct fire out to 1,100 meters, visibility permitting.
- d. Deliver accurate, predetermined fires during limited visibility based upon predetermined direction and elevation data obtained during good visibility.
- e. Deliver overhead fire, particularly where friendly troops are dug in at accurately known locations.

: know that the favorable characteristics of the machinegun can be effectively exploited by guns located along the forward edge of the battle area (FEBA) in selected and improved positions prepared to deliver long-range fires, close defensive fires and final protective fire under both good and limited visibility conditions.

86

He will : ensure that all members of the platoon know that:

87

- a. The mission of the machineguns in the defense is to repel the enemy's assault by fire and close combat.**
- b. Selection of a machinegun's primary position is primarily dependent upon its planned principal mission(s).**
- c. Each machinegun is assigned a primary sector of fire which includes its principal mission which may, if the terrain permits, be a final protective line (FPL), or a principal direction of fire day (PDFD), and a principal direction of fire night (PDFN); where level or uniformly sloping terrain exists a sector of graze fire (SG) may also be included within the sector of fire; a secondary sector of fire is also usually assigned, and fires within this sector are prepared to the extent time and tactical situation permit.**
- d. Every effort should be exerted to insure the use in the defense of the tripod mount which facilitates both accurate long range direct fire and the vital machinegun ability to deliver selected prearranged limited visibility fires; though at times high grass, crops, or other vegetation may preclude direct fire from either tripod or bipod unless elevated positions exist in the vicinity.**
- e. The primary sector of the machinegun is normally prescribed to permit advantageous employment of the 875 mils of controlled traverse available on the M122 tripod mount, whenever possible by achieving grazing fire across the front of the platoon.**

f. The secondary sector of fire, often assigned a machinegun may be as wide as the terrain and situation permit; tactically significant targets within the secondary sector may be engaged when no critical targets are available within the gun's primary sector, employing, when appropriate, free traverse or first removing the gun from its tripod mount, using the bipod mount, or where limited visibility fires are required, field expedient methods described later.

: ensure that all members of the weapons squad are qualified, and all members of the platoon drilled in the selection of:

88

a. The best final protective line (FPL) available from a gun position which permits grazing fire which flanks the defensive position or enfilades a potential hostile approach to the position; over favorable terrain grazing fire against a standing man exists to 600 meters, but it is often preferable to site the gun to obtain the lower knee-high graze existing to 400 meters since a standing man target is rarely presented close to a defensive position.

b. The PDFD and PDFN lines are areas of tactical significance on which the machinegun is initially kept laid under the appropriate condition of visibility; targets appearing in this direction take priority over other targets within the sector of fire; these lines do not conflict with the FPL's priority since they are in the zone of the close defensive fires engaged prior to firing on the FPL during the progressive advance of a hostile attack.

He must : know that the machineguns may be employed singly or in pairs, depending upon factors such as the platoon frontage and the terrain existing in the platoon area; the advantage of employment in pairs being the relative ease of control and resupply; guns so sited usually are assigned different primary and secondary sectors, where feasible the primary sector of one gun being the secondary sector of the other.

89

: know that machineguns should be located to receive incidental protection from adjacent rifle squads both under good and limited visibility conditions.

90

: know that the primary position should possess the best available capabilities for both good and limited visibility defense; in certain cases, selection of an additional separate primary position for night defense may be desirable, but a good visibility primary position must in any case be prepared for limited visibility defense, since limited visibility can occur under conditions precluding change to a night position.

91

He will : together with the platoon NCO's and their suitable replacements be qualified to determine how the platoon's machineguns should be disposed in the defense to include:

92

- a. Whether the guns should be employed singly or in pairs, considering the frontage to be covered, the fields of fire available, and the available position areas.
- b. The incidental protection afforded by adjacent rifle squads to the position areas considered.
- c. The relative cover and concealment available, coupled with the potential for close defense of the gun positions considered.
- d. Rearward routes of communication available.
- e. Whether the organization of the defensive position must be covered by the machineguns from temporary positions; if so, whether grazing fire can be obtained from the temporary position across the front of the platoon from:
 - (1) A position or positions within the platoon position.
 - (2) From a two-gun single position forward of and to a flank of the platoon position.
 - (3) From separate gun positions forward of the platoon position.

