FM 23-67

MACHINEGUN 7.62-MM, M60



FEBRUARY 1984

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No. 23-67

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DEPARTMENT OF THE ARMY
Washington, DC, 29 February 1984

MACHINEGUN 7.62-MM, M60

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*THIS MANUAL SUPERSEDES FM 23-67, 26 October 1964.

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The words "he," "him," "his," "man," and "men," when used in this publication, represent both the masculine and feminine genders, unless otherwise specifically stated.

CHAPTER 1

Introduction

EMPLOYMENT

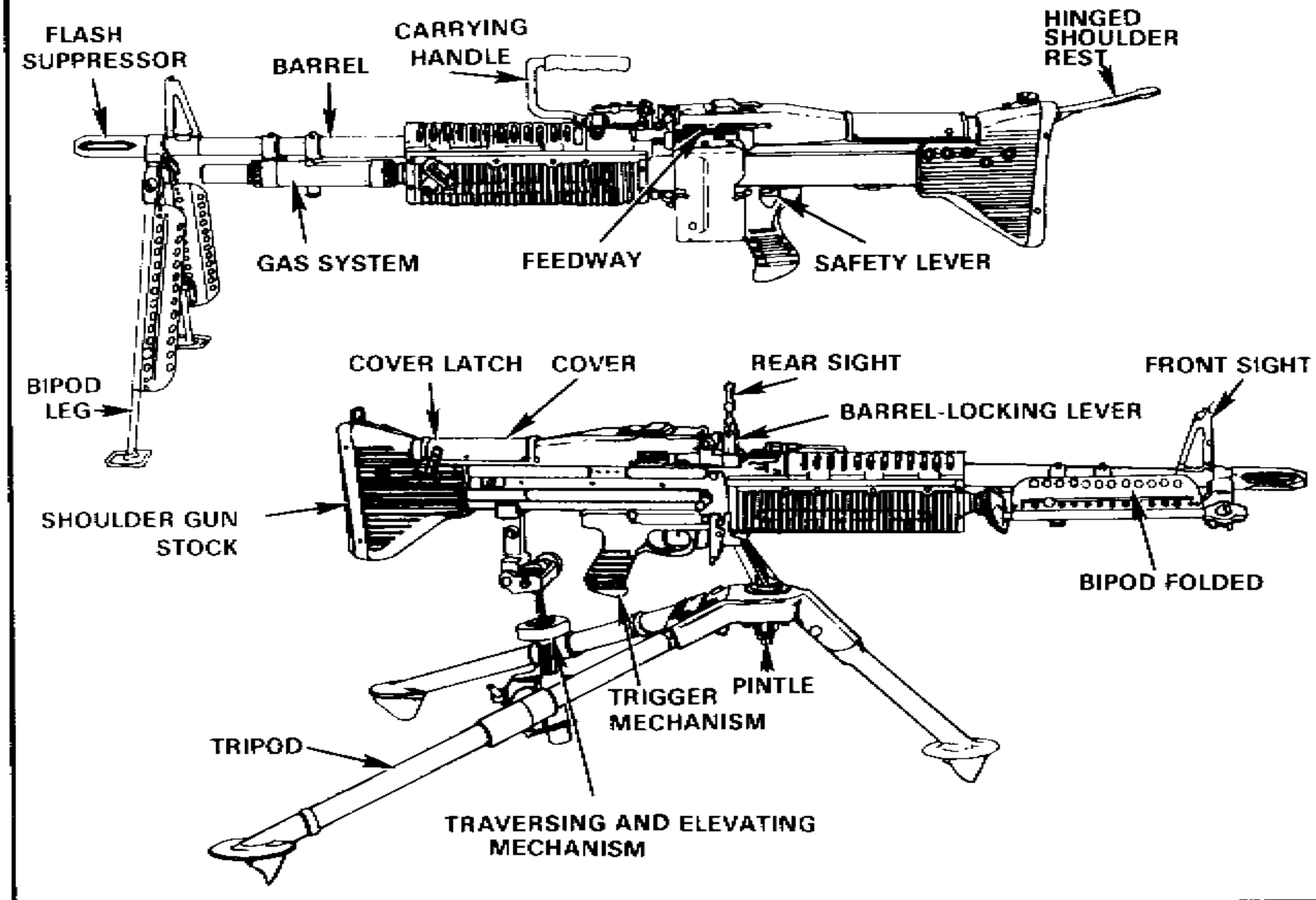
The 7.62-mm M60 machinegun supports the rifleman in both offense and defense. It provides the heavy volume of close and continuous fire he needs to accomplish his mission. It can engage targets beyond the capability of individual weapons, with controlled and accurate fire. The long-range, close defensive, and final protective fires delivered by the M60 form an integral part of a unit's defensive fires.

DESCRIPTION

The M60 is a general purpose machinegun. It is used on a bipod, a tripod, or a vehicular mount. Chapter 3 covers the mounts in detail. The M60 is air-cooled, belt-fed, gas-operated, and automatic. It fires from the open-bolt position. Ammunition is fed by a metallic split-link blet. As the gun is fired, the belt links become unlinked and are ejected from the gun. A spare barrel with a bipod assembly is issued with each M60, and barrels can be quickly changed because the gun has fixed head space.



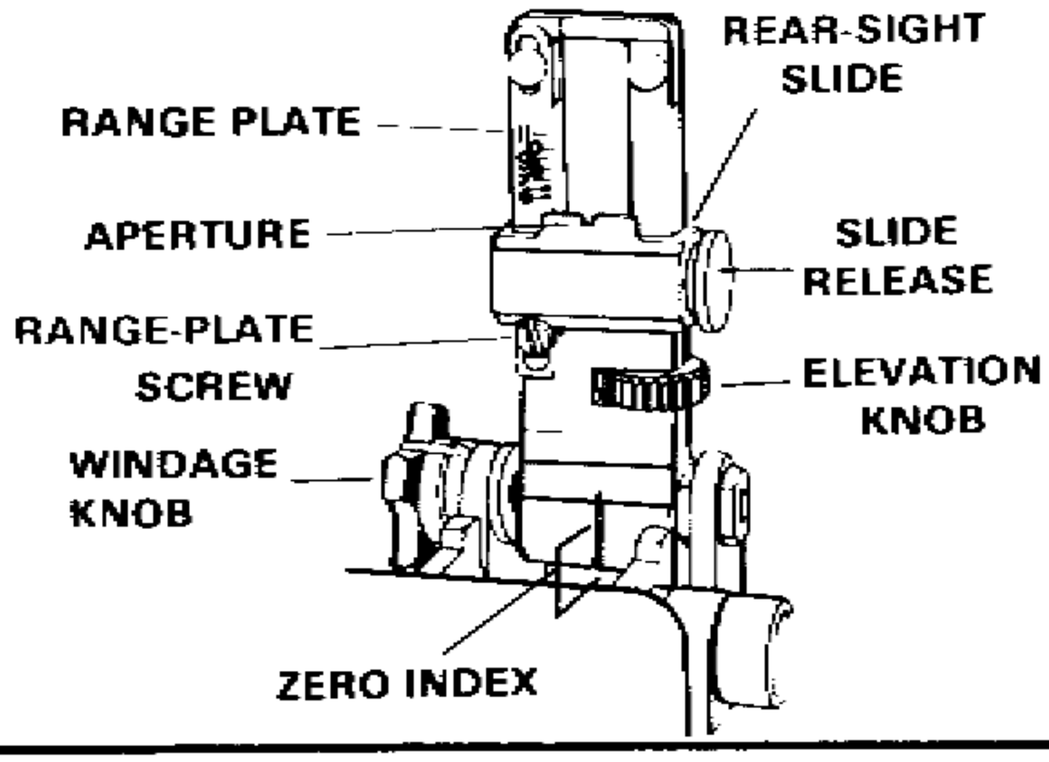
M60 MACHINEGUN, BIPOD- AND TRIPOD-MOUNTED.



SIGHTS

The front sight is attached to the barrel. The rear sight is mounted on a spring-type dovetail base, and it can be folded down when the gun is moved. The range plate scale on the rear sight is marked for each 100 meters, from 300 to 1,100 meters. It can be adjusted for zeroing. Range changes are made by using either the slide release or the elevation knob. The slide release is used to make major adjustments in elevation. The elevation knob is used to make minor adjustments, such as during zeroing. Four clicks on the elevation knob are equal to a 1-mil change in elevation. From the rear of the gun, turning the elevation knob clockwise raises the rear sight and the strike of the round. Turning it counterclockwise lowers the sight and the strike of the round. The rear sight is adjustable for windage, 5 mils right or left of

REAR SIGHT ASSEMBLY.



the zero index. The windage knob is on the left side of the rear sight. One click on the windage knob equals a 1-mil change in deflection. Turning the windage knob toward the muzzle of the gun will move the sight and the strike of the round to the right. Turning it toward the rear will move the sight and the strike of the round to the left.

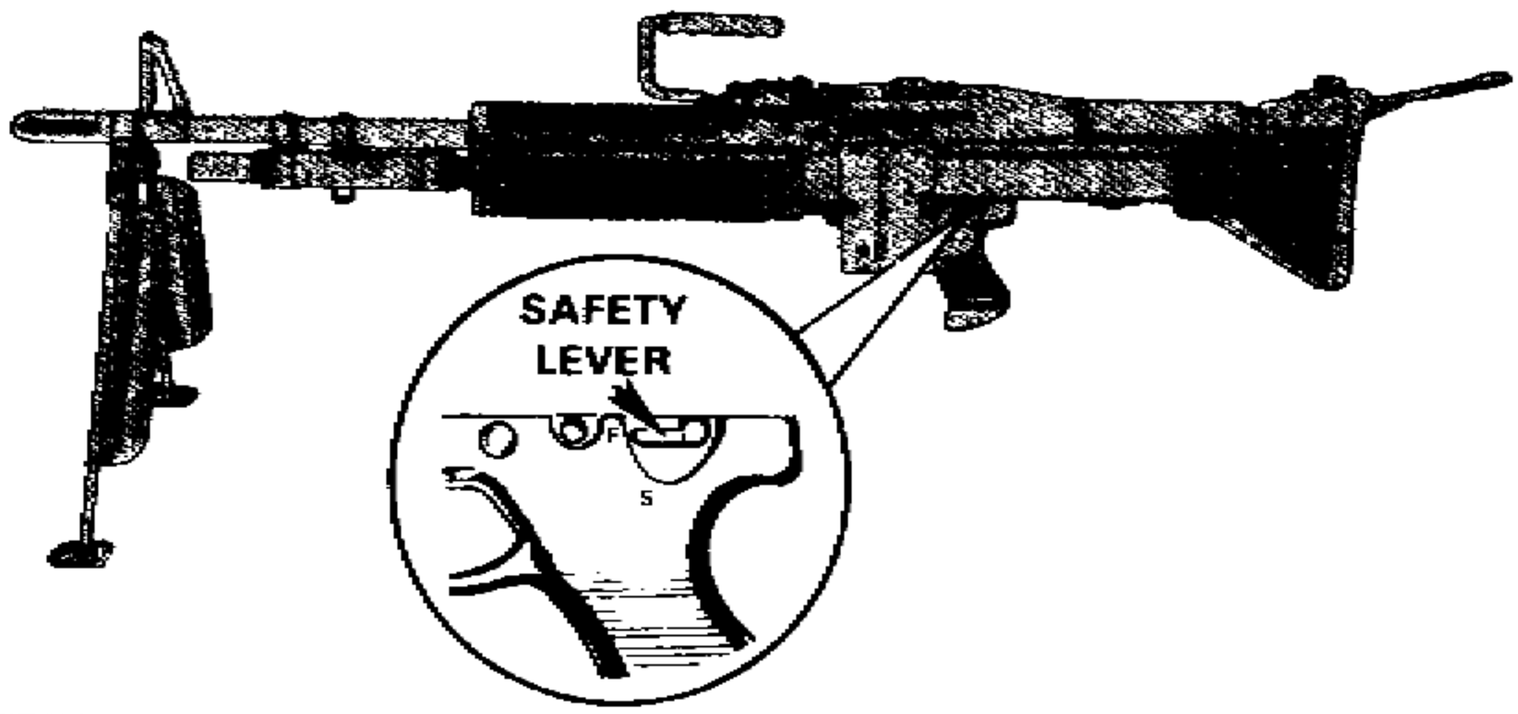
SAFETY LEVER

The safety lever is on the left side of the trigger-mechanism group. It has an S (SAFE) and an F (FIRE) position. On the SAFE position, the bolt cannot be pulled to the rear or released to go forward. The cocking handle is on the right side of the gun. It is used to pull bolt to the rear. EACH TIME THE BOLT IS PULLED TO THE REAR, THE COCKING HANDLE MUST BE RETURNED MANUALLY TO ITS FORWARD POSITION TO PREVENT DAMAGE TO THE COCKING HANDLE AND INJURY TO THE GUNNER.

FLASH SUPPRESSOR

A flash suppressor is fastened to the muzzle of the gun. During firing, the suppressor spreads out the smoke and flash from the muzzle, thus making it harder for the enemy to locate the gun and firing position.

SAFETY LEVER.



GENERAL DATA

AMMUNITION	7-62-MM BALL, TRACER, ARMOR-PIERCING, BLANK, AND DUMMY. AMMUNITION IS PACKAGED IN 100-ROUND BANDOLEERS EACH WEIGHING APPROXIMATELY 2.95 KG (6.5 LB).
TRACER BURNOUT	900 METERS OR MORE.
LENGTH OF MACHINEGUN	110.5 CM (43.5 IN).
WEIGHT OF MACHINEGUN	10.4 KG (23 LB) (APPROX).
WEIGHT OF TRIPOD MOUNT M122 WITH TRAVERSING AND ELEVATING MECHANISM AND OLD PINTLE ASSEMBLY	8.5 KG (19.5 LB) (APPROX).

GENERAL DATA

(CONTINUED)

WITH NEW PINTLE ASSEMBLY	7.6 KG (17.5 LB) (APPROX).
MAXIMUM RANGE	3,725 METERS.
RANGE AT WHICH A .5 PROBABILITY OF HIT IS ACHIEVABLE WHEN FIRING A 6-TO 9-ROUND BURST:	
MOVING POINT TARGET, BIPOD	200 METERS.
POINT TARGET, BIPOD OR TRIPOD	600 METERS.
AREA TARGET, BIPOD	800 METERS.
AREA TARGET, TRIPOD	1,100 METERS.
HEIGHT OF MACHINEGUN ON TRIPOD MOUNT	42 CM (16.5 IN) (APPROX).
RATES OF FIRE:	
SUSTAINED	100 ROUNDS PER MINUTE. (RECOMMEND BARREL CHANGE EVERY 10 MINUTES.)
RAPID	200 ROUNDS PER MINUTE. (RECOMMEND BARREL CHANGE EVERY 2 MINUTES.)
CYCLIC	550 ROUNDS PER MINUTE (APPROX). (RECOMMEND BARREL CHANGE EVERY MINUTE.)
ON-CREW LOAD OF AMMUNITION	600 TO 900 ROUNDS. (BASIC LOAD IS DESIGNATED BY COMMANDER.)

NOTE: Gunner carries three 100-round bandoleers (one attached to weapon). Assistant gunner (if assigned or designated) carries three 100-round bandoleers. Ammunition bearer (when present) carries three 100-round bandoleers.

MAXIMUM EXTENT OF GRAZING FIRE OBTAINABLE OVER LEVEL OR UNIFORMLY SLOPING TERRAIN	600 METERS.
MAXIMUM ELEVATION, TRIPOD CONTROLLED	+ 200 MILS.
MAXIMUM ELEVATION, TRIPOD FREE	+ 445 MILS.
MAXIMUM DEPRESSION, TRIPOD CONTROLLED	- 200 MILS.
MAXIMUM DEPRESSION, TRIPOD FREE	-445 MILS.
MAXIMUM TRAVERSE, CONTROLLED BY TRAVERSING HANDWHEEL	100 MILS.
MAXIMUM TRAVERSE, CONTROLLED BY TRAVERSING BAR	875 MILS.

CHAPTER 2

Disassembly and Assembly

PROCEDURES

The M60 machinegun can be disassembled and assembled without special tools or equipment. With the exception of the barrel group and the cocking handle, general disassembly requires only a cartridge or other pointed object. Detailed disassembly requires a combination tool.

In disassembly, as each part is removed, it should be placed on a clean, flat surface such as a table, shelter half, or disassembly mat. This makes it easy to keep track of parts, and it aids in their assembly since the parts are assembled in reverse order from disassembly.

Disassembly and assembly of the gas system and adjustment of the rear sight elevation scale must be kept to a minimum to avoid excessive wear.

Disassembly of the M60 beyond that described in this manual must be done by ordnance personnel.

TYPES

There are two types of disassembly and assembly, general and detailed.

General disassembly and assembly pertain to removing and replacing the eight major groups.

Detailed disassembly and assembly pertain to removing and replacing the parts of those major groups.

GENERAL DISASSEMBLY

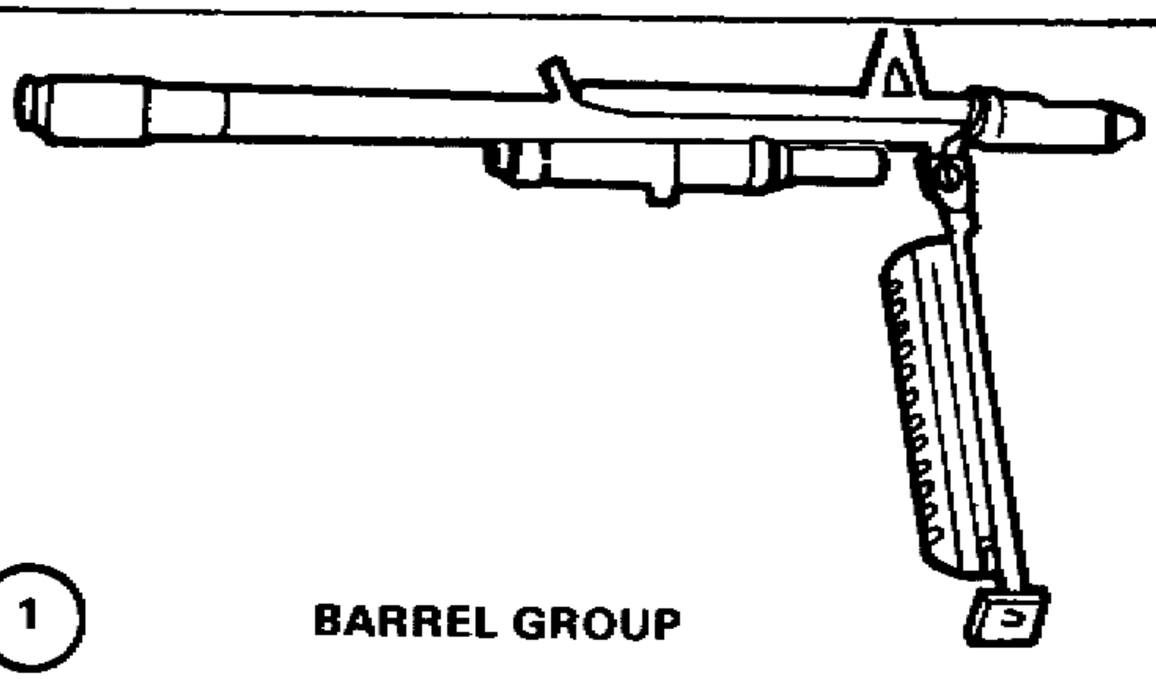
The eight major groups of the M60 are:

- **Barrel Group**
- **Trigger-Mechanism Group**
- **Stock Group**
- **Forearm Assembly Group**
- **Cover, Feed Tray, and Hanger Group**
- **Buffer and Operating-Rod Group**
- **Bolt Group**
- **Receiver Group**

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EIGHT MAJOR ASSEMBLIES OR G

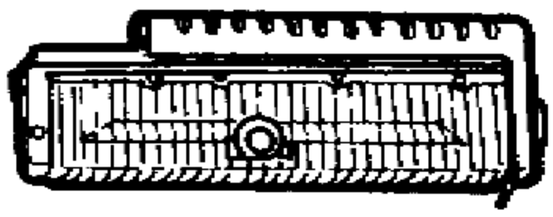


1 BARREL GROUP

TRIGGER-MECHANISM GROUP

A LEAF SPRING
B RETAINING PIN
C TRIGGER MECHANISM GRIP ASSEMBLY

2



4 FOREARM ASSEMBLY GROUP

COVER, FEED TRAY, AND HANGER GROUP

A HINGE-PIN LATCH
B HINGE PIN
C SPRING
D COVER ASSEMBLY
E TRAY ASSEMBLY

5

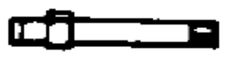
BUFFER AND OPERATING ROD GROUP

A BUFFER YOKE
B BUFFER ASSEMBLY
C DRIVING-SPRING GUIDE
D DRIVING SPRING
E OPERATING ROD

6

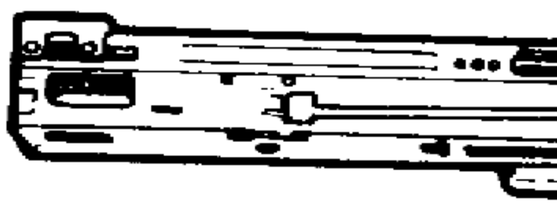
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BOLT ASSEMBLY

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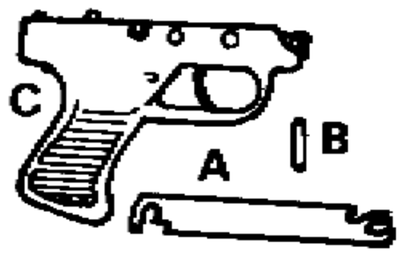
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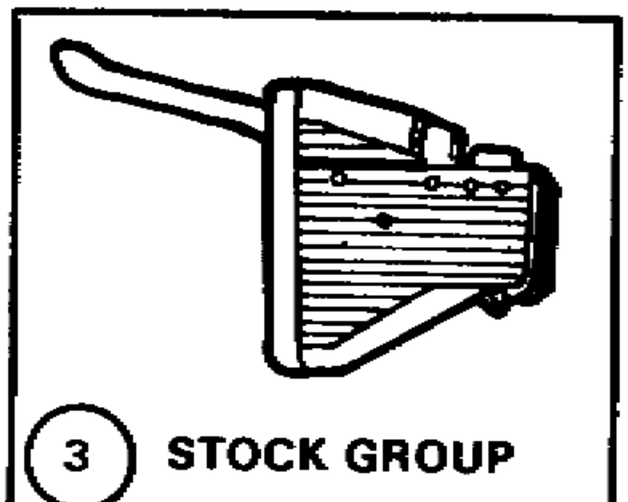
JOR ASSEMBLIES OR GROUPS

RIGGER-MECHANISM GROUP

A LEAF SPRING
B RETAINING PIN
C TRIGGER MECHANISM GRIP ASSEMBLY



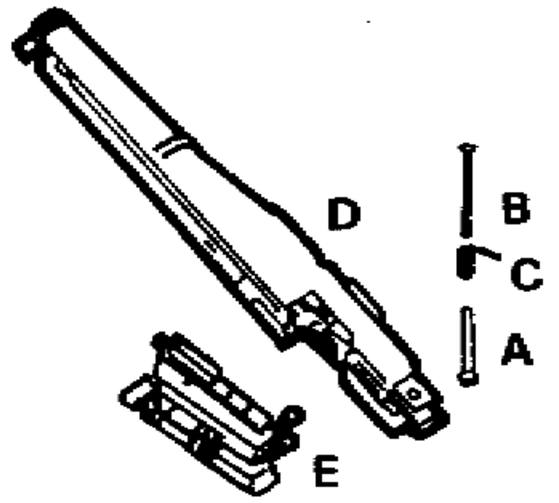
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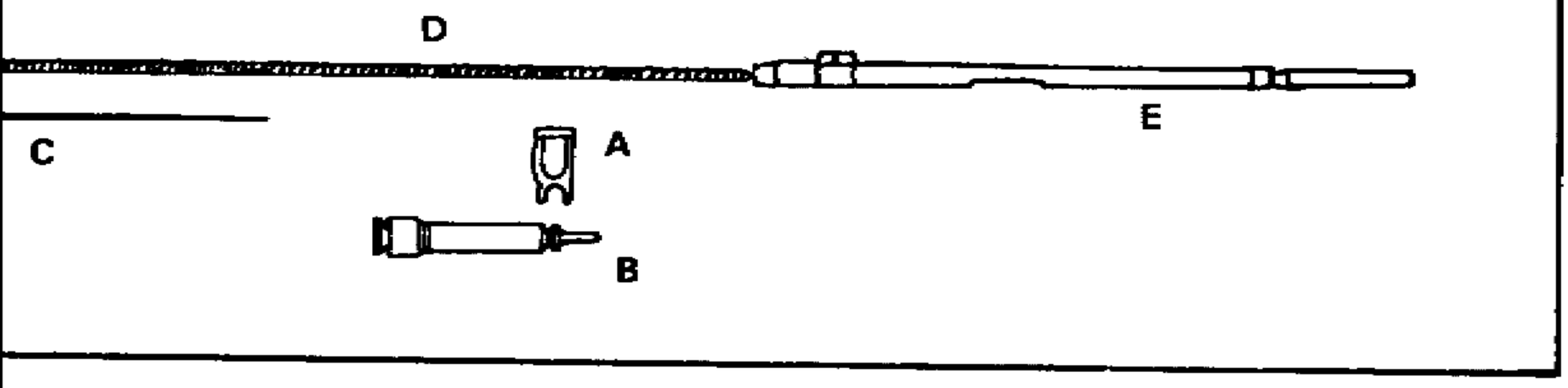
3 STOCK GROUP

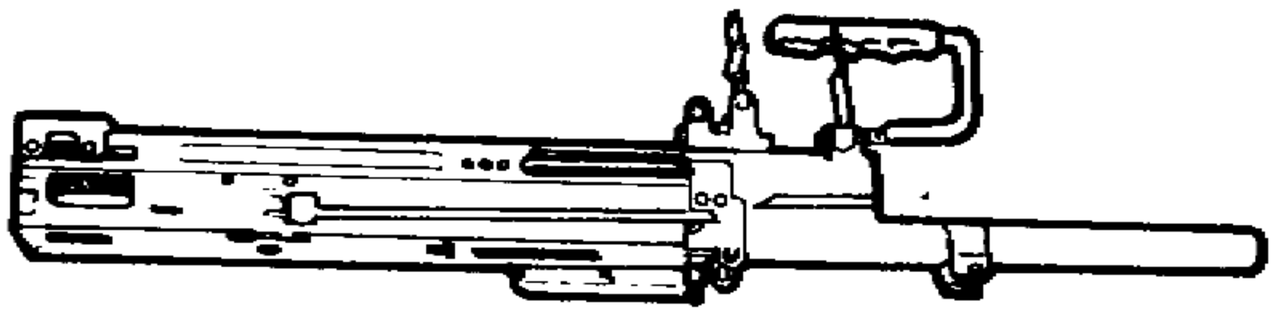
COVER, FEED TRAY, AND HANGER GROUP

A HINGE-PIN LATCH
B HINGE PIN
C SPRING
D COVER ASSEMBLY
E TRAY ASSEMBLY



5





8 RECEIVER GROUP

CLEARING

Clearing is always the first step upon receiving an M60 or preparing it for disassembly. To clear the M60:

(1) Put the safety on FIRE.

(2) Cock the gun.

(3) Put the safety on SAFE and return the cocking handle to its forward position.

(4) Raise the cover, inspect the tray, and remove links or ammunition.

(5) Raise the tray and inspect the chamber to insure that no rounds are present.

(6) Close the cover, place the safety on FIRE, pull the cocking handle to the rear, and pull the trigger while manually easing the bolt forward.

(7) Place the safety on SAFE and raise the cover. (If not disassembling the gun, keep the cover down.)

CAUTION

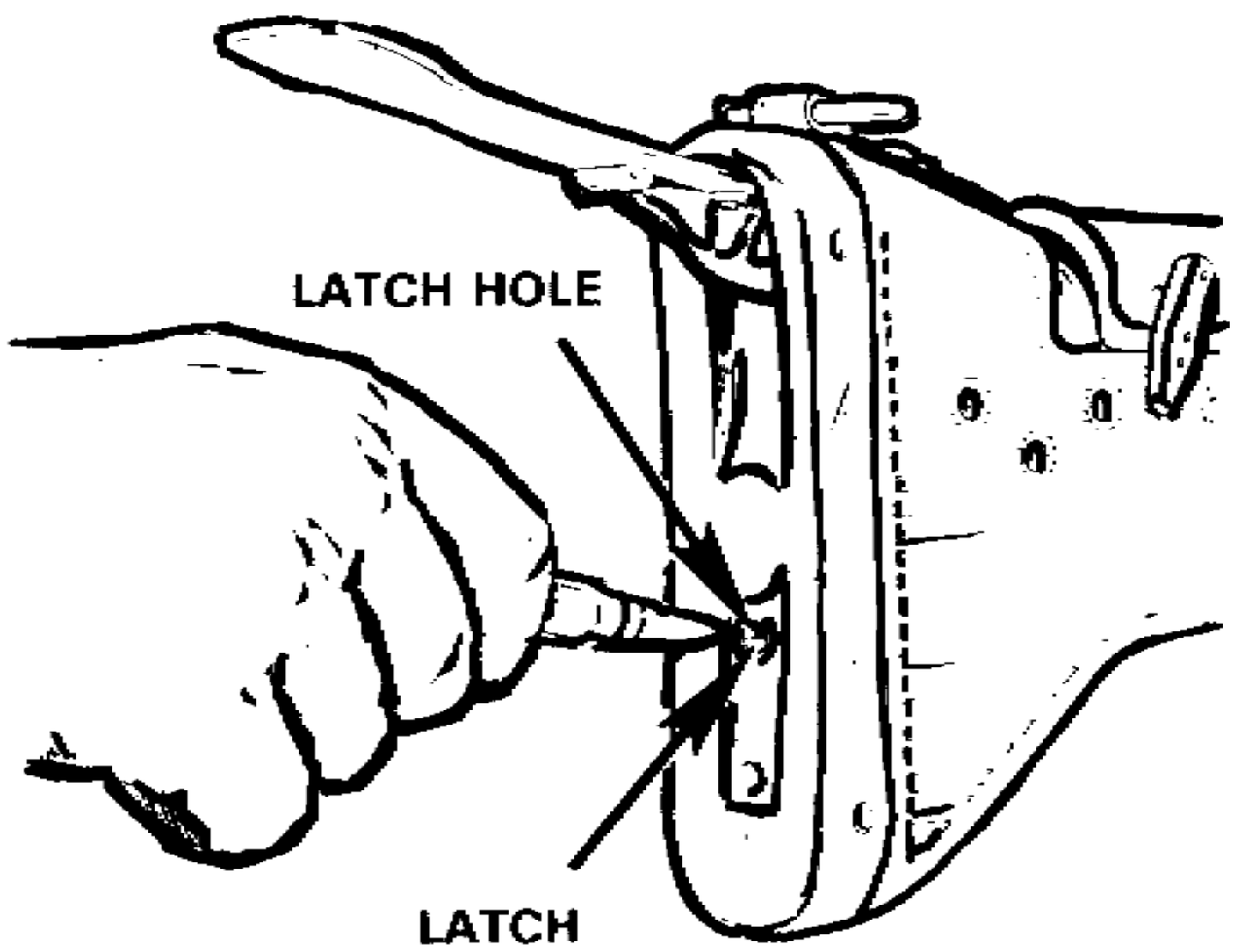
THE BOLT MUST BE EASED FORWARD TO PREVENT DAMAGE TO THE FEED TRAY ASSEMBLY AND OPERATING ROD ASSEMBLY. DO NOT CLOSE THE COVER WITH THE BOLT FORWARD. TO DO SO WOULD DAMAGE PARTS OF BOTH THE COVER AND THE BOLT.

REMOVING THE STOCK

To remove the stock, raise the shoulder rest, insert the nose of the cartridge into the latch hole, and depress the latch.

With the latch depressed, remove the stock by pulling it directly to the rear. It is important that the stock group be removed in this way to prevent damage to the buffer lock.

REMOVING THE STOCK



REMOVING THE BUFFER AND OPERATING-ROD ASSEMBLIES, AND THE BOLT

The buffer assembly consists of the buffer and the buffer yoke. The operating-rod assembly consists of the driving-spring guide, driving spring, and operating rod. The bolt is removed with the operating-rod assembly.

To remove the buffer assembly, hold the palm of the hand against the exposed buffer and press forward LIGHTLY. Remove the buffer yoke by pulling it straight up and away from the receiver assembly.

Withdraw the buffer slowly. Allow the driving spring to expand until the end of the driving-spring guide is exposed at the rear of the receiver group.

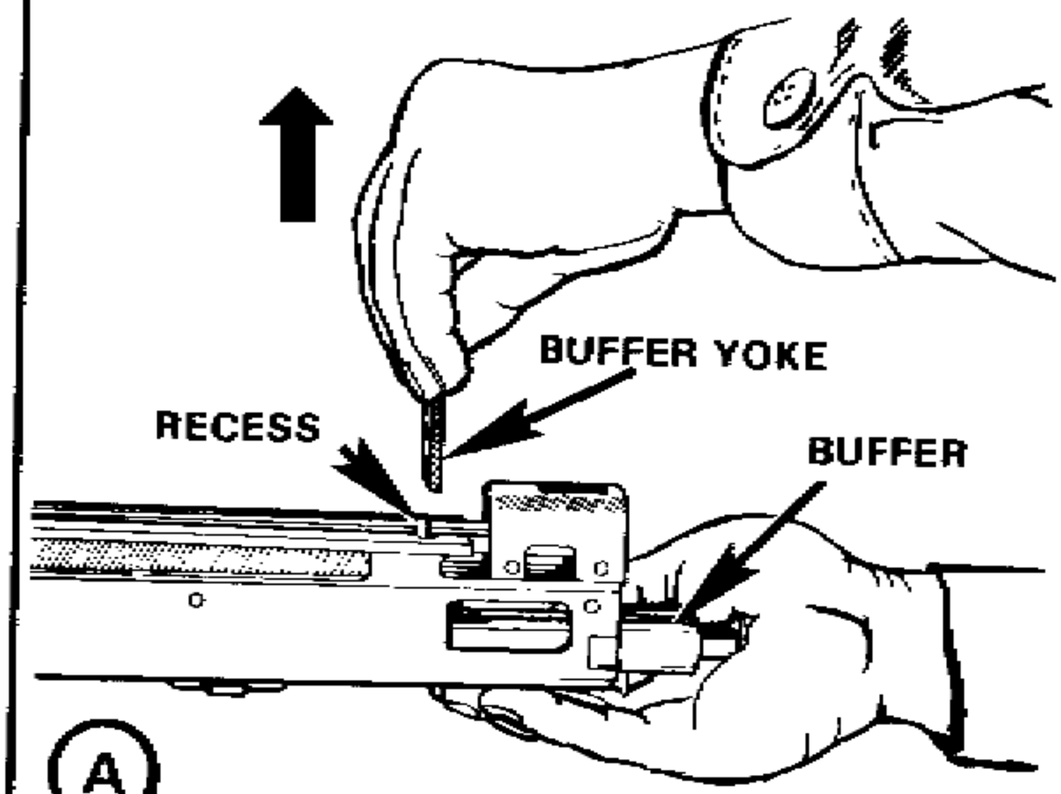
Separate the buffer from the driving-spring guide.

Pull the driving spring and driving-spring guide from the receiver group and separate the two parts.

With the left hand, grasp the trigger-mechanism group to stabilize the gun. With the right hand, pull the cocking handle slowly to the rear until the bolt is separated from the barrel socket about 2 inches. Return the cocking handle to the forward position. Place a finger on the face of the bolt and push until the finger makes contact with the bridge at the end of the receiver.

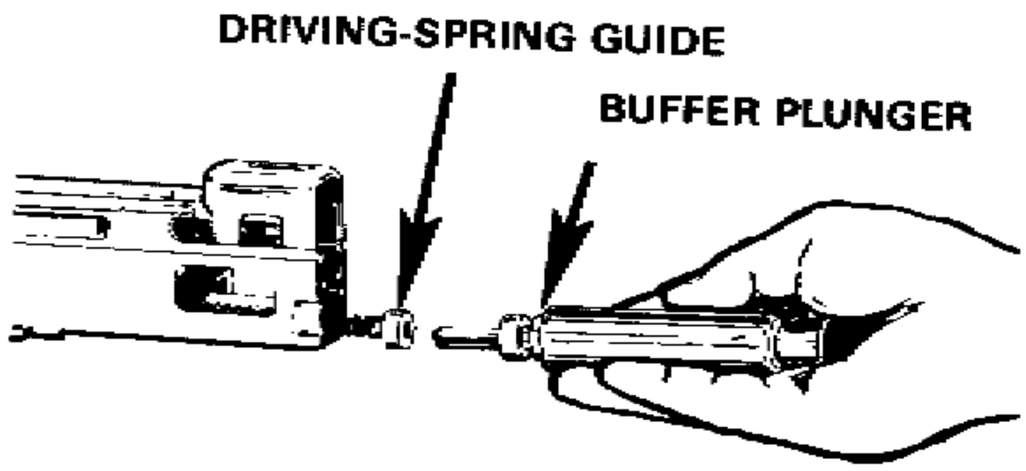
The operating rod and bolt are now exposed approximately 10 cm (4 in) to the rear of the receiver. Hold them securely, to keep the bolt from rotating, and remove them from the receiver; then relax the grip and let the bolt rotate slowly to the right.

REMOVING THE BUFFER AND OPERATING-ROD ASSEMBLIES, AND THE BOLT



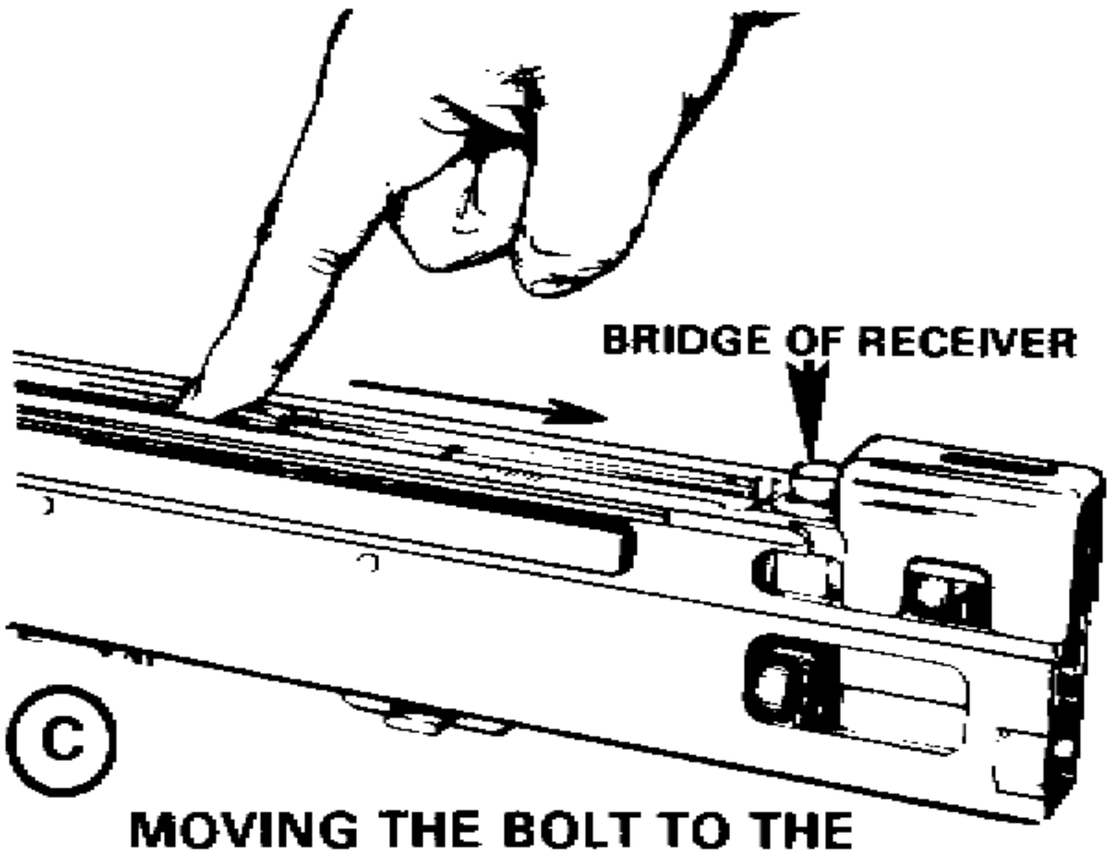
A

REMOVING THE BUFFER-YOKE



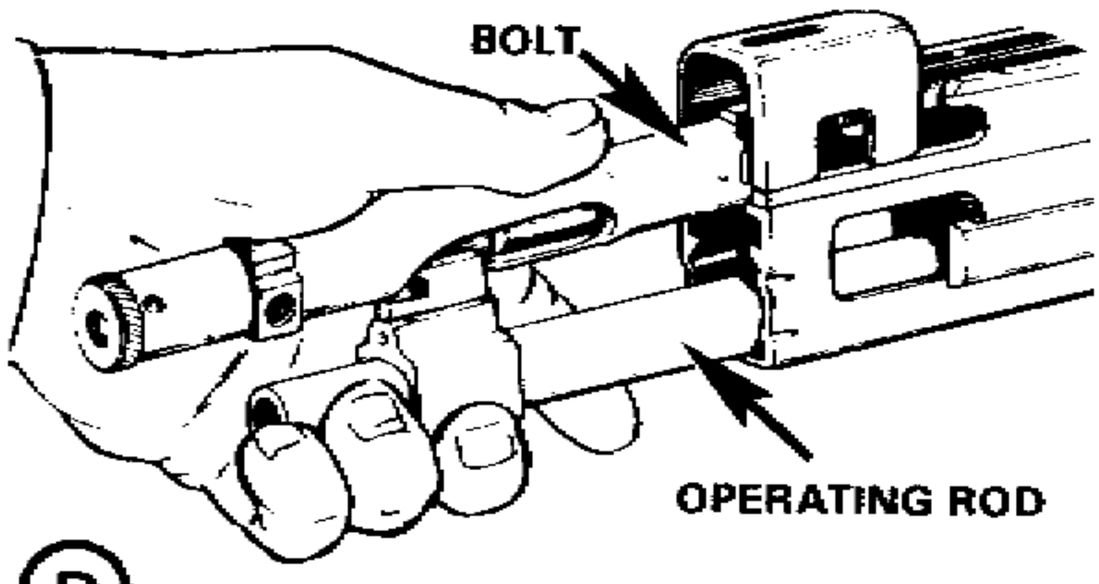
B SEPARATING THE BUFFER FROM THE DRIVING - SPRING GUIDE

REMOVING THE BUFFER AND OPERATING-ROD ASSEMBLIES, AND THE BOLT (CONTINUED)



C

MOVING THE BOLT TO THE REAR OF THE RECEIVER GROUP



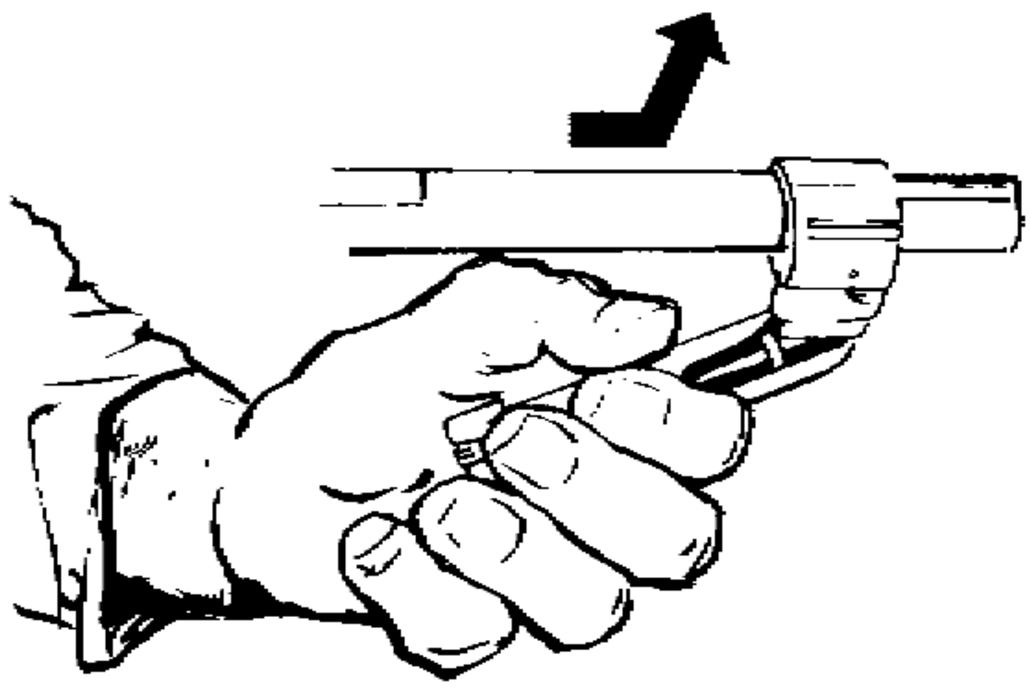
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WITHDRAWING THE BOLT AND OPERATING-ROD FROM THE RECEIVER GROUP

SEPARATING THE BOLT ASSEMBLY FROM THE OPERATING ROD ASSEMBLY

Hold the bolt with one hand, operating rod on top. With the other hand push forward and up on the operating rod, and disengage it from the bolt.

SEPARATING THE BOLT ASSEMBLY FROM THE OPERATING-ROD ASSEMBLY



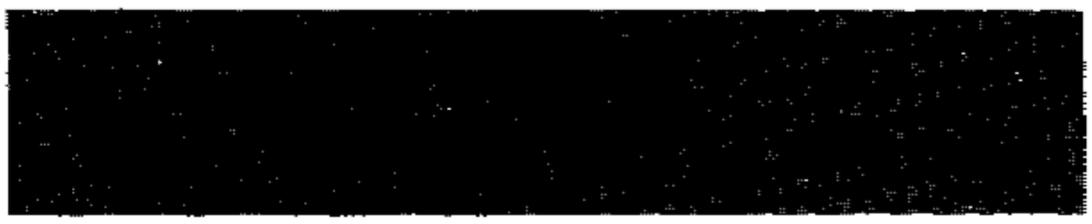
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REMOVING THE TRIGGER-MECHANISM GROUP

The trigger-mechanism group consists of the grip, leaf spring, and retaining pin (this retaining pin is interchangeable with the sear pin).

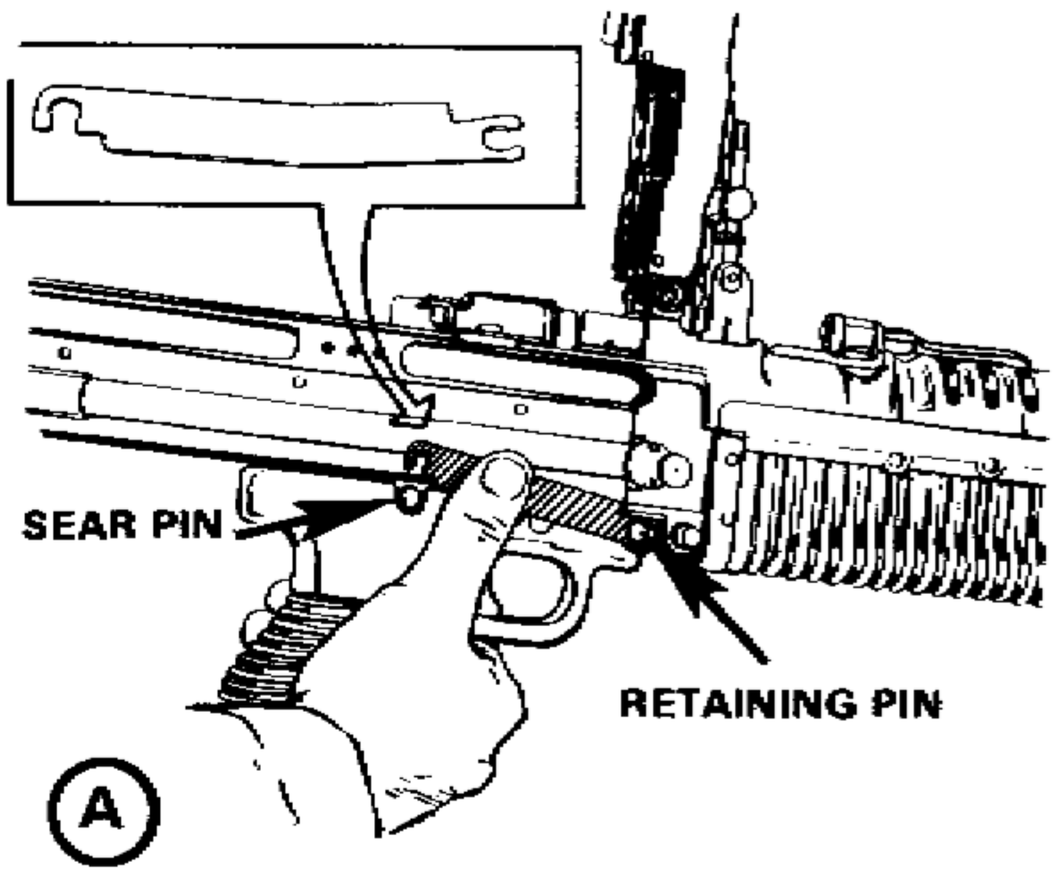
To remove the trigger-mechanism group, depress the rear of the leaf spring and rotate the rear end up to clear it from the sear pin. Pull to the rear to disengage the front notch of the leaf spring from the retaining pin.

Remove the retaining pin by pushing it to the left.

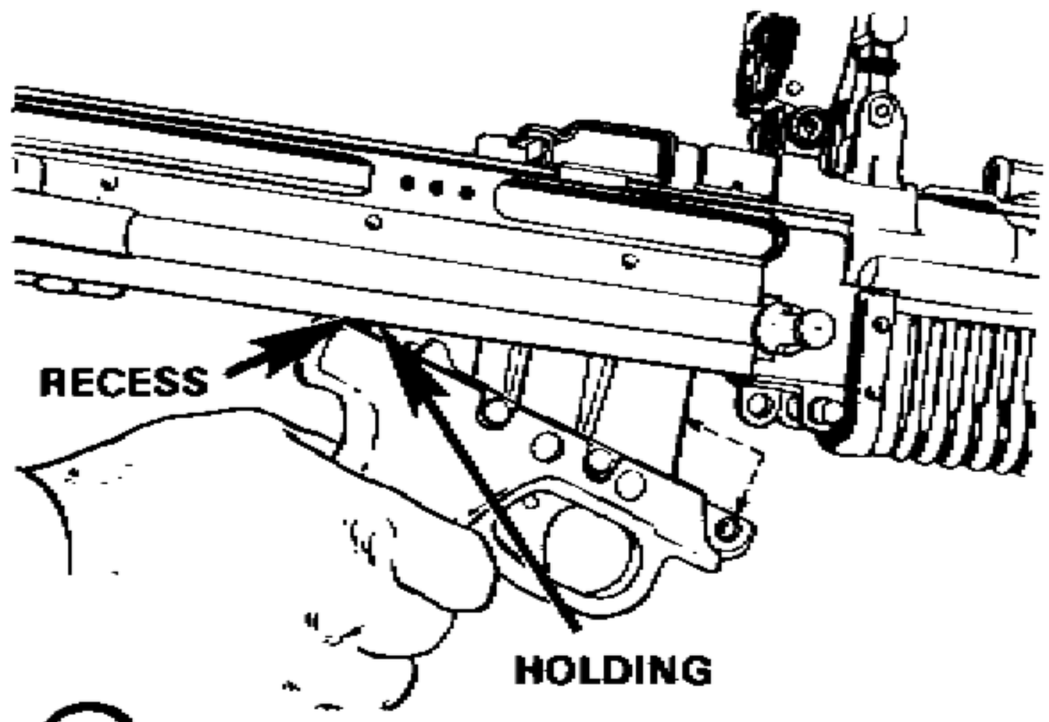


Slide the trigger-mechanism group slightly forward, rotating the front down, and remove it.