He must : ensure that all members of the weapons squad and selected additional members of the platoon are able to select, based upon consideration of the existing terrain, and the gun's principal mission(s), an acceptable defensive machinegun position, including:

93

- a. The location of the primary and secondary sectors of fire.

- b. The selection within the primary sector of:
 - (1) The FPL, if the potential for a tactically significant line exists.
 - (2) The PDFD and the PDFN lines.
 - (3) Any sector of graze fire existing within the primary sector of fire.
- c. Whether a separate night gun position is required, if so, its location, with its final protective line, principal direction of fire, and sector of graze fire, as decided upon.

He will : together with the platoon NCO's and their suitable replacements, consider the relative priorities of these requirements in the selection of a good visibility primary position:

94

- a. Good observation over an acceptable long range field of fire.
- b. Good fields of fire for the close defensive fires to include a tactically significant PDFD.
- c. A tactically significant FPL, particularly one achieving grazing fire across the position or, alternatively, one enfilading a dangerous approach into the position.
- d. An acceptable potential for limited visibility defense.
- e. Avoidance of an unusually conspicuous position likely to draw hostile fires.
- f. A good potential for close defense of the position under both good and limited visibility conditions.
- g. Cover and concealment, including routes into the position.

He must : ensure that all members of the weapons squad and selected additional members of the platoon are able to select acceptable limited visibility firing positions based upon these priorities:

95

- a. Existence of a tactically significant and technically desirable final protective line.

- b. Good potential for preplanned close defensive fires, and where visibility permits, for direct close defensive fires.
- c. Avoidance of a crest position or other background which adversely silhouettes the crew against a revealing background such as a skyline.
- d. Capability for delivery of long range preplanned fires upon likely hostile routes of approach and assembly areas.
- e. Avoidance of a gun position accurately located upon maps of the area, hence likely to draw hostile preparatory concentrations.

He will : if time permits, issue warning orders covering any preliminary preparation or movement prior to reconnoitering the defensive position, together with his weapons squad leader, giving attention during reconnaissance to selecting missions and general position areas for his machineguns so as to ensure the earliest possible occupation of the position with minimum need for subsequent changes of position. 96

He must : upon the arrival of the platoon in the defense area and the completion of the platoon defense order, supervise the organization of the defense area to include: 97

- a. Completion of any further reconnaissance designed to achieve timely changes and modifications required in the machinegun emplacements.
- b. Check of the machinegun crews' execution of orders including provision for local security, sectors of fire, fire missions, and preparations for delivery of good and limited visibility fires.
- c. Check of the organization of the machinegun primary, secondary, and any alternate or supplementary positions as to priorities of work and progress thereon.
- d. Check of coordination of essential details between gun crews and adjacent rifle units and other crew-served weapons involved.
- e. Check of command control and communication details for the weapons squad machineguns and antitank weapons.

- f. Check of completeness of supply and evacuation arrangements, particularly as to adequacy of ammunition, rations, and water, presence of required construction materials and understanding of routes within the position and to the rear as well as where and how casualties are to be collected.
- g. Check of understanding of the location of the platoon CP and the platoon rally point.

: verify the machinegun leader's supervision of range card preparation for limited visibility fires, together with any necessary firing data for anticipated direct fires; where fire for adjustment is permitted, ensure execution of necessary fires employing short bursts, using binocular observation to observe bullet strike and tracer adjustment; where premature avoidance of fire upon detected targets or improved observation of fire is desired, registration can be made upon other points having the same range and elevation as the target being registered.