REMOVING THE TRIGGER-MECHANISM GROUP



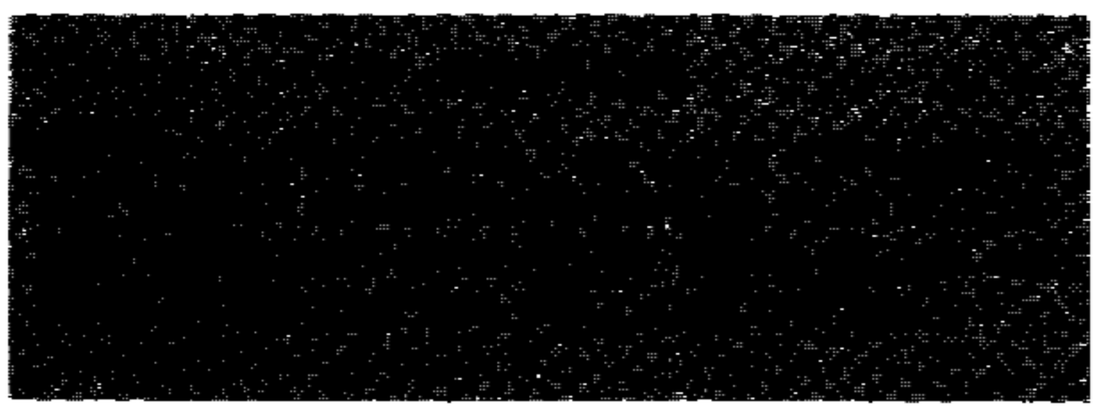
REMOVING THE LEAF SPRING



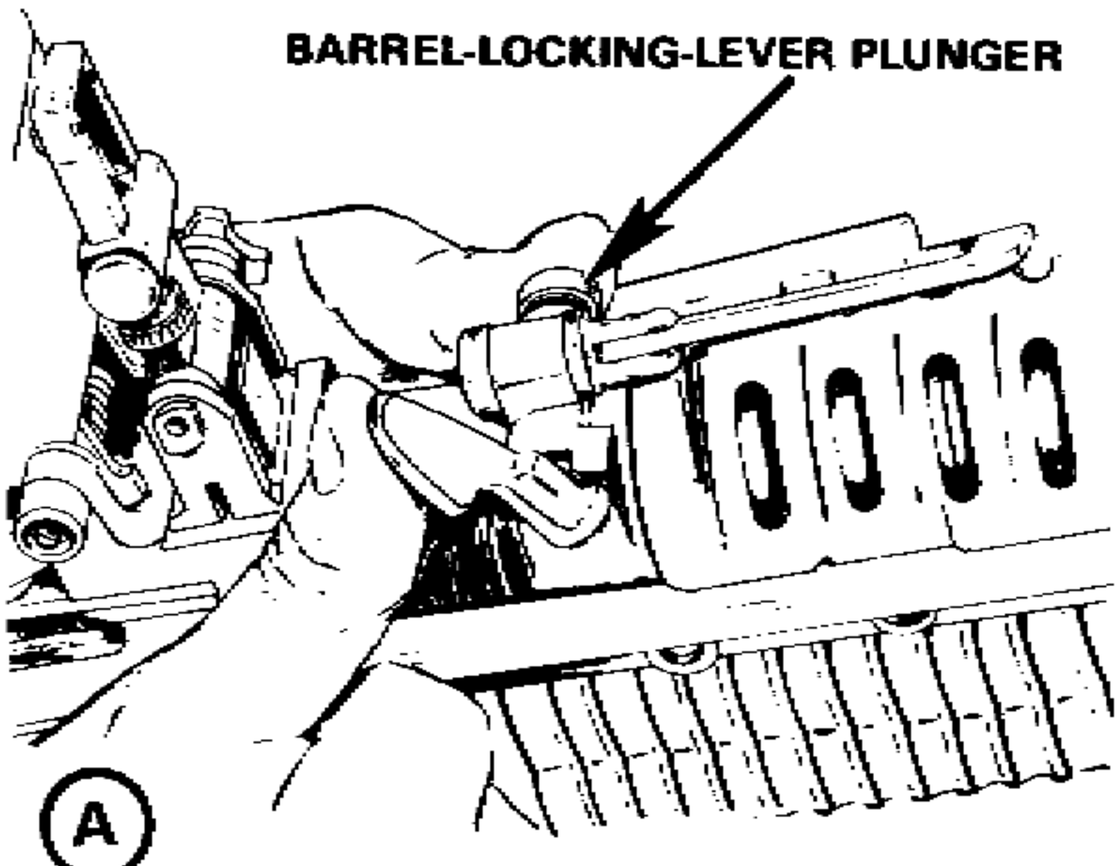
REMOVING THE TRIGGER-MECHANISM GROUP

REMOVING THE BARREL GROUP

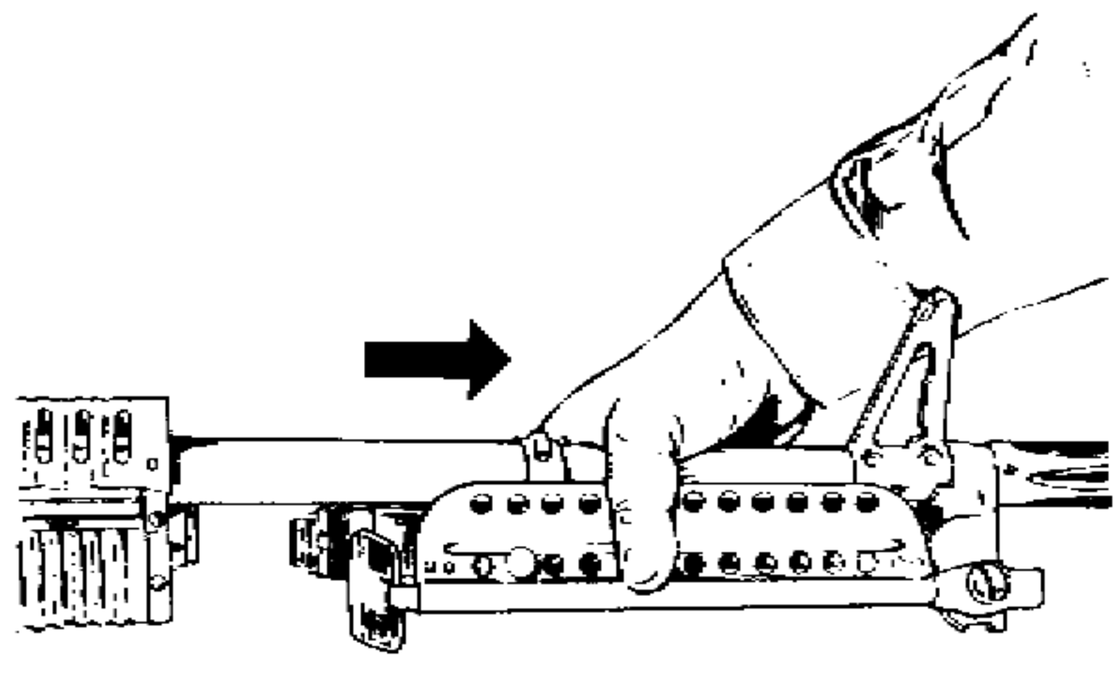
The barrel group consists of the barrel, flash suppressor, front sight, bipod assembly, and gas system. Push in on the barrel-locking-lever plunger and raise the barrel-locking lever to the vertical position. Remove the barrel group by pulling it straight to the front.



REMOVING THE BARREL GROUP



UNLOCKING THE BARREL



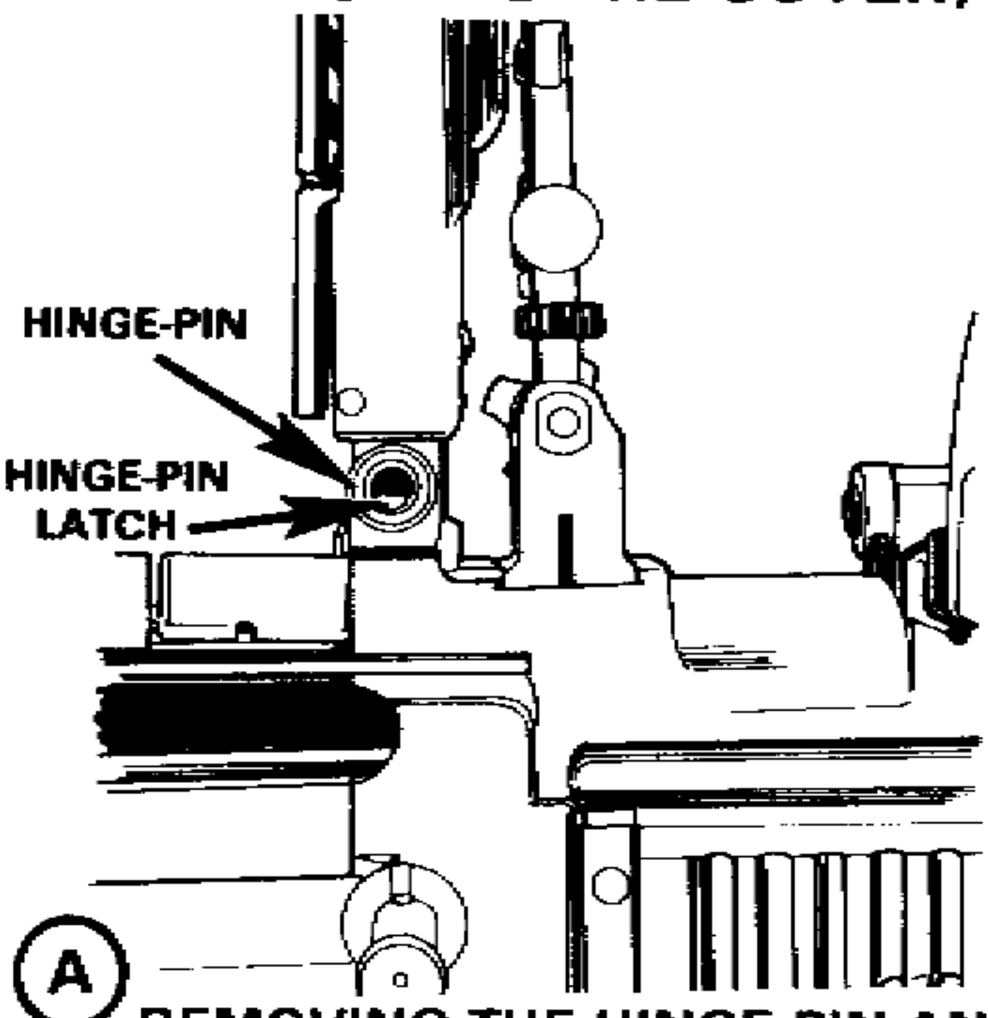
REMOVING THE BARREL GROUP

REMOVING THE COVER, FEED TRAY, AND HANGER GROUP

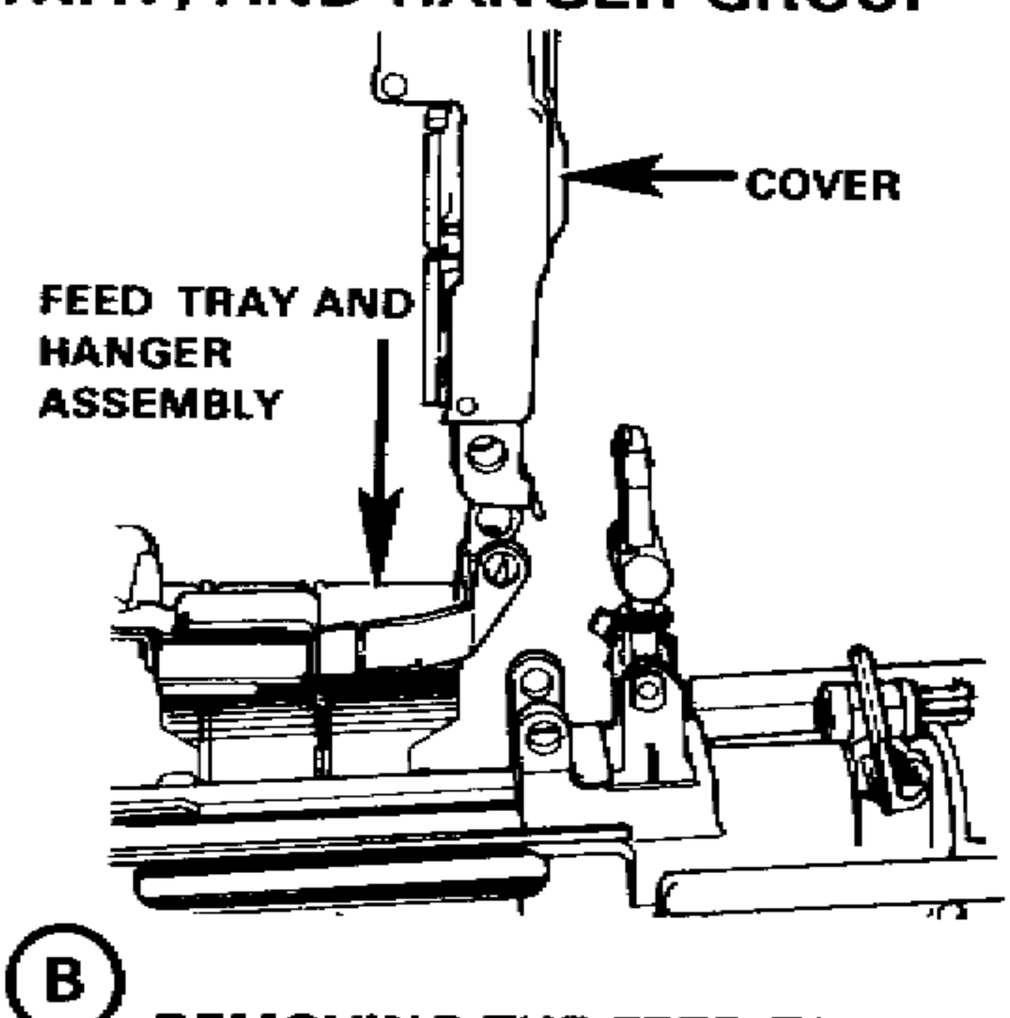
With the cover raised, use a pointed object to unlock the hinge pin latch and push it through the hinge pin by pushing on the half-moon-shaped end. Remove it from the left side.

Remove the hinge pin by pulling it from the right side. Lift the cover from the receiver assembly. Remove the spring from the cover. Raise the feed tray and hanger group and remove them from the receiver assembly.

REMOVING THE COVER, FEED TRAY, AND HANGER GROUP



REMOVING THE HINGE PIN AND THE HINGE-PIN LATCH

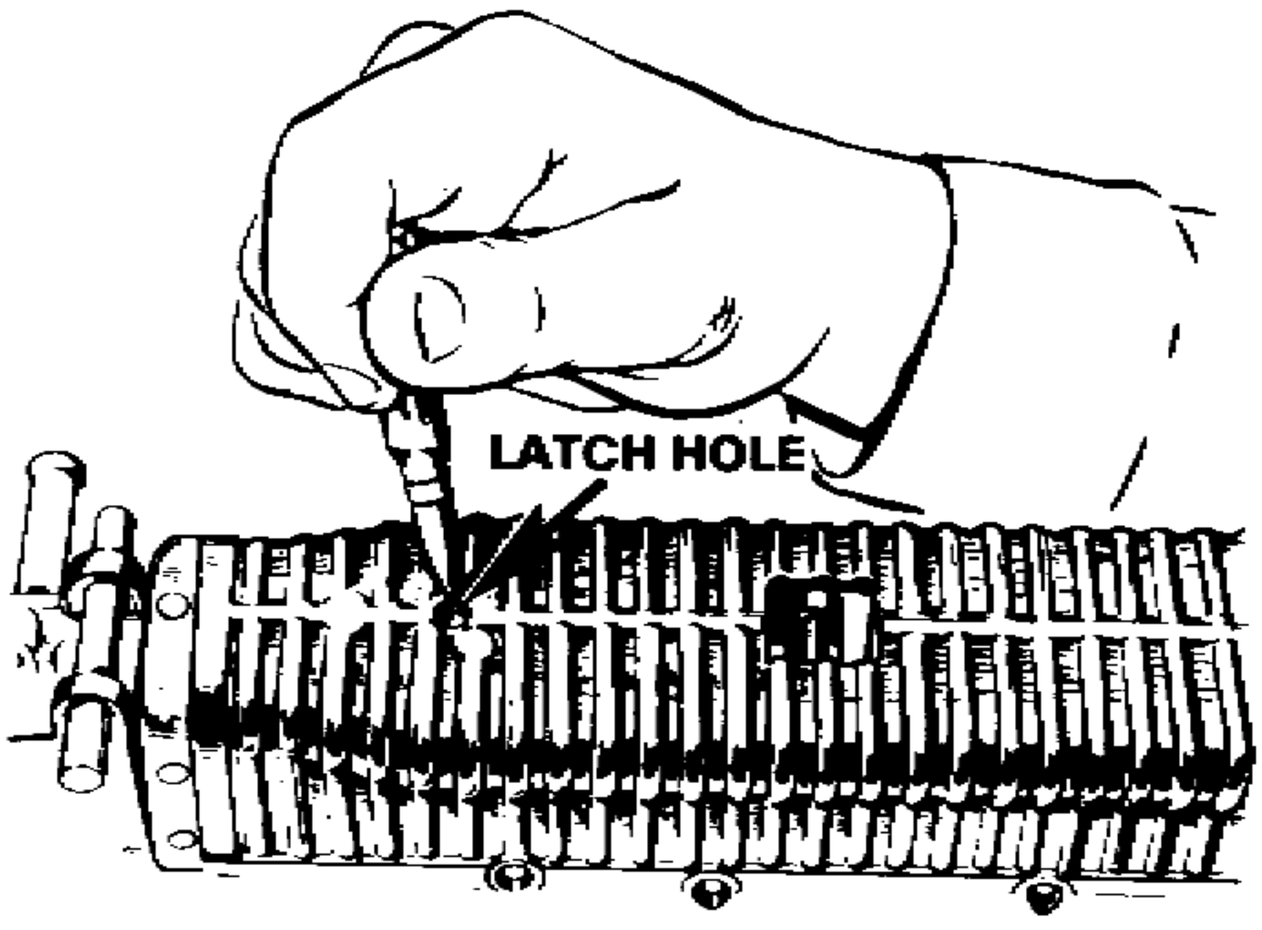


REMOVING THE FEED TRAY AND HANGER GROUP

REMOVING THE FOREARM ASSEMBLY

Press down with a pointed object to release the forearm latch. Slightly raise the rear of the forearm assembly and remove it toward the front.

REMOVING THE FOREARM ASSEMBLY



GENERAL ASSEMBLY

REPLACING THE FOREARM ASSEMBLY

To replace the forearm assembly, slide it over the operating-rod tube, insuring that the operating-rod tube does not strike the baffles inside the forearm assembly. Aline the recess in the forearm assembly with the end of the operating-rod tube.

Tap upward on the bottom rear of the forearm assembly with the palm of the hand to lock it into position.

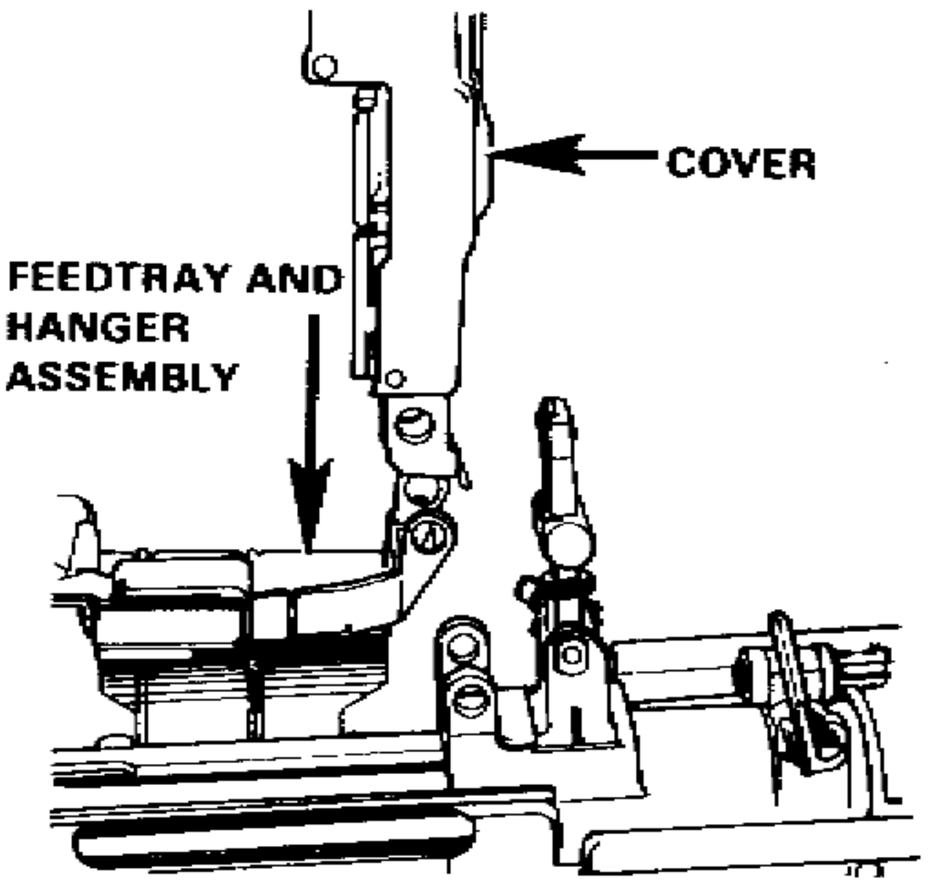
REPLACING THE COVER, FEED TRAY, AND HANGER GROUP

To replace the feed tray and hanger group, aline the guides on the left side of the cover-mounting brackets.

To replace the cover, insert the spring into the cover and then insert the cover spring in the well of the receiver assembly. Aline the cover with the mounting bracket.

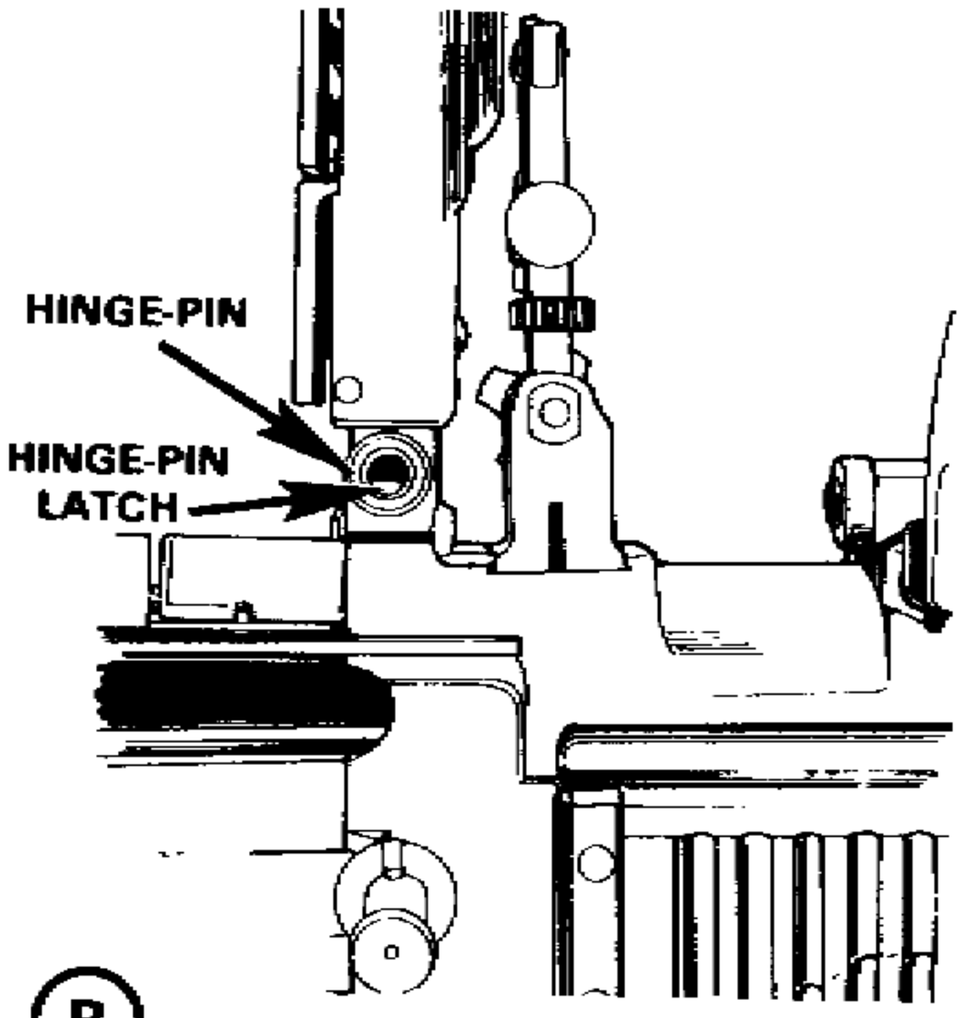
Insert the hinge pin from the right side, and then insert the hinge-pin latch from the left side, making sure that the hinge pin and hinge-pin latch interlock.

REPLACING THE FEED TRAY AND HANGER GROUP.



A

REPLACING THE FEED TRAY AND HANGER GROUP



B

REPLACING THE HINGE PIN AND HINGE-PIN LATCH

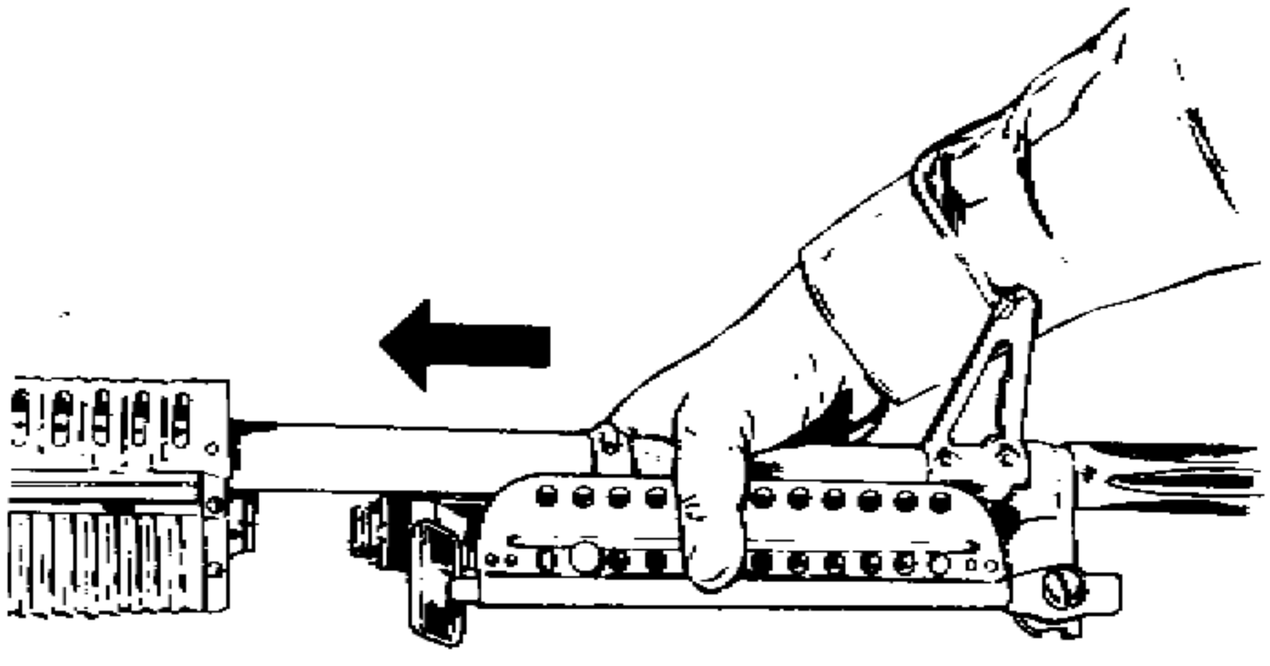
REPLACING THE BARREL GROUP

Insure that the barrel-locking lever is in the vertical position.

Insert the rear of the barrel into the forearm assembly and aline the gas system on the bottom of the barrel with the operating-rod tube.

Lower the barrel-locking lever. Insure that the gas system and operating-rod tube are fully seated.

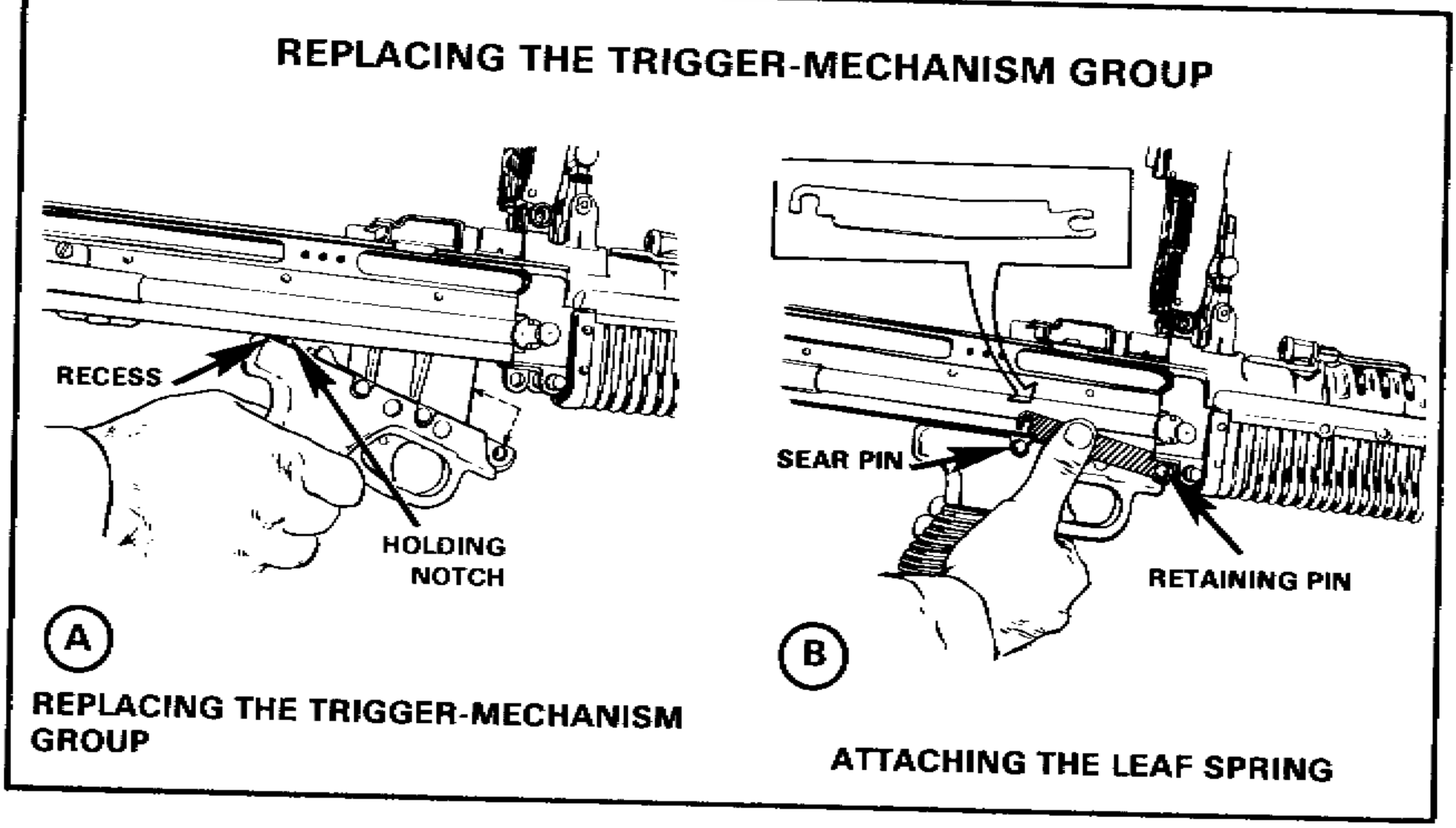
REPLACING THE BARREL GROUP



REPLACING THE TRIGGER-MECHANISM GROUP

Engage the holding notch of the trigger-mechanism group in its recess on the bottom of the receiver group. Rotate the front of the trigger mechanism up and aline the holes of the grip with the mounting bracket on the receiver group.

When replacing the retaining pin, insert it from the left. Attach the leaf spring by placing the open end of the leaf spring on the forward retaining pin, and then engage the hooked end over the sear pin (rear pin).



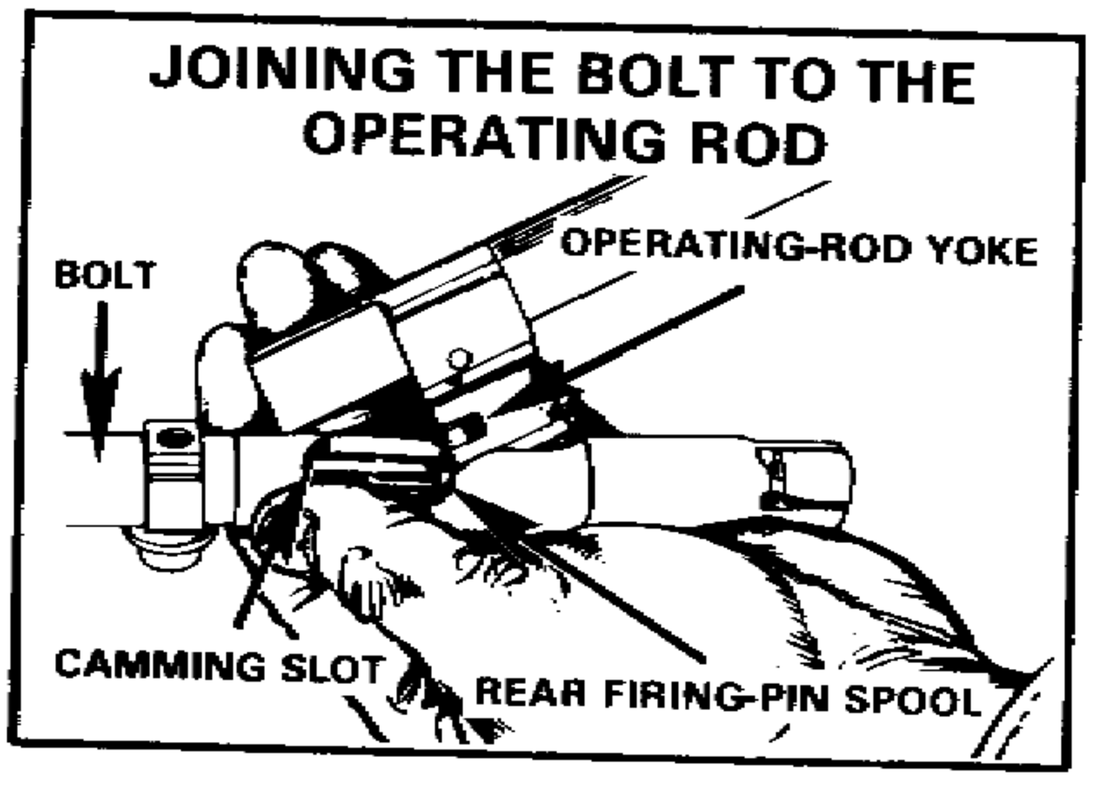
REPLACING THE TRIGGER-MECHANISM GROUP

ATTACHING THE LEAF SPRING

JOINING THE BOLT TO THE OPERATING ROD

Hold the bolt securely in one hand with the face of the bolt toward the body and the camming slot up. With the other hand, put the rear of the operating-rod yoke against the rear firing-pin spool.

Push the operating rod forward and down, compressing the firing-pin spring, and put the operating rod yoke between the two firing-pin spools.



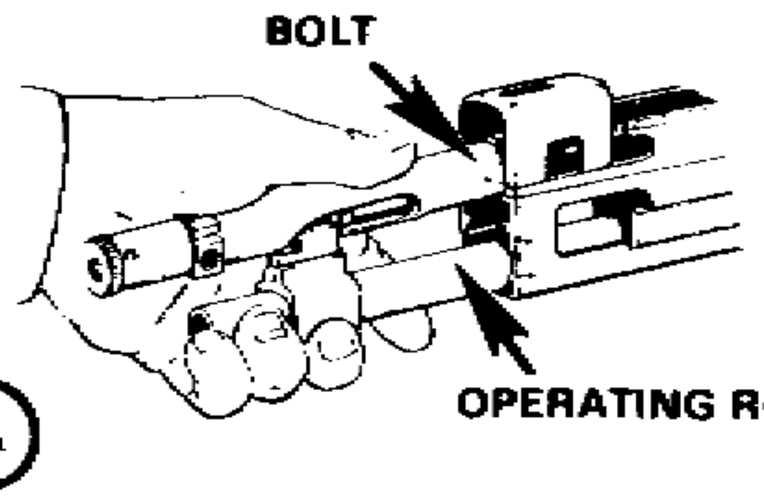
REPLACING THE BOLT AND OPERATING-ROD GROUP

Insert the end of the operating rod into the receiver until the face of the bolt is approximately 5 cm (2 in) from the rear of the receiver. Hold the rod with one hand, and push forward on the rear of the bolt with the other hand, causing it to rotate until the locking lugs are in a vertical position.

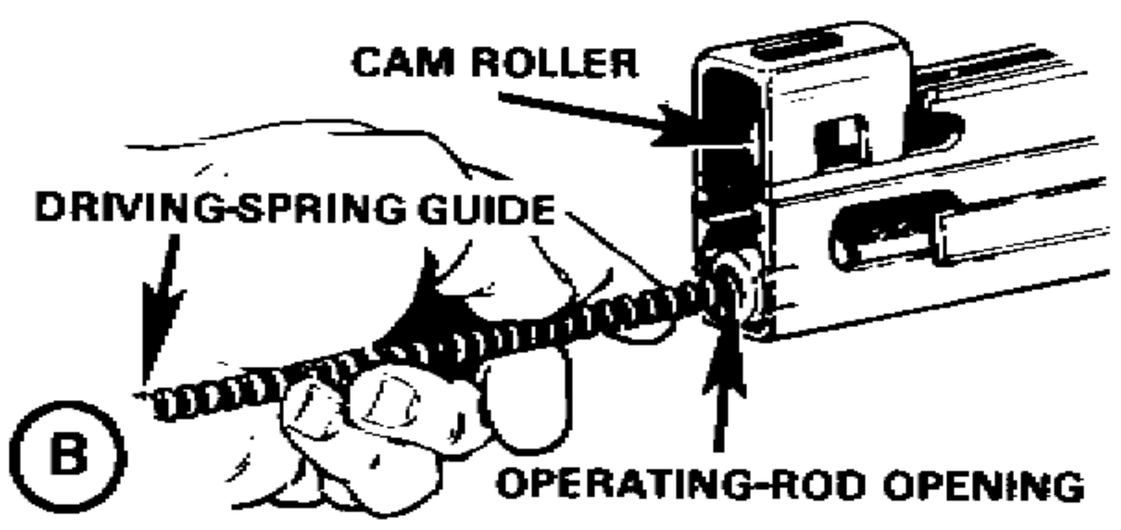
With the cam roller up, push the operating rod and bolt into the receiver until the end of the operating rod is even with the rear of the receiver.

Insert the driving-spring guide into the driving spring, then insert the free end of the driving spring into the opening of the operating rod. Pull the trigger and push forward on the cam roller, following the forward action of the operating rod with the driving spring.

REPLACING THE BOLT AND OPERATING-ROD GROUP



INSERTING THE BOLT AND OPERATING ROD INTO THE RECEIVER GROUP

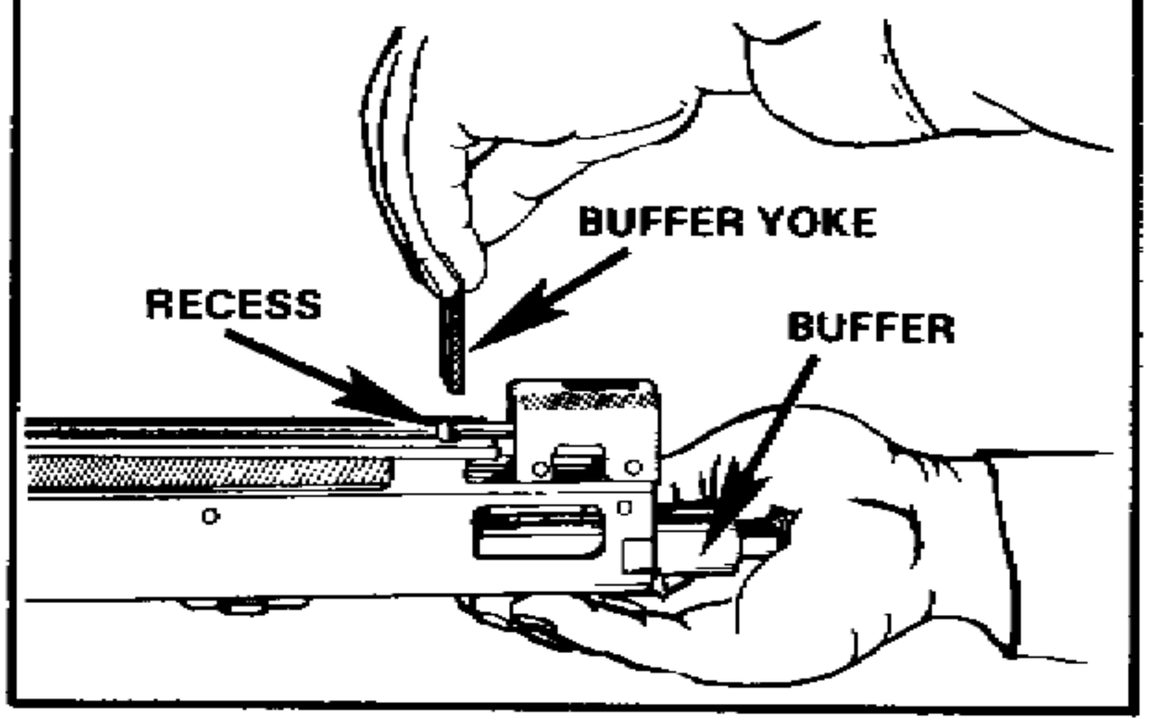


INSERTING THE DRIVING SPRING

REPLACING THE BUFFER ASSEMBLY

Insert the buffer plunger into the driving-spring guide. Push forward on the buffer until the recess on the buffer is alined with the recess in the receiver group. Replace the buffer yoke in the top of the receiver group. Insure that the buffer is locked in place.

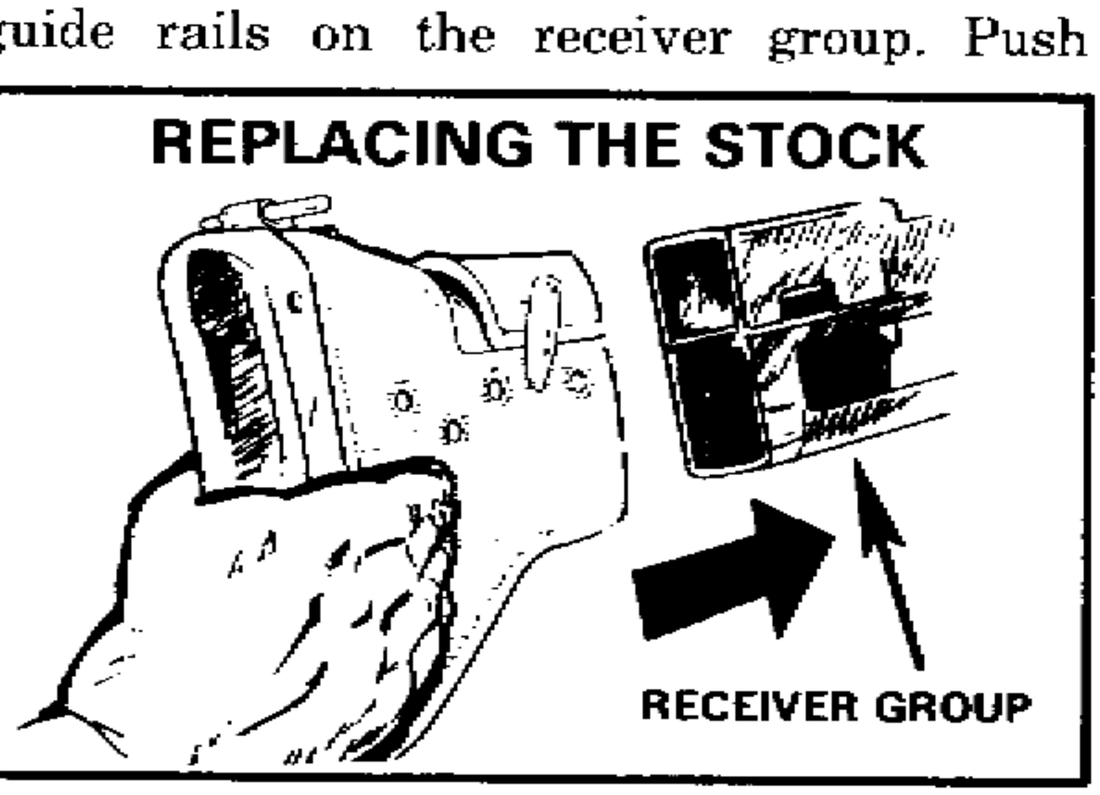
REPLACING THE BUFFER YOKE



REPLACING THE STOCK

Aline the guide rails of the stock with the guide rails on the receiver group. Push

REPLACING THE STOCK



forward until the stock is fully seated. The latch will make a distinct click when it engages.

CAUTION

EASE THE BOLT FORWARD TO AVOID DAMAGE TO THE TRAY AND PARTS OF THE BOLT.

CONDUCTING A FUNCTION CHECK

A function check must be made to insure that the M60 is correctly assembled. Place the safety on FIRE. Pull the cocking handle to the rear, cocking the M60; CLOSE THE COVER; PLACE THE SAFETY ON SAFE AND PULL THE TRIGGER (should NOT fire); place the safety on FIRE and pull the trigger WHILE HOLDING the cocking handle to allow the bolt to EASE forward. Move safety to SAFE.

If the bolt does not go forward, the M60 must be disassembled and then reassembled. If the M60 fires with the safety on SAFE, the squad leader must be notified and the gun must be turned in to maintenance to get the safety repaired.

DETAILED DISASSEMBLY AND ASSEMBLY

Detailed disasembly at unit level is limited to the barrel group, trigger-mechanism group, receiver assembly, and bolt assembly.

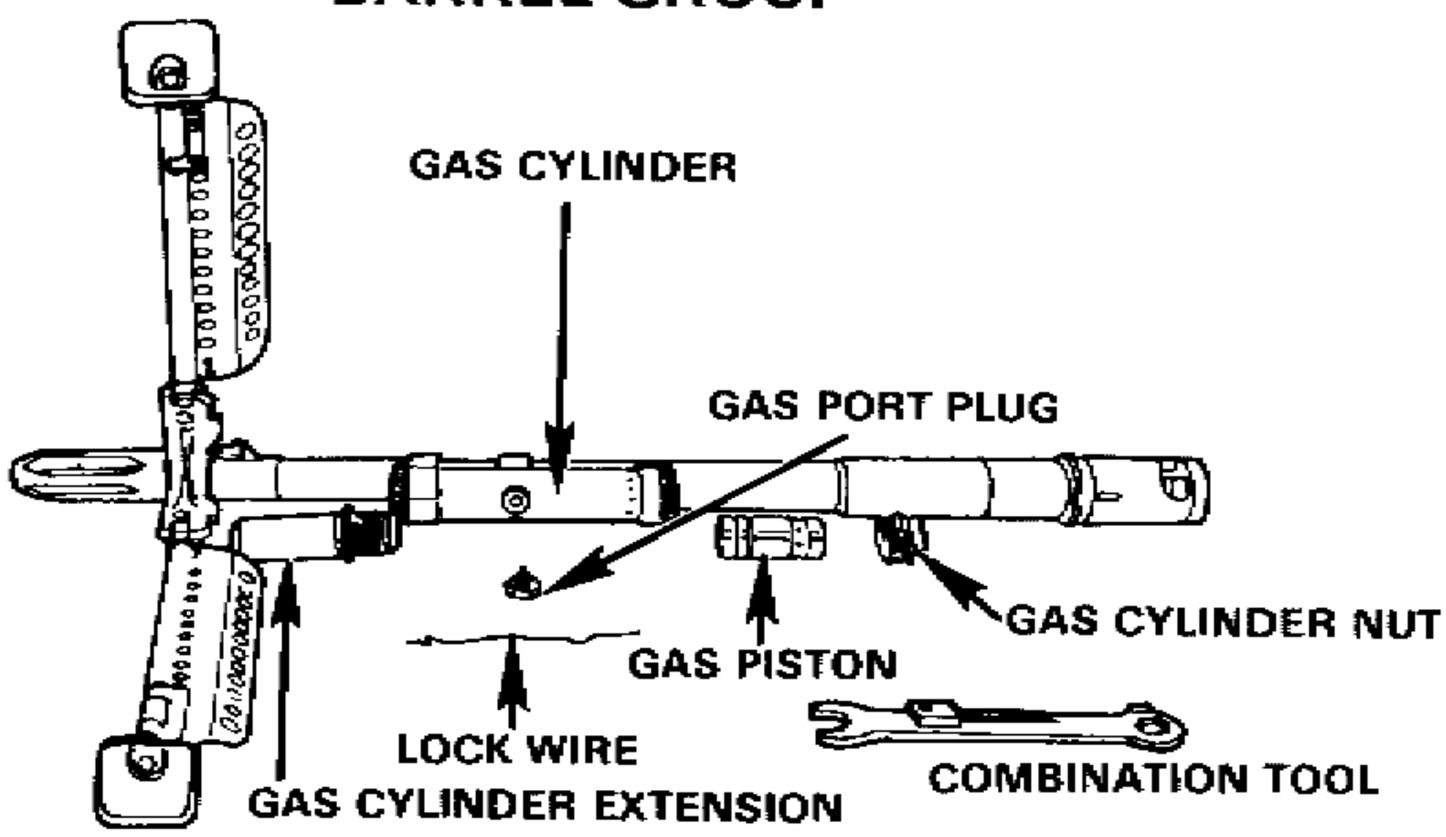
DISASSEMBLY OF THE BARREL GROUP

To disassemble the barrel group, place the bipod legs in the down position.