98

: employ a priority of work for the preparation and improvement of gun positions consistent with the tactical situation, in particular for the anticipated hostile reaction; in the absence of specific reasons otherwise, such as an impending armored or aerial attack, this priority is logical once the gun position is selected:

99

- a. Clear fields of fire, exercising care to maintain camouflage and other position concealment during progress of work.
- b. Prepare a hasty emergency emplacement, as close to the primary position as the assigned fire missions permit.
- c. Prepare the primary position gun emplacement, normally a horseshoe open emplacement initially.
- d. Prepare other positions for gun crew, normally foxholes.
- e. Minimize dust likely to be caused by weapon fire by placing wet sandbags or dampening ground forward of gun muzzle.
- f. Prepare secondary and alternate positions as a minimum to the extent that effective fire can be delivered therefrom.

- g. Construct overhead shell fragment protection for primary position.
- h. Prepare a shelter bunker for off-duty use of gun crew under cover and close to primary position.
- i. Continue progressive improvement of all positions while maintaining local security and provision for adequate rest of gun crews.

He must : ensure that provisions for initiating machinegun fire without orders are well understood and provide for:

100

- a. Engagement of specified targets within a designated "fire at will" line, located so close to the position that delivery of ordered fires would be impracticable.
- b. Withholding fire, particularly in limited visibility against target indications which are not critical in nature and which could be hostile probes to locate the machinegun positions; leave engagement of such targets to other weapons.
- c. Prearrangements to facilitate reporting and description of targets when requesting authority to fire.
- d. Detailed SOP's designed to facilitate fire control, particularly under limited visibility conditions.

He will : ensure that the machinegun crews, as part of the platoon, are drilled in adopting a hasty defense position based on prearranged battle drills, on signal or fragmentary order under which:

101

- a. Rifle squads move to designated relative positions with reference to an indicated defensive hub, for example, the position of the platoon leader, or his replacement, modifying the distances involved to best exploit the available terrain.
- b. Machineguns under direction of the weapons squad leader take position at:
 - (1) The platoon flanks to fire across the platoon front.
 - (2) A position to cover a designated approach into the platoon area.
 - (3) Specific position(s) indicated by the IRPL.

c. Antitank weapons take position indicated by the platoon sergeant or his replacement.

: know that the time pressures governing adoption of a hasty defense will vary from situations permitting hasty choice of a position in the immediate vicinity to meeting engagements where the platoon must defend upon the ground actually occupied, regardless of its desirability, though, in any case, modification and improvement of a position is continuous and as progressive as tactical conditions permit.

102

He must : during conduct of the direct fire defense of the position against long range targets, know that:

103

- a. Such targets are best engaged from machinegun temporary positions to avoid premature betrayal of the location of the primary gun positions; such temporary positions should have as a primary requirement good cover and concealment en route to the primary position and an ammunition supply other than that required for the primary position.
- b. Within a gun's sector of fire, desirable targets are engaged normally on order unless advance authority to open fire has been given; lacking targets within a gun's principal direction of fire, other targets within the gun's primary or secondary sectors may be engaged, normally on order.
- c. As the enemy advance approaches the defensive position, he is subjected to an ever increasing volume of fire; as the effectiveness of these fires increase, less lucrative targets will be presented as the enemy advances by bounds or rushes utilizing available cover; machineguns decrease their volume of fire, engaging only targets which threaten the defense by reason of strength or strategic location; where the fire of other weapons appears adequate, machinegun ammunition should be conserved for fire upon the vital final protective lines.

He will : if the enemy advance initiates its assault:

104

- a. Direct delivery of the final protective fires, either on fixed final protective lines or within assigned sectors of graze fire, such fires are coordinated with the obstacles and mines protecting the position and are sited to achieve a lethal knee-high graze.
- b. Know that the enemy will attempt to destroy the machineguns by flanking maneuver, thus avoiding the gun's field of fire, local protection of the gun position is critical, so ensure that adjacent rifle squads and any available members of the gun crews remain alert against such attacks, employing rifle, grenade launcher, or hand grenades, as the situation dictates.
- c. If the hostile assault penetrates the position, ensure that:
 - (1) Gunners continue their final protective fire as long as remunerative targets exist.
 - (2) Adjacent rifle squads and extra members of the gun crews engage assaults upon the machinegun positions, prepared to replace gunner casualties and keep the machineguns in action as long as possible.
 - (3) If the machinegun position is overrun, or if the platoon rally signal is given, the gun crews move to the rally position, bringing with them gun and ammunition, and, where feasible, destroying the tripod.