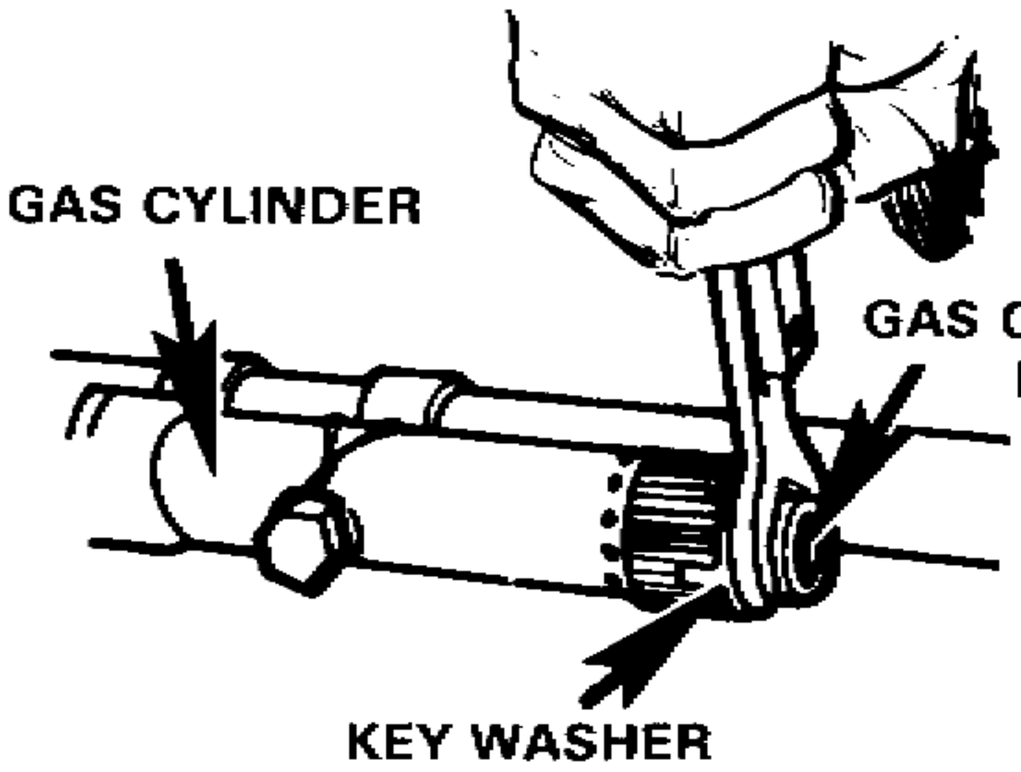
Use the combination tool to unscrew and remove the gas-cylinder nut. Allow the gas piston to slide out the rear of the cylinder. In training, the gas-port plug and lock wire are disassembled by the operator only under supervision. Unscrew and remove the gas-cylinder extension. This completes the disassembly of the barrel group.

NOTE: The gas cylinder components are disassembled only when the piston does not move freely as the barrel is tilted end-for-end. Disassembly of the gas system must be supervised by the unit armorer or organizational maintenance personnel because only they are authorized to wire the assembled parts.

BARREL GROUP

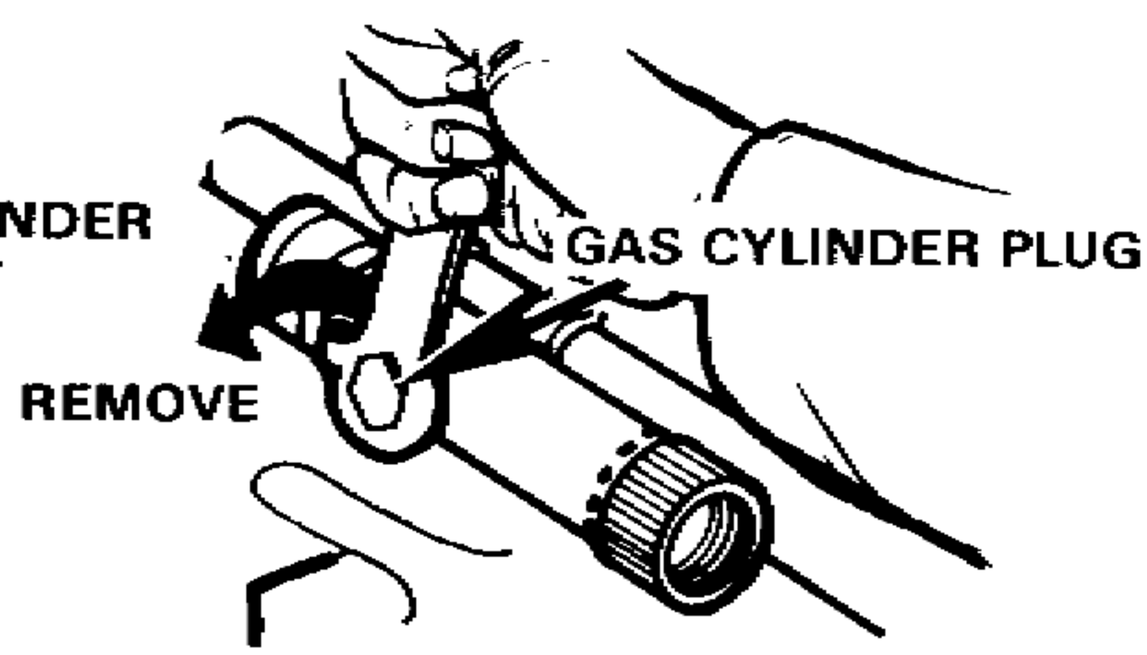


DISASSEMBLING THE BARREL GROUP



A

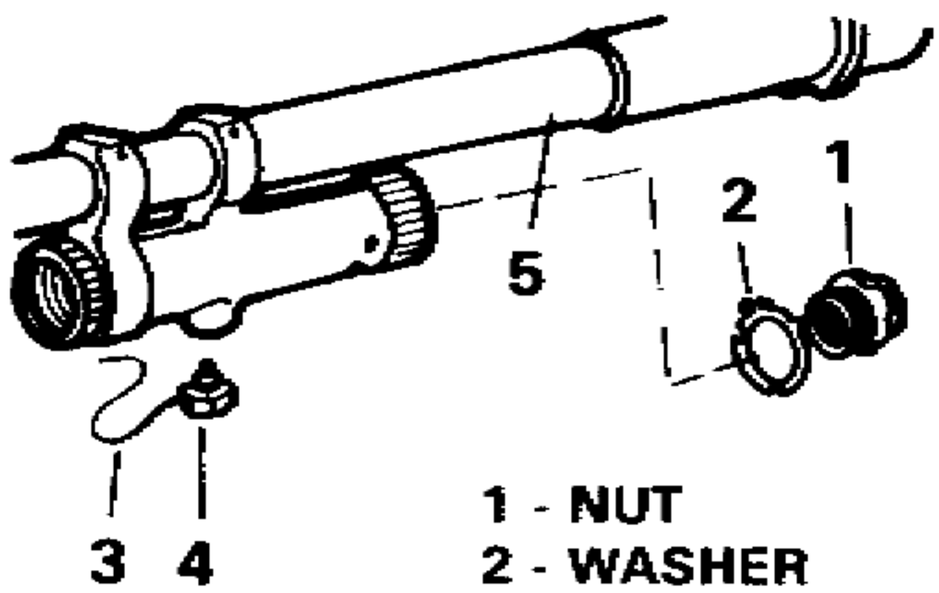
REMOVING THE NUT AND WASHER



CORROSION STEEL WIRE (SAFETY WIRE)

B

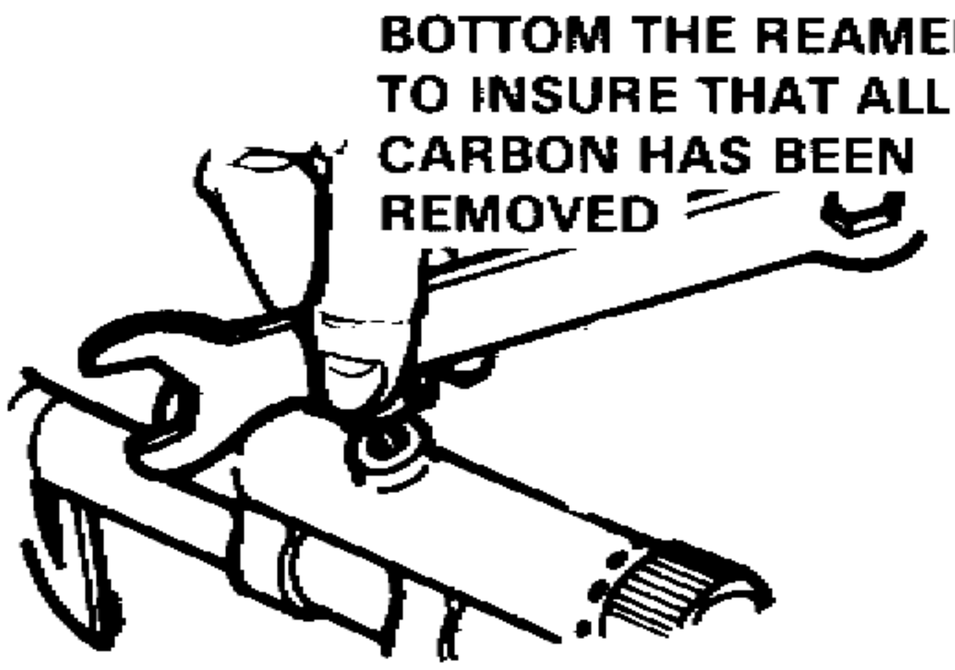
REMOVING THE WIRE PLUG



1 - NUT
2 - WASHER
3 - WIRE
4 - PLUG
5 - BARREL

C

CLEANING THE GAS PLUG



D

CAUTION
TO PREVENT DAMAGE CARE SHOULD BE TAKEN WHEN INSERT-ING REAMER INTO GAS CYLINDER

CLEANING THE GAS SYSTEM

DISASSEMBLY OF THE TRIGGER-MECHANISM GROUP

To disassemble the trigger-mechanism group:

Depress the sear and remove the retaining pin by pulling it to the left.

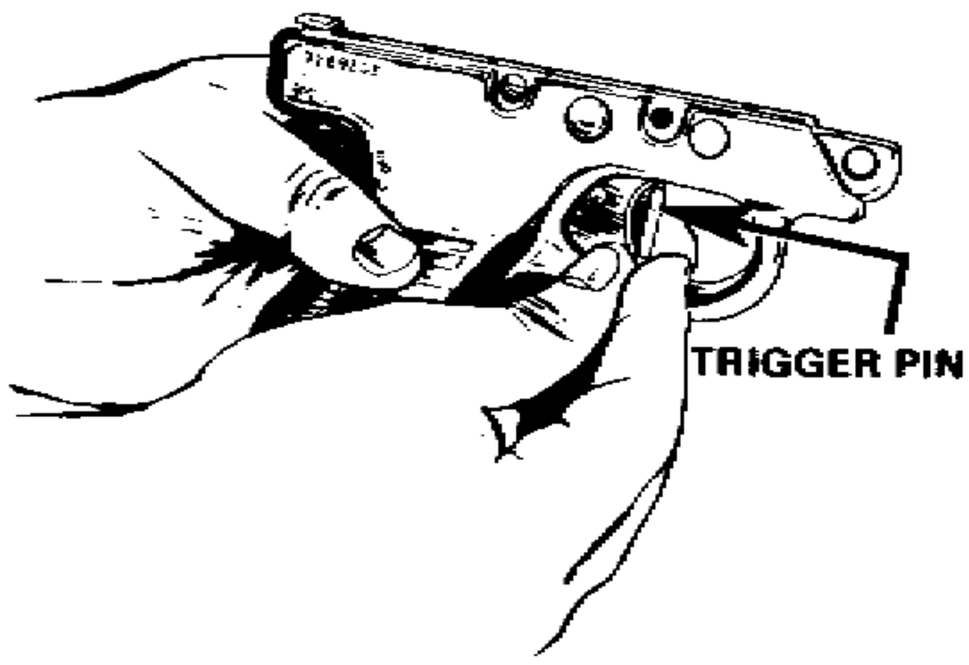
Remove the sear from the top of the trigger-mechanism group.

Remove the sear plunger and sear-plunger spring.

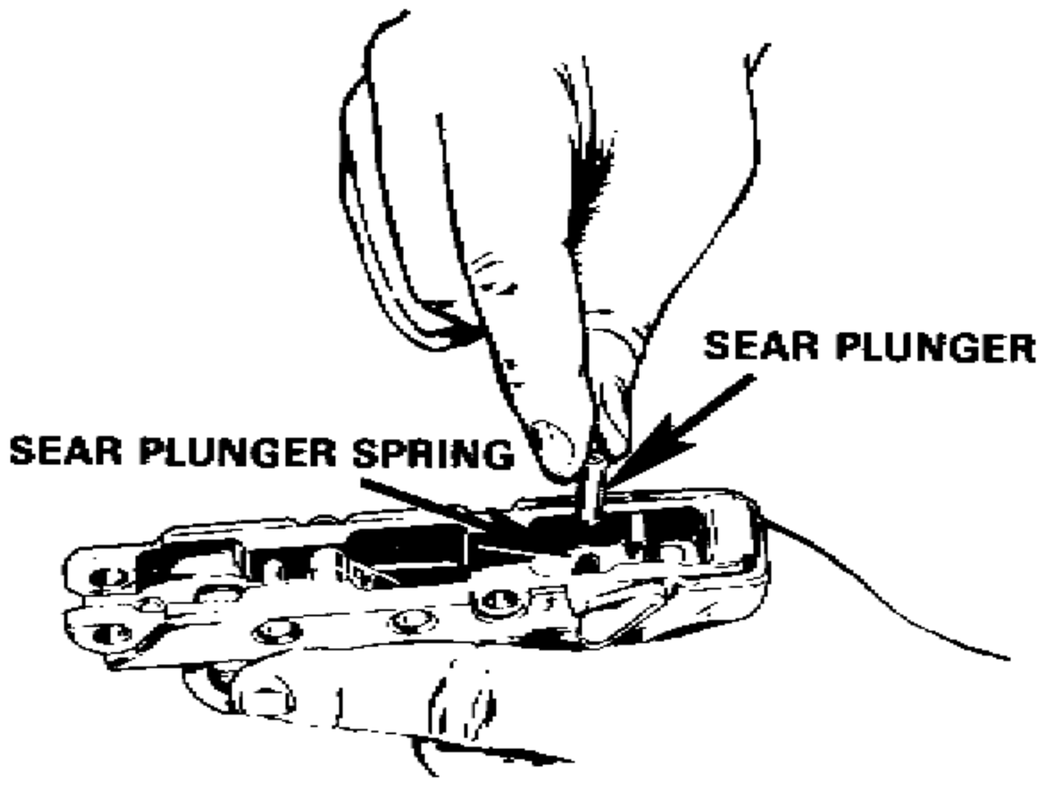
Remove the trigger pin by pulling it to the right.

Remove the trigger through the top of the grip.

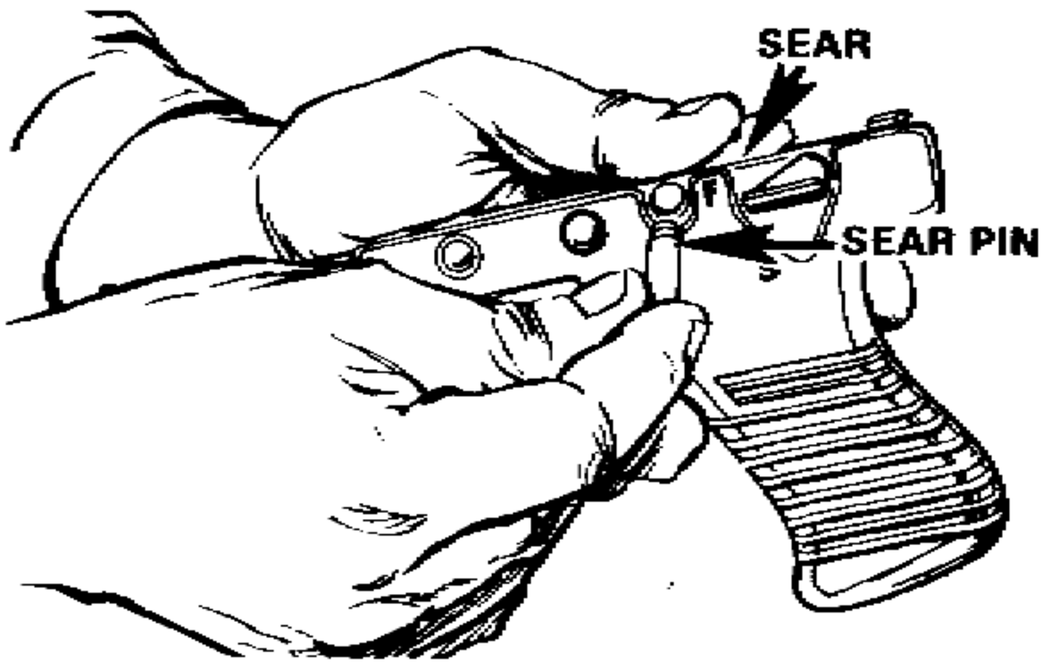
DISASSEMBLING THE TRIGGER-MECHANISM GROUP



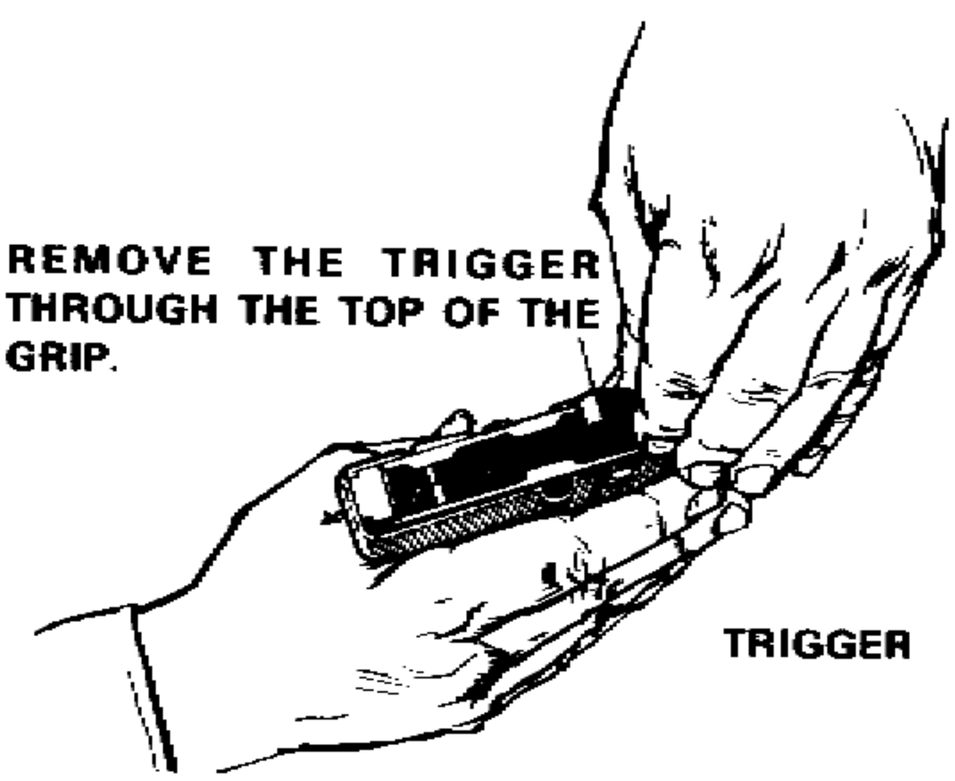
(A) REMOVING THE TRIGGER PIN



(B) REMOVING THE SEAR PLUNGER



(C) REMOVING THE SEAR RETAINING PIN



(D) REMOVING THE TRIGGER

DISASSEMBLY OF THE RECEIVER GROUP (COCKING HANDLE)

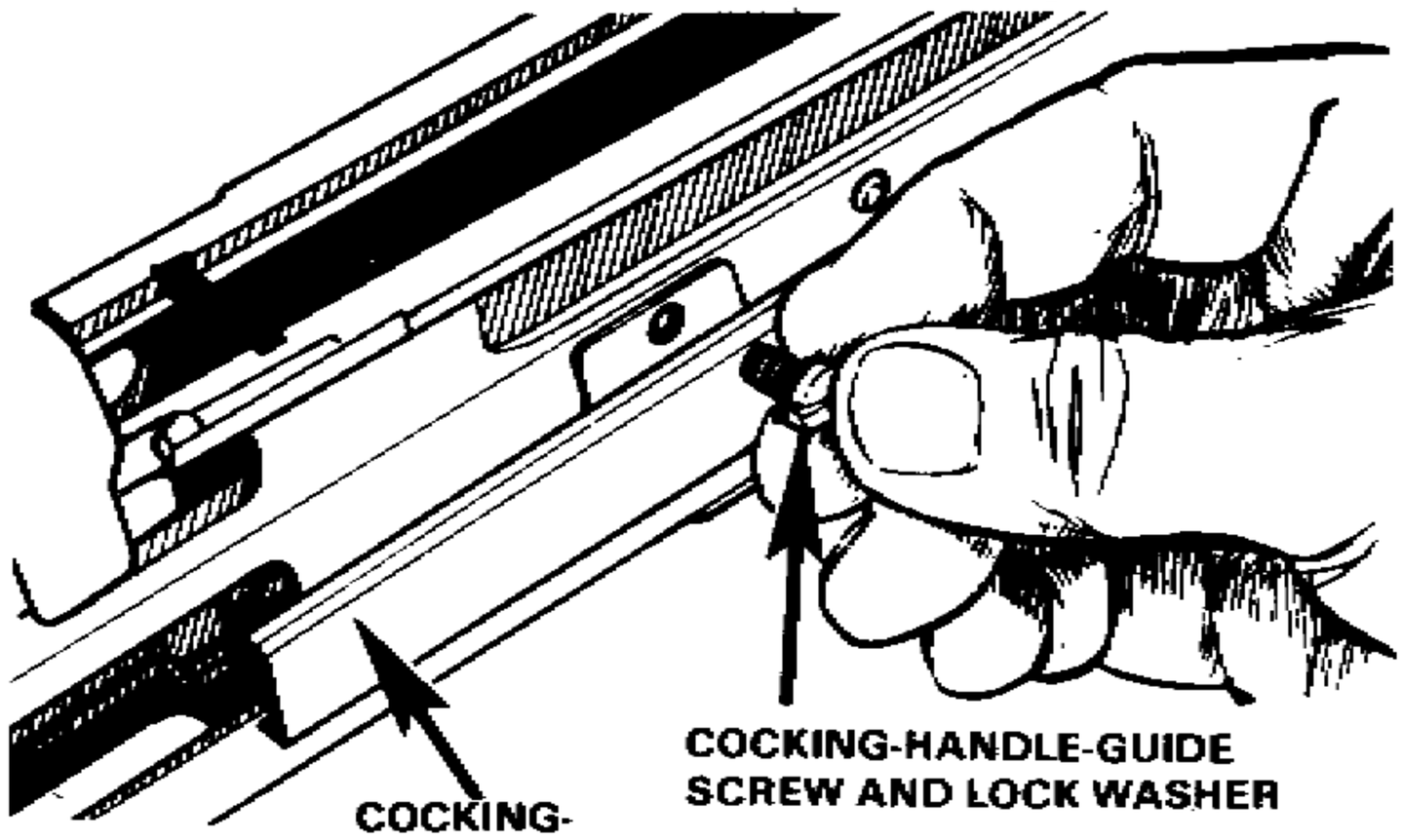
To disassemble the receiver group (cocking handle):

Unscrew and remove the cocking-handle-guide screw and lock washer.

Remove the cocking-handle guide by rotating it downward and away from the receiver.

Pull the cocking handle to the rear and remove it from the guide slot.

REMOVING THE COCKING-HANDLE-GUIDE SCREW AND LOCK WASHER



DISASSEMBLY OF THE BOLT

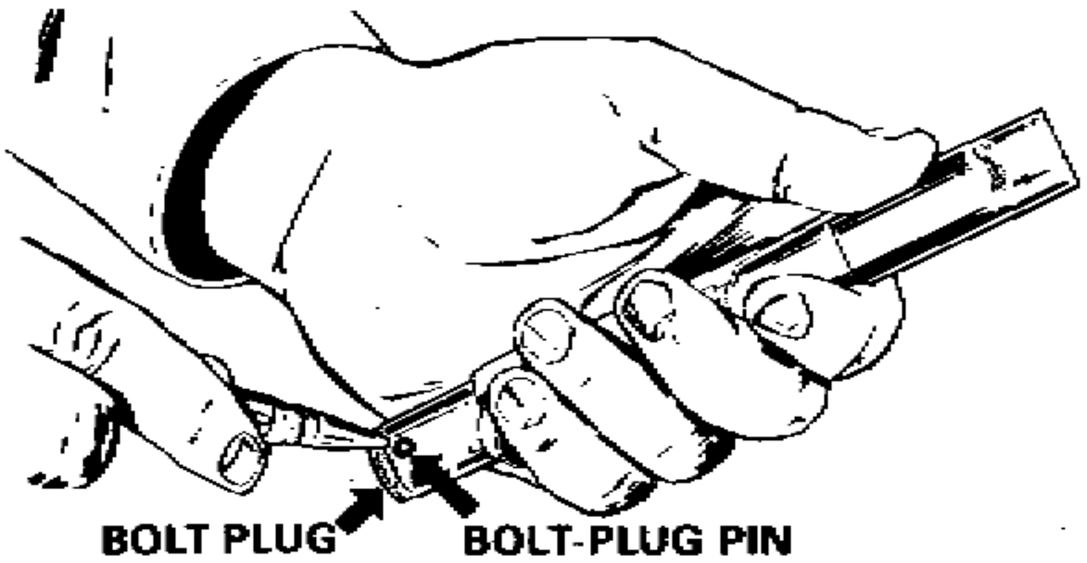
Rotate the cam-roller assembly on the bolt until the holes are alined with the bolt-plug pin at the rear of the bolt. Using the pointed object, remove the bolt-plug pin. Remove the bolt plug by turning it counterclockwise.

Remove the cam roller assembly by pulling it from the rear of the bolt.

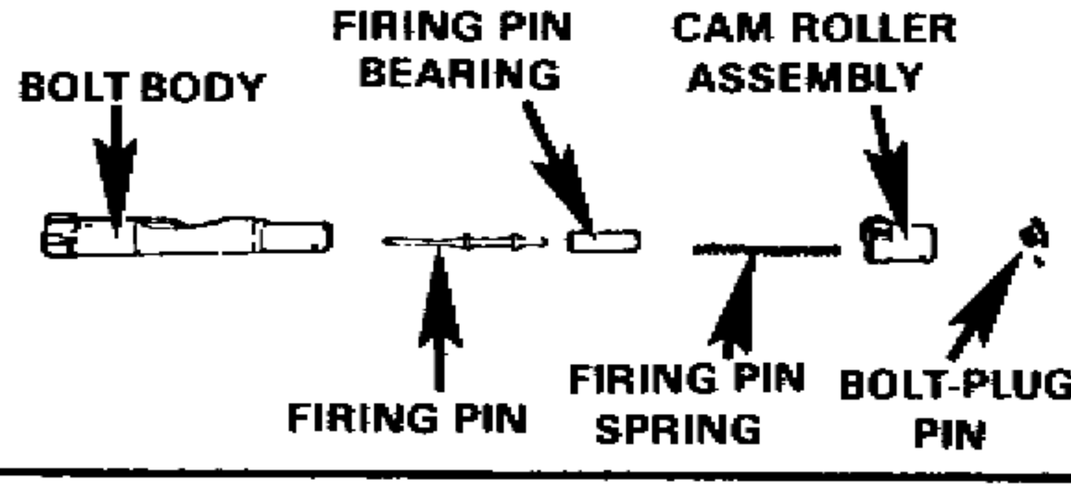
Remove the spring, firing-pin bearing, and firing pin from the bolt body.

NOTE: No further disassembly of the bolt by the machinegun crew is authorized.

REMOVING THE BOLT-PLUG PIN



DISASSEMBLED BOLT



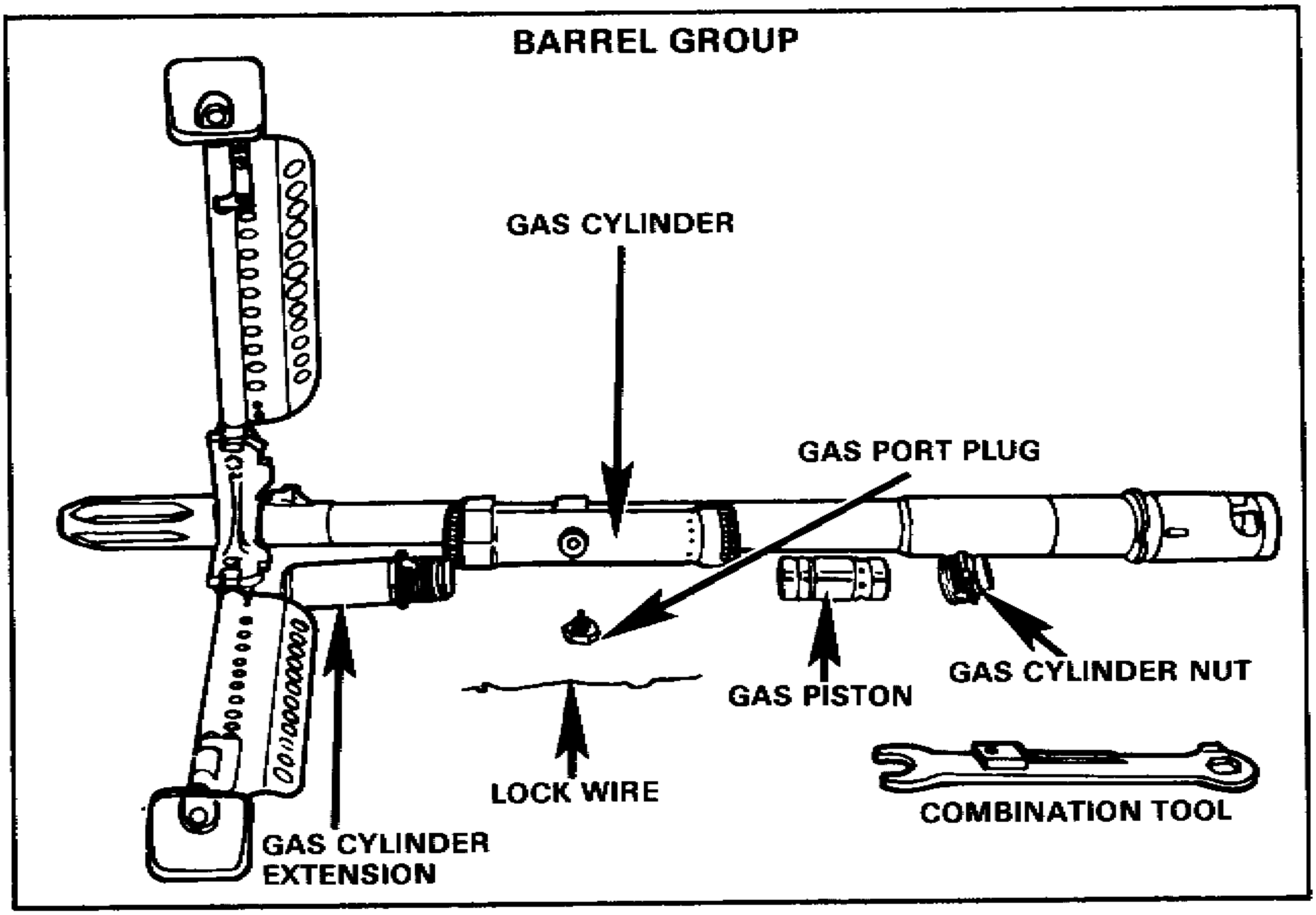
ASSEMBLY OF THE BARREL GROUP

To assemble the barrel, replace the gas-cylinder extension and tighten, using the combination tool.

Position the gas piston so that the gas escape holes are closed and are to the rear. Insert the gas piston into the gas cylinder (open end goes in first).

Replace the gas-cylinder nut and tighten, using the combination tool.

NOTE: The safety wire must be installed by the unit armorer or organizational maintenance personnel.

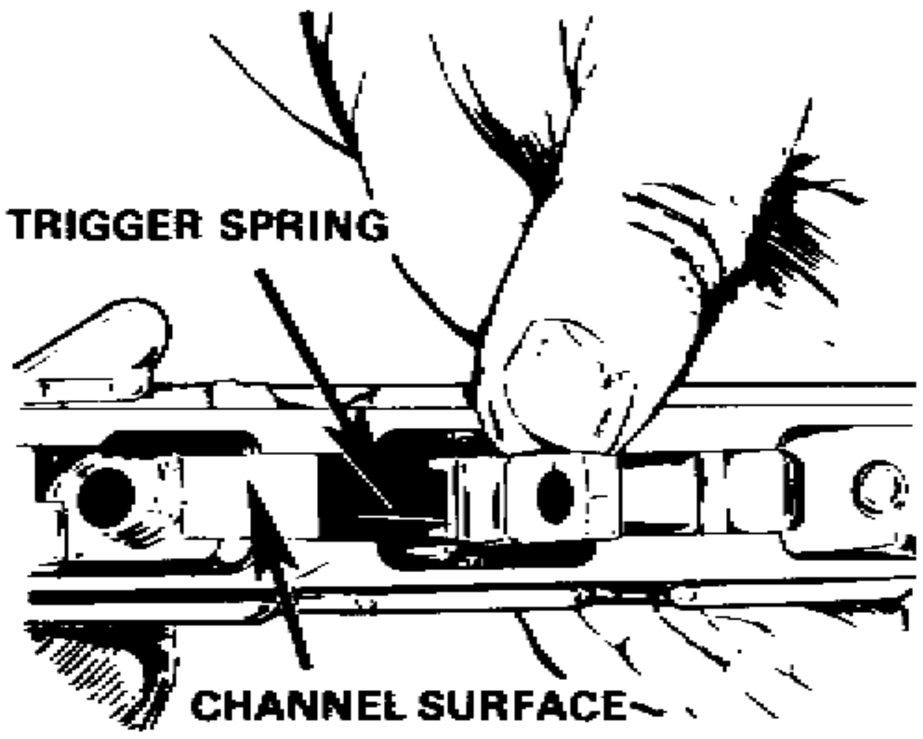


ASSEMBLY OF THE TRIGGER-MECHANISM GROUP

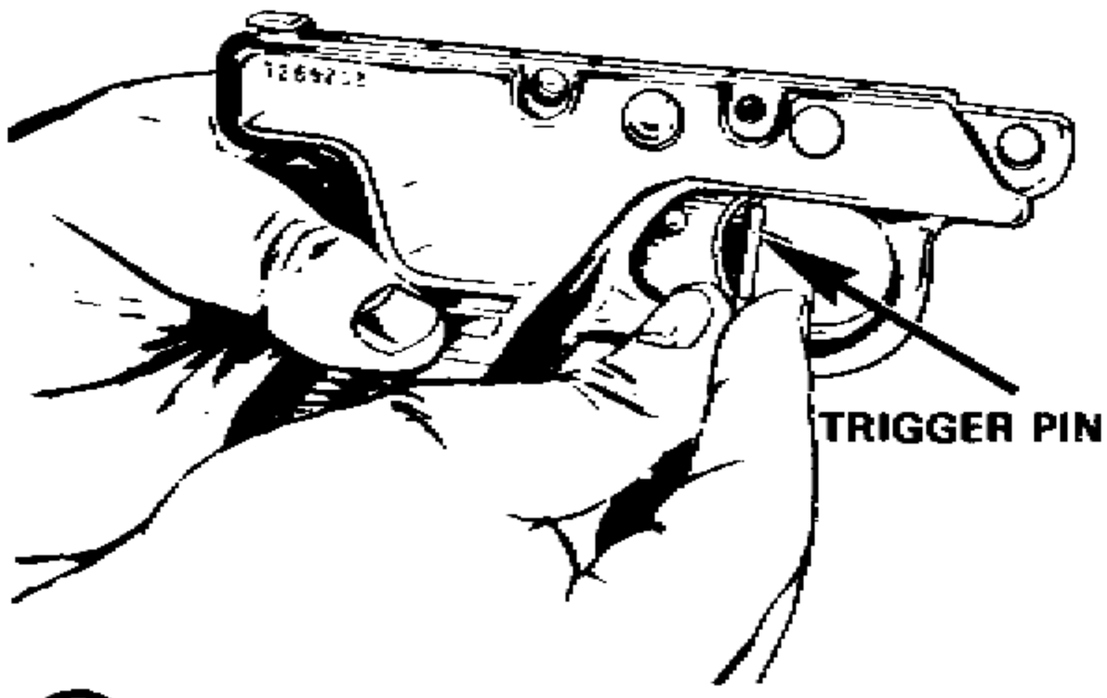
Insert the trigger (with the trigger spring to the rear) through the top of the trigger mechanism so that the spring is under the channel surface. Aline the hole in the trigger with holes in the trigger mechanism. Replace the trigger pin from the right. Replace the sear-plunger spring and sear plunger in the well in the channel surface.

Position the sear with the shoulder up and to the rear. Press down on the sear and replace the sear pin from the left.

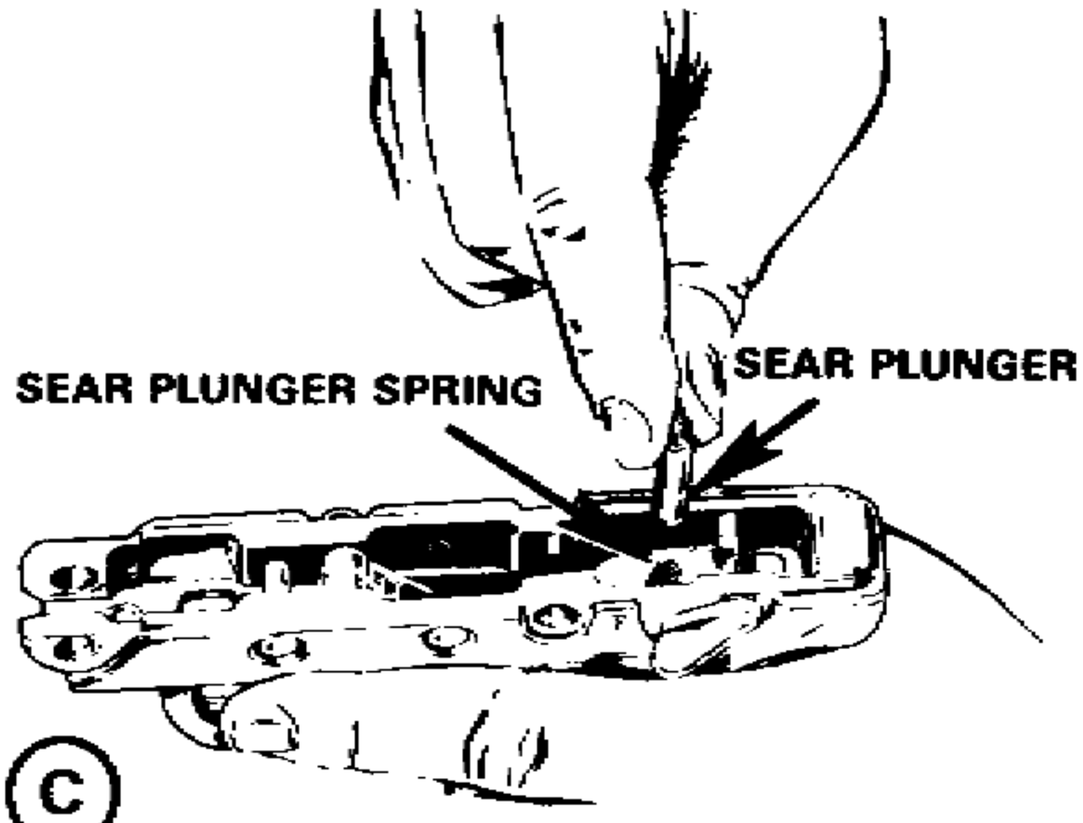
ASSEMBLING OF THE TRIGGER-MECHANISM GROUP



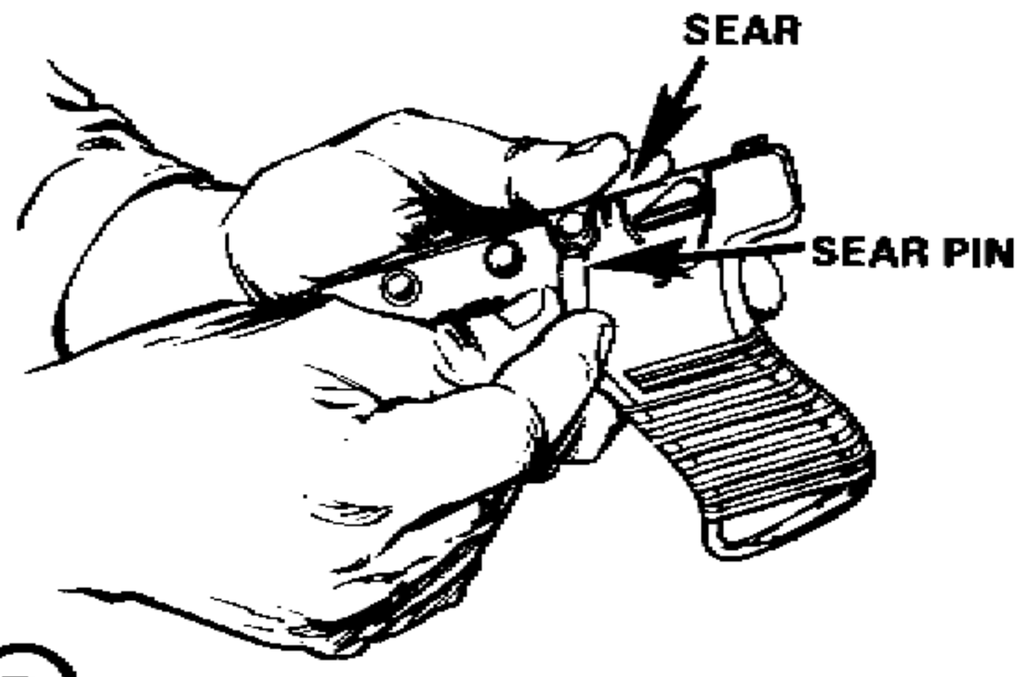
A INSERTING THE TRIGGER



B REPLACING THE TRIGGER PIN



C REPLACING THE SEAR PLUNGER



D REPLACING THE SEAR PIN

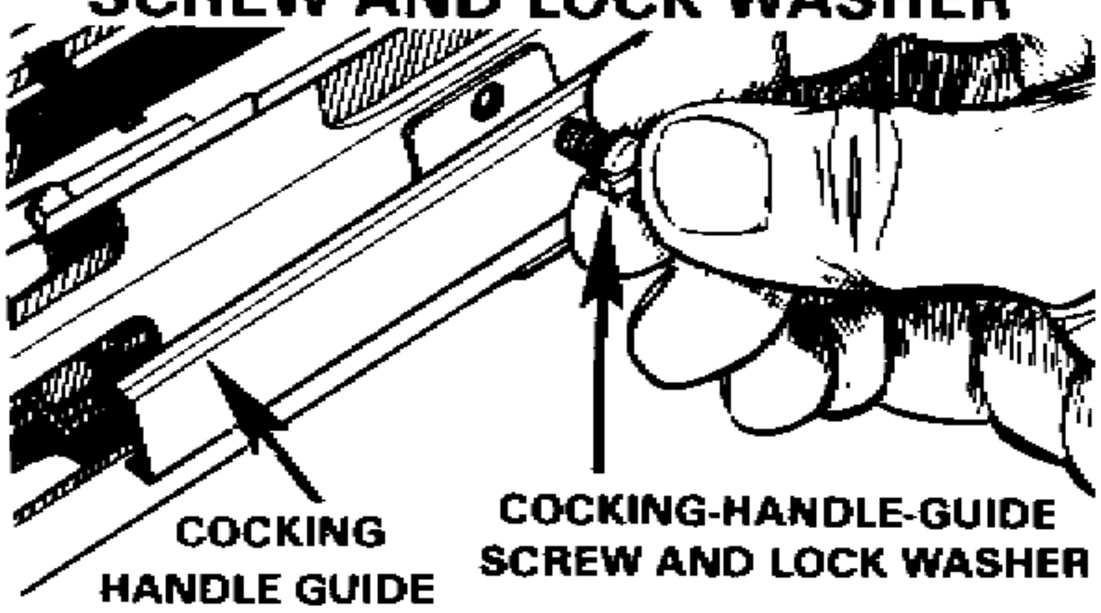
ASSEMBLY OF THE COCKING-HANDLE

Position the cocking-handle in the square opening at the rear of the cocking-handle-guide slot and push it forward.

Position the cocking-handle-guide over the cocking-handle by inserting the bottom tabs in the slots in the receiver, then properly aline the screw holes and rotate it upward into position.

Replace the lock washer and screw.

REPLACING THE COCKING-HANDLE-GUIDE SCREW AND LOCK WASHER



ASSEMBLY OF THE BOLT

Hold the bolt body in the palm of the hand, face down, and insert the striker end of the firing pin into the rear of the bolt body.

Insert the firing-pin bearing into the bolt body with the partially closed end first.

Position the firing-pin spring within the firing-pin bearing.

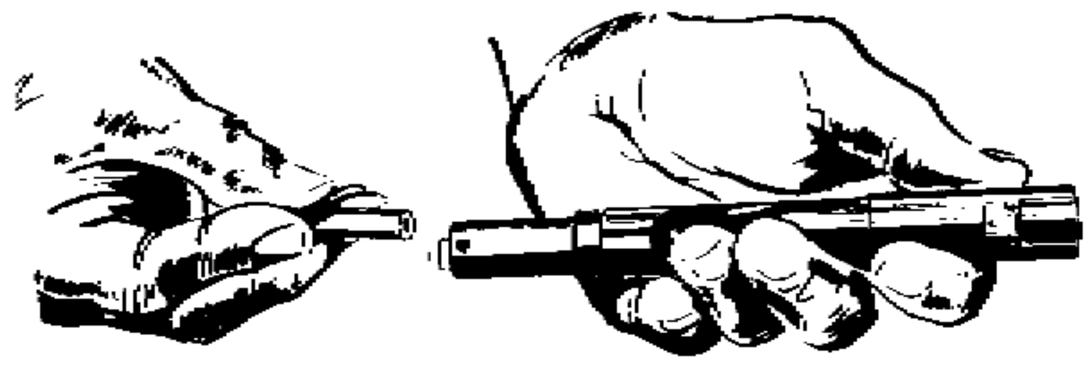
Place the cam-roller assembly over the rear of the bolt body with the cam roller toward the front of the bolt.

Screw the bolt plug finger-tight into the bolt body. Rotate the cam-roller assembly until the holes are alined with the holes in the bolt body. Insert the bolt-plug pin into the cam-roller assembly. The cam-roller assembly should rotate freely around the bolt.

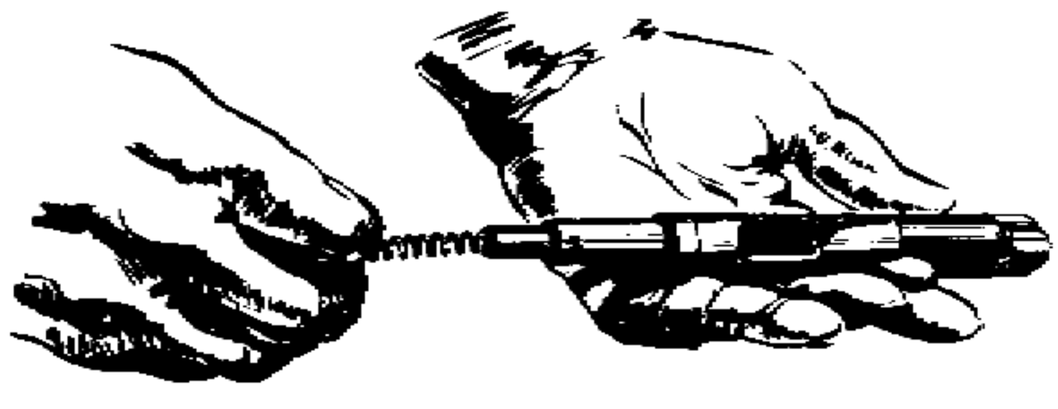
ASSEMBLING THE BOLT



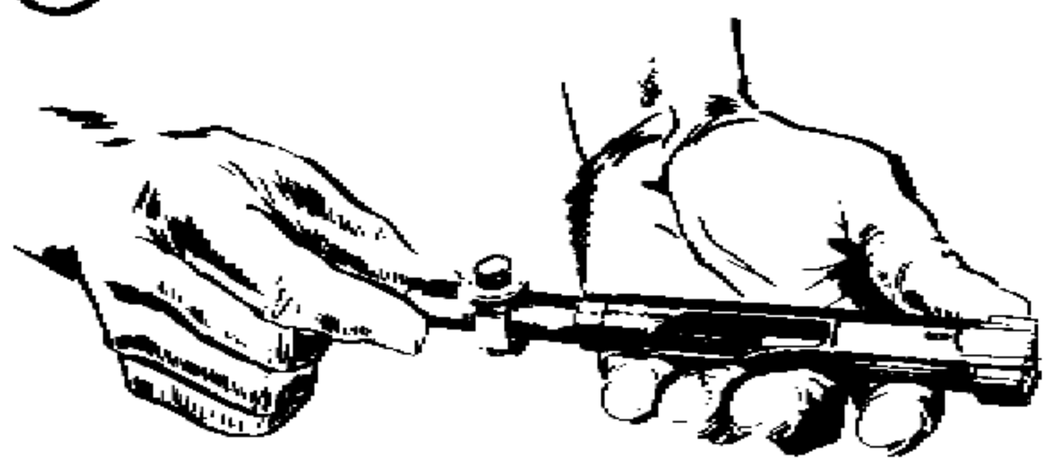
A HOLDING THE BOLT



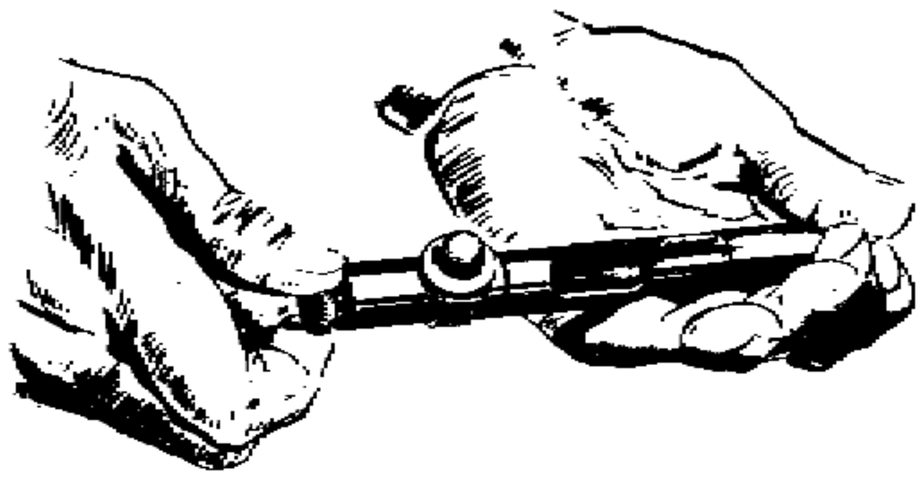
B INSERTING THE FIRING PIN



C POSITIONING THE FIRING-PIN SPRING



D PLACING THE CAM-ROLLER ASSEMBLY



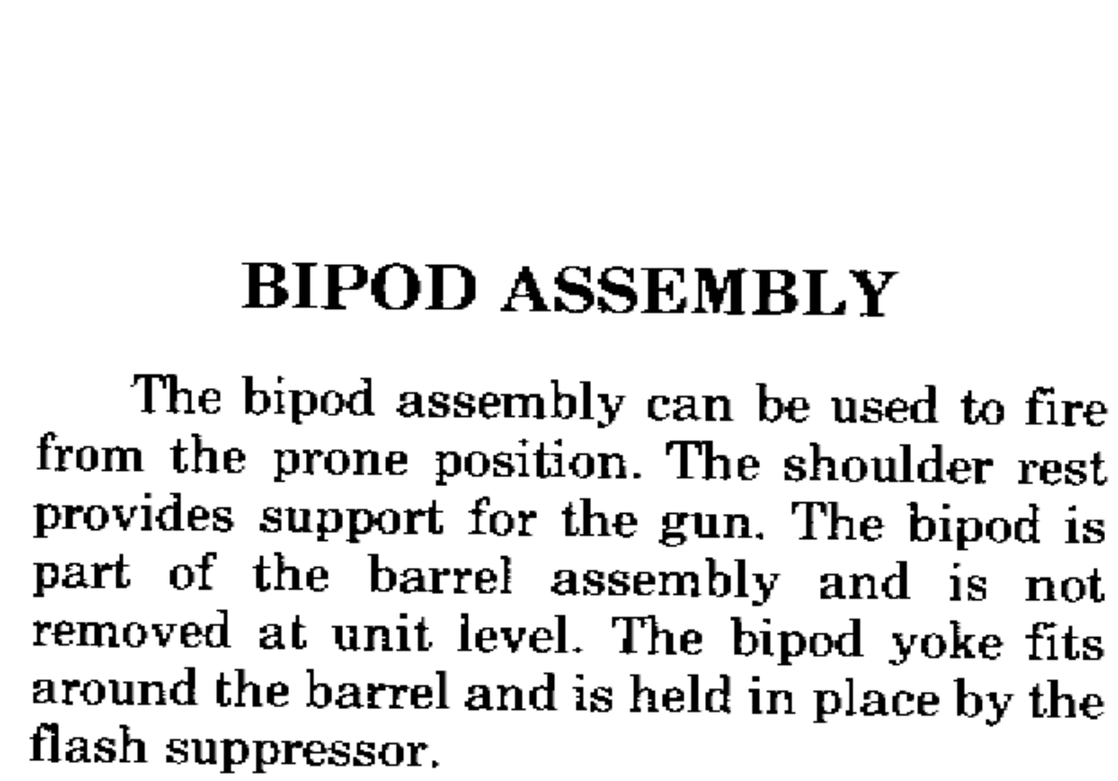
E TIGHTENING THE BOLT

CHAPTER 3

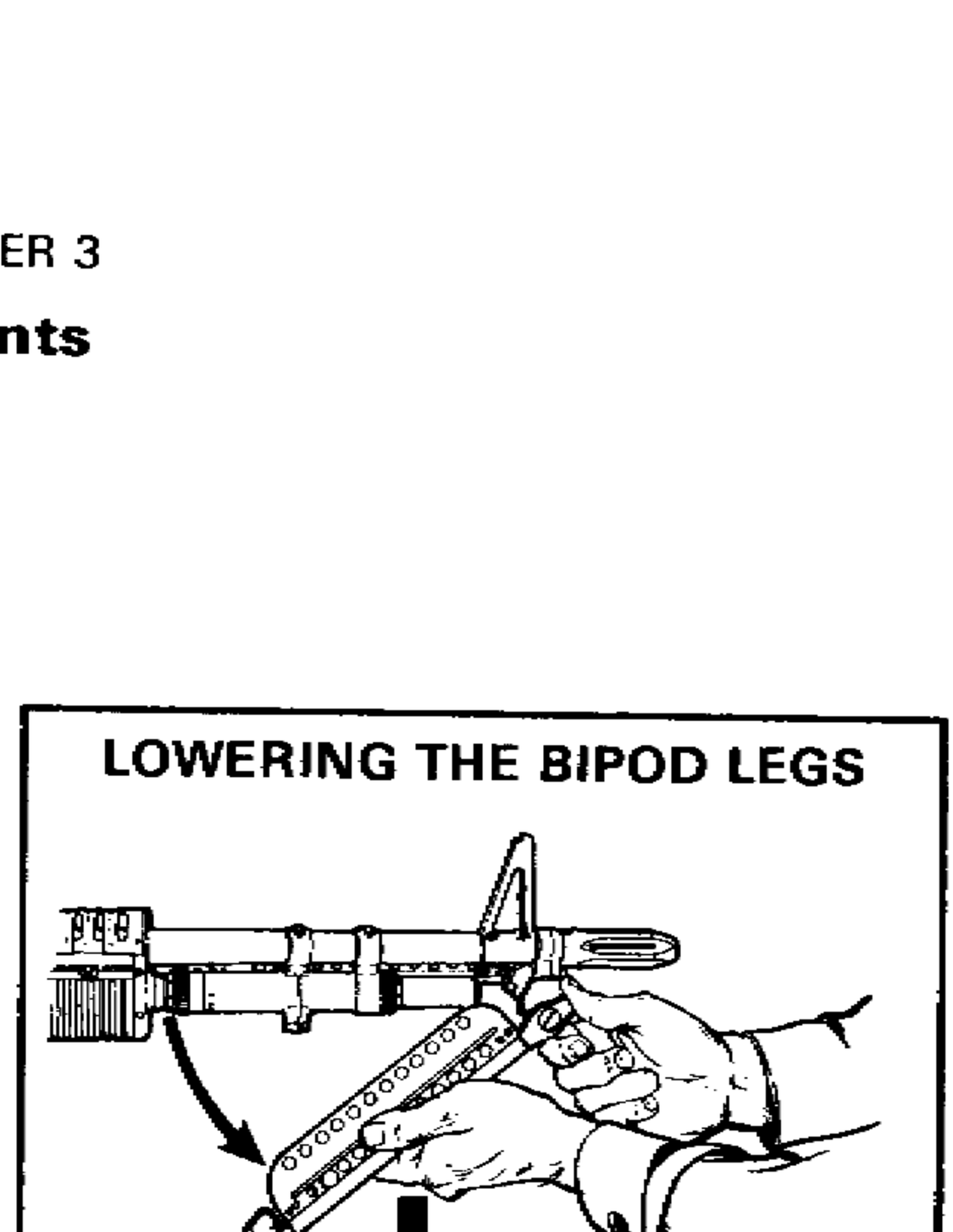
Mounts

BIPOD ASSEMBLY

The bipod assembly can be used to fire from the prone position. The shoulder rest provides support for the gun. The bipod is part of the barrel assembly and is not removed at unit level. The bipod yoke fits around the barrel and is held in place by the flash suppressor.