He must : make all feasible daylight preparation for limited visibility defense, including:

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- a. Deciding whether to organize night primary machinegun positions to supplement preparation of day primary gun positions for limited visibility defense.
- b. When night primary positions are to be used, determining when and how to move to these positions, considering that a daylight move is essential unless extra machinegun tripods can be previously installed in the night position, or extremely detailed arrangements made for the delivery of prearranged fires employing field expedients.

- c. Arrangements for artificial illuminants, infrared sights and image intensification devices are completed, to include selection of precise location of illuminants to maximize hostile illumination while minimizing exposure of friendly positions.
- d. Modifications, if any, required in rifle squad placement to insure incidental protection of night primary machinegun positions.
- e. Checking of communication and signal procedures necessitated by the occupation of night primary positions by machineguns.
- f. Checking that obstacles, mines, Claymores, noise-makers and other aids to limited visibility defense are utilized to best advantage to increase the efficiency of the prearranged fires from the day, and, if used, the night primary positions.

He will : during conduct of the limited visibility defense of the platoon's position, whether created by night or occurring during daylight hours, consider the employment of the machineguns to ensure:

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- a. Timely delivery of predetermined machinegun fires against suspected enemy attack positions or gun locations at long and mid ranges.
- b. Where the nature of the visibility limitation permits, exploit available artificial aids to visibility such as artificial illuminants to deliver such direct and prearranged fires as the visibility and situation favors as the enemy attack progressively closes with the position.
- c. Coordination of the delivery of machinegun fires with all other available fires to concentrate maximum close defensive fires to prevent hostile penetration of the zone of final protective fires.
- d. Keeping the machinegun positions, the rifle squads and company headquarters informed of the progress of the enemy attack to the extent that reasonably dependable information permits.
- e. Delivery of the final protective fires when ordered or in event the attack closes with the platoon's position.

- f. That in the event the platoon position is overrun, machinegun crews move, as in the good visibility defense, to the platoon rally position on platoon command or signal bringing with them their guns and such ammunition as can be carried; due to the visibility limitations, each element involved is almost completely dependent upon information from other elements making maintenance of communication to and from the platoon CP of prime importance during limited visibility combat.

He must : know that the command control of the machineguns of the reserve rifle platoon of a forward defense company is complicated by the several alternative and competitive type missions likely to be assigned the platoon, necessitating that:

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- a. The tripod mount be allocated to either the first priority reserve mission or to the mission most able to effectively employ predetermined fires depending upon the specific situation.
- b. Arrangements facilitating machinegun ammunition supply to widely separated machinegun positions by providing transport, placing ammunition on the positions in question, or by augmenting the weapons squad with additional ammunition carriers.
- c. Provision be made for the organization of one or more defensive positions comparable to that of a forward rifle platoon's machineguns when the reserve mission requires a defense in place for a blocking or flank protection mission.

He will : know that the siting of the machineguns of the reserve rifle platoon involves coordination of the specific priorities of the reserve missions particularly where conflict exists between multiple missions assigned:

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- a. The missions of "limiting the penetration of the company position," or the protection of "the flanks and rear of the forward platoons" will primarily determine the reserve platoon's position, though the defensibility of the position taken must also be weighed; such a defense position is organized for defense like a forward defense position.

- b. A mission of "supporting the forward platoons by fire" places priority upon a position favoring such support though normally the position(s) selected are those which also favor flank protection of the forward platoons since overhead fire is rarely considered; the position(s) organized are prepared for defense though final protective lines may not be required if a final defense of the position is not contemplated.
- c. The possible reserve missions of "surveillance and security of the rear areas" and that of "readiness to support local counterattacks" are less often given as principal missions unless coupled as a dual mission; however, as secondary missions to another task they complicate both the platoon and the machinegun missions, necessitating the ability to move quickly and rapidly by reconnoitered routes to reconnoitered positions; at times involving provision of transport or attached carriers for machinegun ammunition.
- d. The initial mission of manning part of the combat outpost line (COPL) is always coupled with one or more subsequent reserve platoon missions and is particularly difficult for a forward company's reserve platoon to execute due to the time and space factors in reaching the subsequent mission area from the COPL and preparing both positions; transport, at least for the machineguns, is particularly desirable, especially since the machineguns may be used to cover the withdrawal of the balance of the platoon from the COPL.