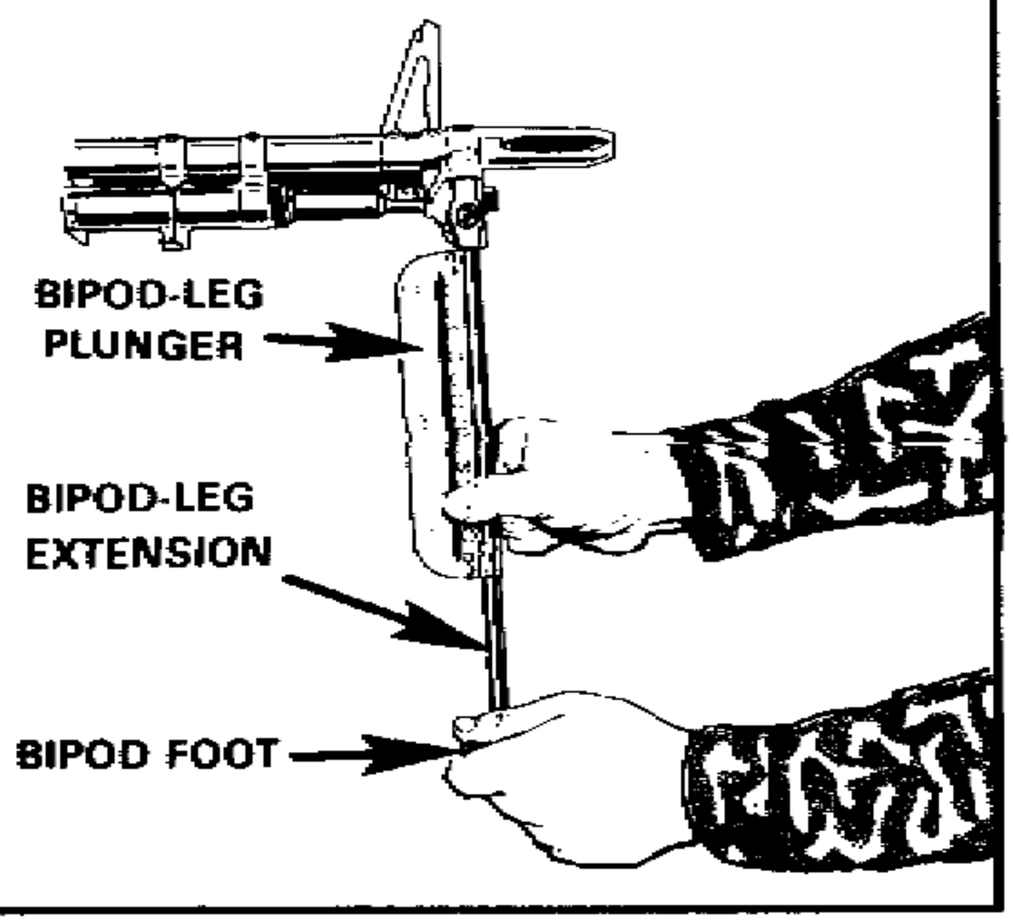


To lower the bipod legs, push or pull them to the rear (compressing the lock springs) and allow them to swing down into the locked position.



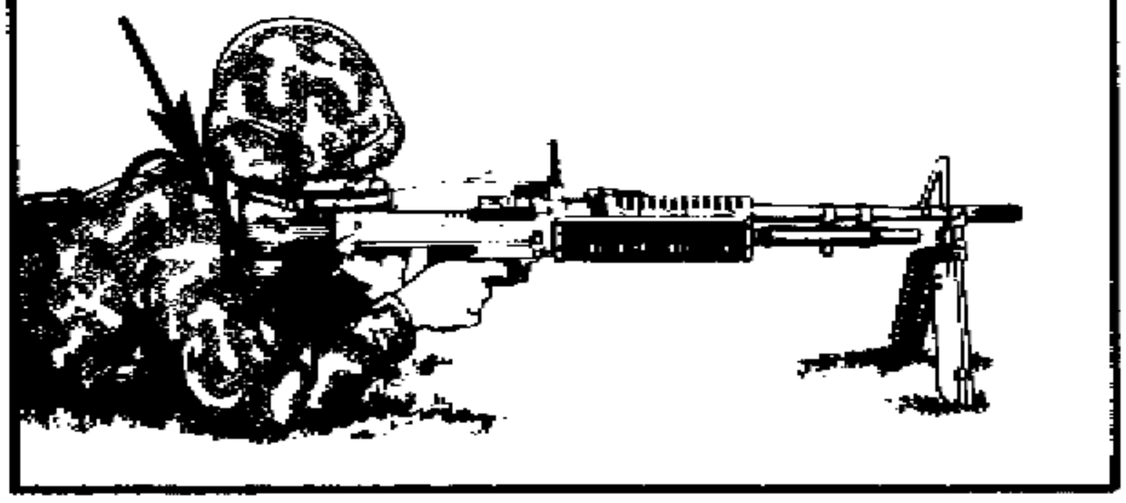
To adjust the bipod-leg extension, pull down on the foot until the leg is the right height. The plunger locks the bipod leg in position. The bipod-leg plunger has to be depressed to unlock and return the bipod-leg extension to the original position.

ADJUSTING THE BIPOD LEGS



To fold the bipod legs, pull down on the legs (to compress the lock springs) and fold them until they lock into position alongside the barrel.

USING BIPOD ASSEMBLY IN PRONE POSITION



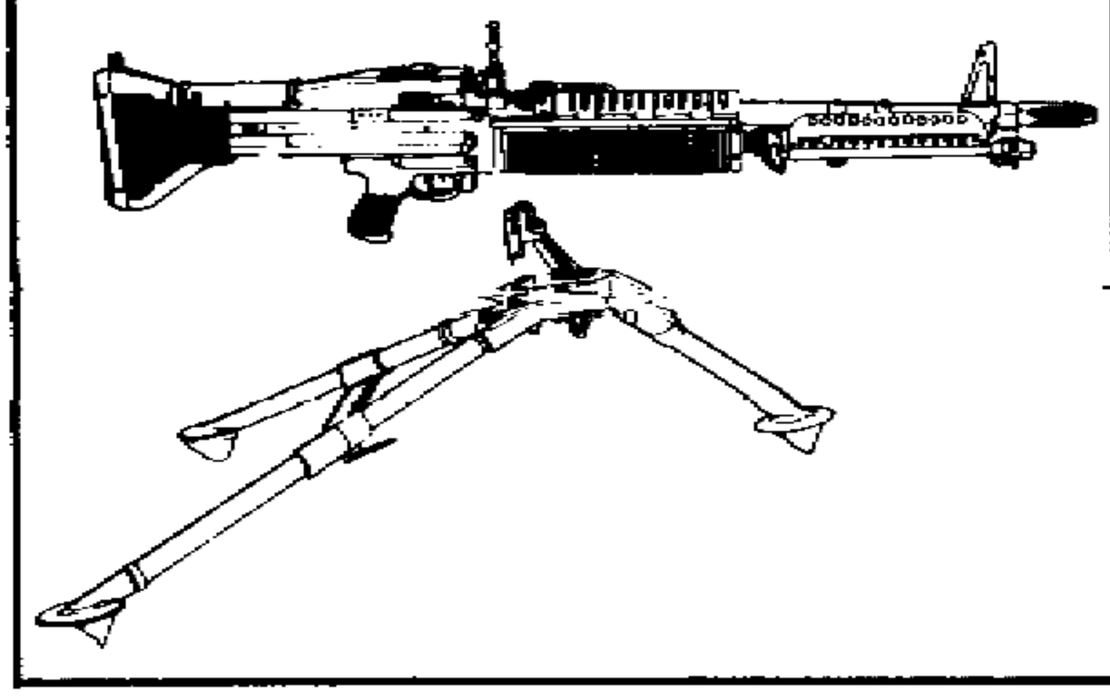
TRIPOD MOUNT

The M122 tripod provides a stable mount for the M60 machinegun, and it permits a high degree of accuracy and control. The tripod mount is recommended for marksmanship training and defensive employment.

DESCRIPTION

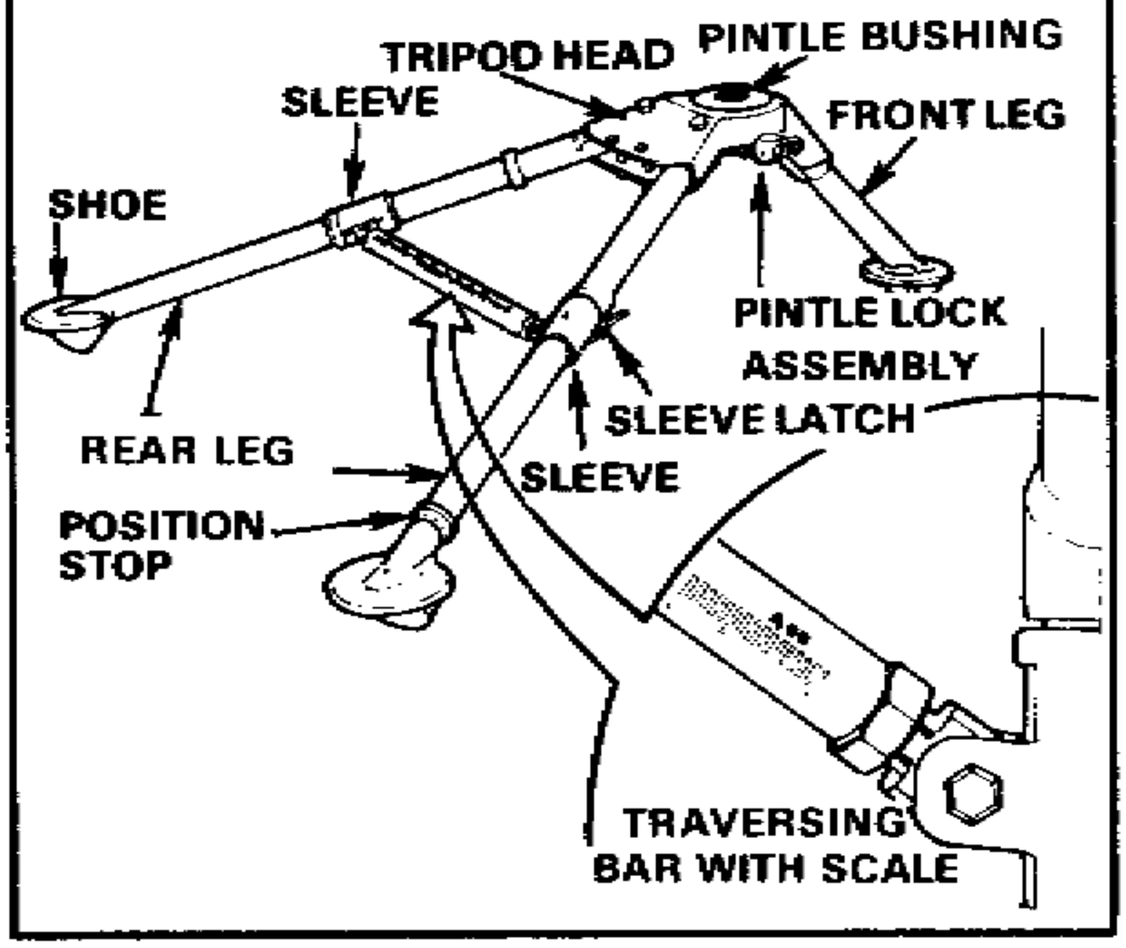
The tripod mount consists of the tripod group (M122), the traversing and elevating mechanism, and the pintle assembly.

MACHINEGUN IN RELATION TO TRIPOD



Tripod Group. The tripod group consists of the tripod head with the pintle bushing and the pintle-lock assembly, one front and two rear legs, and a traversing bar. The traversing bar connects the two rear legs and supports the traversing and elevating

M122 TRIPOD GROUP



mechanism. Engraved on the bar is a mil scale graduated in 5-mil increments. It is numbered every 425 mils right of center. A sliding sleeve connects the traversing bar and the rear legs to permit folding of the legs. Position stops are provided to stop the traversing bar in the open and close position. The sleeve latch on the right rear leg secures the traversing bar when the legs are in the open position.

Traversing and Elevating Mechanism. The traversing and elevating mechanism consists of the elevating adapter, the traversing handwheel, the elevating handwheel, and the traversing-slide-lock lever.

The elevating adapter connects to the mounting plate on the bottom of the receiver group.

The traversing handwheel has a mil-click device built into it. One click equals a change of 1 mil. Attached to the traversing handwheel is a mil scale which is divided into 1-mil increments. One complete turn of the handwheel equals 25 mils. With the traversing handwheel, the gun can be traversed approximately 100 mils (50 mils right and 50 mils left of center).

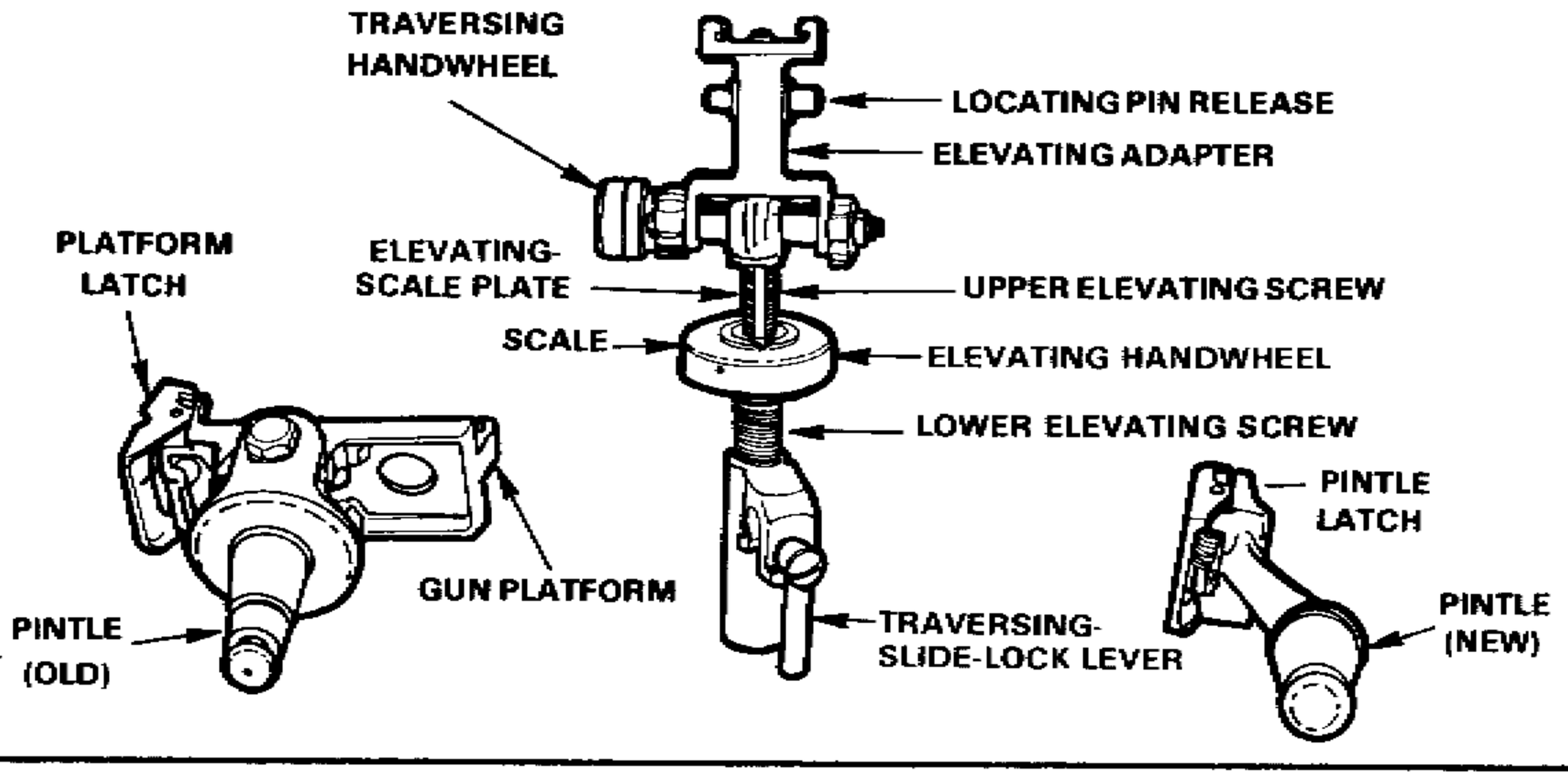
The elevating handwheel has a mil-click device built into it. One click equals a change of 1 mil. Engraved on the handwheel is a scale divided into 5-mil divisions and 1-mil subdivisions for a total of 50 mil increments. There are 200 mils above and 200 mils below the zero mark for a total of 400 mils in elevation change. Elevation readings are taken in two parts. First, the major reading is taken from the handwheel. The two readings are separated by a slash (/) when they are recorded.

The traversing-slide-lock lever allows rapid lateral adjustments along the traversing bar. Direction readings are taken from the scale on the traversing bar, using the left side of the traversing slide as an index. The direction of the reading, i.e., right or left, comes from the position of the muzzle, not the position of the slide.

Pintle Assembly. The platform and pintle group (OLD ISSUE) consists of the gun platform, to which the M60 is attached, and the pintle, which is secured to the tripod mount.

The pintle assembly (NEW ISSUE) eliminates the need for a gun platform.

THE MECHANISM WITH NEW AND OLD PINTLES

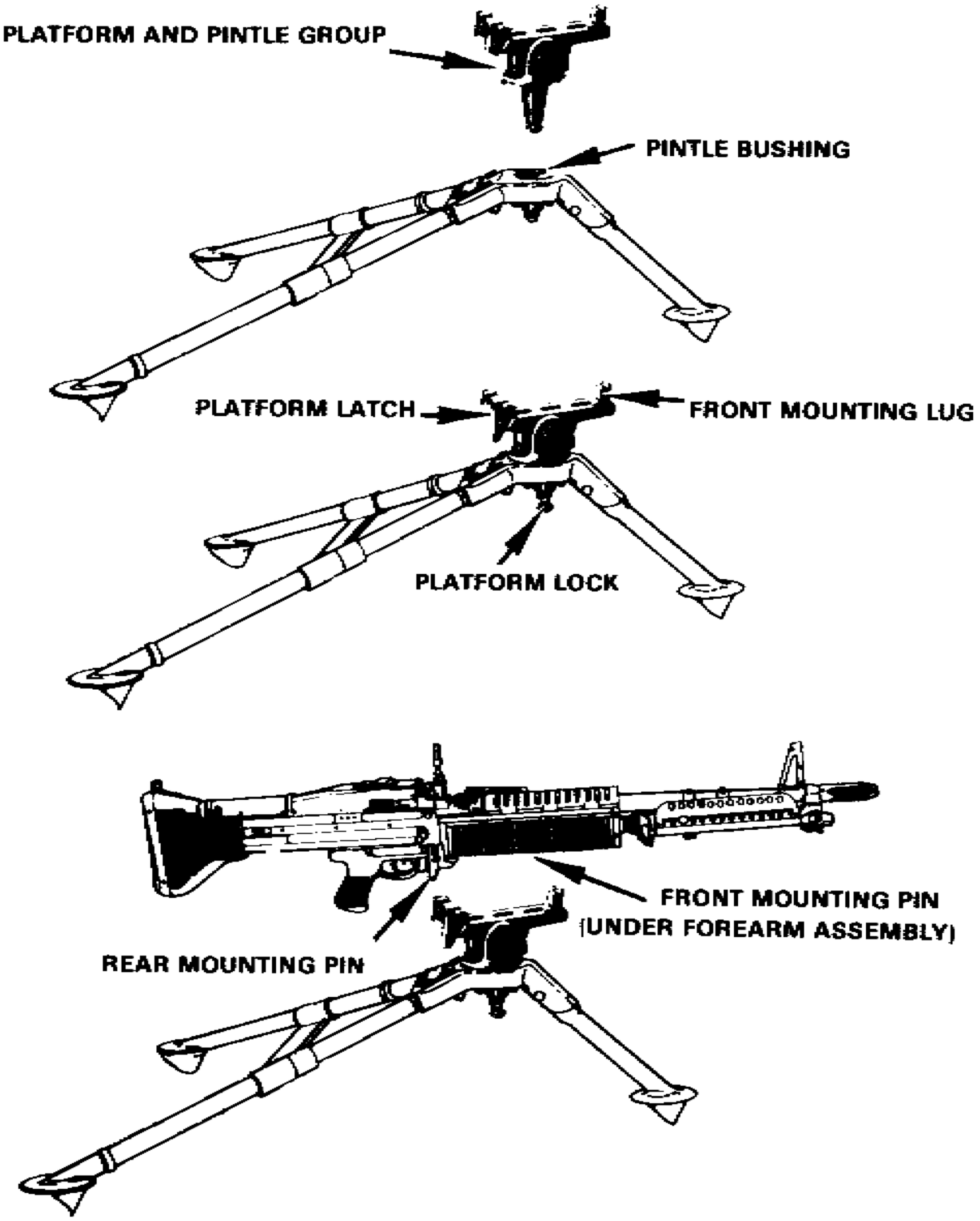


MOUNTING THE GUN

Mounting the Gun--Old Issue. To mount the M60 using the platform and pintle group (old issue), first lock the platform and pintle group into the pintle bushing and engage the platform lock. Next, position the front mounting pin (in the forearm assembly) in the front mounting lug. Then, lower the receiver so that the rear mounting pin snaps into the platform latch.

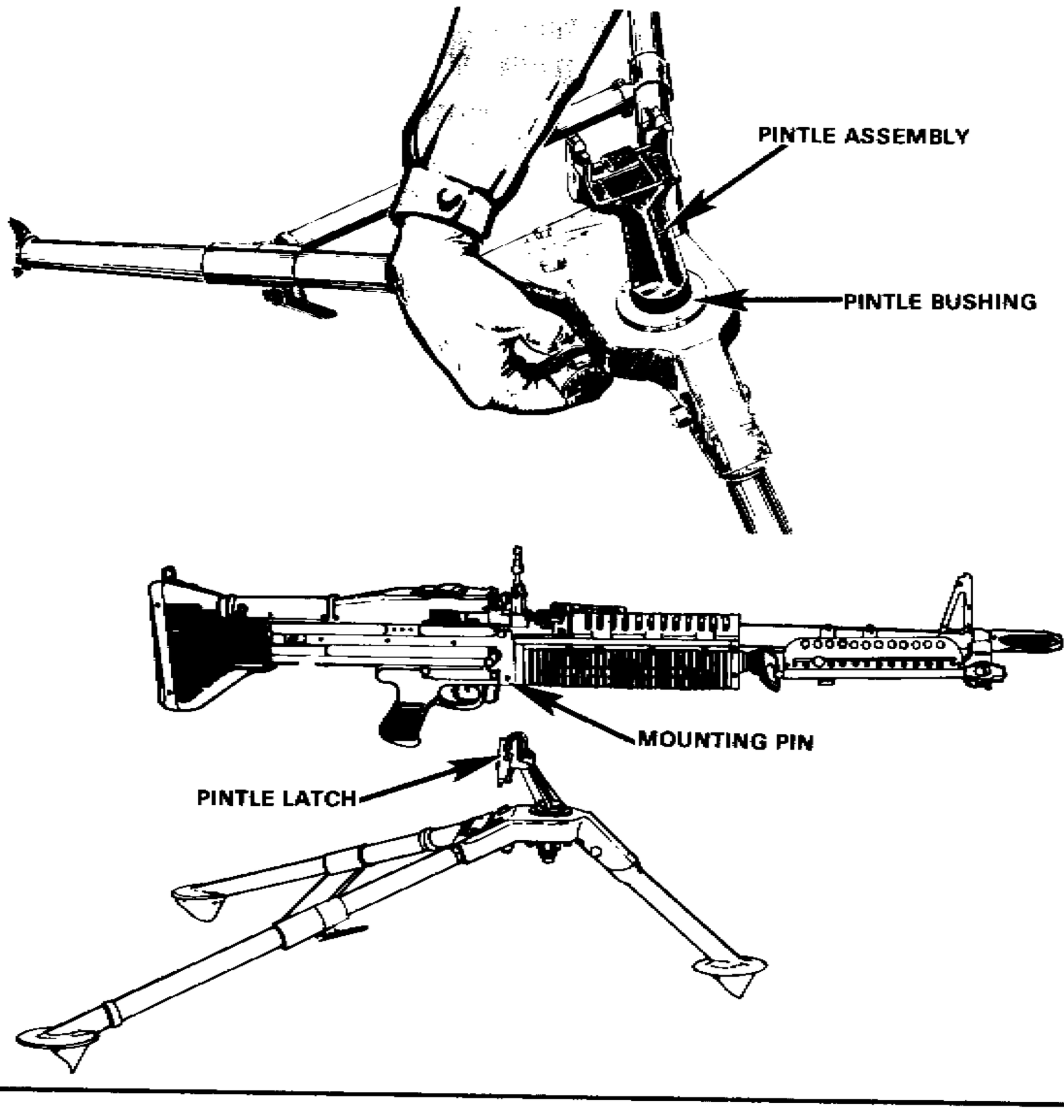
Mounting the Gun--New Issue. To mount the M60 using the pintle assembly (new

MOUNTING THE GUN - OLD ISSUE



issue), first lower the receiver so the mounting pin snaps into the pintle latch. Then, lock the pintle assembly into the pintle bushing.

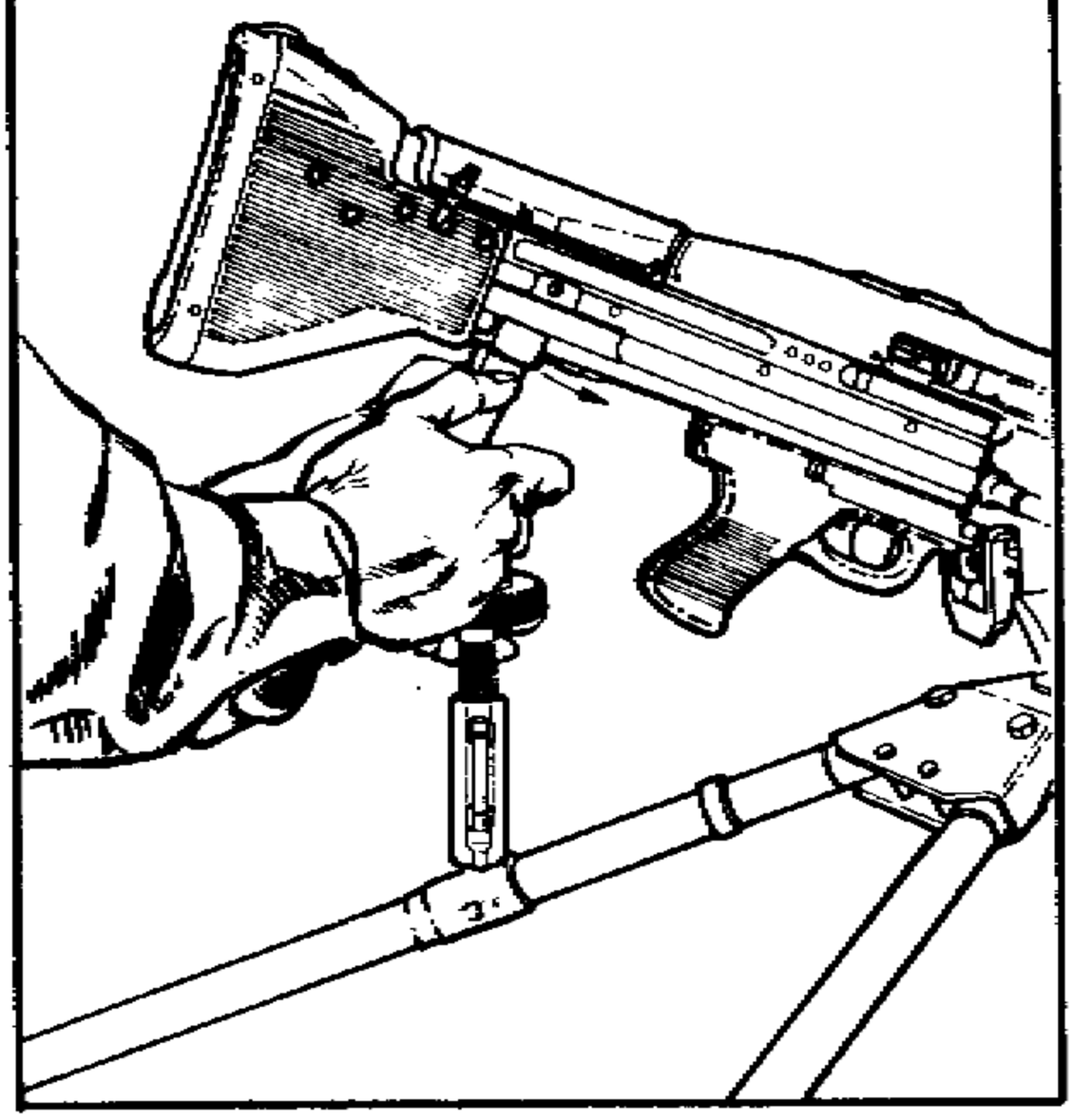
Attaching the Traversing and Elevating Mechanism. To attach the traversing and elevating mechanism to the gun mounted on the tripod, first center the elevating and traversing handwheels. Next, disengage the platform lock (OLD ISSUE), allowing the muzzle of the gun to point downward; with the NEW ISSUE, just allow the gun to go forward.



point downward; with the NEW ISSUE, just allow the gun to go forward.

With the slide lock lever to the REAR and the traversing handwheel to the LEFT, place the mounting-plate recess on the rear of the mounting plate. Pull down on the locatingpin release and push the adapter assembly forward. The locating pin automatically locks into position in the bottom of the mounting plate.

ATTACHING THE TRAVERSING AND ELEVATING MECHANISM.



Lower the rear of the gun, place the traversing slide on the traversing bar with the locking lever to the rear, and lock it into position. Index the left edge of the slide lock at zero unless instructed to do otherwise.

DISMOUNTING THE GUN

To remove the traversing and elevating mechanism, release the traversing-slide lock lever and raise the rear of the gun. Pull down on the mounting-pin release and pull the adapter assembly to the rear and off the mounting plate.

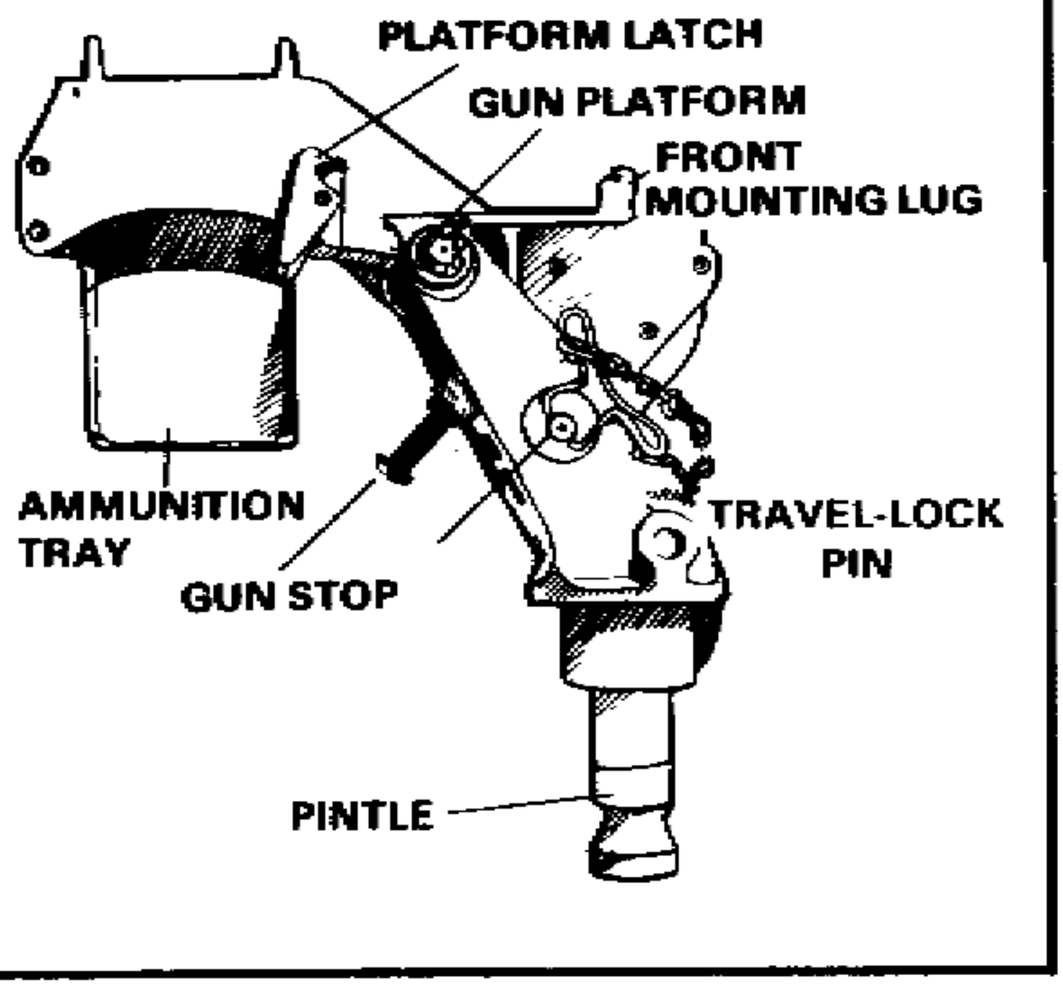
To dismount the M60 using the platform and pintle group (OLD ISSUE), engage the platform lock and grasp the carrying handle with the left hand. With the right hand, depress the platform latch and raise the rear of the gun slightly, thus removing the rear locating pin from the platform latch. Place the right hand on top of the stock, pull the gun slightly to the rear, push down on the stock, and lift the gun from the mount.

To dismount the M60 using the pintle assembly (NEW ISSUE), grasp the carrying handle with the left hand and depress the pintle latch with the right hand. Lift the gun from the pintle assembly.

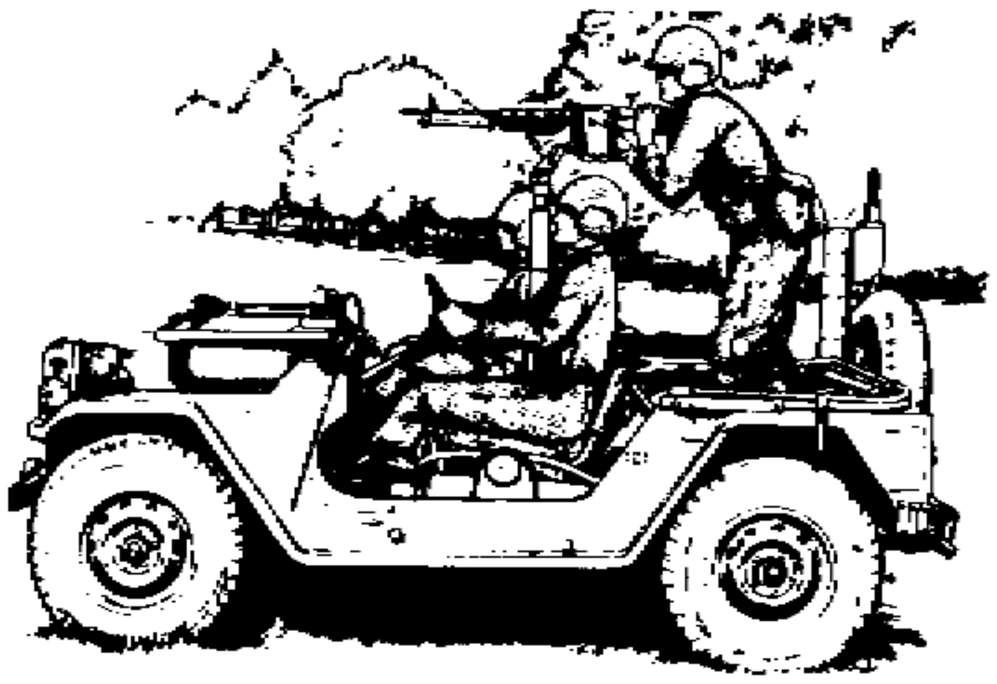
VEHICULAR MOUNTS

The standard vehicular mount for M60 machinegun is the M4 pedestal mount used on the M151 series, 1/4-ton truck. One component of the pedestal mount, the M142 machinegun mount (which serves as a cradle for the gun), is adaptable to other vehicles.

M142 GUN MOUNT



M4 PEDESTAL MOUNT ON 1/4-TON TRUCK



MOUNTING, FIRING, AND DISMOUNTING THE GUN ON THE M142 MOUNT

To Mount the Gun. Lock the platform in the horizontal position by inserting the travel-lock pin into the travel lock.

Place the front mounting pin (in the forearm assembly) in the front mounting lug.

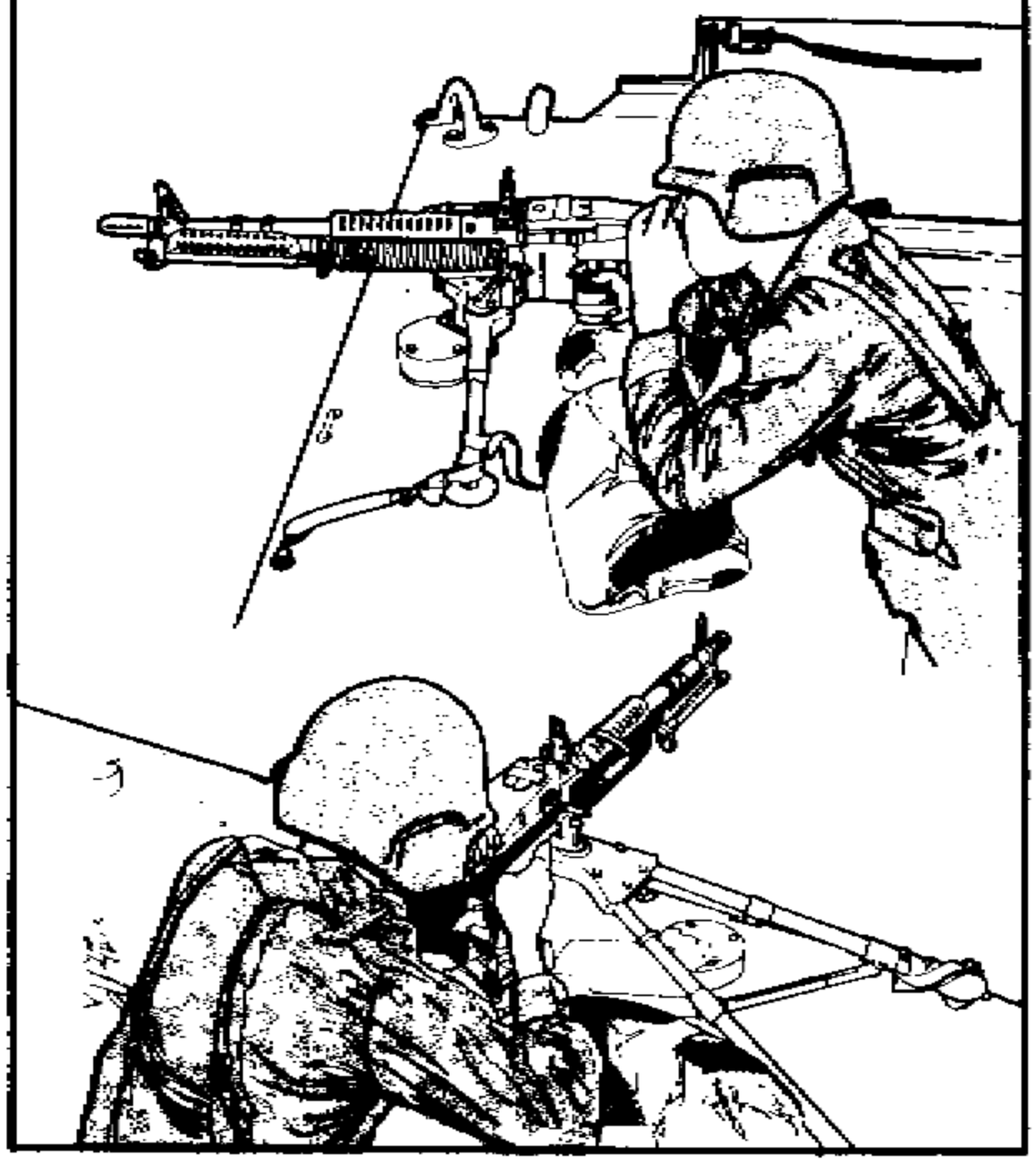
Lower the receiver so that the rear locating pin snaps into the platform latch.

To Fire the Gun. Assume the gunner's position and grip as shown below. (The hinged shoulder rest is up to help stabilize gun.)

While moving, lower the rear sight slide all the way down. When firing, get the target area and front sight post somewhere within the rectangular window formed by the top, sides, and slide of the rear sight. Fire a 9- to 12-round burst.

While stationary, use the sight the same as described for the sight on a ground-mounted gun.

THE GUNNER'S POSITION AND GRIP



To Dismount the Gun. Insure that the travel lock is engaged (holding the platform in a horizontal position).

Grasp the carrying handle with one hand and depress the platform latch with the other. Raise the rear of the gun slightly and lift it from the mount.

MOUNTING, AND FIRING THE GUN ON THE M122 TRIPOD ON THE M113A1 APC

The M122 tripod mount can be strapped on either side of the cargo hatch. To allow the cargo hatch to close, the tripod's rear legs should not be fully extended. The tripod is strapped down using equipment tie-down straps to wrap the legs and secure it to the top deck of the APC.

Firing is as described for the M142 machinegun mount.

CHAPTER 4

Operation and Cycle of Functioning

OPERATION

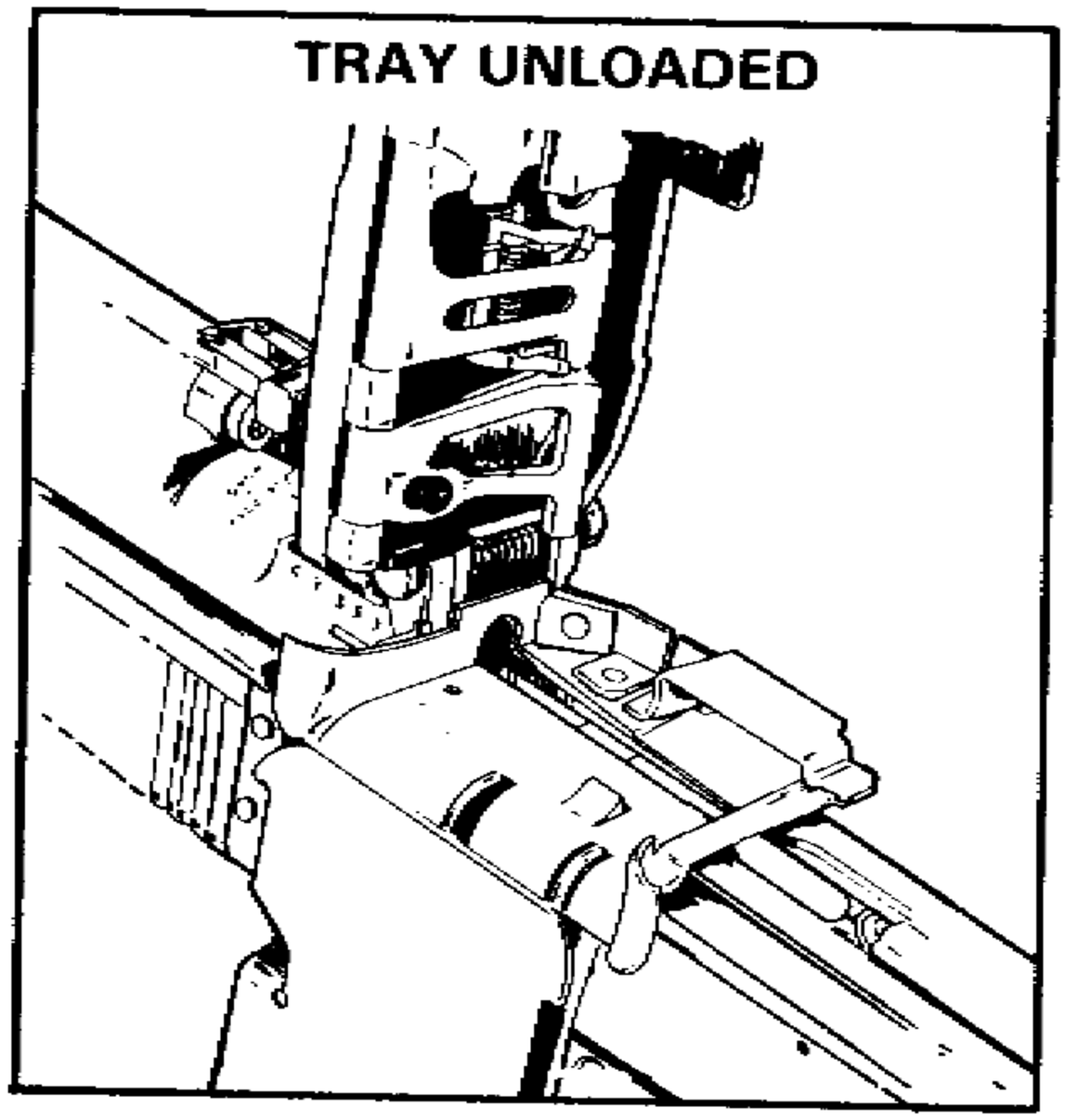
The M60 machinegun is loaded, fired, unloaded, and cleared from the open-bolt position. The safety lever must be placed on FIRE before the bolt can be pulled to the rear.

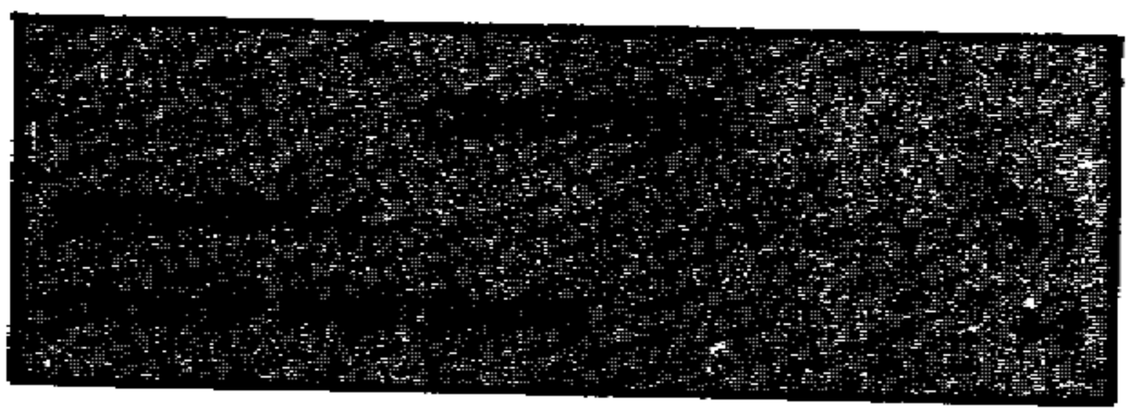
Before using ammunition, insure that:

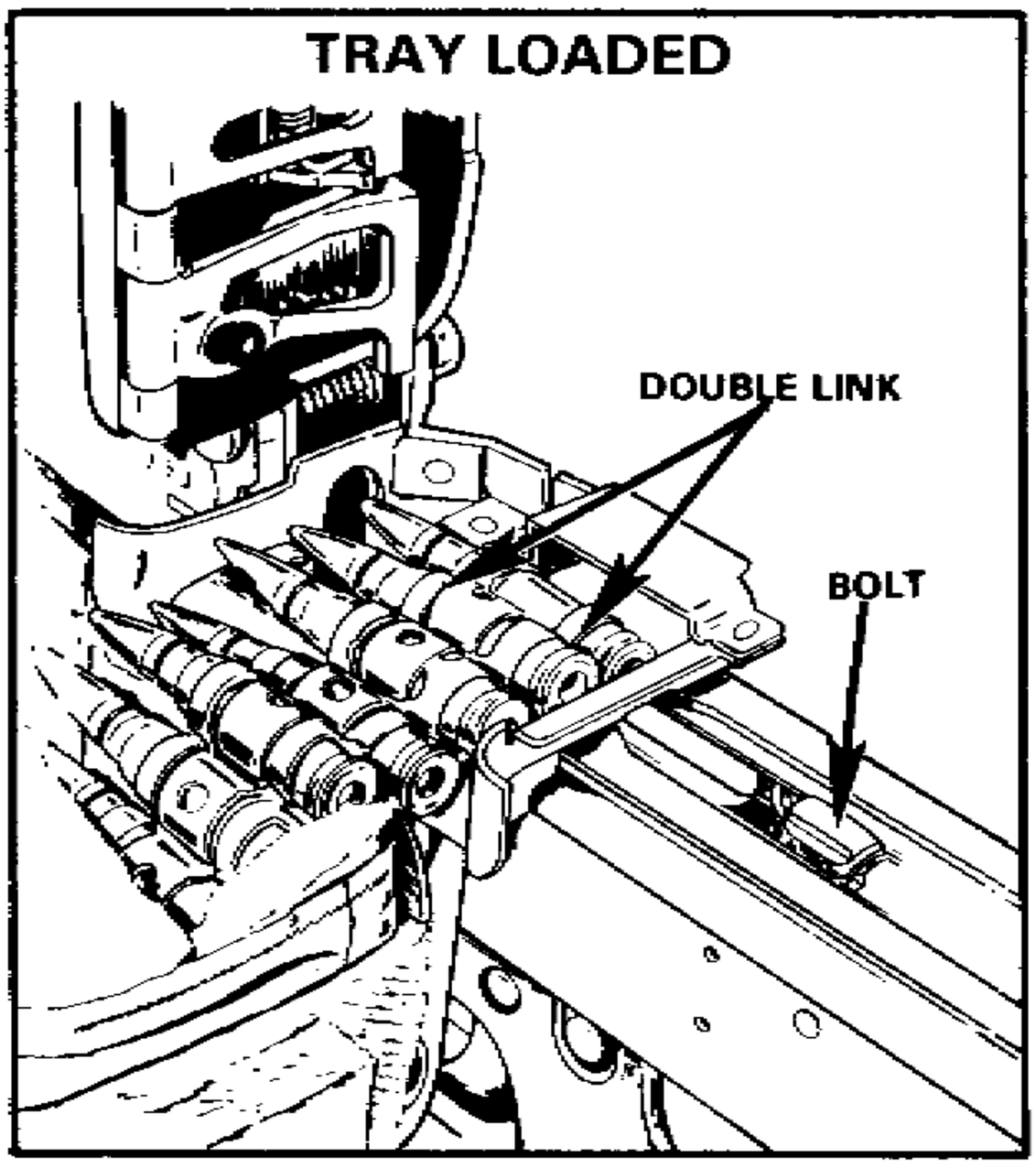
- **It is properly linked.**
- **It is free of dirt and corrosion.**
- **The double link is at the opening end of the bandoleer.**

LOADING

Place the safety lever on FIRE. Pull the bolt to the rear by the cocking handle with the palm facing UP. When the bolt is held to the rear by the sear, manually return the cocking handle to the forward position and place the safety lever on SAFE. Raise the cover and insure that the tray, receiver group, and chamber are clear. Place the first round of the belt in the tray groove, double link leading, open side of links down. INSURE THAT THE ROUND REMAINS IN THE TRAY GROOVE, AND CLOSE THE COVER. Hold the belt up, approximately six rounds from the loading end, while closing the cover.







UNLOADING AND CLEARING

Pull the bolt to the rear, if it is not already there. Place the safety lever on SAFE and manually return the cocking handle to its forward position. Raise the cover and remove any ammunition or links from the tray. Look in the chamber to insure that it is clear. Clearing procedure is covered in chapters 2 and 5.

CYCLE OF FUNCTIONING

Crew members can recognize and correct stoppages when they know how the gun functions. The gun functions automatically as long as ammunition is fed into it and the trigger is held to the rear. Each time a round fires, the parts of the gun function in sequence. Many of the actions occur at the same time and are separated only for teaching purposes. The sequence of functioning is known as the CYCLE OF FUNCTIONING. As a "minimum" standard, the soldier should know the eight basic terms and short definitions in the paragraph below.

STEPS OF THE CYCLE

The complete cycle of functioning is taught in eight separate steps, as follows:

(1) ***Feeding.*** A round is positioned in the feed-tray groove.

(2) ***Chambering.*** A round is stripped from the belt and placed into the chamber.

(3) ***Locking.*** The bolt is locked inside the barrel socket.

(4) ***Firing.*** The firing pin strikes and fires the primer, which fires the cartridge.

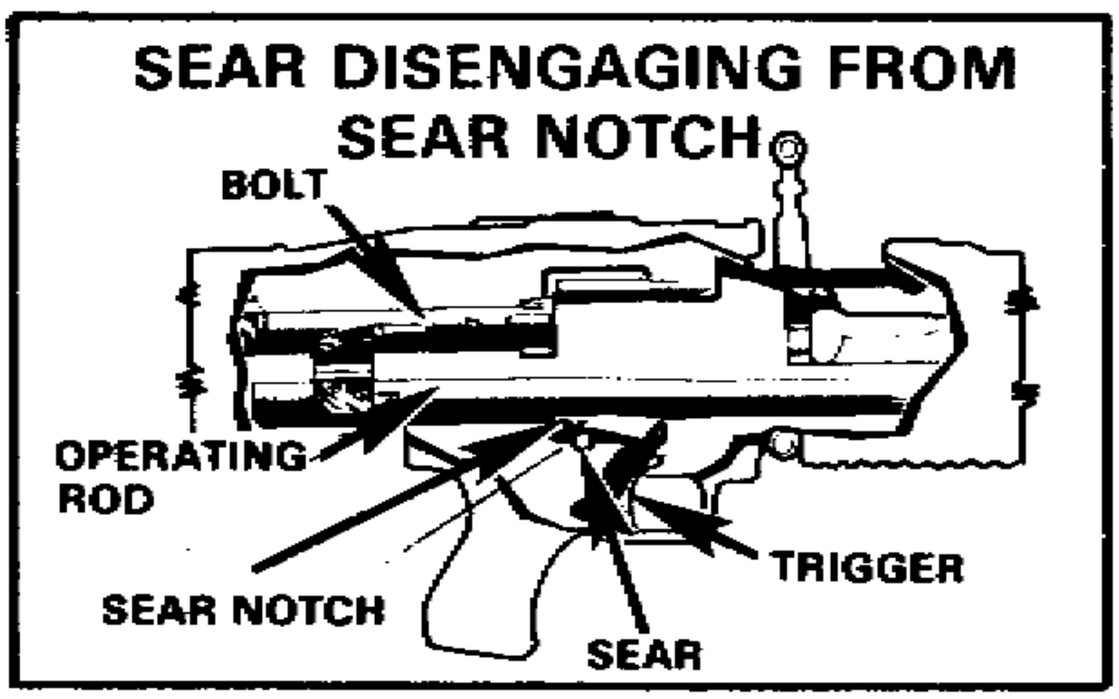
(5) ***Unlocking.*** The bolt is unlocked from the barrel socket.

(6) ***Extracting.*** The empty cartridge case is pulled from the chamber.

(7) ***Ejecting.*** The empty cartridge case is thrown from the receiver.

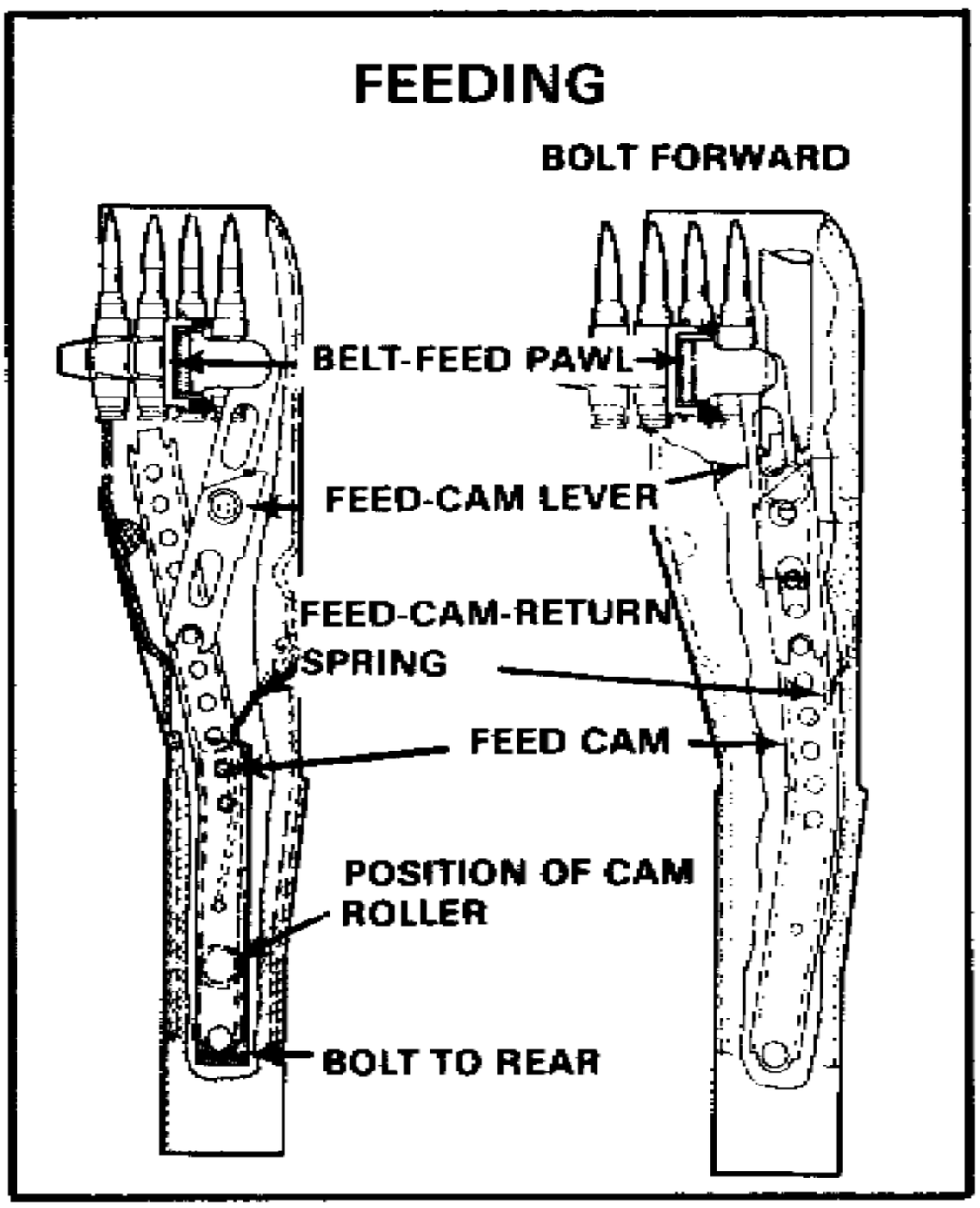
(8) ***Cocking.*** The sear engages the sear notch on the operating rod.

Start the cycle by putting the first round of the belt in the tray groove. Then, pull the trigger, releasing the sear from the sear notch. When the trigger is pulled to the rear, the rear of the sear is lowered and disengaged from the sear notch. This allows the operating rod and bolt to be driven forward by the expansion of the driving spring. The cycle stops when the trigger is released and the sear again engages the sear notch on the operating rod.



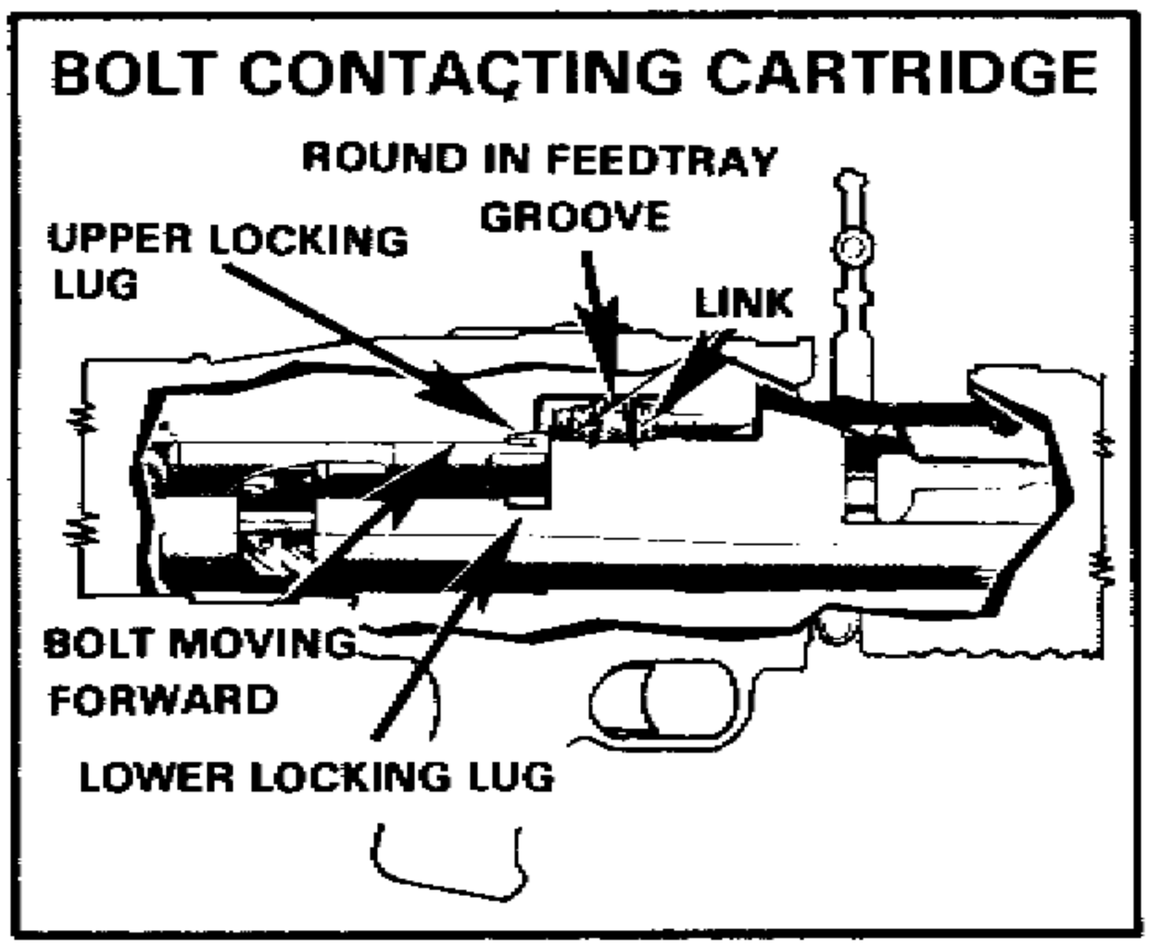
SEQUENCE OF FUNCTIONING

Feeding. As the bolt starts its forward movement, the feed cam is forced to the right, causing the feed-cam lever to turn in the opposite direction. This forces the belt-feed pawl over the next round in the bolt, and it is ready to place the next round into the tray groove when the rearward action occurs again.

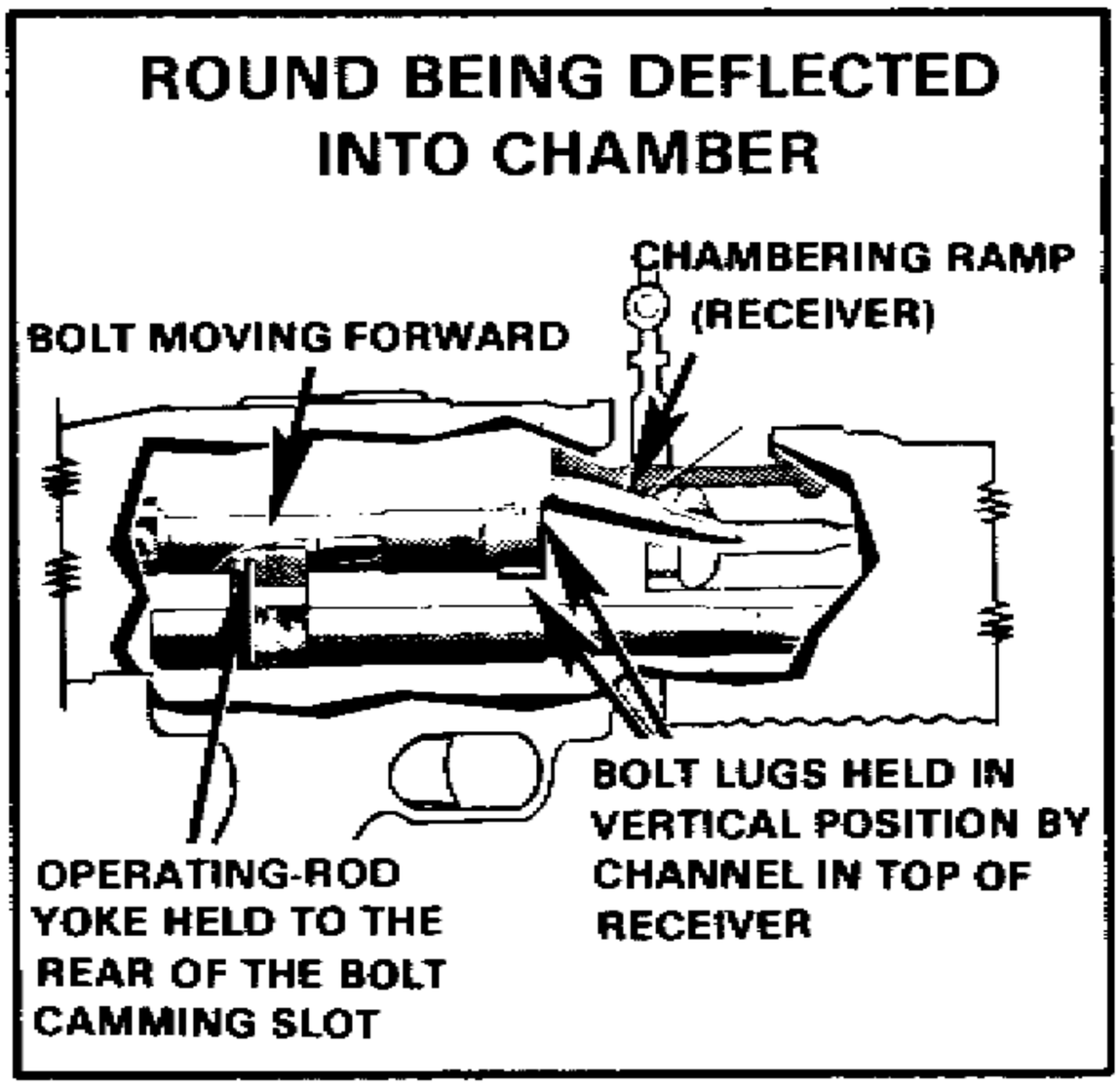


As the bolt moves to the rear after firing, the cam roller forces the feed cam to the left. The feed-cam lever is forced to turn, moving the feed pawl to the right, and this movement places a round in the tray groove.

Chambering. As the bolt travels forward, the upper locking lug engages the rim of the round. The pressure of the front and rear cartridge guides holds the rounds so that positive contact is made with the upper locking lug of the bolt. The front cartridge guide prevents forward movement of the link as the round is stripped from the belt.



The upper locking lug carries the round forward. The chambering ramp causes the nose of the round to be cammed downward into the chamber.

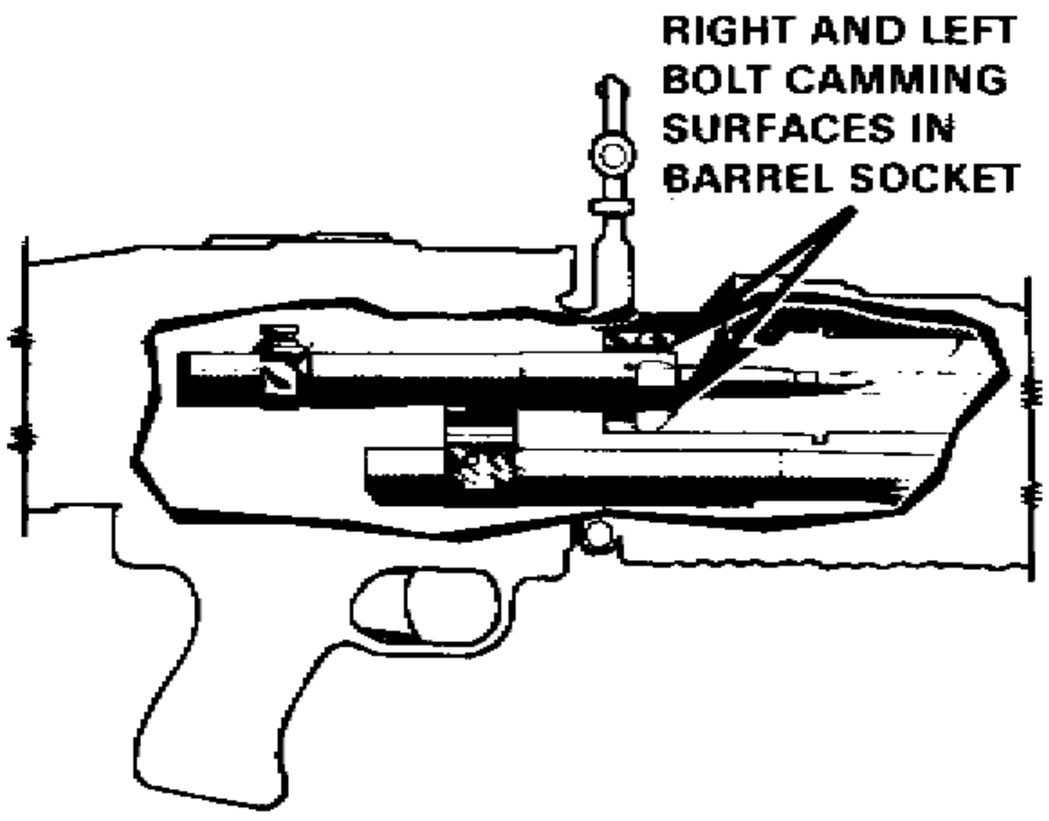


When the round is fully seated in the chamber, the extractor snaps over the rim of the round, and the ejector on the face of the bolt is depressed.

Locking. As the round is chambered, the bolt enters the barrel socket. The upper and lower locking lugs contact the bolt camming surfaces inside the barrel and start turning

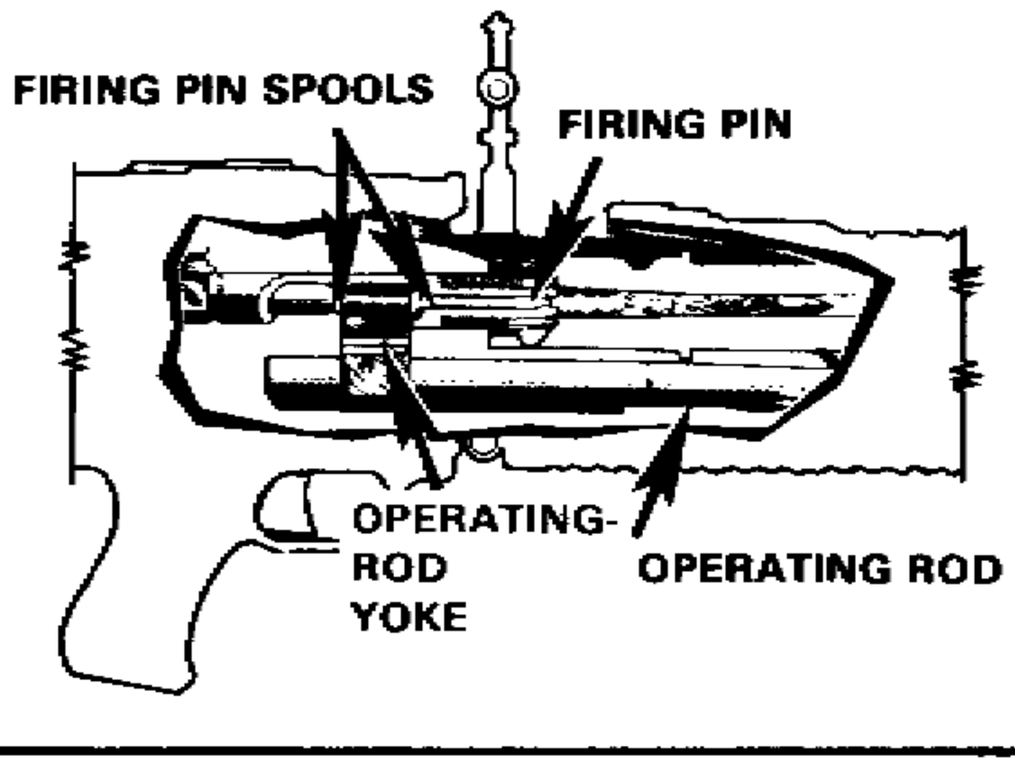
the bolt clockwise. The action of the operating-rod yoke against the bolt-camming slot, as the operating rod continues forward, turns the bolt to complete its 90-degree (one-quarter turn) clockwise rotation. Locking is now complete.

GUN LOCKED, READY TO FIRE



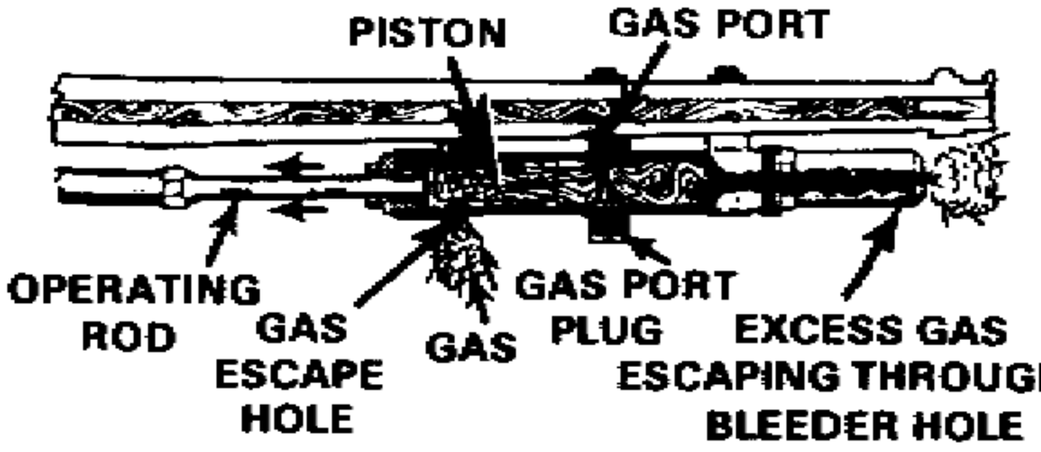
Firing. After the bolt is fully forward and locked, the operating rod continues to go forward, independent of the bolt, for a short distance. The yoke, engaged between the firing-pin spools, carries the firing pin through the opening in the face of the bolt. The firing pin strikes the primer of the round, and the primer fires the round.

FIRING AND COCKING



Unlocking. After the round is fired and the bullet passes the gas port, part of the expanding gases go into the gas cylinder through the gas port. The rapidly expanding gases enter the hollow gas piston and force it to the rear. The operating rod, being in contact with the piston, is then forced to the rear.

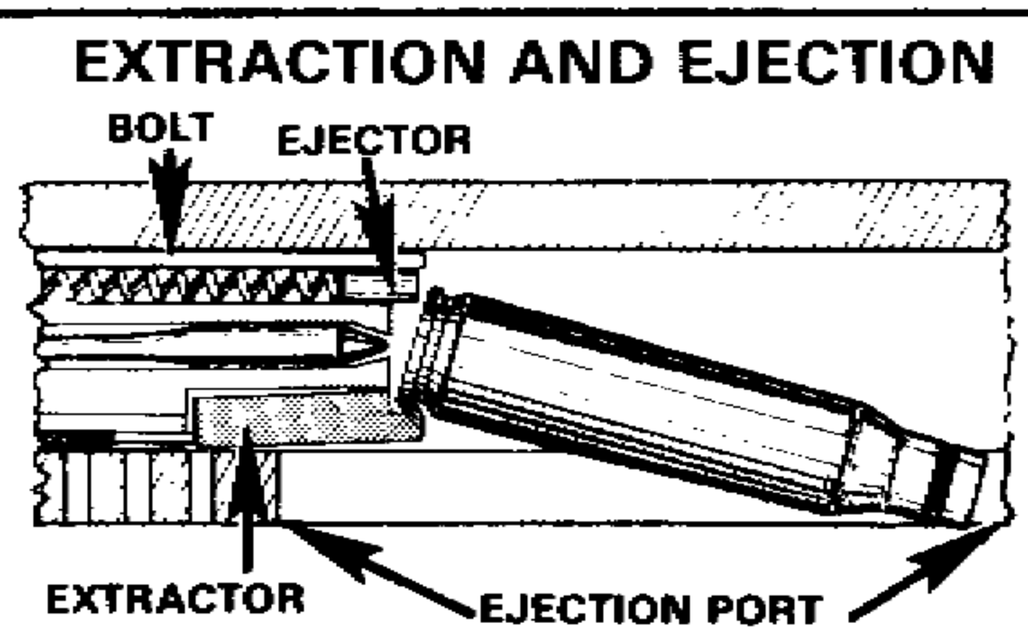
ACTION OF GASES



As the operating rod continues to the rear, the operating-rod yoke acts against the bolt-camming slot. This causes the bolt to begin its counterclockwise rotation. The upper and lower locking lugs of the bolt contact the bolt-camming surfaces inside the barrel socket, and, as the bolt continues to the rear, it completes a one-quarter turn counterclockwise. The rotation and movement to the rear unlocks the bolt from the barrel socket. Unlocking begins as the yoke of the operating rod contacts the curve of the bolt-camming slot, and ends as the bolt clears the end of the barrel socket.

Extracting. Extracting begins during the unlocking cycle. The rotation of the bolt loosens the cartridge case in the chamber.

EXTRACTION AND EJECTION



As the operating rod and bolt move to the rear, the extractor pulls the cartridge case from the chamber.

Ejecting. As the cartridge case is pulled from the chamber, the ejector spring expands. This causes the ejector to press on the base of the spent case, forcing the front of the case against the right side of the receiver. As the bolt continues to the rear, the action of the ejector pushing against the base of the cartridge case and the extractor gripping the right side of the case causes the cartridge case to spin from the gun as the case reaches the ejection port. The empty belt links are forced out of the ejection port as the rearward movement of the bolt causes the next round to be positioned in the tray groove.

Cocking. As the expanding gases force the gas piston to the rear, the operating rod first moves independently of the bolt. The yoke of the operating rod acts against the rear firing-pin spool, pulling the firing pin from the primer of the spent cartridge case. The action of the operating-rod yoke, continuing to the rear against the rear firing-pin spool, fully compresses the firing-pin spring.

As long as the trigger is held to the rear, the M60 will continue to complete the right steps of functioning automatically. When the trigger is released and the sear again engages the sear notch, the cycle of functioning is stopped and the gun is cocked. To prevent undue wear to the sear and sear notch, the gunner must hold the trigger firmly to the rear during firing.

CHAPTER 5

Malfunctions, Stoppages, Immediate Action, Remedial Action, Maintenance, and Destruction

MALFUNCTIONS

A malfunctioning machinegun is a gun that is not firing properly. Defective ammunition or improper operation by the gunner is not a malfunction. Two of the more common malfunctions of the M60 machinegun are sluggish operation and uncontrolled fire (runaway gun). The table on the next page shows malfunctions, their probable causes, and corrective actions.

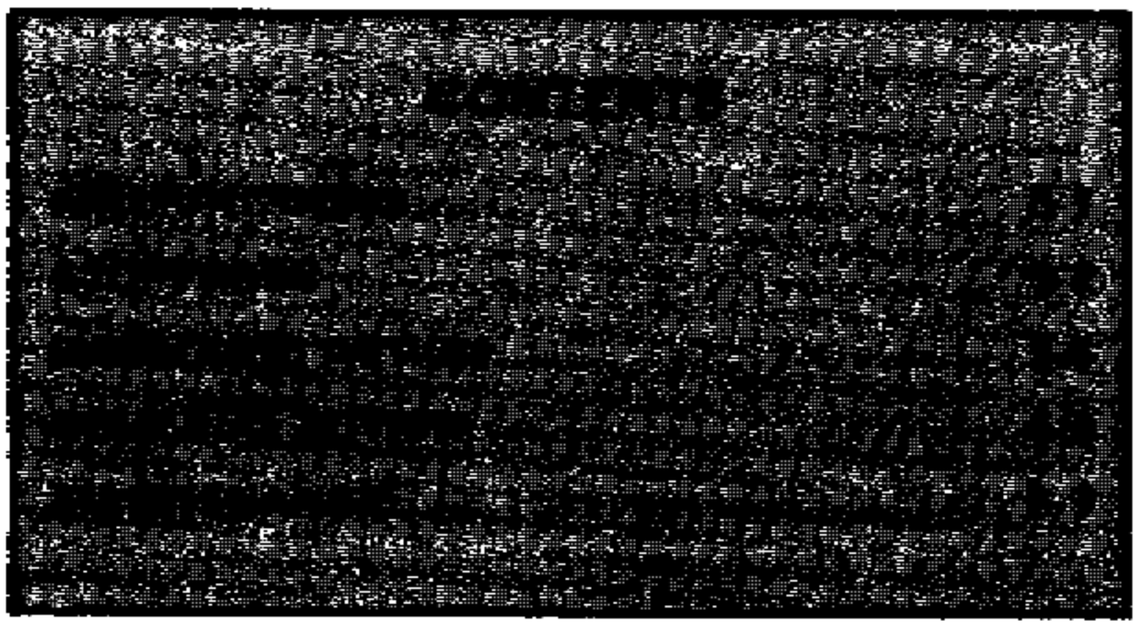
SLUGGISH OPERATION.

Sluggish operation of the M60 usually is due to excessive friction caused by carbon, lack of proper lubrication, burred parts, or excessive loss of gas due to a loose or missing gas-port plug. Corrective action includes cleaning, lubricating, inspecting, and replacing parts as necessary.

UNCONTROLLED FIRE (RUNAWAY GUN).

Uncontrolled fire (the gun continues to fire after the trigger is released) is usually caused by the gunner not pulling and holding the trigger all the way to the rear. This results in the sear not clearing the sear notch, which causes wear to both parts. The following are immediate actions for uncontrolled fire:

- **The gunner holds the gun on target and fires the remaining ammunition.**
- **The assistant gunner stops the gun from firing by breaking the belt (twist quickly in either direction).**
- **When the gun has stopped firing, the gunner checks it to find the cause of the malfunction.**



MALFUNCTIONS		
MALFUNCTION	**PROBABLE CAUSE**	**CORRECTIVE ACTION**
SLUGGISH OPERATION.	CARBON IN GAS PORT.	CLEAN GAS PORT.
	LOSS OF GAS.	TIGHTEN OR REPLACE GAS-PORT PLUG.
UNCONTROLLED FIRE (RUNAWAY GUN).	WORN OR BROKEN SEAR.	SEND TO DIRECT SUPPORT MAINTENANCE.
	WORN OR BROKEN SEAR NOTCH.	SEND OPERATING ROD TO DIRECT SUPPORT MAINTENANCE.
	SEAR INSTALLED BACKWARDS.	INSTALL CORRECTLY.
	BOLT AND OPERATING-ROD GROUP IMPROPERLY JOINED.	INSTALL CORRECTLY. NOTE: IT IS IMPORTANT THAT THE OPERATING-ROD YOKE BE INSTALLED BETWEEN THE TWO FIRING-PIN SPOOLS.
	CARBON BUILDUP IN GAS PORT.	CLEAN GAS PORT.

STOPPAGES

A stoppage is any interruption in the cycle of functioning caused by faulty action of the gun or faulty ammunition. Stoppages are classified by their relationship to the cycle of functioning. The following table shows types of interruptions or stoppages and their probable causes and corrective actions.

STOPPAGES		
STOPPAGES	**PROBABLE CAUSE**	**CORRECTIVE ACTION**
FAILURE TO FEED.	INSUFFICIENT GAS PRESSURE.	CLEAN GAS PORT.
	IMPROPER LUBRICATION.	LUBRICATE AS REQUIRED.
	DEFECTIVE LINKS OR AMMUNITION.	INSERT NEW LINK OR AMMUNITION.
	AMMUNITION BELT INSTALLED WRONG.	REVERSE BELT WITH OPEN SIDE OF LINK DOWN.
	DAMAGED OR WEAK OPERATING-ROD SPRING.	REPLACE.
	OBSTRUCTION IN RECEIVER.	REMOVE OBSTRUCTION; CLEAN AND LUBRICATE AS REQUIRED.
	DAMAGED OR WEAK FEED PAWLS AND SPRINGS OR FEED LEVER.	SEND TO DIRECT SUPPORT MAINTENANCE.
	FRONT/REAR CARTRIDGE GUIDE DEFECTIVE.	SEND TO DIRECT SUPPORT MAINTENANCE.
	BOLT-CAM ACTUATOR ROLLER DEFECTIVE.	REPLACE ACTUATOR ASSEMBLY.
	DEFECTIVE COVER LATCH.	SEND TO DIRECT SUPPORT MAINTENANCE.
	FEED-CAM ASSEMBLY DEFECTIVE.	SEND TO DIRECT SUPPORT MAINTENANCE.
	DEFECTIVE LATCH-LEVER ASSEMBLY.	SEND TO DIRECT SUPPORT MAINTENANCE.

STOPPAGES
(CONTINUED)

STOPPAGES	PROBABLE CAUSE	CORRECTIVE ACTION
FAILURE TO CHAMBER.	RUPTURED CARTRIDGE CASE.	REMOVE (TM 9-1005-224-10).
	CARBON BUILDUP IN GAS CYLINDER.	REMOVE CARBON.
	CARBON BUILDUP IN RECEIVER.	REMOVE CARBON.
	DAMAGED ROUND.	REMOVE ROUND AND RELOAD GUN.
	DIRTY CHAMBER.	CLEAR BARREL AND CLEAN AND LUBRICATE AS REQUIRED.
	WEAK OR SHORT OPERATING-ROD SPRING.	REPLACE.
FAILURE TO LOCK.	WEAK OR SHORT OPERATING-ROD SPRING.	REPLACE.
	FOREIGN MATTER IN CHAMBER OF RECEIVER.	CLEAN AND LUBRICATE AS REQUIRED.
FAILURE TO FIRE.	FAULTY AMMUNITION.	REPLACE.
	BROKEN OR DAMAGED FIRING PIN OR FIRING-PIN SPRING.	REPLACE.
	DEFECTIVE TRIGGER.	SEND TO DIRECT SUPPORT MAINTENANCE.
	BROKEN OR DEFORMED SEAR PLUNGER AND/OR SPRING.	SEND TO DIRECT SUPPORT MAINTENANCE.
	FAILURE TO LOCK.	SEE FAILURE TO LOCK.

STOPPAGES
(CONTINUED)

STOPPAGES	PROBABLE CAUSE	CORRECTIVE ACTION
FAILURE TO EXTRACT.	GAS PISTON INSTALLED BACKWARDS.	INSTALL PROPERLY (TM 9-1005-224-10).
	BROKEN EXTRACTOR SPRING.	REPLACE.
	CHIPPED OR BROKEN EXTRACTOR.	REPLACE.
	DEFECTIVE EXTRACTOR PLUNGER.	REPLACE.
	SHORT RECOIL.	CLEAN GAS PORT AND OPERATING-ROD TUBE, AND LUBRICATE AS REQUIRED. REPLACE DRIVER SPRING.
FAILURE TO COCK.	BROKEN SEAR.	SEND TO DIRECT SUPPORT MAINTENANCE.
	WORN OPERATING-ROD SEAR NOTCH.	SEND TO DIRECT SUPPORT MAINTENANCE.
	BROKEN, DEFECTIVE, OR MISSING SEAR PLUNGER AND/OR SPRING.	SEND TO DIRECT SUPPORT MAINTENANCE.
	SHORT RECOIL.	CLEAN GAS PORT AND AND OPERATING-ROD TUBE, AND LUBRICATE AS REQUIRED. REPLACE DRIVER SPRING.

IMMEDIATE ACTION

Immediate action is action taken to reduce a malfunction or stoppage without looking for the cause. Immediate action should be taken in the event of either a misfire or a cookoff.

A MISFIRE is the failure of a chambered round to fire. Such failure can be due to an ammunition defect or faulty firing mechanism. A misfire is not dangerous, but it is handled as described below.

A COOKOFF is the firing of a round by the heat of a very hot barrel, and not by the firing mechanism. A cookoff may be avoided by applying immediate action within 10 seconds after a failure to fire.

If an M60 machinegun stops firing, the following actions are taken WITHIN 10 SECONDS:

- **Cock the gun, and watch the ejection port to see if a cartridge case, belt link, or round is ejected. Insure that the bolt remains to the rear to prevent double feeding if a round or cartridge case is not ejected. (See TM 9-1005-224-24 for detailed explanation of double feeding.)**

- **If a cartridge case, belt link, or a round is ejected, return cocking handle to forward position, re-lay on the target, and try to fire. If the gun still does not fire, clear it and inspect the ammunition and the gun to determine the cause of the stoppage.**

- **If a cartridge case, belt link, or round IS NOT ejected, take remedial action as outlined in the following paragraphs.**

REMEDIAL ACTION

Remedial action is also taken immediately in case of a stoppage, but it includes an attempt to determine the cause.

COLD GUN

If the stoppage occurs with a cold gun, raise the cover and remove the belt of ammunition. Raise the feed tray and inspect the chamber.

If there is no round in the chamber, reload and try to fire. If the gun fires, continue firing. If it does not fire, reapply immediate and remedial action as necessary. Inspect the gun and the ammunition.

If there is a round in the chamber, close the cover and try to fire. If the gun fires, reload and continue firing. If it does not fire, clear the gun and inspect the gun and ammunition.

HOT GUN

If the stoppage occurs with a hot gun (200 rounds in 2 minutes), move the safety to SAFE, raise the cover, and remove the ammunition belt. Raise the feed tray and inspect the chamber.

NOTE: During training, an experienced gunner should wait 15 minutes and then clear the gun.

If there is no round in the chamber, reload and try to fire. If the gun fires, continue firing. If it does not fire, reapply immediate and remedial action as necessary. Inspect the gun and the ammunition.

If there is a round in the chamber, close the cover and try to fire. If the gun fires, reload and continue firing. If it does not fire during combat, change barrels, reload, and continue firing. If the gun does not fire during training, wait 15 minutes and then clear the gun and inspect it for cause.

JAMMED COCKING HANDLE

If a stoppage occurs and the cocking handle cannot be pulled to the rear by hand (the bolt may be fully forward and locked or only partially forward), the following steps should be taken:

- **Try once again to work the cocking handle by hand. Do not try to force the cocking handle to the rear with your foot or a heavy object. This could damage the gun.**
- **If the gun is hot enough to cause a cookoff, move all soldiers a safe distance from the gun and keep them away for 15 minutes. (Reference chapter 3, TM 9-1005-224-25.)**
- **After the gun has cooled, open the cover and disassemble it, keeping rearward pressure on the cocking handle until the buffer is removed. (Two soldiers will be required to do this.)**
- **Remove the round or fired cartridge. A cleaning rod or ruptured-cartridge extractor should be used if necessary.**

In a training situation, after completing the remedial action procedures, the gun should not be fired until it has been inspected by an ordnance specialist.

In a combat situation, after the stoppage has been corrected, change the barrel and try to fire. If the gun fails to function properly, it should be sent to the unit armorer.

MAINTENANCE

Maintenance of the M60 machinegun includes inspection, cleaning, and replacement of parts. A complete operator's and organizational maintenance guide is found in TM 9-1005-224 and TM 9-1005-224-24.

INSPECTION

Inspection begins with the gun disassembled in its major groups or assemblies. Note that shiny surfaces on parts do not mean the parts are unserviceable.

Inspect the following parts of the gun and related equipment for the conditions indicated:

Stock Group. The stock group should not be cracked and must fit securely on the receiver assembly.

The guide rails should not be cracked, bent, or burred.

The shoulder rest and stock latch should function correctly.

The rubber coating (covering the stock, forearm, trigger mechanism, cover, and carrying handle) should be checked for signs of gumming or cracking. If these parts are cleaned with solvents, they may soften and become unserviceable.

Buffer and Operating-Rod Group. The yoke and yoke recess should not be be burred, cracked, or bent.

The buffer plunger must fit easily into the recess in the driving-spring guide.

The driving spring should not have any kinks, and the wires should not be broken or separated.

The driving-spring guide should be straight, and the spool should be tight on the shaft.

The sear notch on the operating rod should not show excessive wear or burring.

Bolt Group. The bolt plug, bolt-plug pin, and actuatorcam assembly should be checked for visible damage.

The firing pin should be checked for cracks and wear on the tip.

The ejector and extractor should be checked to insure that they are under spring tension and are not chipped or worn.

Trigger-Mechanism Group. The shoulder of the sear should not show excessive wear.

The group should be checked for cracks near the retaining pins.

The leaf spring should be under tension.

The safety should function properly. (The sear should move only slightly when the safety lever is on SAFE, and freely when the safety lever is on FIRE.)

Barrel Group. (Both barrels should be checked.) The flash suppressor should be tight. The front sight and barrel-locking cam should not be bent, cracked, burred, or excessively worn.

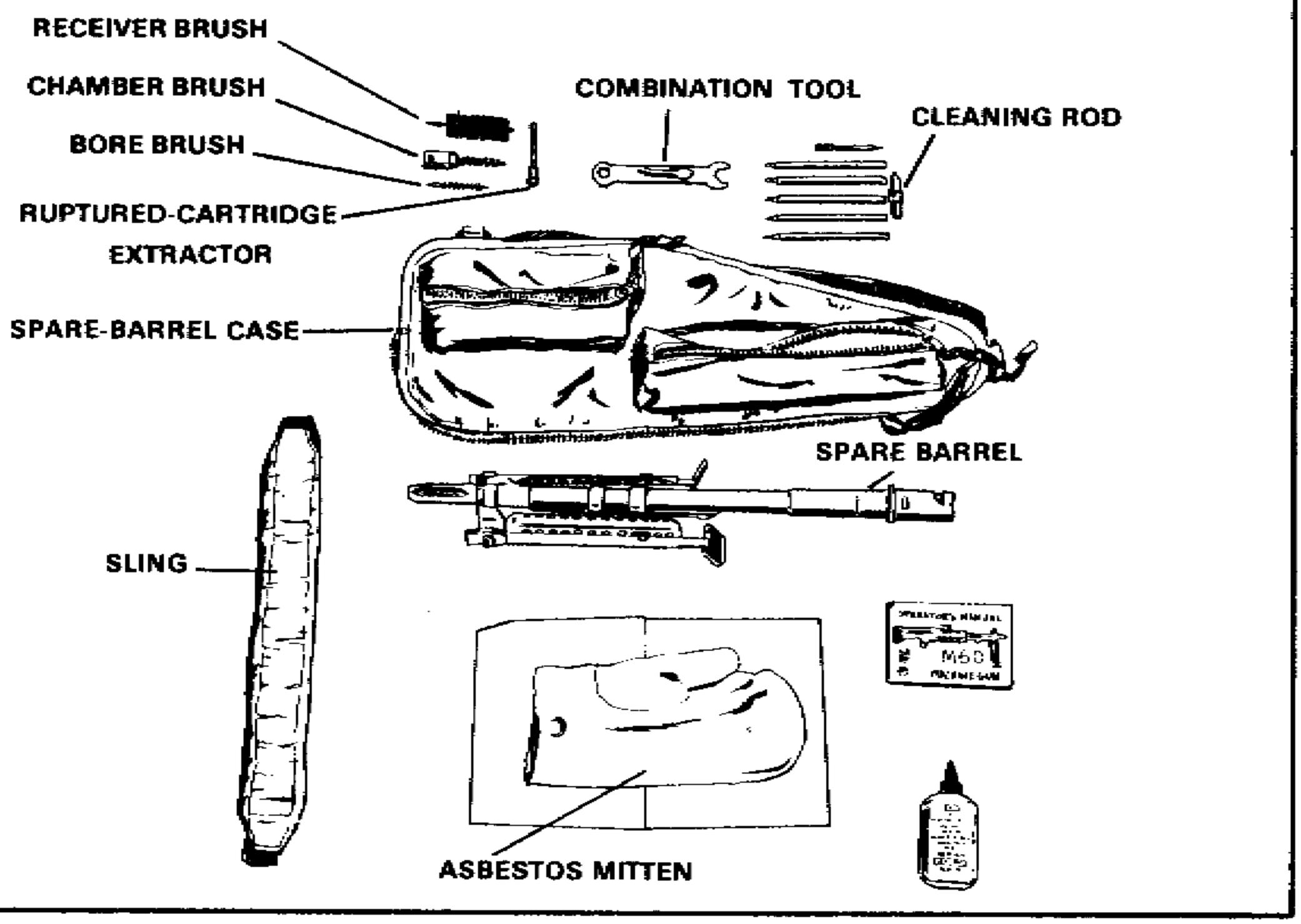
The bipod assembly should be checked to insure that it functions properly.

The gas piston and gas cylinder should not be burred, and the gas piston should move freely when the barrel is tilted end-for-end. The tolerance between the wall of the gas cylinder and the gas piston is so small that the moving gas piston cleans itself. Therefore, the gas system should be disassembled and cleaned ONLY when the gun fires sluggishly and no other reason for the sluggishness can be found. The detent on the tab lock washers of the gas-cylinder nut and gas-cylinder extension should not be broken.

The bleeder hole in the gas-cylinder extension should be clear.

Cover, Feed Tray, and Hanger Group. The cover latch should work properly.

CARRYING CASE WITH CONTENTS



All parts inside the cover should be under spring tension.

The cover should not be bent or torn.

When reassembled, the cover should remain open without support.

The belt-holding pawl must be under spring tension.

Forearm Assembly. The assembly must not be bent.

The spring in the latch hole must work properly.

Receiver Group. The receiver should not be bent or cracked.

The cocking handle should slide freely within its guide.