He will : ensure that all members of the platoon are trained in operating a machinegun as part of the COPL involving:

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- a. Operation in single gun attachment to a separated outguard on the COPL, machinegunners occupying priority positions affording both wide sectors of direct fire and long range observation for fire out to the maximum effective range.
- b. Coordination of fires between guns achieved by assignment of primary and secondary sectors of fire for each gun providing for mutual support between adjacent outguards, and wide coverage of tactically significant areas of likely hostile approach at the longer ranges.

- c. Assignment of principal direction of fire day and principal direction of fire night lines, with guns kept laid upon the appropriate principal direction; (final protective lines are not utilized on the COPL).
- d. Use of tripods for the primary position and bipod or free gun fire to cover the secondary sector of fire unless the sector can be covered from the primary position employing free gun fire.
- e. Preparation of the COPL gun positions as complete as time permits, with high priority given to reconnaissance of withdrawal routes and for rearward gun positions, if intermediate delay is planned.
- f. Use of the machineguns to cover the withdrawal of rifle elements when good routes of withdrawal and transport exist to aid in breaking contact; under favorable conditions, machineguns may fire from vehicles in hull defilade positions; otherwise, rifle squads may have to cover initial rearward movement of the machineguns.

He must : know that retrograde operations include any organized movement away from the enemy or to the rear, either forced or voluntary, including withdrawals, delaying actions and retirements in which:*

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- a. The platoon usually operates as part of the company.
- b. The fire of the machineguns is of particular importance due to their ability to maintain a heavy volume of fire at the longer ranges, and to fire along predetermined lines of tactical significance.
- c. Positions occupied during good visibility are selected to permit effective long range fires and to favor covered withdrawal; therefore, positions are frequently higher on a forward slope than in defensive action, though stereotyped occupation of such near-crest positions may betray impending retrograde operation.
- d. During limited visibility retrograde operations, machineguns normally remain in their previously occupied gun positions to maintain fires until withdrawn.

*For details see FM 7-15, "Rifle Platoon and Squads, Infantry, Airborne and Mechanized."

- e. During limited visibility operations, machineguns withdrawn cannot deliver effective predetermined fires from rearward positions unless extremely detailed preparations of the rearward position for such fires have been completed during good visibility.

He will : ensure that he, his NCO's and their potential replacements are trained in the differences existing in the handling of the platoon's machine-guns in the different types of retrograde action to include:

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- a. Withdrawals, the action where the withdrawing force seeks to disengage from the enemy to take up other action and is divided technically into the:
 - (1) Night or deception withdrawal, where, during limited visibility or in the absence of enemy pressure, the withdrawal is by stealth, supported by deceptive action by a portion of the force left in position to simulate normal activity; within the platoon one rifle squad and half the crew-served weapons remain, the machinegun having the best position to deliver close defensive and final protective fires usually being selected to remain.
 - (2) Daylight or under pressure withdrawal, where the forward platoon is forced by enemy pressure to fight its way to the rear covering the movement by elements positioned to cover each withdrawal; whether the rearward movement is made by thinning the lines progressively, withdrawal by squad maneuver, or by fire team maneuver, machinegun fire is essential to cover the movement, in squad and fire team withdrawal, the machineguns may be leapfrogged to the rear to cover each other's movement; in any case, timely reconnaissance for machinegun positions and routes thereto by the weapons squad leader and platoon sergeant is important and positions should be sought affording both long range and close defensive fires.
- b. Delaying Action, an operation where the unit trades space for time, endeavoring to delay the enemy by inflicting casualties and requiring his repeated deployment; in action of this type, the machineguns are:

- (1) Of particular value because of their ability to deliver a heavy volume of effective long range fire.
- (2) Protected by rifle squads positioned to furnish incidental protection while also able to employ long range rifle fire.
- (3) Reinforced, wherever possible, by transport or human carriers to increase mobility and the ability to sustain fire.
- (4) Withdrawn last to cover withdrawal of the rifle units when extra means of mobility have been furnished the machinegun squads.
- (5) Withdrawn with the rifle squad or riflemen, covered by the fire of the rifle squads when the gun crews must operate on foot.