The elevation scale on the rear sight must be movable and legible. The elevation-scale screw should not be burred or worn.

Mount. The traversing and elevating mechanism should not bind. The numbers on the scales and dials must be legible.

Distinct clicks must be heard when the handwheels are turned. Index lines should be calibrated with the indicator pointer.

The pintle should fit snugly in the pintle bushing, and the pintle lock should hold the pintle securely.

The sleeve latch should function properly, and the traversing bar should be tight when the tripod legs are spread and latched.

Carrying Case. Maintenance tools and equipment should be complete and serviceable.

The case should be serviceable. Frequent washing of the case should be avoided. Such washing may destroy the waterproofing and shrink the case.

CLEANING AND LUBRICATION

The M60 machinegun should be cleaned immediately after firing.

It should be disassembled into its major groups or assemblies for cleaning.

All metal components and surfaces that have been exposed to powder fouling should be cleaned using cleaner, lubricant, preservative (CLP) on a bore-cleaning patch. Use CLP on the bristles of the receiver brush to clean the receiver. CAUTION: TAKE CARE TO AVOID GETTING CLP IN THE GAS CYLINDER WHEN CLEANING THE BARREL, POSITION THE GAS CYLINDER ABOVE THE BARREL DURING CLEANING.

The gas-cylinder components will be removed and cleaned only when inspection shows that the piston will no longer move within the cylinder under its own weight when the barrel is tilted end-for-end. Under supervision of organizational maintenance personnel, disassemble and clean the gas cylinder and gas port. The receiver brush and swab-holding section of the cleaning rod may be used to clean the interior of the gas cylinder. When CLP is used, wipe the gas cylinder and gas piston dry before assembly. After assembly, check for free movement of the gas piston by tilting the barrel assembly. The unit armorer will rewire the gas-port plug (not removed by operator).

NOTE: Use a cloth lightly saturated in CLP on exterior surfaces to prevent corrosion.

After the M60 is cleaned and wiped dry, apply a thin coat of CLP by rubbing with a cloth. This will lubricate and preserve the exposed metal parts under all normal temperature ranges.

Lubricate moving parts, as described below, with CLP:

Barrel group. On the camming surfaces of the bolt-locking lugs.

Operating rod. On the rollers and those surfaces, immediately below the yoke, that ride within the receiver rails.

Cover. In the feed-cam assembly.

Bolt. On the bolt-locking lugs and actuator cam roller, and in the camming recess (for the operating rod).

Receiver. On the receiver rails.

After lubricating, cycle the components by hand to spread the CLP.

Guns fired infrequently or stored for prolonged periods should have a light film of CLP applied to the interior of the gas cylinder and the gas piston immediately after cleaning or after inspection. Preventive maintenance will be performed every 90 days, unless inspection reveals more frequent servicing is necessary. The use of the lubricant will NOT eliminate the requirement for cleaning and inspecting to insure that corrosion has not formed. Before using, the gas system and components must be clean and free of oil and lubricants.

Clean all exposed surfaces of the M122 tripod, pintle assembly, and traversing and elevating mechanism. Wipe dry and lubricate with CLP.

The following procedures apply to cleaning and lubricating the M60 under unusual conditions:

- **Below - 18 degrees Celsius (0 degrees Fahrenheit)--use lubricating oil, arctic weather (LAW) and oil lightly to avoid freezeup.**
- **Extremely hot--use CLP.**
- **Damp or salty air--use CLP. Clean and apply frequently.**
- **Sandy or dusty areas--use CLP. Clean and apply frequently. Wipe with a rag after each application to remove excess.**

ACTIONS BEFORE, DURING, AND AFTER FIRING

Before firing:

- **Wipe bore dry.**
- **Inspect the gun as outlined in crew drill.**
- **Inspect the spare barrel.**
- **Insure that the gun is properly lubricated.**

During firing:

- **Change the barrels as prescribed in chapter 1. Barrel changing will prolong the life of both barrels.**
- **Periodically inspect the gun to insure that it is properly lubricated.**
- **When malfunctions or stoppages occur, follow the procedures previously given.**

After firing:

- **Clear and clean the gun immediately.**
- **During periods of inactivity, clean and lubricate every 90 days unless inspection reveals more-frequent servicing is necessary (paragraph 2-11a, TM 9-1005-224-24).**

MAINTENANCE UNDER NBC CONDITIONS

If contamination is anticipated, apply oil to all outer metal surfaces of the gun and accessories. DO NOT OIL AMMUNITION. Keep the gun covered as much as possible.

If the gun is contaminated, decontaminae it as prescribed by FM 21-40 and TM 3220, and then clean and lubricate.

DESTRUCTION

The gun and mount will be destroyed only on the authority of the unit commander, in accordance with orders or policy of the Army commander. Report the destruction through command channels.

Disassemble the gun as completely as time permits. Using the barrel or tripod mount, destroy the parts in the order listed below:

(1) Bolt.

(2) Buffer and operating-rod group.

(3) Barrels.

(4) Sights, rear and front.

(5) Mounts.

To destroy the gun by burning, place an incendiary grenade on the receiver group over the bolt (with the cover resting on the grenade) and fire the grenade.

Bury the disassembled gun or dump the parts into streams, mud, snow, sumps, or latrines.

Smash the traversing and elevating mechanism and pintle assembly. Bend the tripod legs.

CHAPTER 6

Crew Drill

PREPARATION FOR DRILL

Crew drill gives squad and platoon members training in the fundamentals of machinegun operation and confidence in their ability to put the gun into action with precision and speed. Rotation of duties during training insures that every member becomes trained in the duties of each crew position. Precision is attained by learning and practicing correct procedures, to include inspecting the gun before firing and observing safety procedures. Speed is acquired after precision has been developed. PRECISION IS NEVER SACRIFICED FOR SPEED.

Crew drill can be conducted during transition firing, concurrently during other courses of fire, or anytime at the discretion of the unit commander. The organization for crew drill described in this chapter is for training crews in the fundamentals of machinegun operation; it is not the organization to be employed in every tactical situation.

To instill realism and relate crew drill to actual situations, the unit leader should vary his method of instruction. Possible approaches to this include the following methods:

- **Conduct crew drill from the prone position.**
- **Initiate crew drill from all types of tactical formations.**
- **Perform crew drill under simulated tactical situations.**

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PREPARATION FOR DRILL 6-1
BIPOD ASSEMBLY 6-3
TRIPOD MOUNT 6-8
PRONE POSITION 6-11

Crew drill, as discussed here, involves the leader and one machinegun crew. The machinegun crew will normally consist of at least two members (a gunner and an assistant gunner), but a complete crew consists of a gunner, an assistant gunner, and an ammunition bearer. There are two complete machinegun crews in the headquarters section of infantry, airmobile infantry, and airborne infantry platoons.

There are no assigned (dedicated) machinegun crews in the mechanized infantry platoon, but there are five M60 machineguns (two in the headquarters APC and one in each squad APC). It is imperative that squad members be designated for training in crew drill as well as machinegun marksmanship.

All commands are given by a leader. This leader may be a team leader, squad leader, or someone placed in charge of the crew. The gunner and assistant gunner repeat all commands. After the gun is mounted, the assistant gunner transmits all signals from the leader to the gunner and from the gunner to the leader.

ASSIGNING CREW EQUIPMENT

In addition to individual arms and equipment, crew members carry equipment for both bipod and tripod training. The following is a suggested assignment of the equipment to the machinegun crew members:

- **Leader (designated)----Binoculars, compass.**
- **Gunner-------Machinegun, three bandoleers (with dummy ammunition).**
- **Assistant gunner-------Spare-barrel case (spare barrel and accessories), traversing and elevating mechanism, and three bandoleers (with dummy ammunition).**
- **Ammuntion bearer-------M122 tripod, pintle assembly, and three bandoleers (with dummy ammunition).**

If there is no ammunition bearer, the assistant gunner carries the spare-barrel case, the tripod, and the pintle assembly. He performs the duties of the ammunition bearer that pertain to those items of equipment.

FORMING FOR CREW DRILL (BIPOD OR TRIPOD MOUNT)

The leader commands, FORM FOR CREW DRILL. The crew forms in a file with five steps between men in this order: gunner, assistant gunner, and ammunition bearer. The gunner is five steps from and facing the leader. When the crew members reach their positions, each assumes the prone position and is ready for crew drill.

CREW IN PRONE POSITION FORMED FOR CREW DRILL



ROTATING DUTIES DURING CREW DRILL

Duties are rotated during crew drill to train each man in the duties of all crew members.

The command to rotate duties is FALL OUT, GUNNER. At this command, the gunner becomes the ammunition bearer, the assistant gunner becomes the gunner, and the ammunition bearer becomes the

assistant gunner. When crew members have assumed their new positions, they call out their new duties in order: AMMUNITION BEARER, ASSISTANT GUNNER, GUNNER.

BIPOD ASSEMBLY

INSPECTING

An inspection of equipment is made at the beginning of each exercise. After the crew is formed for crew drill, the leader commands, INSPECT EQUIPMENT BEFORE FIRING, BIPOD. At this command, each crew member inspects his equipment as explained below.

Inspection by Gunner. The gunner inspects the ammunition first. He insures that the ammunition is properly linked and free of dirt and corrosion, and that the double link is up (ready for loading). After he inspects the ammuntition, he reinserts the cardboard flaps in the bandoleers and places the cloth slings over his shoulder (except for one bandoleer, which he prepares for loading).

He then inspects the machinegun as follows:

- **Holding the forearm assembly with his left hand, he reaches over with his right hand, pulls to the rear on the right bipod leg, and lowers it. Then, reaching under the right bipod leg, he lowers the left bipod leg and rests the gun on the bipod.**
- **Attaches the bandoleer to the machinegun.**
- **Places the safety lever on FIRE, pulls the cocking handle to the rear, pulls the trigger, eases the bolt forward manually with the cocking handle, and places the safety lever on SAFE.**
- **Calls for the cleaning rod and combination tool and receives them from the assistant gunner.**
- **Crawls forward and runs the cleaning rod through the barrel to insure that it is clear. While in this position, he visually checks the bleeder hole of the gas-cylinder extension to insure that it is clear.**
- **Checks the flash suppressor for cracks.**
- **Checks the front sight for tightness and for damage to the blade.**
- **Uses the combination tool to check the gas-cylinder extension, gas-port plug, and gas-cylinder nut for tightness, and insures that the retaining wire is secured.**
- **Checks the carrying handle to insure that it can be positioned so it will not be in the way during aiming and firing.**
- **Insures that the barrel-locking lever is down and the barrel is securely locked to the receiver.**
- **Returns the cleaning rod and combination tool to the assistant gunner.**
- **Moves to the rear of the gun and checks the moving parts in the feed cover.**

  Insures that the feed cam is clean and properly lubricated.

  Pushes back and forth on the feed cam to check for freedom of movement.

  Pushes on the belt-feed pawl to insure that it has spring tension.

  Pushes on the cartridge guides to insure that they have spring tension.
- **Pushes the belt-holding pawl to insure that it has spring tension.**

- **Lowers and latches the cover (without inserting the belt).**
- **Pulls the trigger to check the functioning of the safety.**
- **Places the safety lever on FIRE, pulls the cocking handle to the rear, pulls the trigger, eases the bolt forward manually with the cocking handle, and places the safety on SAFE.**
- **Checks the rear sight, sets it at 500 meters and zero windage, then lowers the sight.**
- **Checks the hinged shoulder rest for proper operation and leaves it in the down position.**

This completes the gunner's inspection; he resumes his position parallel to the machinegun (his head on line with the feedway).

Inspection by Assistant Gunner. Remaining prone, the assistant gunner begins by inspecting his ammunition.

He takes the cleaning rod and the combination tool from the carrying case and assembles the cleaning rod.

He then takes the traversing and elevating mechanism from the case and prepares it as follows:

- **Rotates the elevating handwheel, exposing 4 cm (1-1/2 inches or the width of two fingers) of threads above the elevating handwheel.**
- **Rotates the traversing slide sleeve, exposing 4 cm (1-1/2 inches or the width of two fingers) of threads below the elevating handwheel.**
- **Centers the traversing mechanism as prescribed in chapter 8.**
- **Checks the locating pin of the elevating adapter to insure that it functions and has spring tension.**
- **Replaces the traversing and elevating mechanism in its case and removes the spare barrel from the spare-barrel case.**

The assistant gunner next inspects the spare barrel as follows:

- **Checks the barrel and the bleeder hole of the gas-cylinder extension to insure that they are clear.**
- **Checks the flash suppressor for cracks.**
- **Checks the front sight for tightness and for damage to the blade.**
- **Checks the bipod assembly for proper operation.**
- **Uses the combination tool to check the gas-cylinder extension, gas-port plug, and gas-cylinder nut for tightness, and insures that the retaining wire is secure.**

The assistant gunner's inspection is complete when he returns the spare barrel to its case; closes the case; disassembles the cleaning rod and returns it and the combination tool to the accessory pocket; and checks the ruptured-cartridge extractor, bore brush, chamber brush, receiver brush, and asbestos mitten for serviceability.

Inspection by Ammunition Bearer. Remaining prone, the ammunition bearer inspects his ammunition as described above for gunner and assistant gunner. He then inspects the tripod and pintle assembly as follows:

- **Insures that the legs are folded closely together.**
- **Checks the sleeve latch to insure that it has spring tension and will function.**
- **Inserts the pintle assembly into the pintle bushing and engages the pintle lock.**
- **Checks the pintle assembly to insure that it is locked into the**

pintle bushing and that the pintle rotates freely within the bushing.

- **Checks the front mounting lug to insure that it is free of dirt and pointing forward (checks the platform and pintle group, OLD ISSUE).**
- **Lowers the platform lock (lowers the platform and pintle group, OLD ISSUE).**
- **Depresses the pintle platform latch on the OLD ISSUE, insuring that it is free of dirt and has spring tension.**

This completes the ammunition bearer's inspection.

REPORTING COMPLETION OF INSPECTION

When all members of the crew have completed their inspections of equipment, they call out their report, without command, starting from the rear:

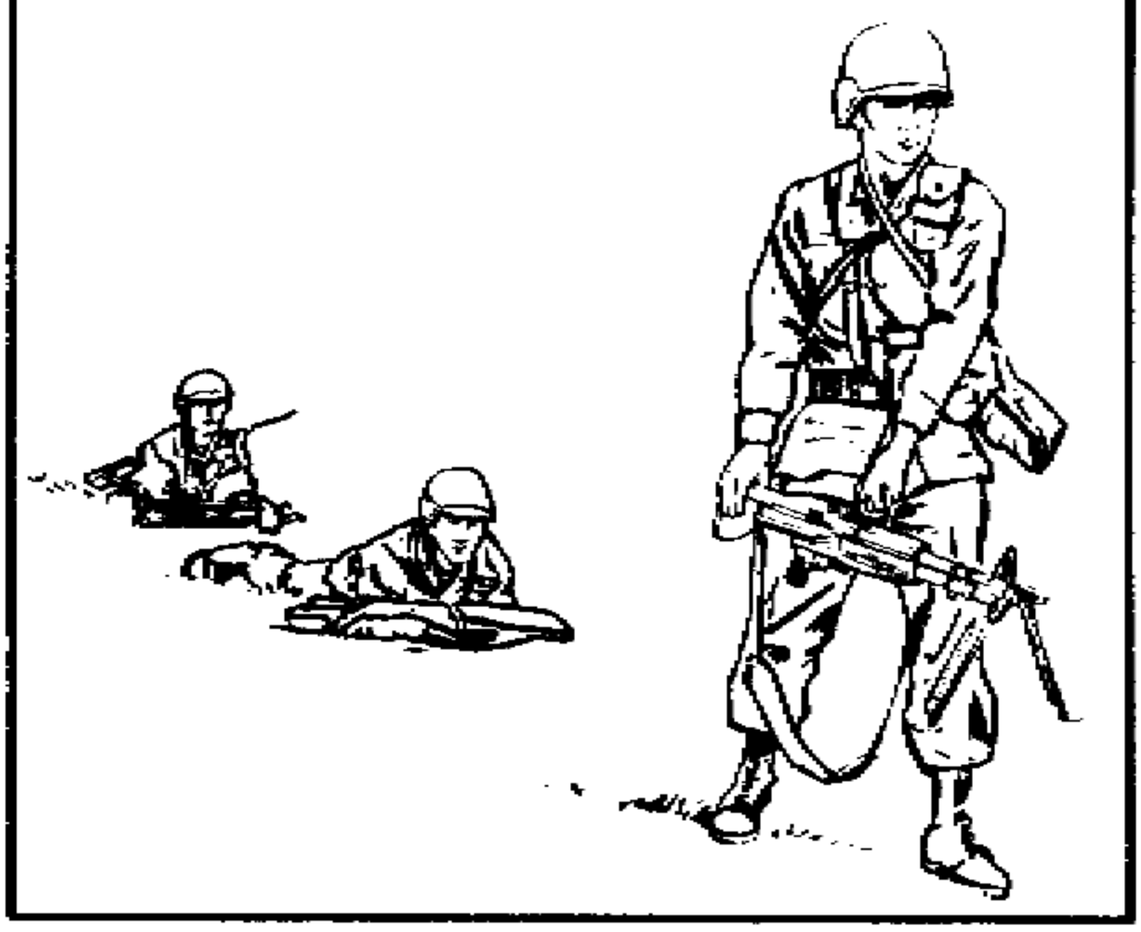
- **AMMUNITION BEARER CORRECT (or reports deficiencies).**
- **AMMUNITION BEARER AND ASSISTANT GUNNER CORRECT (or reports the ammunition deficiences).**
- **The gunner announces, ALL CORRECT (or deficiencies found during the inspections).**

PLACING THE MACHINEGUN INTO ACTION

To place the gun into action, the leader commands and signals, GUN TO BE MOUNTED HERE (pointing to the position where the gun is to be mounted), FRONT (pointing in the direction of fire), ACTION (raising fist to shoulder level and thrusting it several times in the direction of the selected position).

At the command ACTION, the gunner rises to his feet, grasps the carrying handle with his left hand, grasps the top of the stock with his right hand, raises the gun to a carrying position (muzzle to the front) and moves to the selected position.

GUNNER MOVING TO THE MACHINEGUN POSITION



Upon arrival at the position, the gunner places the gun on the ground. He then assumes the prone position to the rear of the gun, positions the carrying handle to the left so that it will not interfere during a barrel change or aiming and firing, alines the gun in the direction of fire, and raises the rear sight and hinged shoulder rest. He places the safety on FIRE, pulls the bolt to the rear, places the safety on SAFE, and returns the cocking handle to the forward position. He then raises the feed cover, places the first round of ammunition in the cartridge feed-tray groove, and closes the feed cover, insuring that the round does not slip out of the cartridge feed-tray groove. He then places the gun to his shoulder and puts the safety on FIRE.

The assistant gunner times his movements so that he arrives at the position as the gunner is assuming the prone position. He lies prone on his left hip, feet to the rear, and on the left side of the gunner. He places

the spare-barrel case parallel to the gun with the zippered side toward the gun. He opens the case and removes the spare barrel. He extends the bipod legs and places the spare barrel on the case, muzzle to front and even with the muzzle of the gun.

GUNNER IN FIRING POSITION



AMMUNITION BEARER IN POSITION



CREW IN POSITION



The ammunition bearer times his movements so that he arrives at the position as the assistant gunner is assuming the prone position. He places the folded tripod one step to the left of the muzzle of the gun and on line with the gun. He unslings his bandoleers and places them next to the folded tripod legs. He then lies prone approximately 10 meters to the left and on line with the position, provides security, and prepares to fire into the target area with his rifle.

If the bipod legs must be adjusted, the assistant gunner crawls forward and supports the muzzle of the gun by holding the bipod yoke with his left hand. He adjusts the height of the bipod legs with his right hand. (The assistant gunner wears an asbestos mitten as required.)

When ready to fire, the gunner puts the safety lever on FIRE and reports, UP. The assistant gunner signals, READY, to the leader.

CHANGING THE BARREL

To insure proficiency and speed in changing barrels, the barrel-changing process is included in crew drill.

When the gunner has reported UP, and the assistant gunner has signaled READY, the leader commands, CHANGE BARRELS.

The gunner insures that the bolt is to the rear, puts the stock on the ground, and puts the safety lever on SAFE. He then pushes to the right on the barrel-locking-lever detent with his left hand and raises the barrel-locking lever with his right hand. Next, he moves his right hand to the top of the stock. He puts his left hand under the forearm assembly and raises the muzzle of the gun.

When the gunner raises the muzzle, the assistant gunner (wearing the asbestos mitten) grasps the gas system, removes the barrel, and puts it down with the barrel socket on the spare barrel case. He holds the spare barrel by the gas system and inserts it into the forearm assembly.

The gunner lowers the barrel-locking lever, moves the safety lever to FIRE, assumes the correct firing position, and reports, UP. The assistant gunner signals, READY, to the squad leader.

TAKING THE MACHINEGUN OUT OF ACTION

To take the gun out of action, the leader commands and signals OUT OF ACTION. The gunner and assistant gunner repeat the command.

At the command OUT OF ACTION, the ammunition bearer moves to the position,

CORRECT POSITION FOR BARREL CHANGE



slinging his rifle. He picks up and slings the bandoleers that he previously left there. He gets the tripod and moves 15 steps to the rear of the gun. He lies prone, facing the position with the tripod in front of him.

The assistant gunner closes the bipod legs on the spare barrel and places it and the asbestos mitten in the spare-barrel case. Before rising, he closes the spare-barrel case enough to retain the spare barrel and the traversing and elevating mechanism. He moves 10 steps to the rear of the position and lies prone, facing the position. At this time, he fully closes the spare-barrel case.

The gunner places the stock on the ground, insures that the bolt is to the rear, places the safety lever on SAFE, and raises the feed cover. He removes the ammunition from the tray, puts it into the bandoleer, and closes the bandoleer. The gunner examines the chamber to insure that it is clear; closes the feed cover; pulls the cocking handle to the rear; puts the safety lever on FIRE; pulls the trigger, easing the bolt forward; and puts the safety lever on SAFE. He lowers the shoulder rest with his right hand and the rear sight assembly with his left hand. He grasps the carrying handle with his left hand and the stock with his right hand. Rising, he pivots on his right foot; without turning the gun, he raises it to his left hip and moves five steps to the rear. He visually checks to insure that the ammunition bearer and the assistant gunner are in their proper positions. He lies prone, facing the position with the gun on his right. He folds the bipod legs alongside the barrel and reports, UP, to the squad leader.

TRIPOD MOUNT

The inspection of equipment for tripod training is the same as for bipod training except the leader's command to start the inspection of equipment is INSPECT EQUIPMENT BEFORE FIRING, TRIPOD.

Also, the gunner inspects the bipod legs and folds them to their position alongside the barrel.

PLACING THE MACHINEGUN INTO ACTION

The leader commands and signals, GUN TO BE MOUNTED HERE, FRONT, ACTION, in the same manner as for bipod training.

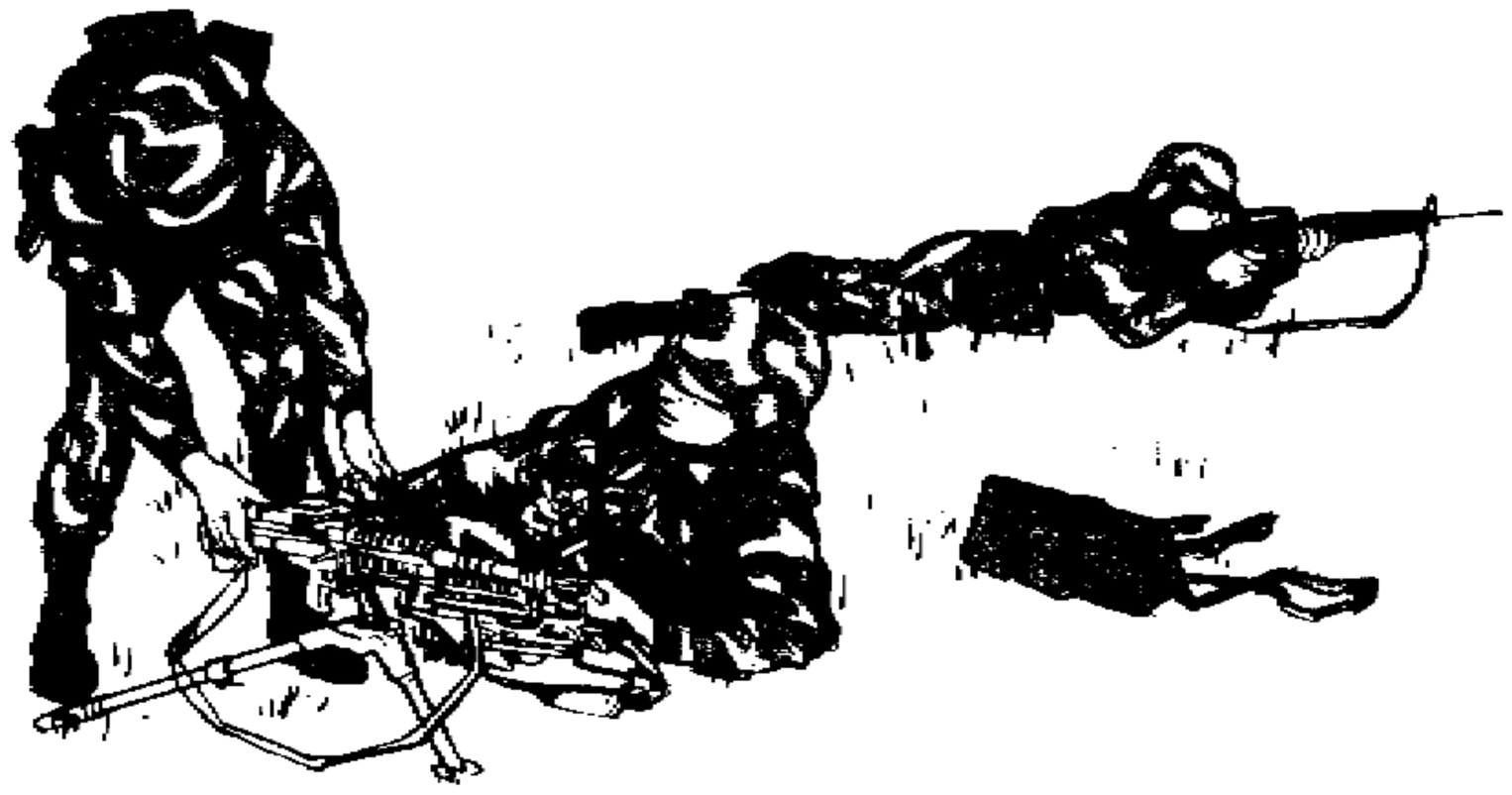
Upon the command ACTION, the ammunition bearer rises to his feet, holds the tripod with his right hand, and moves forward to the position. He kneels on his right knee and rests the shoes of the rear tripod legs on the ground, with the mount in a vertical position. Steadying the mount with his right hand near the tripod head, he raises the front leg with his left hand. He grasps the right shoe with his right hand and the left shoe with his left hand, and raises the tripod chest high. He separates the tripod legs with a quick jerk. Insuring that the sleeve latch engages the sleeve, he places the tripod on the ground with the front leg pointing in the direction of fire. He rises to his feet and stamps the rear shoes into the ground. He then unslings his bandoleers and places them on line with the front leg of the tripod, one step to the left. He moves approximately 10 meters to the left of the position, unslings his rifle, lies prone, provides security, and prepares to fire into the target area.

The assistant gunner times his movements and arrives at the position as the ammunition bearer leaves. He places the spare-barrel case (zippered side toward the tripod) parallel to and on line with the spot where the muzzle of the gun will be when it is mounted. He lies on his left side, with his hip near the left tripod shoe. He unzips the spare-barrel case and removes the spare-barrel and the traversing and elevating mechanism. He places the spare barrel on the spare-barrel case with the muzzle forward.

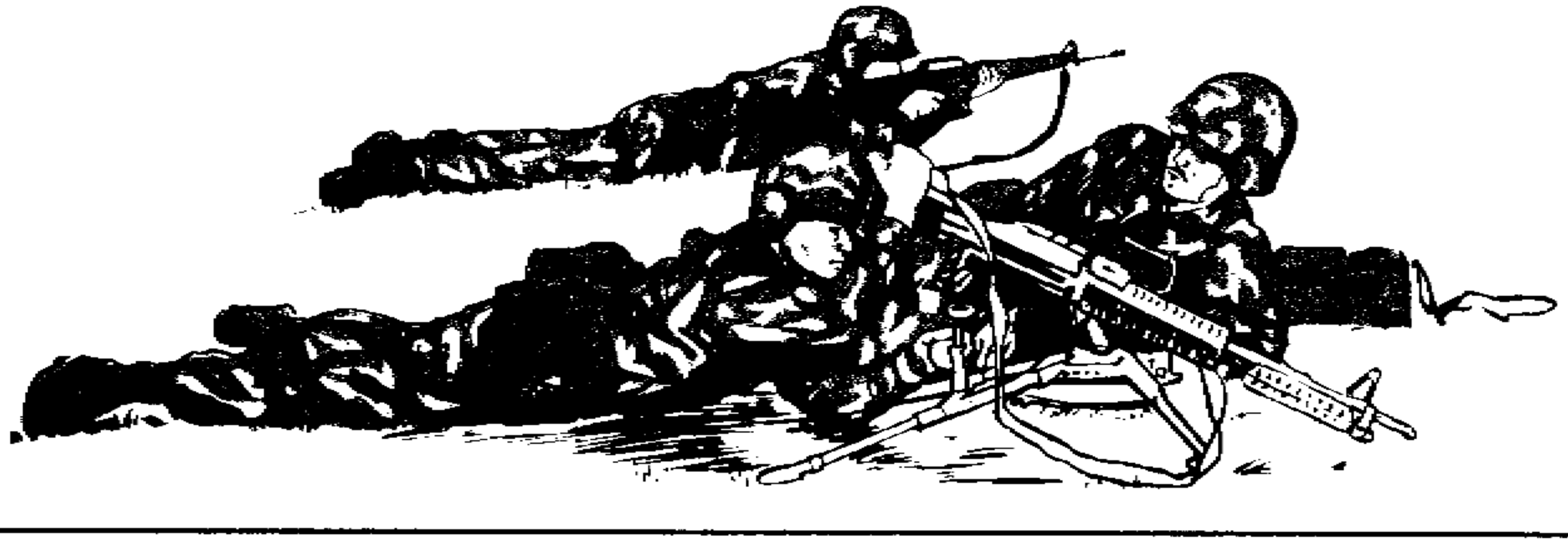
OPENING THE TRIPOD



MOUNTING THE MACHINEGUN



ATTACHING THE TRAVERSING AND ELEVATING MECHANISM



The gunner times his movements and arrives at the position as the assistant gunner assumes the prone position. He rises to his feet, holds the carrying handle in his left hand and the stock in his right hand, and raises the gun to the carrying position (muzzle to the front). He mounts the gun in accordance with chapter 3. He then positions the carrying handle to the left so it will not interfere with aiming and firing, raises the rear-sight assembly, and lies prone.

The assistant gunner hands the gunner the traversing and elevating mechanism and then steadies the gun. The gunner then positions and locks the traversing and elevating mechanism on the gun and the traversing bar.

The gunner places the safety on FIRE, pulls the bolt to the rear, places the safety on SAFE, and returns the cocking handle to the forward position. The assistant gunner places the first round of ammunition in the tray groove and supports the belt while the gunner closes the cover. The gunner takes the correct position and grip, places the safety lever on FIRE, and reports, UP. The assistant gunner signals, READY, to the squad leader.

CHANGING THE BARREL

When the gunner has reported, UP, and the assistant gunner has signaled, READY, the leader commands, CHANGE BARRELS.

The gunner puts the safety lever on SAFE and pushes to the right on the barrel-locking-lever detent with his left hand. He raises the barrel-locking lever with his right hand and keeps his hand at that position.

The assistant gunner grasps the bipod legs, removes the barrel from the gun, and places it on the carrying case. He then holds the spare barrel by the bipod legs and inserts it into the forearm assembly.

The gunner lowers the barrel-locking lever, moves the safety lever to FIRE, assumes a correct firing position, and reports, UP. The assistant gunner signals, READY, to the squad leader.

TAKING THE MACHINEGUN OUT OF ACTION

At the command OUT OF ACTION, the gunner insures that the bolt is to the rear, places the safety lever on SAFE, and raises the cover. The assistant gunner removes the ammunition from the tray, returns it to the bandoleer, and closes the bandoleer. The gunner inspects the chamber to insure that it is clear; closes the cover; pulls the cocking handle to the rear; puts the safety lever on FIRE; pulls the trigger, easing the bolt forward; and puts the safety lever on SAFE. The gunner removes the traversing and elevating mechanism from the tripod and hands it to the assistant gunner.

The assistant gunner puts the traversing and elevating mechanism into the spare-barrel case. He puts the spare barrel and mitten into the case and closes it enough to retain the contents. He rises, moves 10 steps to the rear of the position, and lies prone, facing to the front. At this time, he fully closes the spare-barrel case.

MACHINEGUN CREW GOING OUT OF ACTION (TRIPOD)



After handing the traversing and elevating mechanism to the assistant gunner, the gunner rises to his feet, lowers the rear sight, and holds the carrying handle with his left hand. With his right hand, he depresses the pintle latch and removes the gun from the tripod. Holding the stock with his right hand, he pivots to his right as he raises the gun to the carrying position. He then moves five steps to the rear of the position and lies prone, facing to the front.

The ammunition bearer rises, slings his rifle, moves to the gun, and secures his bandoleers, timing his arrival so that the gunner and assistant gunner will be clear of the tripod. He grasps the tripod with his left hand and moves five steps to the rear of the position. He turns, facing the front, and kneels on his right knee. He places the tripod in a vertical position with the rear shoes on the ground and supports it with his right hand near the head of the tripod. He reaches up with his left hand and lowers the front leg, slides his right hand down the right leg, and releases the sleeve latch. He then grasps the shoes and closes the tripod legs. He lowers the tripod to the ground, head to the left, lies prone behind it, and reports, UP.

CLOSING THE TRIPOD LEGS



PRONE POSITION

Crew drill, as it is described in the preceding paragraphs, is an excellent training vehicle for the machinegun crew. However, it is not realistic for any situation other than training. A continuation or second phase of crew drill (crew drill in the prone position) is outlined in this section. It should be used only as a technique for adding realism to training.

INSPECTING EQUIPMENT BEFORE FIRING

The inspection of equipment for crew drill from the prone position is the same as that for bipod training and tripod training.

PLACING THE GUN INTO ACTION

The leader commands and signals, GUN TO BE MOUNTED HERE, FRONT, ACTION, in the same manner as for bipod training.

The procedures for bipod training are the same, with one exception. Crew members do not get to their feet, and all movements are executed in the low crawl. Once in position, all actions are performed from the prone position.

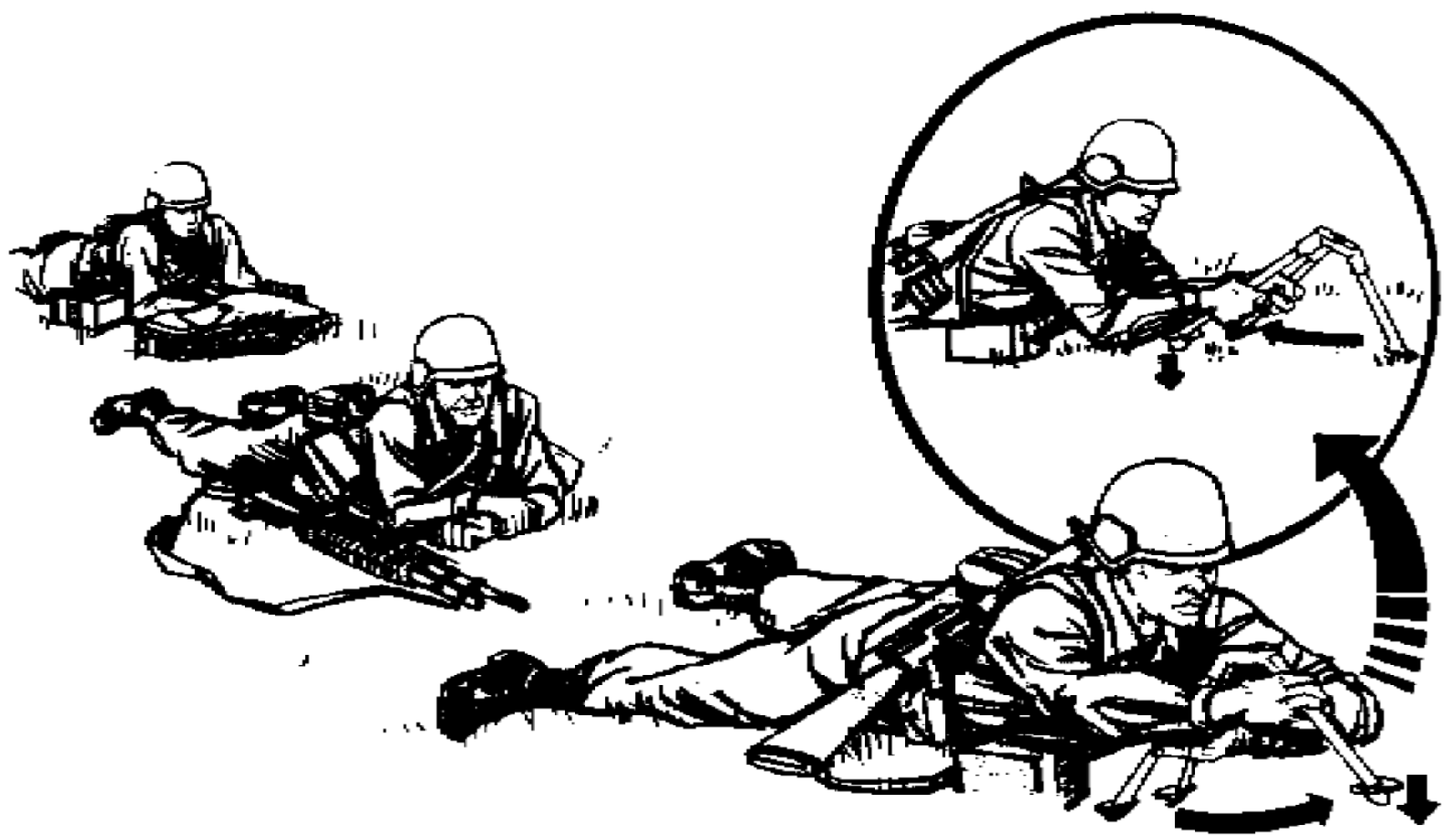
TRAINING WITH THE TRIPOD

Upon the command ACTION, the ammunition bearer crawls forward to the

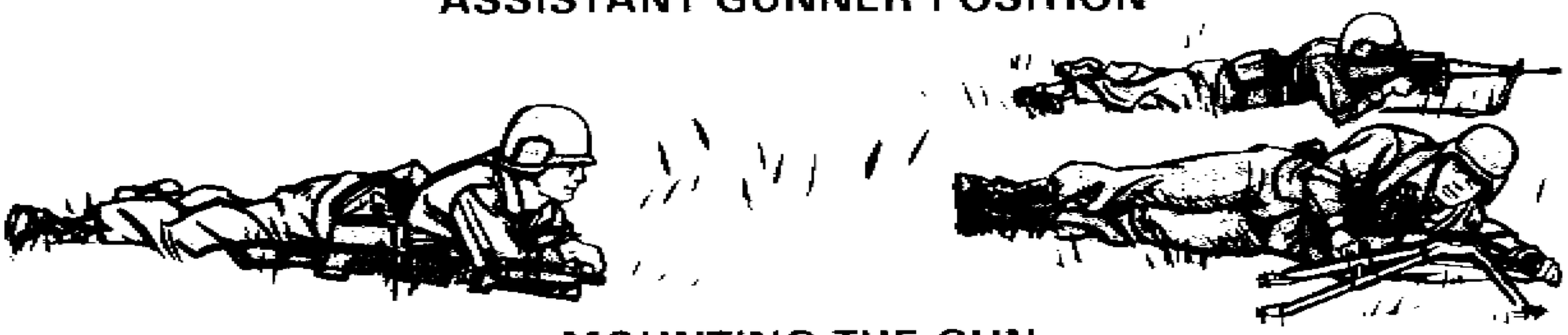
designated position and extends the front leg of the tripod. Grasping the rear legs firmly, he emplaces the front leg. Applying downward pressure, he emplaces the rear legs. He then crawls to a position about 10 meters to the left of the machinegun and gets into a good firing position with his rifle.

The assistant gunner crawls forward, timing his movement to arrive as the ammunition bearer leaves. Positioning him-

EXTENDING FRONT LEG OF TRIPOD



ASSISTANT GUNNER POSITION



MOUNTING THE GUN



self on the left side and facing the tripod, he places the spare-barrel case alongside the tripod, unzips the case, and removes the spare barrel and the traversing and elevating mechanism.

The gunner crawls forward to the rear of the tripod. The assistant gunner grasps the forearm assembly with his left hand (while the gunner holds on to the stock) and guides the mounting pins into the pintle latch until the gun locks into place. The gunner takes the traversing and elevating mechanism from the assistant gunner and mounts it on the gun and tripod. The assistant gunner then loads the gun.

The procedures for taking the gun out of action remain the same except all are performed in the prone position and all movements are in the low crawl.

CHAPTER 7

Techniques of Fire During Good Visibility

FUNDAMENTALS AND FIRING TECHNIQUES

Each member of the machinegun crew must be trained in standard methods of applying fire with the machinegun, both as a member of the crew and as a gunner.

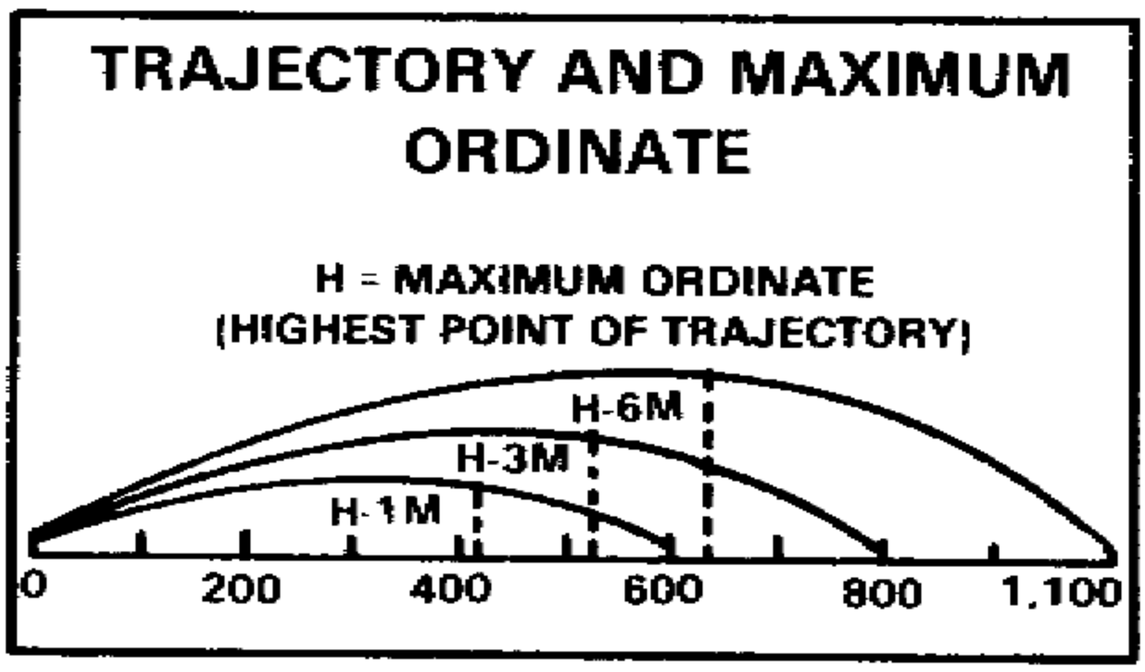
The easiest and quickest means of delivering fire with the gun mounted on its bipod, tripod, or vehicular mount is by alining the sights of the gun on the target and properly applying fire. This technique of fire is called DIRECT LAY.

At times, techniques of fire other than direct lay are more effective. When delivering fire in the assault, overhead fire, and fire from position defilade, the gunner must use the techniques described in this chapter.

To teach crew members to employ the machinegun to the best advantage, this chapter provides guidance in the fundamentals of characteristics of fire, classes of fire, range determination, and lateral distance measurements.

CHARACTERISTICS OF FIRE

Trajectory. This is the path of a bullet during flight. It is almost flat at ranges of 300 meters or less. At ranges beyond 300 meters, the trajectory is curved, and the curve becomes greater as the range increases.



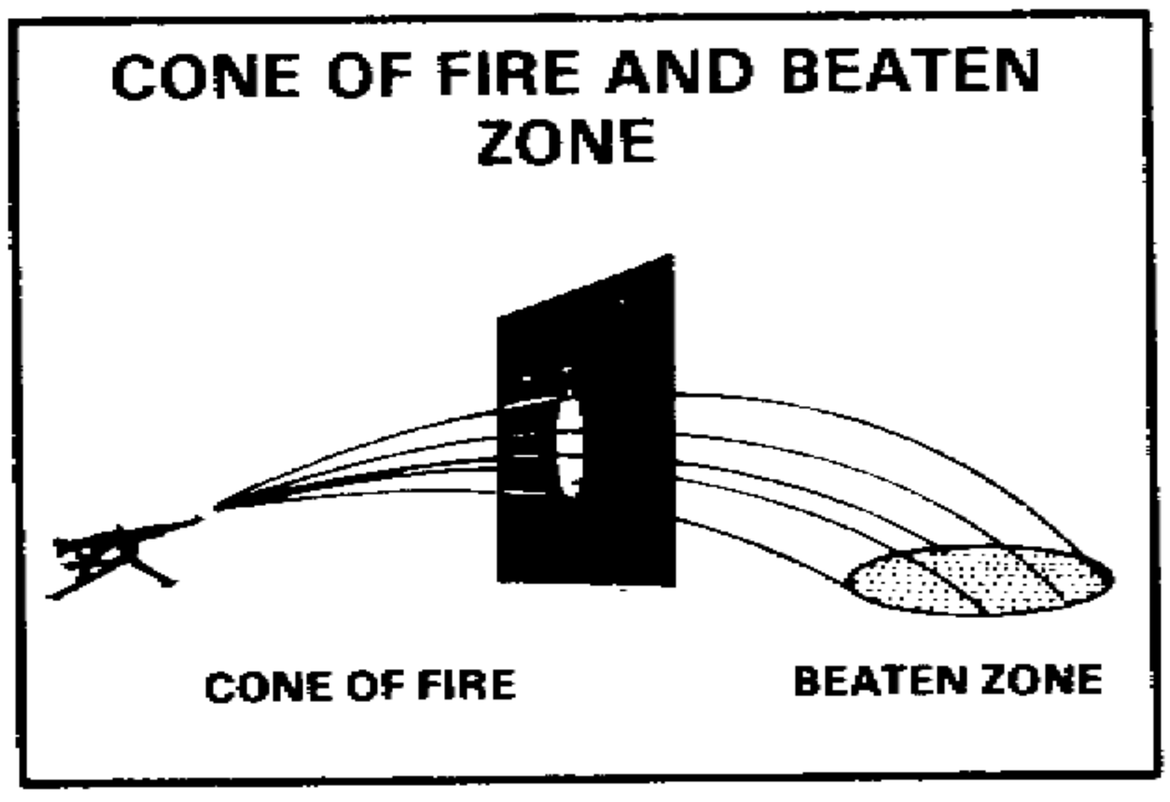
Maximum Ordinate. This is the highest point the trajectory reaches between the muzzle of the gun and the base of the target. It always occurs at a point approximately two thirds of the distance from the gun to the target. The maximum ordinate increases as the range increases.

Cone of Fire. This is the pattern formed by the different trajectories in each burst as they travel downrange. When several rounds are fired in a burst from a machinegun, each

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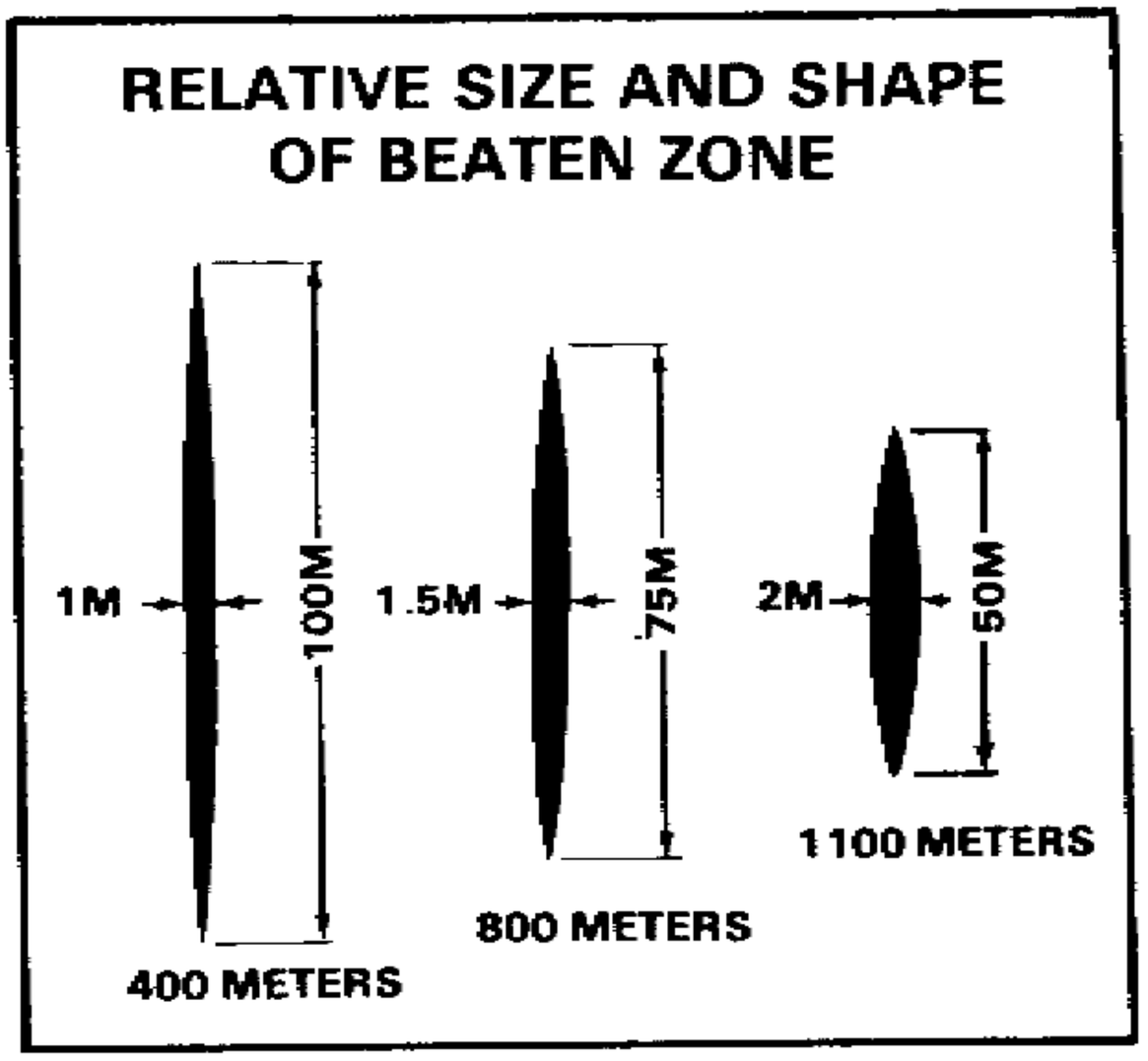
round takes a slightly different trajectory. This is primarily caused by the vibration of the gun. Variations in ammunition and atmospheric conditions also contribute to the different trajectories.



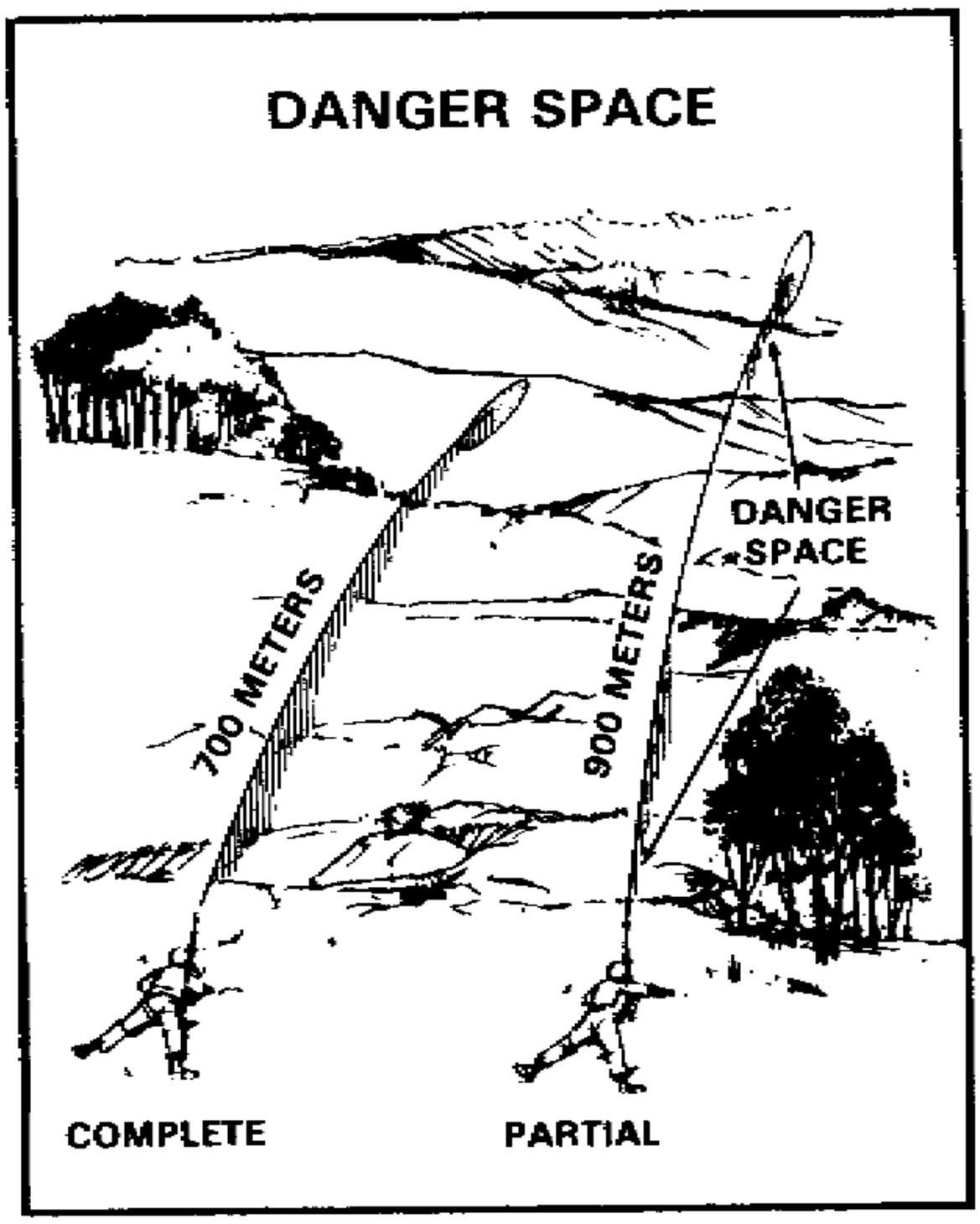
Beaten Zone. This is the pattern formed by the rounds within the cone of fire striking the ground or the target. The size and shape of the beaten zone changes when the range to the target changes or when the machinegun is fired into different types of terrain. On uniformly sloping or level terrain, the beaten zone is long and narrow. As the range to the target increases, the beaten zone becomes shorter and wider. When fire is delivered into terrain sloping down and away from the gun, the beaten zone becomes longer. When fire is delivered into rising terrain, the beaten zone becomes shorter. The terrain has no great effect on the width of the beaten zone.

Danger Space. This is the space between the gun and the target where the trajectory does not rise above 1.8 meters (the average height of a standing soldier). This includes the area of the beaten zone.

When a machinegun (on its bipod or tripod mount) is fired over level or uniformly sloping terrain at a target less than 700 meters away, the trajectory will not rise above the average height of a standing soldier.



When engaging targets over level or uniformly sloping terrain at ranges greater than 700 meters, the trajectory will rise above the average height of a standing soldier.



Therefore, not all the distance between the gun and the target is danger space.

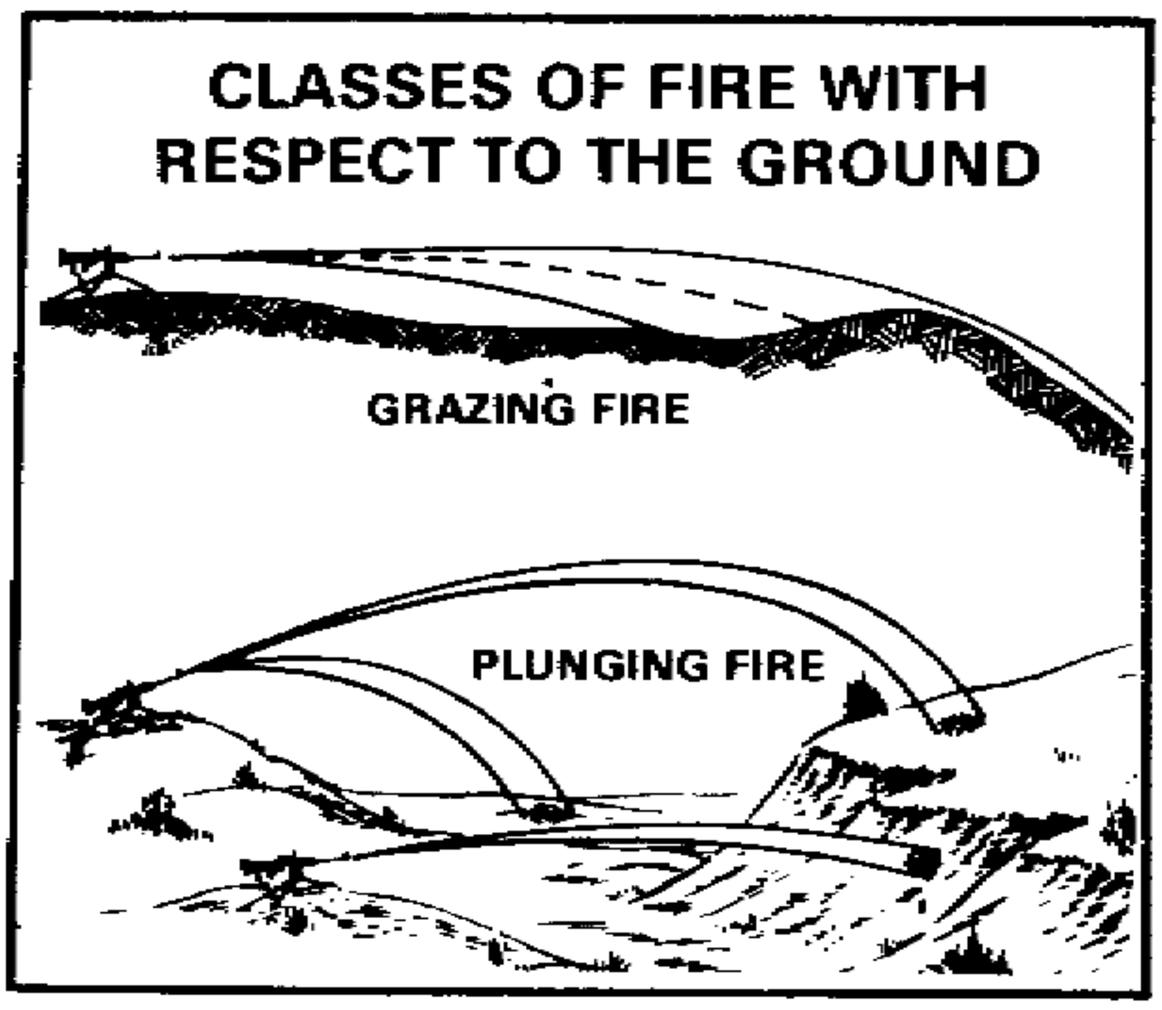
CLASSES OF FIRE

Machinegun fire is classified with respect to the GROUND, the TARGET, and the GUN.

Fire with respect to the GROUND includes:

Grazing Fire - when the center of the cone of fire does not rise more than 1 meter above the ground. When firing over level or uniformly sloping terrain, a maximum of 600 meters of grazing fire can be obtained.

Plunging Fire - when danger space is practically confined to the beaten zone. Plunging fire occurs when firing at long ranges, when firing from high ground to low ground, when firing into abruptly rising ground, or when firing across uneven terrain, resulting in a loss of grazing fire at any point along the trajectory.



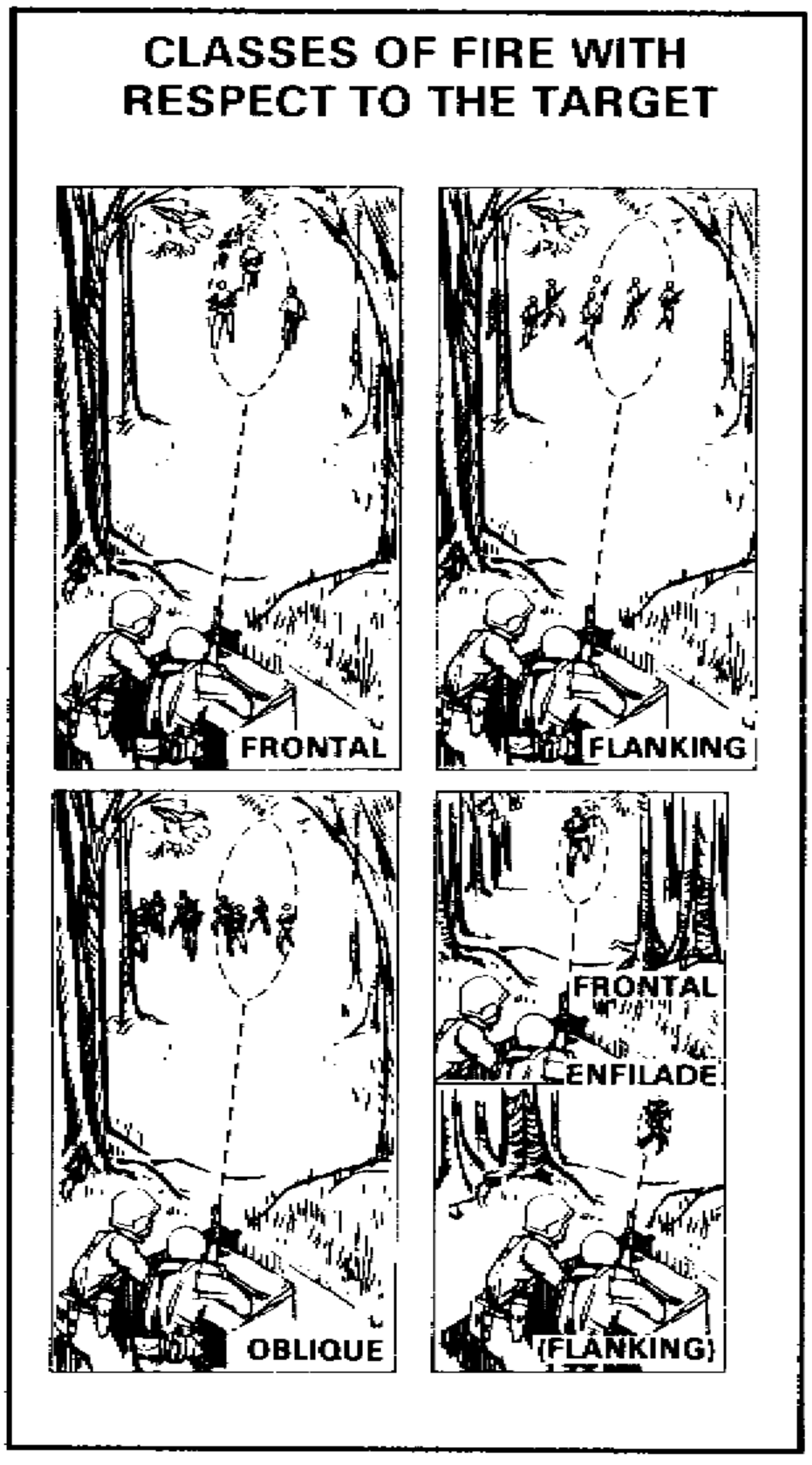
Fire with respect to the TARGET includes:

Frontal Fire - when the long axis of the beaten zone is at a right angle to the front of the target. Simply stated, that means when firing directly into the front of a target.

Flanking Fire - when delivered directly against the flank of a target.

Oblique Fire - when the long axis of the beaten zone is at an angle other than a right angle to the front of the target.

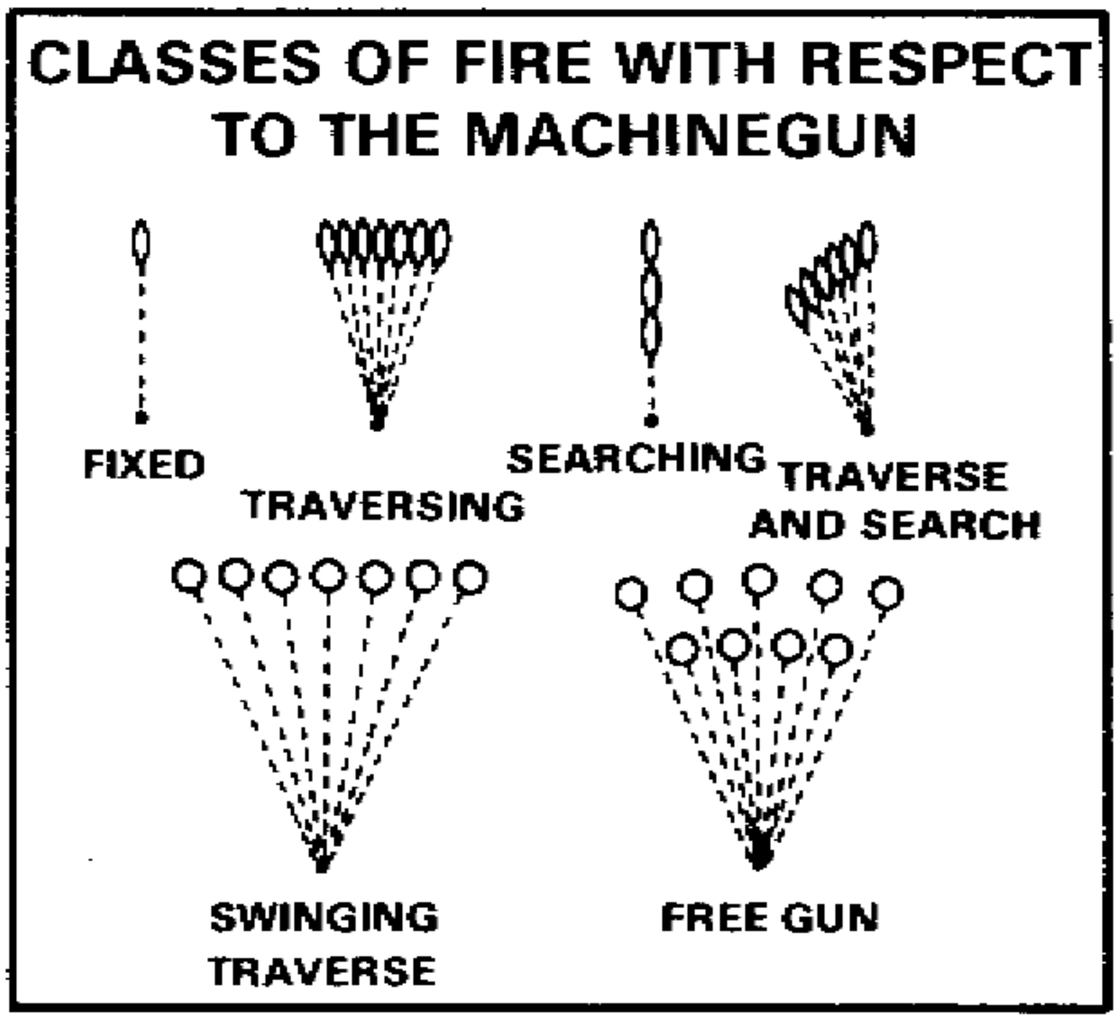
Enfilade Fire - when the long axis of the beaten zone coincides or nearly coincides with the long axis of the target. This type of fire is either frontal or flanking. It is the most desirable type of fire with respect to a target because it makes maximum use of the beaten zone.



Fire with respect to the GUN includes:

Fixed Fire - that delivered against a stationary point target when the depth and width of the beaten zone will cover the target.

Traversing Fire - that distributed in width by successive changes in direction. With the tripod-mounted gun, the changes are made in 2- to 6-mil increments on the traversing handwheel between bursts. If denser fire is needed, a 2-mil change in direction will cause an overlap of beaten zones to insure complete coverage of the target.



Searching Fire - that distributed in depth by successive changes in elevation. When firing the tripod-mounted gun over level or uniformly sloping terrain, the changes are made on the elevating handwheel in 2-mil increments. When fires are delivered into terrain sloping away from the gun, less than 2 mils of change may be required. Gunners will learn the amount of change to apply through experience. To get good target coverage, a burst is fired after each elevation change.

Traversing and Searching Fire - that distributed in width and depth by successive changes in direction and elevation. With the tripod-mounted gun, the changes in direction are made in 2- to 6-mil increments on the traversing handwheel. The amount of elevation change is determined by the slope of the terrain and the angle of the target. To get good coverage, a burst is fired after each COMBINED change in direction and elevation.

Swinging Traverse Fire - that delivered against targets too wide to cover with the traversing handwheel, or targets moving so rapidly across the gunner's front that he cannot maintain effective fire while using the traversing handwheel. To deliver this type of fire, the gunner loosens the traversing-slide-lock lever to allow the traversing and elevating mechanism to slide freely on the traversing bar. Changes in direction are made by applying pressure (left or right) to the rear of the gun. Changes in elevation are made by turning the elevating handwheel.

Free Gun Fire - that delivered from the tripod mount against targets requiring rapid major changes in direction and elevation which cannot be applied with the traversing and elevating mechanism. This fire can also be delivered from the vehicular mount against targets that cannot be adequately covered by selecting a series of aiming points. To deliver this type of fire from the tripod mount, the gunner removes the traversing and elevating mechanism from the bottom of the receiver, allowing the gun to be moved freely in any direction. To deliver this type of fire from the vehicular mount, the gunner changes direction and elevation by applying pressure to the rear (left or right) of the gun.

NOTE: Swinging-traverse and free-gun fire cannot be delivered with the bipod mount. The other types of fire can be delivered with the gun mounted on the bipod, tripod, or vehicle mount.

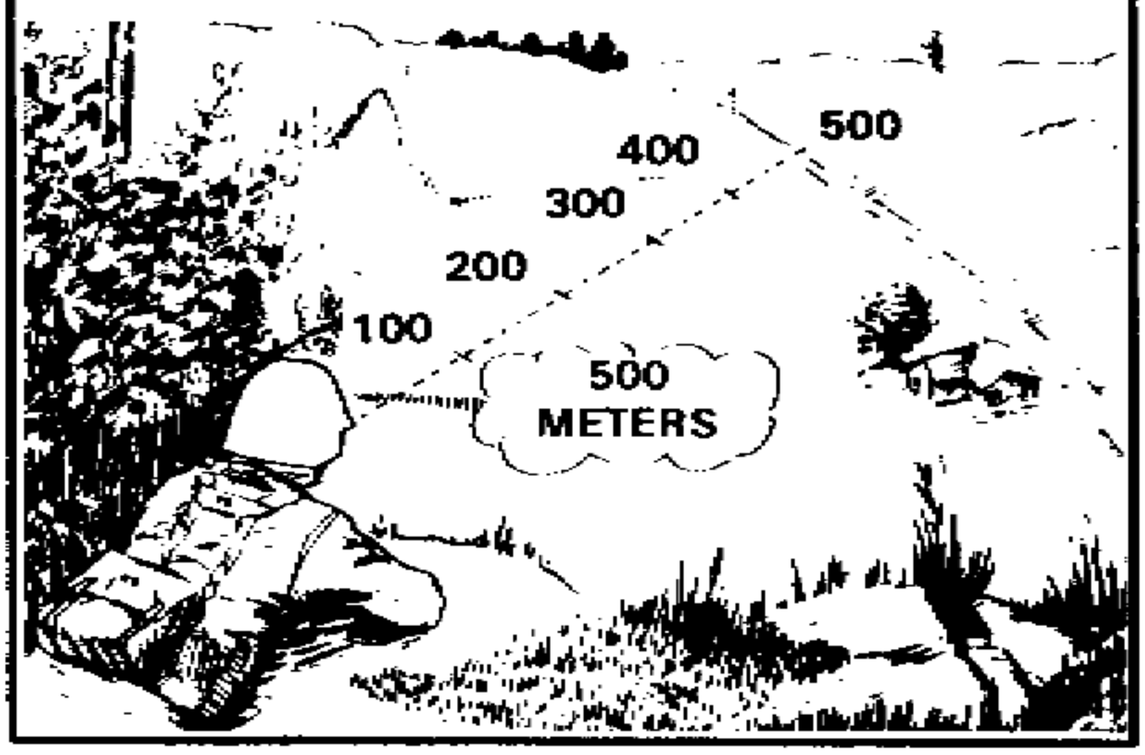
RANGE DETERMINATION

Range determination is the process of finding the distance between two points. In most situations, one of these points will be the observer's own position. The other point may be a target or prominent terrain feature. THE ABILITY TO DETERMINE RANGE ACCURATELY IS A KEY SKILL NEEDED BY THE GUNNER TO ACCOMPLISH HIS MISSION. Not only does the accurate determination of range affect his marksmanship, but it is also required in the reporting of information and the adjustment of artillery and mortar fire.

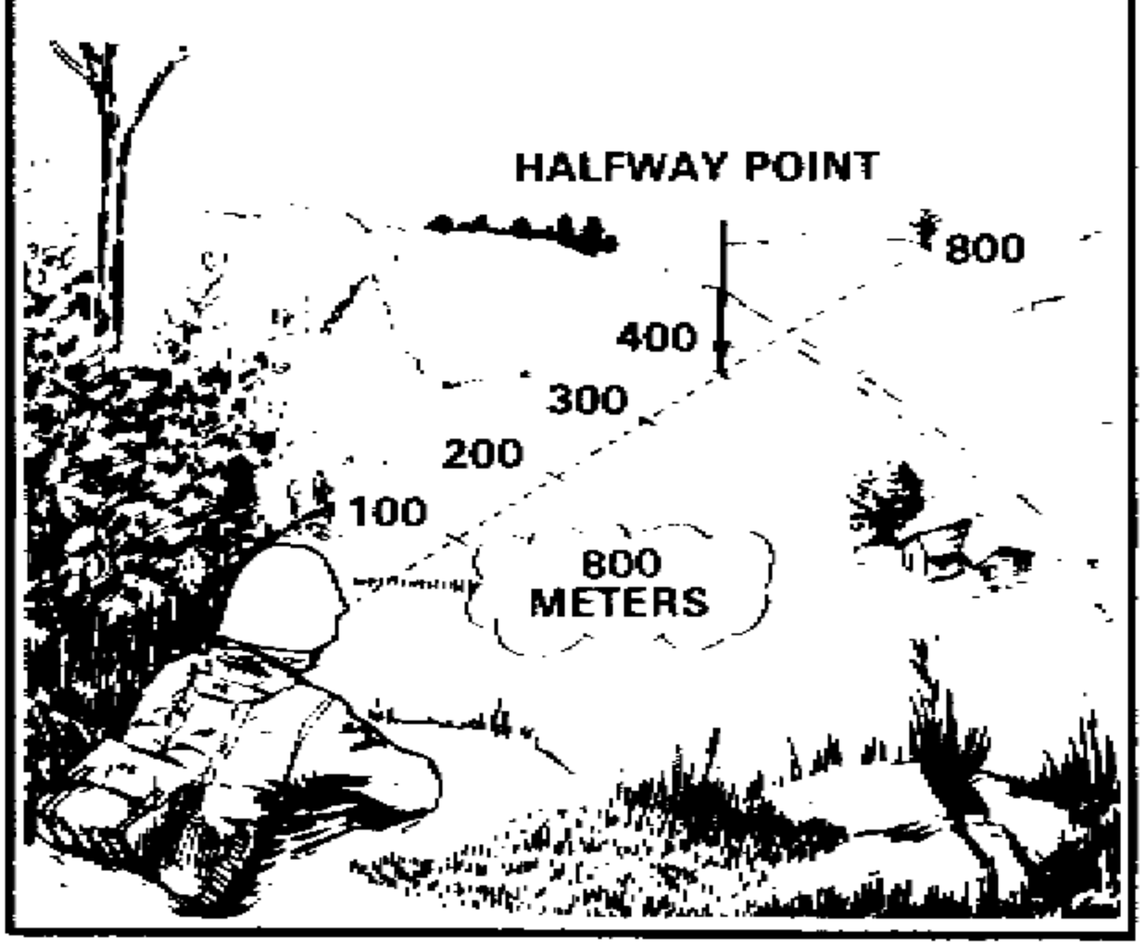
There are several methods of determining range, to include measuring distance on a map, pacing the distance between two points, estimating range, using an optical rangefinder, and using registration fire. However, the gunner does not usually have a map, and he rarely has access to an optical rangefinder. He can pace the distance between two points if the enemy is not within range. Firing rounds just to determine the range is not desirable since it may reveal the machinegun position to enemy observers. Most of the time, the gunner must use techniques that require no equipment and that can be used without exposing himself or revealing his position. There are two methods of determining range which meet these requirements: the 100-METER-UNIT-OF-MEASURE method and the APPEARANCE-OF-OBJECTS method.

100-Meter-Unit-of-Measure Method. To use this method, the gunner must be able to visualize a distance of 100 meters on the ground. For ranges up to 500 meters, he determines the number of 100-meter increments between the two points he wishes to measure. Beyond 500 meters, the gunner must select a point halfway to the target, determine the number of 100-meter increments to the halfway point, and then double it to find the range to the target.

APPLYING THE 100-METER-UNIT-OF-MEASURE METHOD FOR RANGES UP TO 500 METERS



APPLYING THE 100-METER-UNIT-OF-MEASURE METHOD FOR RANGES UP TO 800 METERS



During training periods, gunners must become familiar with the effect that sloping terrain has on the appearance of a 100-meter increment. Terrain that slopes upward gives the illusion of longer distance, and observers have a tendency to underestimate a 100-meter increment. Terrain that slopes downward gives the illusion of shorter distance. In this case, the observer's tendency is to overestimate a 100-meter increment.

FACTORS OF RANGE ESTIMATION		
FACTORS AFFECTING RANGE ESTIMATION	**FACTORS CAUSING UNDERESTIMATION OF RANGE.**	**FACTORS CAUSING OVERESTIMATION OF RANGE.**
THE CLEARNESS OF OUTLINE AND DETAILS OF THE TARGET.	WHEN MOST OF THE TARGET IS VISIBLE AND OFFERS A CLEAR OUTLINE.	WHEN ONLY A SMALL PART OF THE TARGET CAN BE SEEN OR THE TARGET IS SMALL IN RELATION TO ITS SURROUNDINGS.
NATURE OF TERRAIN OR POSITION OF THE OBSERVER.	WHEN LOOKING ACROSS A DEPRESSION THAT IS MOSTLY HIDDEN FROM VIEW. WHEN LOOKING FROM LOW GROUND TOWARD HIGH GROUND. WHEN LOOKING DOWN A STRAIGHT, OPEN ROAD, OR ALONG A RAILROAD. WHEN LOOKING OVER UNIFORM SURFACES LIKE WATER, SNOW, DESERT, OR GRAIN FIELDS.	WHEN LOOKING ACROSS A DEPRESSION THAT IS TOTALLY VISIBILE. WHEN LOOKING DOWNWARD FROM HIGH GROUND. WHEN VISION IS NARROWLY CONFINED, AS IN STREETS, DRAWS, OR FOREST TRAILS.
LIGHT AND ATMOSPHERE.	IN BRIGHT LIGHT OR WHEN THE SUN IS SHINING FROM BEHIND THE OBSERVER. WHEN THE TARGET IS IN SHARP CONTRAST WITH THE BACKGROUND OR IS SILHOUETTED BECAUSE OF ITS SIZE, SHAPE, OR COLOR. WHEN SEEN IN THE CLEAR AIR OF HIGH ALTITUDES.	IN POOR LIGHT SUCH AS DAWN AND DUSK; IN RAIN, SNOW, FOG, OR WHEN THE SUN IS IN THE OBSERVER'S EYES. WHEN TARGET BLENDS INTO THE BACKGROUND OR TERRAIN.

Proficiency in the 100-meter-unit-of-measure method requires constant practice. Throughout the training in this technique, comparisons should be frequently made between the range as determined by the gunner and the actual range as determined by pacing or other, more accurate means of measurement. The best training technique is

to require the gunner to pace the range after he has visually determined it. In this way, he discovers the actual range for himself, which makes a much greater impression than if he is simply told the correct range.

A limitation of the 100-meter-unit-of-measure method is that its accuracy is directly related to the amount of terrain visible to the observer. This is particularly true at the greater ranges. If a target appears at a range of 500 meters or more, and the observer can only see a portion of the ground between himself and the target, it becomes difficult to use the 100-meter-unit-of-measure method of range determination with any degree of accuracy.

Appearance-of-Objects Method. The appearance-of-objects method is a means of determining range by the size and other characteristic details of the object. This is a common method of determining distances and is used by most people. For example, a motorist trying to pass another car must judge the distance of oncoming vehicles based on his knowledge of how vehicles appear at various distances. In this example, the motorist is not interested in precise distances but only in having enough road space to safely pass the car in front of him. Suppose, however, the motorist knew that at a distance of 1 kilometer an oncoming vehicle appeared to be 1 centimeter wide and 2 centimeters high, with about a half centimeter between headlights. Then, anytime he saw other oncoming vehicles which fitted these dimensions he would know they were about 1 kilometer away. This same technique can be used by gunners to determine ranges on the battlefield. If the gunner knows the characteristic size and detail of men and equipment at known ranges, he can compare these characteristics to similar objects at unknown ranges. When the characteristics match, so does the range.

To use the appearance-of-objects method with any degree of accuracy, the gunner must be familiar with the characteristic details of objects as they appear at various ranges. For example, the gunner should study the appearance of a man standing at a range of 100 meters. He fixes the man's appearance firmly in his mind, carefully noting details of size and the characteristics of uniform and equipment. Next, he studies the same man in a kneeling position and then in a prone position. By comparing the appearance of the man at known ranges from 100 to 500 meters, the gunner can establish a series of mental images which will help determine range on unfamiliar terrain. Training should also be conducted in the appearance of other familiar objects such as weapons or vehicles. Because the successful use of this method depends upon visibility, anything which limits visibility (such as weather, smoke, or darkness) will also limit the effectiveness of this method.

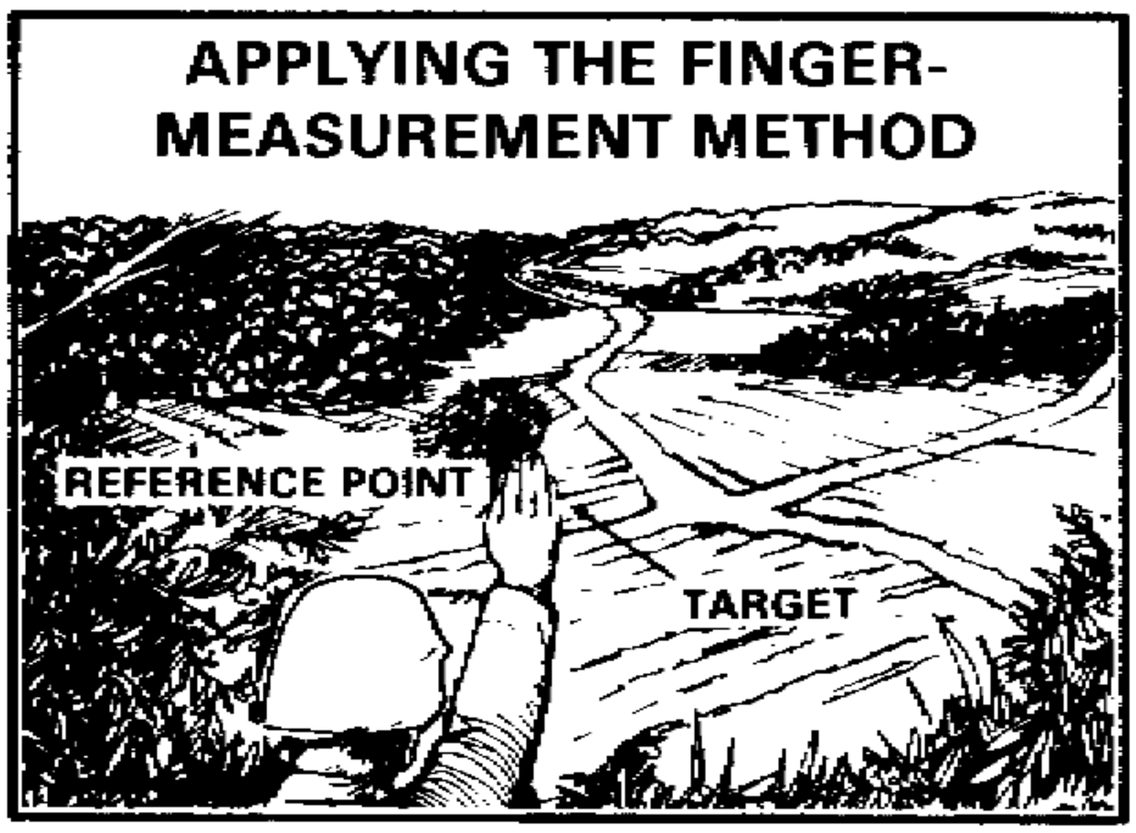
Combination of Methods. Under ideal conditions, either the 100-meter-unit-of-measure or the appearance-of-objects method is an effective method of determining range. However, ideal conditions rarely exist on the battlefield, so the gunner must use a combination of methods. The terrain might limit the use of the appearance-of-objects method. For example, a gunner may not be able to see all the terrain out to the target; however, he may see enough to get a general idea of the distance. A slight haze may obscure many of the target details, but the gunner should still be able to judge its size. By carefully considering the ranges estimated by both methods, an experienced gunner should arrive at a figure close to the true range. The best way to reduce ranging errors using these two methods is to train frequently.

LATERAL DISTANCE MEASUREMENT

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

When the gun is mounted on the tripod, width can be measured by aiming on a point, manipulating the traversing handwheel, and counting the clicks from one point of aim to another point of aim. Each click equals 1 mil and is equivalent to 1 meter at 1,000 meters, or half a meter at 500 meters.

The fingers can be used to measure the lateral distance between a reference point and a target. Extend the arm with the palm outward, lower the fingers, and lock the elbow. Close one eye, raise the index finger, and sight along its edge, placing the edge of the finger along the flank of the target or reference point. Note the space remaining between the points, and then fill this space by raising fingers until the space is covered. The measurement from the reference point to the target is then stated as being one or more fingers, depending upon how many fingers are raised to cover this distance.



FIRE CONTROL REQUIREMENTS

Fire control includes all actions of the leader and crews in planning, preparing, and actually applying fire on a target. It is the ability to select and designate targets, open fire at the instant desired, adjust fire, regulate the rate of fire, shift from one target to another, and cease fire.

Fire control depends upon the ability of the leader and the discipline and training of the crew. Failure to exercise fire control results in ineffective employment of the gun and can result in danger to friendly troops, loss of surprise, premature disclosure of positions, fire on unimportant targets, loss of time in adjusting fire, and wasted ammunition.

METHODS OF FIRE CONTROL

The noise and confusion of battle may limit the use of some of these methods; therefore, the leader must select a method or combination of methods that will best accomplish the mission.

Oral. This is an effective method of control, but at times the leader may be too far away from the crews, or the noise of battle may make it impossible for the crews to hear him.

Arm-and-Hand Signals. This is an effective method when the crews can see the leader. All crew members must understand the standard arm-and-hand signals.

Prearranged Signals. These are either visual or sound signals such as pyrotechnics or blasts on a whistle. These signals should be included in standing operating procedures and must be understood by all squad members.

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

Standing Operating Procedures. SOPs are actions to be executed without command. SOPs are developed during the training of the gun crews. Their use eliminates many commands and simplifies the leader's job of fire control.

PURPOSE OF FIRE COMMANDS

A fire command is given to deliver effective fire on a target quickly and without confusion. When the leader decides to engage a target which is not obvious to the gunners, he must provide them with the information they need to effectively engage the target. He must alert the crews, and give a target direction, description, and range; the method of fire; and the command to fire.

There are initial fire commands and subsequent fire commands. Initial fire commands are given to begin firing at a target, and subsequent fire commands are given to adjust direction and elevation, change the rate of fire after a fire mission is in progress, interrupt fire, or terminate the alert.

Elements of Fire Commands. Fire commands for all direct fire weapons follow a pattern that includes similar elements. There are six elements in the fire command for the machinegun: ALERT, DIRECTION, DESCRIPTION, RANGE, METHOD OF FIRE, and COMMAND TO OPEN FIRE. The crew repeats each element of a fire command as it is given.

Alert

This element gets the crews ready to receive further instructions. The leader may alert both crews or only one, depending upon the situation. To alert and fire both guns, the leader announces, FIRE MISSION. If the leader desires to alert and fire only one gun, he will announce, GUN NUMBER ONE (TWO), FIRE MISSION. If he desires to alert both guns but fire only one, he will announce, FIRE MISSION, GUN NUMBER ONE (TWO). Once alerted, the assistant gunner(s) continuously observes the leader in order to relay instructions.

Direction

This element indicates the general direction to the target and may be given in one or a combination of the following methods:

- **Orally. The leader gives the direction to the target in relation to the position of the gun.**
- **Pointing. The leader can designate a small or obscure target by pointing with his arm or aiming with a gun. When he points with his arm, a man standing behind him should be able to look over his shoulder and sight along his arm and index finger to locate the target. When a gun has been aimed at a target, a soldier looking through the sights should be able to see the target.**
- **Using tracer ammunition. Tracer ammunition is a quick and sure method of designating a target which is not clearly visible. When using this method, the leader should first give the general direction in order to direct the crew's attention to the target area. To prevent the loss of surprise when using tracer ammunition, the leader does not fire until he has given all of the elements of the fire command except the command to fire. The leader may fire his individual weapon or fire one or more bursts from a machinegun. The firing of the tracer(s) then becomes the last element of the fire command and is the signal to open fire.**

Example:

FIRE MISSION

FRONT

500

WATCH MY TRACER(S)

- **Using reference points. Another method of designating obscure targets is to use easy-to-recognize reference points. All leaders and crews must be familiar with terrain features and the terminology used to describe them (FM 21-26). When using a reference point, the word "reference" precedes its description. This is done to avoid confusion. The general direction to the reference point should be given.**

An example of the use of a reference point is as shown below.

FIRE MISSION, GUN NUMBER ONE

FRONT

REFERENCE: LONE PINE TREE

Sometimes a target must be designated by using successive reference points.

Example:

GUN NUMBER TWO, FIRE MISSION

RIGHT FRONT

REFERENCE: RED-ROOFED HOUSE, LEFT TO HAYSTACK, LEFT TO BARN

Finger measurements can be used to direct the crew's attention to the right or left of reference points.

Example:

FIRE MISSION

LEFT FRONT

REFERENCE: CROSSROADS, RIGHT FOUR FINGERS

When the guns are mounted on tripods, lateral distance from reference points can be announced in mils. Lateral distance is assumed to be in mils so the word "mils" is not necessary.

Example:

FIRE MISSION

FRONT

REFERENCE: KNOCKED-OUT TANK, LEFT FOUR ZERO

Description

The target description is used to create a picture of the target in the minds of the crew. To properly apply their fire, the crew must know the type of target they are to engage. The leader should describe it briefly. The word "target" precedes the target description, as in TARGET: TROOPS; TARGET: TANKS; TARGET: AIRCRAFT, etc. If the target is obvious, no description is necessary.

Range

The leader will always announce the estimated range to the target. The range is given so the crews know how far to look for the target and what range setting to put on the rear sight. Range is announced in meters. Since the meter is the standard unit of range measurement, the word "meters" is not used. With machineguns, the range is determined and announced to the nearest hundred or thousand (in other words, THREE HUNDRED, or ONE THOUSAND, or ONE ONE HUNDRED).

Example:

FIRE MISSION

FRONT

REFERENCE: KNOCKED-OUT TANK, LEFT FOUR ZERO

TARGET: TROOPS

THREE HUNDRED

Method of Fire

This element includes manipulation and rate of fire.

Manipulation is used to prescribe the class of fire with respect to the gun. It is announced as FIXED, TRAVERSE, SEARCH, TRAVERSE AND SEARCH, SWINGING TRAVERSE, or FREE GUN.

Rate is used to control the amount of fire. There are three rates which may be announced: sustained, rapid, and cyclic. The rate of fire may be omitted from the fire command; however, when a rate is omitted, the rapid rate is implied.

Example:

FIRE MISSION

FRONT

REFERENCE: KNOCKED-OUT TANK, LEFT FOUR ZERO

TARGET: TROOPS

THREE HUNDRED

TRAVERSE

RAPID

Command to Open Fire

It is often important that fire be withheld so that surprise fire can be delivered on a target, or to insure that both guns open fire at the same time. The leader may preface the command to commence firing with, AT MY COMMAND, or AT MY SIGNAL. When the gunners are ready to engage the target, they report, UP, to the assistant gunners who signal, READY, to the leader. The leader then gives the command, FIRE, at the specific time desired.

Example:

FIRE MISSION

FRONT

TROOPS

400

AT MY COMMAND or AT MY SIGNAL (Pause until crew members are ready and fire is desired.)

FIRE (or prearranged signal)

If immediate fire is required, the command, FIRE, is given without pause and the gunners fire as soon as they are ready.

Subsequent Fire Commands. Subsequent fire commands are used to make adjustments in direction and elevation, change rates of fire after a fire mission is in progress, interrupt fires, or terminate the alert. If the gunner fails to properly engage a target, the leader must promptly correct him by announcing or signaling the desired changes. When these changes are given, the gunner makes the corrections and resumes firing without further command. When firing under the control of a leader, the assistant gunner observes the leader for instructions which he passes on to the gunner.

Adjustment for direction is given first. (Examples: RIGHT ONE ZERO; LEFT FIVE.) Adjustment for elevation is given next. (Examples: ADD FIVE; DROP ONE FIVE.) These may be given orally or with arm-and-hand signals. Adjustments in direction and elevation with the bipod or vehicular-mounted gun are always given in meters by using one finger to indicate 1 meter. Adjustments in direction and elevation on the tripod-mounted gun are always given in mils; one finger indicates 1 mil.

Changes in the rate of fire are given orally or by arm-and-hand signals.

To interrupt firing, the leader announces, CEASE FIRE, or signals to cease fire. The crews remain on the alert. They resume firing when given the command, FIRE.

To terminate the alert, the leader announces, CEASE FIRE, END OF MISSION.

Doubtful Elements and Corrections. When the gunner is in doubt about any

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element of the fire command, he replies, SAY AGAIN RANGE, TARGET, etc. The leader then announces, THE COMMAND WAS, repeats the element in question, and continues with the fire command.

When the leader makes an error in the initial fire command, he corrects it by announcing, CORRECTION, and then gives the corrected element.

Example:

FIRE MISSION

FRONT

TROOPS

500

CORRECTION

600

TRAVERSE

AT MY COMMAND

When the leader makes an error in the subsequent fire command, he may correct it by announcing, CORRECTION, and then repeating the entire subsequent fire command.

Example:

LEFT FIVE, DROP ONE

CORRECTION

LEFT FIVE, DROP ONE ZERO

Abbreviated Fire Commands. Fire commands need not be complete to be effective. In combat, the leader's fire command will give only the elements necessary to place fire on a target quickly and without confusion. During training, however, he should use all of the elements to get crew members in the habit of thinking and reacting properly when a target is to be engaged. After the crew's initial training in fire commands, they should be taught to react to abbreviated fire commands, using the various methods of control, as follows:

Oral

The leader wants to place the fire of one gun (on tripod) on an enemy machinegun he has located.

Example:

FIRE MISSION, GUN NUMBER ONE

MACHINEGUN

600

FIRE

Range Card

When a range card has been prepared, the leader, by using only the alert, description, and the command to fire, can place fire on targets that the gunner cannot see. The leader describes the target by its number, saying the word "target" before the number of the target.

Example:

FIRE MISSION, GUN NUMBER ONE

TARGET NUMBER THREE

AT MY COMMAND

FIRE

Abbreviated Arm-and-Hand Signals

The leader gets the gunner's attention and then points to the target. When the assistant gunner returns the, READY, signal, the leader commands, FIRE.

Prearranged Signals

If the leader wants to shift fire at a certain time, he gives a prearranged signal, such as smoke or pyrotechnics. Upon seeing the signal, the gunners shift their fire to a prearranged point.

Personal Contact

The leader may also move to the gunner whose fire he wants to shift, get his attention,

point out the new target, and command, FIRE.

Standing Operating Procedures. SOPs for certain actions and commands can be developed to make crews more effective. Some examples follow:

Observation

The crew members continuously observe their sector.

Fire

Gunners open fire without command on appropriate targets that appear within their sector.

Check

While the gunner is firing, the assistant gunner checks with the leader for instructions.

Return Fire

The crews return enemy fire, concentrating on enemy automatic weapons, without order.

Shift Fire

Gunners shift their fire without command when more dangerous targets appear.

Rate of Fire

When gunners engage a target, they initially fire at the rate necessary to gain and maintain fire superiority.

Mutual Support

When two or more guns are engaging the same target and one gun stops firing, the other gunner(s) increases the rate of fire and covers the entire target. When only one gun is required to engage a target and the leader has alerted two or more crews, the gun not firing lays on the target and follows the movements of the target so that it can fire instantly should the other gun malfunction or cease fire before the target has been eliminated.

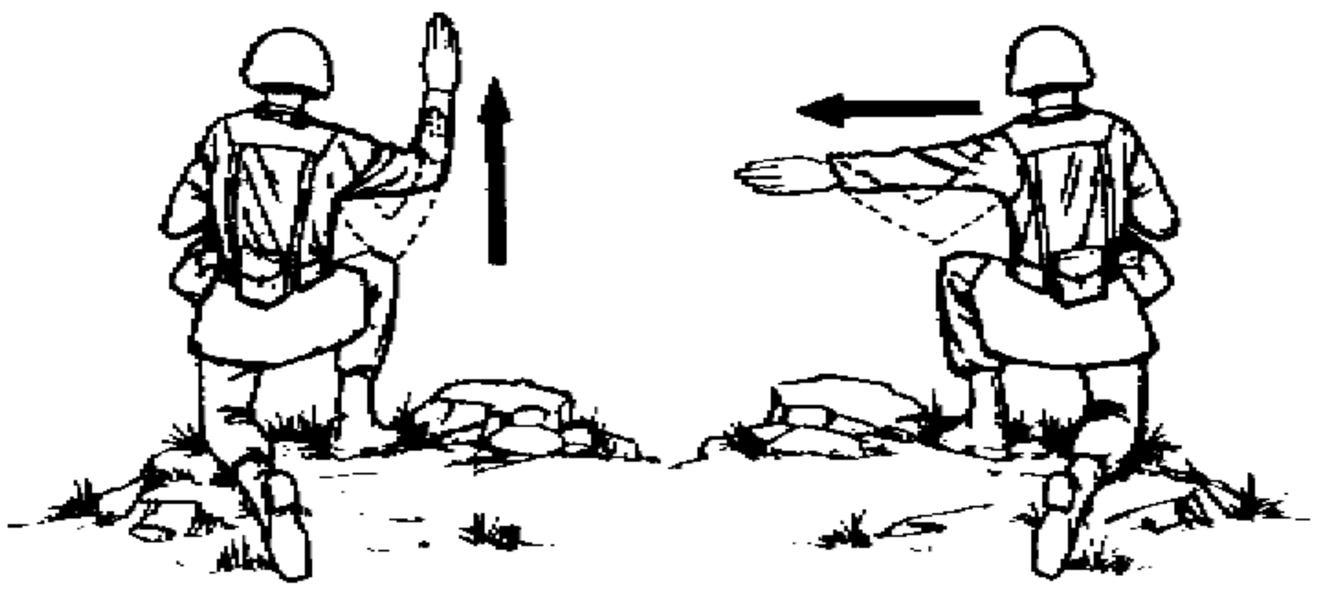
Arm-and-Hand Signals. Battlefield noise and the distance between guns and the leader often make it necessary to use arm-and-hand signals to control fire. When an action or movement is to be executed by only one of the crews, a preliminary signal is given to designate the crew to act. When necessary, all signals are relayed to the gunner by the assistant gunner. The following are commonly used signals for fire control.