He will : know that a reverse slope gun position is one in which the position is masked from enemy ground observation and direct fire by a crest and that such a position is desirable for machineguns when:

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- a. The potential intensity of hostile fire indicates the probable early loss or neutralization of guns in a forward slope position.
- b. Effective grazing enfilade fire can be placed upon any enemy advance either from a position on the reverse slope of the sheltering crest, or the forward slope of the next crest to rear.
- c. An enfilade beaten zone can be sited covering the reverse slope of the sheltering crest, or preferably an adjacent forward slope to the one protecting the gun position provided fire is exchanged with a gun in the adjacent sector so as to enfilade the ground forward of the gun position in question.
- d. The fields of fire between the position and the crest protecting the position permit adequate defense of the position considering all fires available, including supporting fires.
- e. The flanking nature of such fire enfilades an enemy who is not well positioned to engage it and therefore must coordinate reaction against such flanking fire with adjacent and/or supporting units under difficult conditions.

f. Coordinated final protective lines and principal directions of fire can be achieved as for a forward slope defense.

: know that machineguns occupying reverse slope primary gun positions may occupy initial temporary forward positions, with the observation and security groups, withdrawing in time to occupy their reverse slope positions; or, terrain permitting, may deliver early frontal fires from position defilade. 113

He must : know that in the defense of a river line the machineguns can be effectively employed in guarding against hasty crossing attempts from well forward positions offering long fields of grazing, enfilade fires covering dangerous crossing points and the approaches thereto, or along the river line itself, covering the far (enemy) bank; and that: 114

- a. Such forward guns must be well dug in and protected against the heavy preparatory fires and air attack the enemy may employ or be withdrawn prior to the hostile preparatory fires to rearward positions designed to support counterattacks against hostile footholds on the near bank.
- b. Forward guns must be protected by rifle squad personnel against hostile probing attacks or raids which may cross the river under cover of limited visibility preparatory to a deliberate crossing attempt.

He will : ensure that all members of the weapons squad and selected additional members of the platoon are trained in these relieving (incoming) and relieved (outgoing) machinegun aspects of a relief in place: 115

- a. Wherever possible the machineguns and other crew-served weapons crews will execute the relief a night earlier or later than the main force relief to ensure the limited visibility preplanned fires are in complete readiness in event of hostile attack during the relief.
- b. The weapons squad leader, and where possible, an additional gunner, should accompany the platoon leader in his reconnaissance of the defensive position to be taken over, by day if at all possible, to check the machinegun emplacements and familiarize themselves with all details of the machinegun defense.

- c. The outgoing machinegun crews will leave their tripod mounts (complete with traversing and elevating mechanisms), field expedients for delivering preplanned fires, and range cards in position, as well as all ammunition on the position except that considered necessary with the outgoing guns.
- d. The incoming machinegun crews will turn over to the outgoing machinegunners their tripods (complete with traversing and elevating mechanisms) at a previously agreed upon location to the rear.
- e. Both incoming and outgoing machinegun crews will make every effort to turn over equipment in excellent condition and the outgoing crews will leave their position well policed and with necessary guidance for the position written out in detail.
- f. At times, in a stabilized situation, the outgoing machinegunners may leave one or two key men with the new unit for an additional twenty-four hours or similar period.

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13. ABSTRACT This document is one of a series of research by-products that details the critical skills, knowledges, and performances the infantry rifle platoon leader must possess for effective individual and unit combat performances. The overall goal of the research is to improve officer training in these critical combat skill areas necessary for effective leadership. This document concerns the critical skill requirements in the area of the machinegun 7.62-mm, M60.			

14. KEY WORDS	LINE A		LINE B		LINE C	
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Infantry						
Leader						
Machinegun						
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