- **Ready. The assistant gunner signals that the gunner is ready to fire by raising his right hand and arm above his head toward the leader.**
- **Commence Firing, or Change Rate of Firing. The leader brings his hand, palm down, to the front of his body, about waist level, and moves it horizontally in front of his body. To signal faster fire, he increases the speed of the hand movement; to fire slower, he decreases the speed of the hand movement.**
- **Change Direction/Elevation (Tripod-, Bipod-, or Vehicular-Mounted Machinegun). The leader extends his arm and hand in the new direction and indicates, by the number of fingers extended, the amount of change necessary. The fingers must be spread so the assistant gunner can easily see the number of fingers extended. Each finger indicates 1 mil of change for the tripod-mounted gun and 1 meter of change for the bipod- and vehicular-mounted gun. If the desired change is more than 5 mils, the leader extends his hand the number of times necessary to indicate the total amount of change. For example, RIGHT NINE would be indicated by extending the hand once with five fingers showing and a second time with four fingers showing for a total of nine fingers.**

ARM-AND-HAND SIGNALS



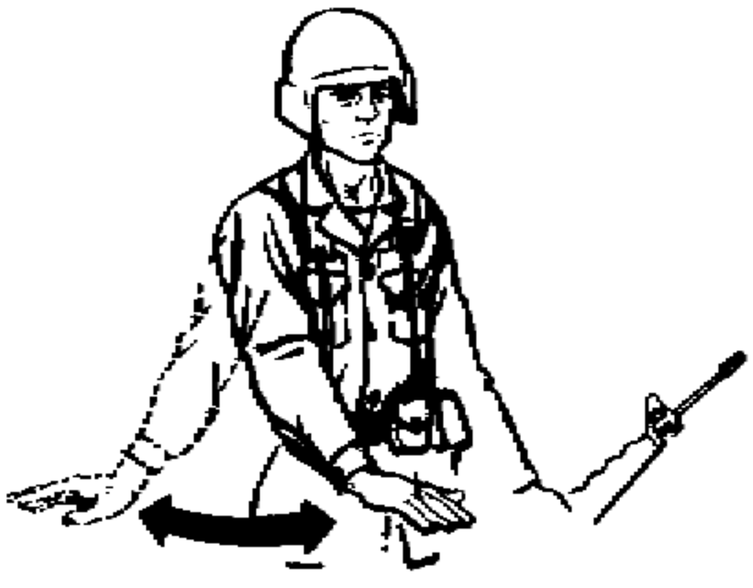
THE READY SIGNAL



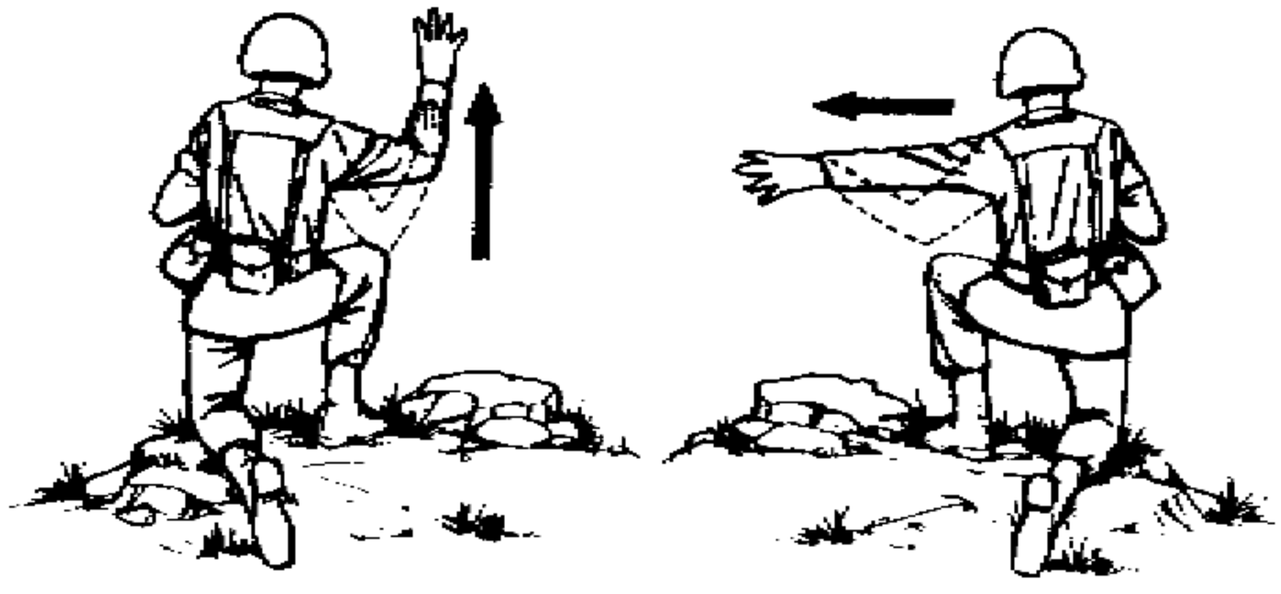
ADJUSTING FIRE WITH THE BIPOD-MOUNTED GUN



CEASE FIRE



COMMENCE FIRING



ADJUSTING FIRE WITH THE TRIPOD-MOUNTED GUN

- **Interrupt or Cease Firing. The leader raises his arm and hand, palm outward, in front of his forehead and brings it downward sharply. The assistant gunner then slaps the gunner on his back to indicate CEASE FIRE.**

- **Other Signals. The leader can devise other signals to control his guns; for example, signals to change barrels, remove the gun from the tripod, or emplace the gun in a certain position. A detailed description of arm-and-hand signals is given in FM 21-60.**

PRINCIPLES OF APPLICATION OF FIRE

Application of fire consists of the methods crews use to get complete and effective coverage of a target area.

Training in the methods of applying fire can be accomplished only after the crews have learned to recognize the different types of targets they may find in combat, how to properly distribute and concentrate their fire, and how to maintain the proper rate of fire.

TYPES OF TARGETS

Targets for machineguns in combat will in most cases be enemy troops. Different troop formations will make it necessary to use different classes of fire distribution. These targets have width and depth, and the fire must thoroughly cover the area in which the enemy is known or suspected to be. The targets may be easy to find or hard to see or find.

Point Targets. These require the use of a single aiming point. Examples of point targets are enemy bunkers, weapons emplacements, vehicles, and troops.

Area Targets. These may have considerable width and depth and may require extensive traversing and searching fire, such as a target where the enemy's exact location is unknown. Area targets are of three major kinds:

- **Linear.**
- **Deep.**
- **Linear with depth.**

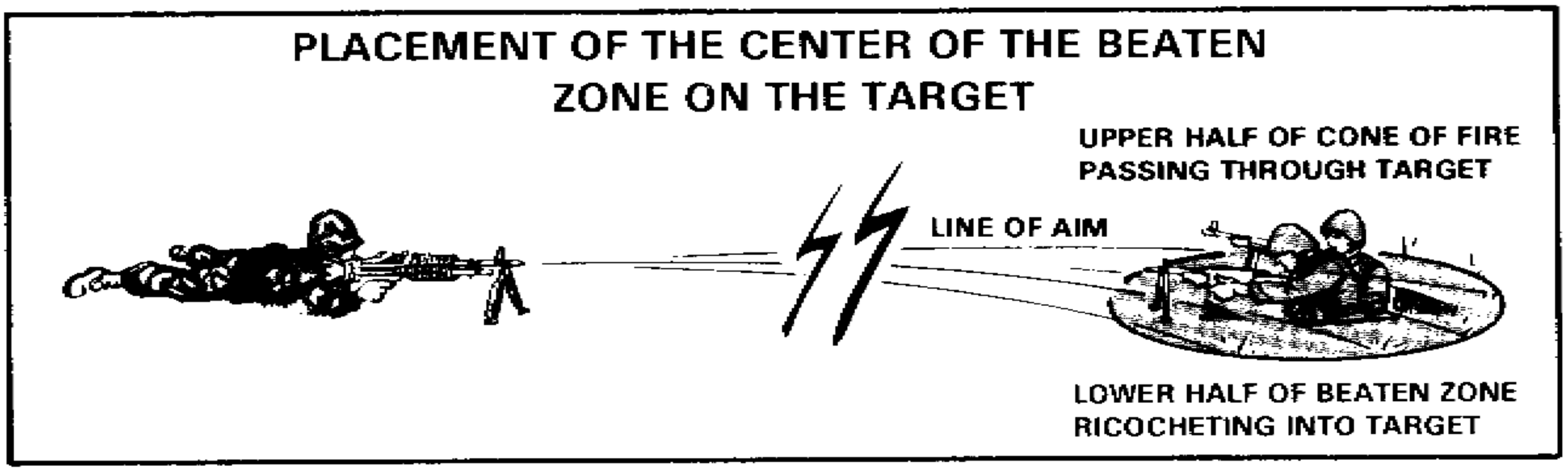
METHODS OF APPLICATION OF FIRE

In combat, the size and nature of a target may call for the fire of more than one gun. The method of applying fire to a target is generally the same for either a single gun or a pair.

Area and Point Fire. Area fire is fire that is delivered in width, in depth, or in a combination of both. To distribute fire properly, gunners must know where to aim, how to adjust their fire, and in which direction to manipulate the gun.

With regard to the point of initial lay and adjustment, the gunner must aim, fire, and adjust on a certain point of the target. It is important that fire be adjusted boldly, rapidly, and continuously. Binoculars can be used by the leader to help adjust fire. The gunner always keeps the center of his beaten zone at the base of the target. This makes the bullets in the upper half of the beaten zone hit the target, and bullets in the lower half of the beaten zone ricochet into the target.

With regard to direction of manipulation, the gunner must move his beaten zone in a certain direction over the target. The direction depends upon the type of target and whether the target is engaged with a single gun or a pair. When engaging area targets (but not point targets) with a pair of guns, the targets are divided. Each gun is given a part of the target so that fire is evenly distributed over the target.



Rates of Fire. There are three rates of fire with the machinegun — sustained, rapid, and cyclic. These rates are established as a guide for training and to indicate when a barrel change is desirable. In training, the rate of fire should be announced to aid learning and give the gunners a basis for judging the number of rounds being fired.

Sustained Fire

Sustained fire is 100 rounds per minute in bursts of 6 to 9 rounds at 4- to 5-second intervals. It is directed by announcing, SUSTAINED. (A barrel change is recommended after firing the sustained rate for 10 minutes.)

Rapid Fire

Rapid fire is 200 rounds per minute in bursts of 6 to 9 rounds at 2- to 3-second intervals. It is directed by announcing, RAPID. (A barrel change is recommended after firing the rapid rate for 2 minutes.)

Cyclic Fire

Cyclic fire uses the most ammunition that can be used in 1 minute. The cyclic rate of fire with the M60 machinegun (approximately 550 rounds per minute) is fired when the trigger is held to the rear and ammunition is fed into the gun. (A barrel change is recommended after firing the cyclic rate for 1 minute.)

Ground targets are INITIALLY engaged using the rapid rate (200 rounds per minute) to gain fire superiority. After fire superiority has been gained, the rate of fire is reduced to a rate that is sufficient to maintain fire superiority. This reduced rate of fire is necessary to keep the barrel from overheating and to conserve ammunition.

Aerial targets are engaged using the cyclic rate.

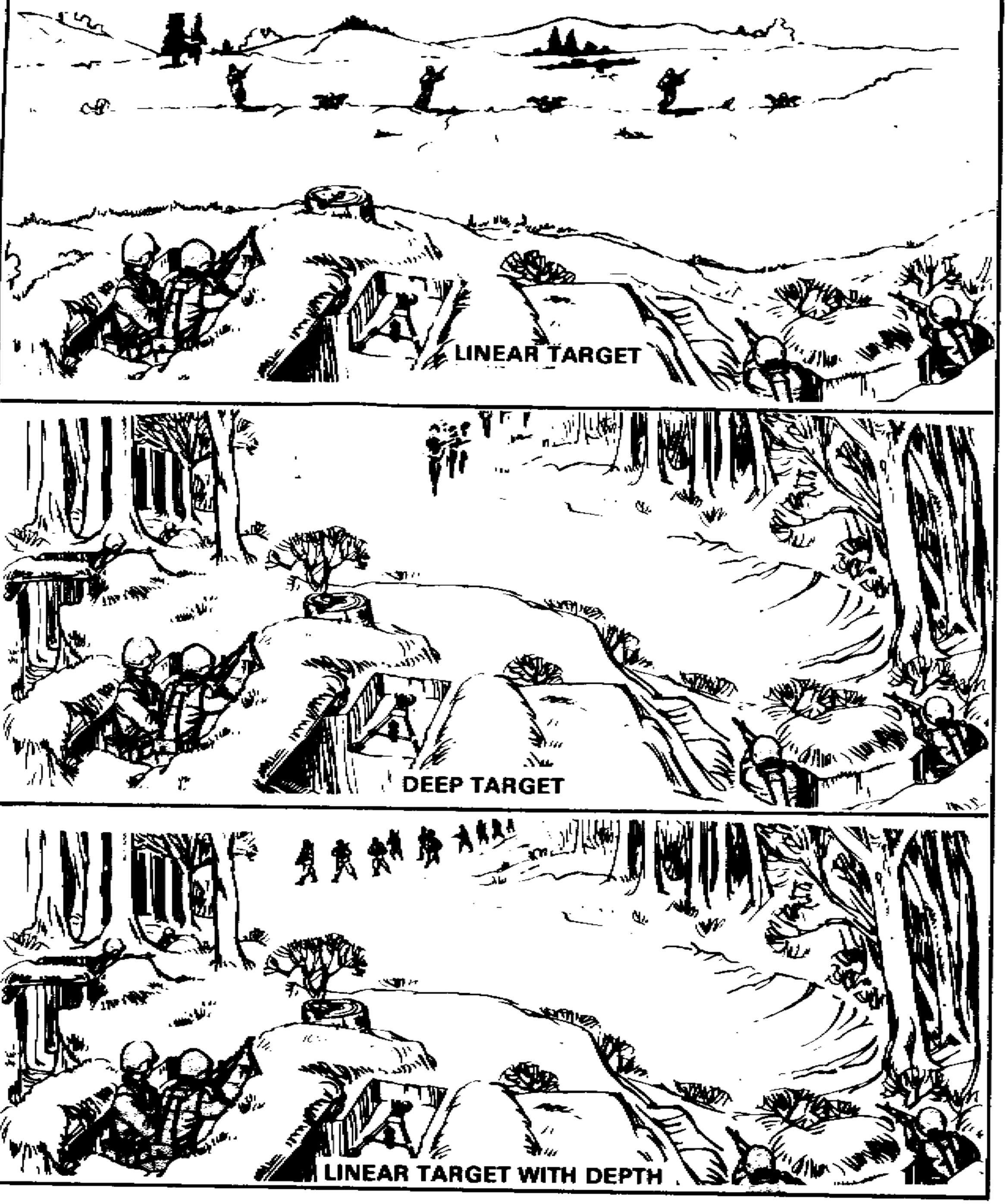
TARGET ENGAGEMENT
DIRECT LAY

When fire is under direct control of a leader, he designates the midpoint and flanks or ends of a target unless they are obvious to the crews. In the case of an area target, the gunner on the left applies his fire to the left half of the target, and the gunner on the right takes the right half. Each gunner must be prepared to engage the entire target. Gunners continue to fire until the target is neutralized or until signaled to do otherwise by the leader.

To aid in fire control, guns employed in pairs are designated number 1 gun (right position) and number 2 gun (left position).

To insure that gunners react quickly and properly when they detect a target or when a target is designated by the leader, standard methods of applying fire to the various types of targets are used. These methods are the same for bipod-, tripod-, and vehicular-mounted guns.

SPECIAL DIVISION OF TARGETS



LINEAR TARGET

DEEP TARGET

LINEAR TARGET WITH DEPTH

Point targets are engaged with fixed fire (also called "point fire"). If the target moves after the initial burst, crews keep fire on the target by following its movement.

Linear targets are engaged with traversing fire.

Machineguns in Pairs. The target is divided at the midpoint with the right gun (normally, No. 1) firing on the right half and the left gun (normally, No. 2) firing on the left half. The point of initial lay and adjustment for both guns is on the midpoint. After adjusting on the midpoint, the right gun traverses right, firing a burst after each change in direction, until it reaches one aiming point beyond the right flank (this insures complete target coverage). The left gun traverses to the left flank in the same way. Both gunners then reverse their directions and return to the midpoint. It is important to select aiming points for each burst rather than "spray" the target area.

If one part of the target is a greater threat, fire can be concentrated on the greater threat by dividing the target unevenly. The special division of the target is done with subsequent fire commands after firing begins. To preclude confusion, the gunners initially lay on the midpoint regardless of the special division to be made.

One Machinegun. A single gunner must engage the entire width of a linear target. The point of initial lay is on the midpoint. The gunner then manipulates to cover the rest of the target.

Hard-to-Identify Linear Targets. If a linear target is hard to identify, the leader

ENGAGING DISTINCT LINEAR TARGETS



may designate the target by using a reference point. When this method is used, the leader determines the center of mass of the target and announces the number of mils or fingers from the reference point that will cause each gunner to lay on the center mass. The reference point may be within or adjacent to the target; however, it should be on line with the target for best effect. After the command to fire has been given, the leader maintains and controls the fire by subsequent fire commands.

Example of a fire command with the reference point OUTSIDE the target area:

FIRE MISSION

FRONT

REFERENCE: CHIMNEY, RIGHT FIVE, CENTER MASS

TARGET: TROOPS

600

TRAVERSE

AT MY COMMAND

FIRE

Example of a fire command with the reference point INSIDE the target area:

FIRE MISSION

LEFT FRONT

REFERENCE: BURNED-OUT TANK, CENTER MASS

TARGET: TROOPS EXTENDING LEFT FIVE ZERO, RIGHT FIVE ZERO

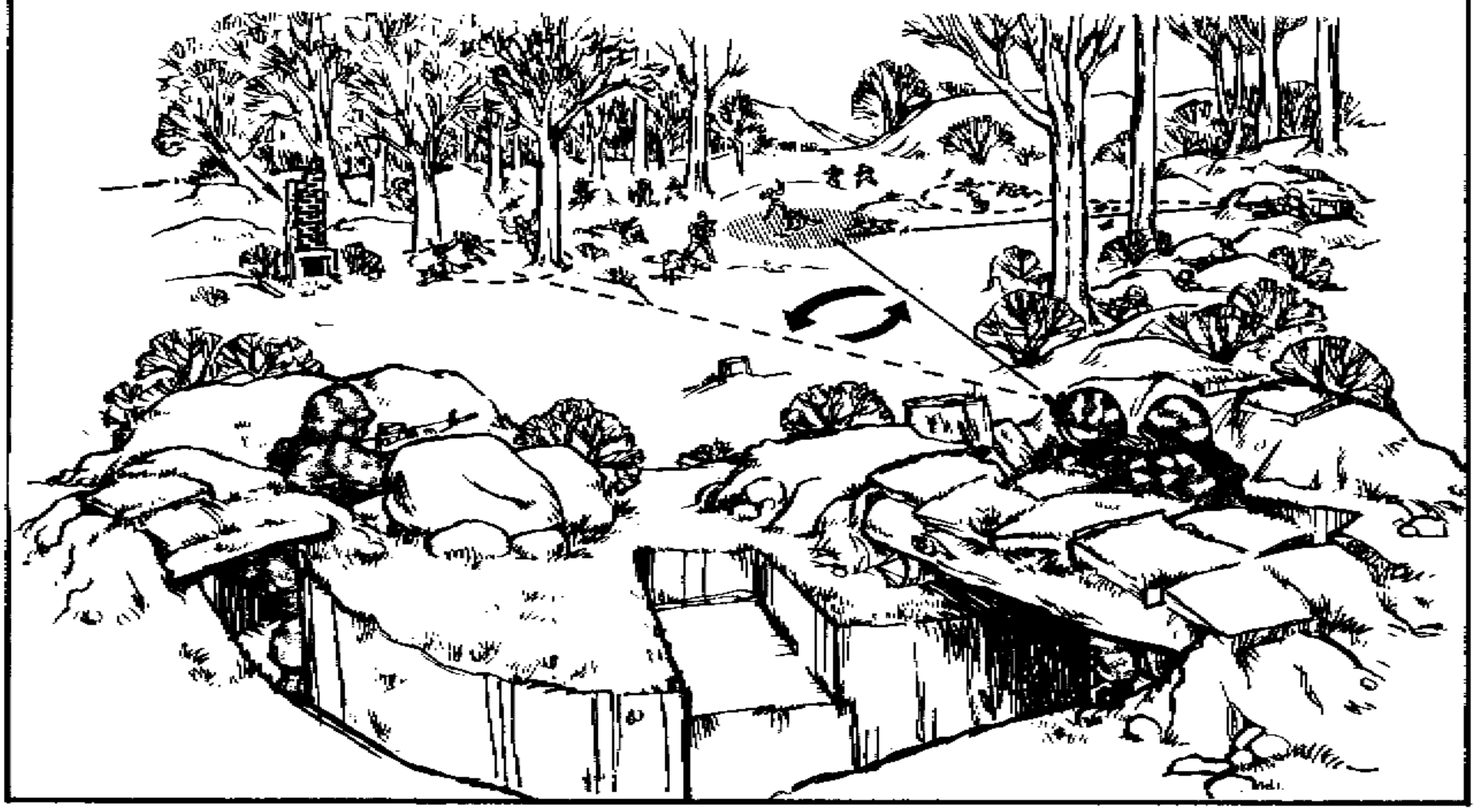
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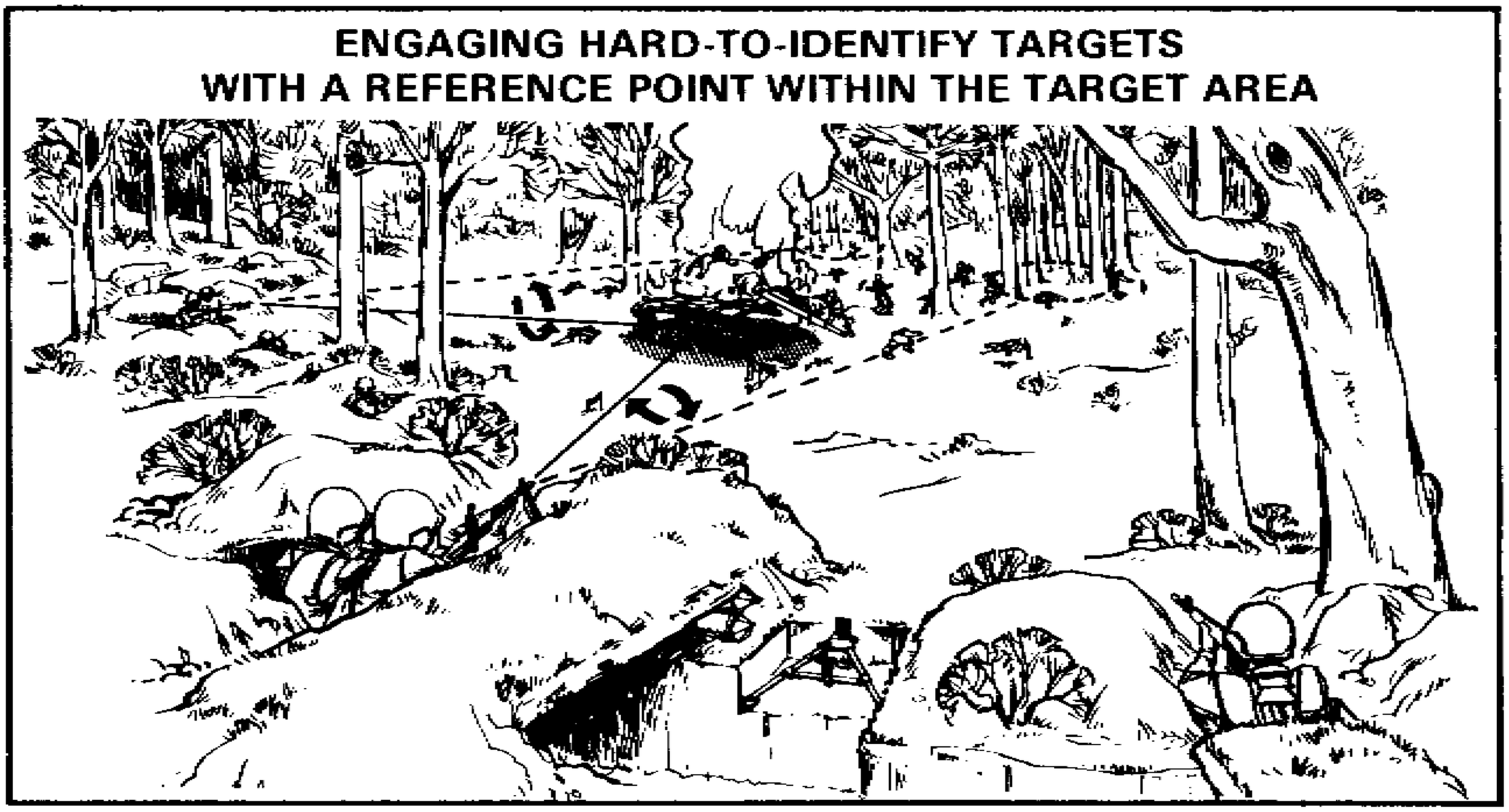
TRAVERSE

AT MY COMMAND

FIRE

ENGAGING HARD-TO-IDENTIFY LINEAR TARGETS WITH A REFERENCE POINT OUTSIDE THE TARGET AREA





DEEP TARGETS

Deep targets are engaged with searching fire. When range is announced, it is given to the midpoint of the target.

Machineguns in Pairs. The point of initial lay on a deep target for both guns is on the midpoint, which is also the point of division. Normally, the number 1 gun has the near half and the number 2 gun the far half. Since enfilade fire is being delivered, it is not necessary to adjust on the midpoint of the target, because the long beaten zone will compensate for any range errors. After the initial burst, the right gun searches down to one aiming point in front of the near end of the target and the left gun searches up to one aiming point beyond the far end. Both gunners then reverse their direction of search and return to the midpoint.

One Machinegun. A single gunner initially lays on the midpoint of a deep target unless another portion of the target is more critical. The gunner then searches down to one aiming point in front of the near end and back up to one aiming point beyond the far end.

HARD-TO-IDENTIFY DEEP TARGETS

The center of mass of hard-to-identify deep targets may be designated by using reference points as for linear targets, except that the extent (depth) of the target is always given in meters.

Example of a fire command with the reference point INSIDE the target area:

FIRE MISSION

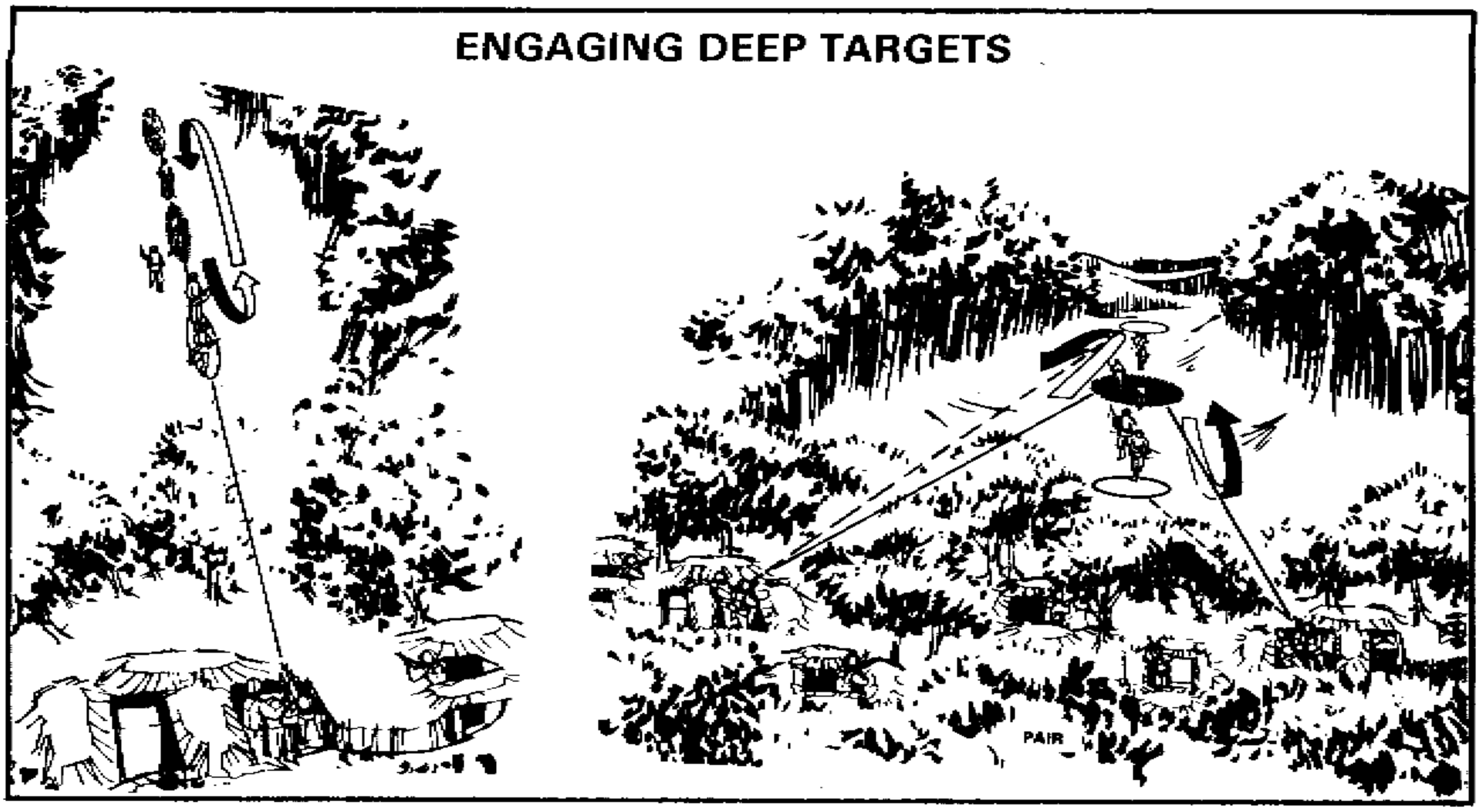
FRONT

REFERENCE: BUNKER, CENTER MASS

TARGET: TROOPS EXTENDING SHORT 100 (meters), OVER 100 (meters)

700

FIRE



Example of a fire command with the reference point OUTSIDE the target area:

FIRE MISSION

FRONT

REFERENCE: BUNKER, RIGHT FOUR, CENTER MASS

TARGET: TROOPS EXTENDING SHORT 100, OVER 100

900

SEARCH

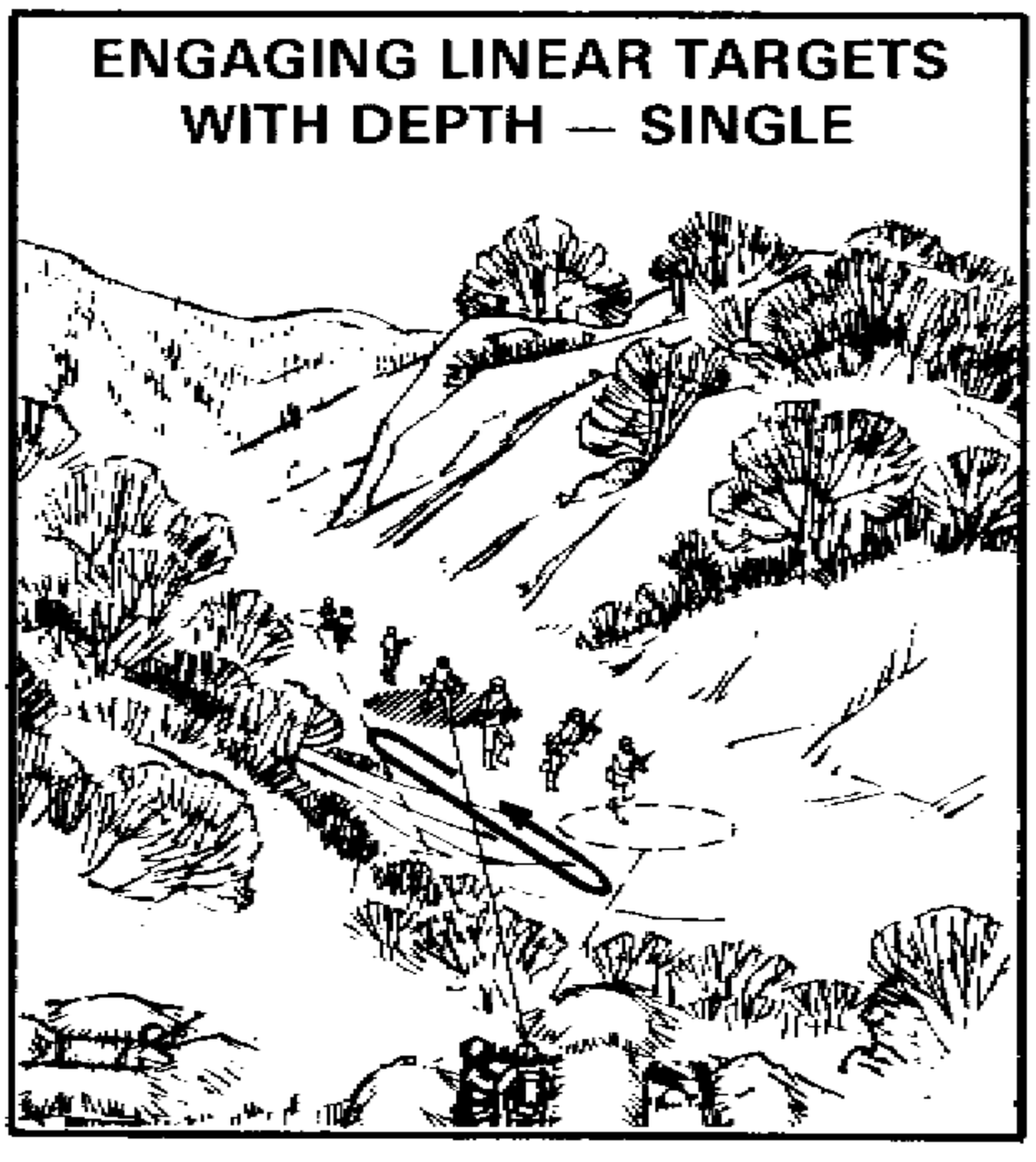
AT MY COMMAND

FIRE

LINEAR TARGETS WITH DEPTH

Linear targets with depth are engaged with traversing and searching fire. The range is given to the midpoint.

Machineguns in Pairs. The method of division, the point of initial lay and adjustment, and the extent of manipulation





for both guns is the same as that prescribed for linear targets. The gunners employ enough search between bursts to keep the center of impact on the base of the target.

One Machinegun. A single gunner initially lays and adjusts on the midpoint of a linear target with depth, unless some other part of the target presents a greater threat. The gunner then traverses and searches to the near flank, then back to the far flank.

Hard-to-Identify Linear Targets with Depth. The flanks and midpoint of a hard-to-identify linear target with depth should be designated with machinegun or rifle fire. The reference-point method should not be used, because a minimum of two reference points are required to show the angle of the target.

AREA TARGETS

The leader designates an area target by indicating the width and depth of the target. Area targets are engaged with traversing and searching fire.

Machineguns in Pairs. The target is divided at the midpoint; the right gun fires on the right half and the left gun fires on the left half. The point of initial lay and adjustment for both guns is on the midpoint.

After adjusting fire on the center of mass, fire is distributed by applying direction and elevation changes that give the most effective coverage of the target area. The right gunner traverses to the right, applies the necessary amount of search, and fires a burst. He traverses and searches up and down until the right flank of the area target has been reached. The left gunner traverses and searches to the left flank in the same way.

Both gunners then reverse the direction of manipulation and return to the center of mass, firing a burst after each combined direction and elevation change.

Example of a fire command to engage an area target:

FIRE MISSION

FRONT

REFERENCE: LONE PINE TREE, CENTER MASS

TARGET: AREA, LEFT FIVE ZERO, RIGHT FIVE ZERO

900

SUSTAINED

AT MY COMMAND

FIRE

One Machinegun. A single gunner engages an area target by laying and adjusting on the center of mass, then traversing and searching to either flank. Upon reaching the flank, direction is reversed and the gun is traversed and searched in the opposite direction.

ASSAULT FIRE REQUIREMENTS

Machineguns need not be limited to supporting fire roles in the attack. In many

situations, the leader can get best results from the machineguns by placing them in the assault (maneuver) elements. The procedures described are used when assaulting in a line, such as during a night attack or during the final stages of a day assault when fire superiority has been gained.

To assault successfully, crew members must:

- **Deliver fire effectively without use of sights.**
- **Move rapidly and maintain alinement.**
- **Reload rapidly to prevent lulls in the firing.**
- **Keep the fire low on the objective area.**
- **Distribute fire properly.**

ASSAULT FIRE POSITIONS

There are three firing positions which may be used when firing the M60 machinegun in the assault — hip, shoulder, and underarm. The use of each position at the proper time allows gunners to place effective fire on the enemy without alining the sights. In all assault firing positions, the gunner adjusts his fire by observing the tracers and the impact of the bullets in the target area. To support the machinegun in the assault, a sling is attached to the gun and placed over the gunner's shoulder. It supports the gun in the underarm or hip position.

Hip Firing Position. The hip firing position is used to get a heavy volume of fire in the target area when rapid movement is not necessary. This position is stable, but it is awkward to use while moving. Not less than nine rounds are fired in each burst. When firing from this position:

- **The bipod legs are down for instant use in the prone position if necessary.**
- **The rear sight is down.**
- **The left hand is holding the handguard of the forearm assembly.**
- **The right hand is on the trigger-mechanism-group grip.**
- **The rear of the stock is held firmly against the forward portion of the right thigh.**
- **The left foot is pointed in the direction of the target during firing.**
- **The right foot is placed to the rear to provide stability.**
- **The gunner leans toward the target before and during firing.**

HIP FIRING POSITION



Shoulder Firing Position. The shoulder firing position is used to hit specific points in the target area when rapid movement is not necessary. The gunner pauses and fires a burst as his left foot strikes the ground. This position gives accuracy. A maximum of nine rounds is fired in each burst. When firing from this position:

SHOULDER FIRING POSITION



- **The rear sight and bipod legs are down. To aim, the gunner alines the front sight with the target, depressing the muzzle so the top of the front sight is below the target.**
- **The gunner's hands and feet are placed the same as when firing from the hip position.**
- **The stock of the gun is held firmly into the shoulder, and the gunner leans toward the target before and during firing.**
- **Once the gunner has fired a burst, he removes the gun from his shoulder and holds it in the ready position. He raises the gun back to his shoulder to fire the next burst. This reduces muscular tension and fatigue.**

Underarm Firing Position. The underarm firing position is used when closing with the enemy and when a heavy volume of fire and rapid movement are required. During limited visibility, this position may be used during the entire assault. The gunner's movement is continuous, and he fires a SHORT burst each time his left foot strikes the ground. (Firing a short burst each time his left foot strikes the ground is only a technique, not a requirement.) A maximum of six rounds is fired in each burst. When firing from this position:

UNDERARM FIRING POSITION



- **The rear sight and bipod legs are down.**
- **The gunner's hands and feet are placed the same as when firing from the hip position.**

- **The gun is held firmly, well up into the right underarm and the right side of the chest. The gunner leans forward while firing.**

MOVEMENT SPEED AND ALINEMENT

Machinegun crews must move rapidly and maintain alinement with the other members of the assaulting element. To accomplish this, gunners must use the following techniques:

Move as rapidly as possible, consistent with their ability to fire accurately and maintain alinement.

Maintain alinement by guiding on the base man, first team, or squad, using visual contact when possible. Use special techniques such as watching muzzle flashes and muzzle blasts, and sometimes making physical contact, during limited visibility.

RELOADING

Gunners and assistant gunners must reload rapidly to avoid lulls in the firing. This can be achieved by practice and by applying the following techniques:

Prior to the assault, the gunner conducts prefire checks on the gun. The assistant gunner removes the cardboard cover from the top of the bandoleer. He inspects the ammunition to insure that it is clean and serviceable, and he checks the bandoleer for serviceability.

During the assault, assistant gunners assist in reloading the gun; however, if the assistant gunner is hit, the gunner must continue moving forward and reload as rapidly as possible. The sling will assist the gunner in using both hands to reload. The assistant gunner moves to the left of the gunner, carrying a belt of 100 rounds of ammunition. He attaches it to the end of the belt in the gun before that belt is expended. If the gunner becomes a casualty, the assistant gunner must take the gun and continue in the assault or move to the objective for the consolidation and reorganization.

FIRE ADJUSTMENT

Gunners have a tendency to fire high in the assault. To overcome this, they must be trained to boldly depress the muzzle when firing and then adjust upward. It is easier to adjust upward than downward, and firing low takes advantage of ricochets.

The use of tracer ammunition provides a means of adjusting fire. At night, it aids in illuminating the objective area and has a demoralizing effect on the enemy.

FIRE DISTRIBUTION

To properly distribute fire over the objective, gunners must fire and adjust rapidly and continuously on as much of the objective area as possible without endangering friendly troops. They must give priority of fire to enemy automatic weapons.

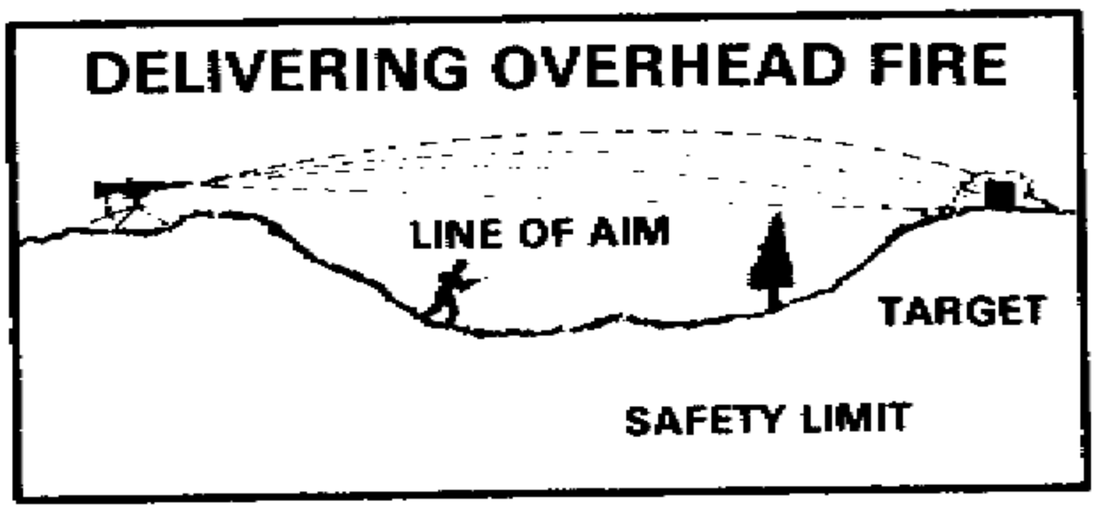
OVERHEAD FIRE

Fire delivered over the heads of friendly troops is called OVERHEAD FIRE. It is used during training ONLY AFTER TROOP SAFETY IS CHECKED AND VERIFIED. The terrain and visibility dictate when overhead fire can be delivered safely. Refer to AR 385-63 for a complete summary of training safety requirements.

Overhead fire CANNOT be safely delivered on a target at a range greater than 850 meters from the M60 machinegun, and it is not delivered over level or uniformly sloping terrain.

Overhead fire is delivered with guns on TRIPODS because they provide greater stability and accuracy, and because vertical mil angles can be measured by using the elevating mechanism.

Ideally, overhead fire is delivered when there is a depression in the terrain between the gun position and the target. The depression should place the gunner's line of aim well above the heads of friendly troops.



THE SAFETY LIMIT

The squad leader normally controls overhead fire. He lifts or shifts the fire when the friendly troops reach an imaginary line, parallel to the target, where further fire would cause casualties to friendly troops. This imaginary line is called the SAFETY LIMIT. The leader of the friendly troops may direct lifting of fire by prearranged signals transmitted by radio, wire, or visual means.

The safety limit can be determined by observing the fire or by using the gunner's rule.

To determine the safety limit by observation, the leader uses binoculars to see how close the fire is to advancing friendly troops.

A safety limit can be selected by using the gunner's rule before the gun is fired. The accuracy and safety of this method depends upon the gun being ACCURATELY zeroed and the range to the target being correctly determined. The gunner's rule is used only when the target is between 350 and 850 meters from the gun. The gunner's rule consists of the following procedure:

Determine the range to the target and set the range on the rear sight.

Lay the gun to hit the target.

Raise the rear sight slide to 1,100 meters.

Depress the muzzle of the gun 10 mils by using the elevating handwheel (one click equals 1 mil).

Look through the rear sight and note the point where the new line of aim strikes the ground. An imaginary line drawn through this point and parallel to the target is the SAFETY LIMIT.

Reset the range to the target on the rear sight, re-lay on the target, and prepare to fire.

Cease or shift fire when troops reach the SAFETY LIMIT.

PRECAUTIONS FOR OVERHEAD FIRE

The following safety measures MUST be applied when delivering overhead fire:

Firmly emplace the tripod mount.

Use field expedient depression stops to prevent the muzzle of the gun from accidentally being lowered below the SAFETY LIMIT.

Do not deliver overhead fire through trees.

Inform commanders of friendly troops when fire is to be delivered over their heads.

Insure that all members of the crew are aware of the SAFETY LIMIT.

Do not deliver overhead fire if the range from the gun to the target is less than 350 meters or more than 850 meters.

Do not use a barrel that is badly worn.

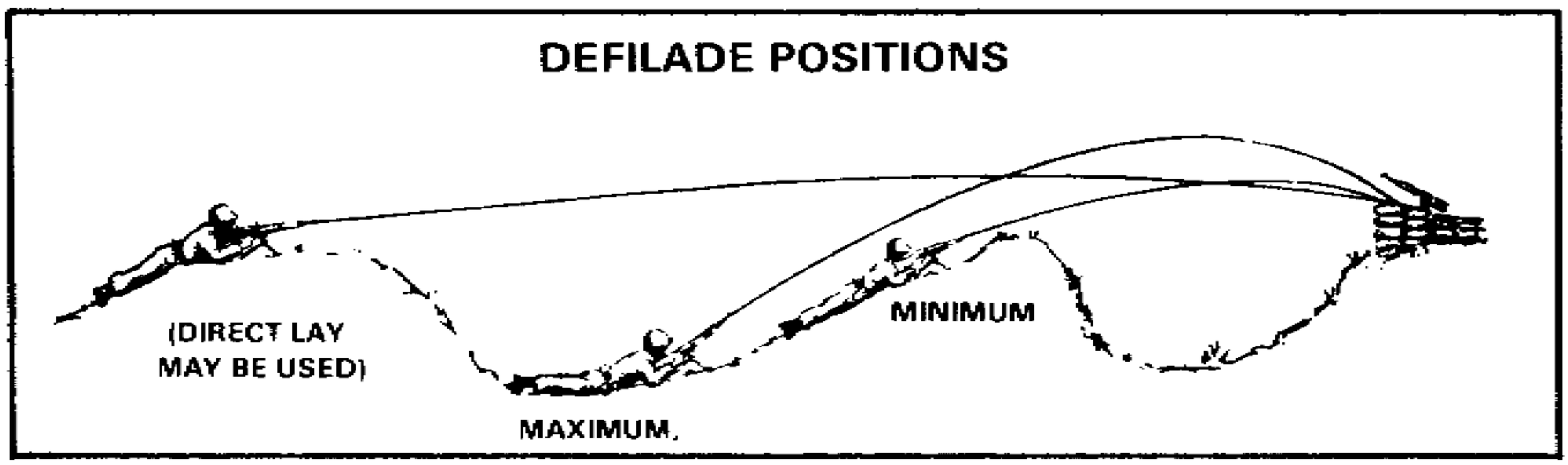
During training exercises, do not lay guns where their trajectories will cross at a point directly over the heads of friendly troops; and consult AR 385-63 and local safety regulations concerning overhead fire.

DEFILADE POSITIONS

At times, it may be desirable to employ machineguns from defilade positions.

A machinegun is in defilade when the gun and its crew are completely behind terrain which masks them from the enemy (usually on the reverse slope of a hill). The gun must fire up and over the hill. Its fire must be observed and adjusted by a crew member who can observe the target from a position on a flank or to the rear of the gun (on higher ground). A defilade position allows little opportunity to engage new targets. The tripod mount is used when firing from defilade because the gunner can measure vertical angles with it. This makes changes in elevation for adjusting fire easier, and, if data is determined during daylight, the crew can fire from the same position after dark.

A machinegun is in partial defilade when it is positioned just back of the crest of a hill so that the crest provides some protection from enemy direct fire and the gun is still able to engage its target by direct-lay techniques.



Advantages. The crew has cover and concealment from enemy direct fire weapons.

The crew has some freedom of movement in the vicinity of the position.

Control and supply are easier.

The smoke and flash of the gun are hidden from the enemy.

Disadvantages. Rapidly moving ground targets are hard to engage because adjustment of fire must be made through an observer.

Targets close to the mask usually cannot be engaged.

It is hard to get a final protective line.

ENGAGEMENT

The essential elements in the engagement of a target from position defilade are mask clearance, direction, elevation, and adjustment of fire. If possible, a minimum mask clearance (minimum elevation) will be determined for the entire sector of fire. However, it may be necessary (due to the slope of the mask) to establish clearance for each target.

If the mask is 300 meters or less from the gun position, place a 300-meter range setting on the rear sight, lay on the top of the mask, and add 3 mils (clicks) of elevation with the elevating handwheel.

If the mask is over 300 meters from the gun position, place the range setting to the mask on the rear sight, lay on top of the mask, and add 3 mils (clicks) of elevation.

The elevation readings obtained using the methods outlined above give the minimum elevation for the sector or target(s). The minimum elevation should be recorded on a range card.

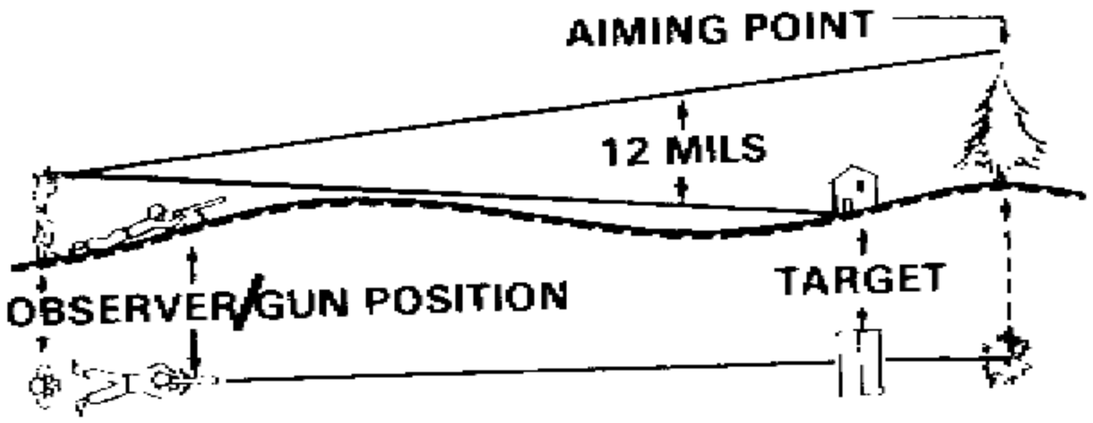
LAYING THE MACHINEGUN FOR DIRECTION

The observer places himself to the rear of the gun on the gun-to-target line and in a position where he can see the gun and the target. He alines the gun for general direction by directing the gunner to shift the mount/gun until the gun is alined on the target. A prominent terrain feature or landmark visible to the gunner through his sights is selected as an aiming point. This aiming point should be at a greater range than the target and at a higher elevation. When laying the gun on the aiming point, the range setting on the rear sight must correspond to the range to the target.

If the aiming point is on the gun-to-target line, the gun is laid on the aiming point and is thereby alined for direction.

If the aiming point is not on the gun-to-target line, the horizontal distance in mils is determined using the best means available (usually binoculars) and announced to the gunner. This measured distance is then laid off with the traversing handwheel.

ADJUSTING FIRE BY OBSERVER

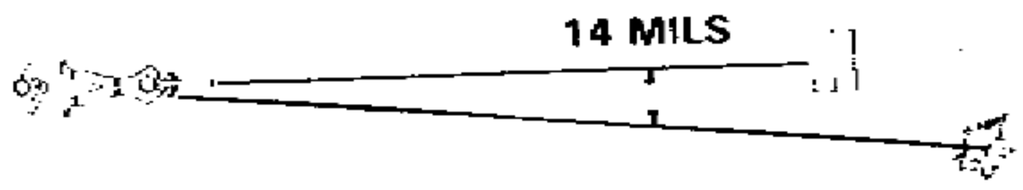


AIMING POINT ON GUN-TO-TARGET LINE

GUN-TO-TARGET RANGE: 1,000 METERS

DIRECTION: WITH REAR SIGHT SET AT 1,000 METERS, LAY GUN ON AIMING POINT

ELEVATION: DEPRESS GUN 12 MILS



AIMING POINT NOT ON GUN-TO-TARGET LINE

GUN-TO-TARGET RANGE: 1,000 METERS

DIRECTION: WITH REAR SIGHT SET AT 1,000 METERS, LAY GUN ON AIMING POINT; TRAVERSE GUN LEFT 14 MILS

ELEVATION: DEPRESS GUN 12 MILS

LAYING THE MACHINEGUN FOR ELEVATION

The observer measures the vertical distance from the aiming point to the base of the target using the best means available and directs the gunner to depress the muzzle of the gun the number of mils measured. The gun should now be laid to hit the target.

CONTROLLING FIRE

Fire from position defilade is controlled by an observer (the leader or a member of the crew who can see the target) in a position near the gun. An example of a fire command used to engage a target from position defilade is as follows:

(The gun has already been laid for direction and elevation.)

AS LAID

AT MY COMMAND

FIRE

CHAPTER 8

Techniques of Fire During Limited Visibility

LIMITATIONS AND TERMS

This chapter describes machinegun firing techniques during limited visibility. LIMITED VISIBILITY refers to periods of darkness and to daylight when visibility is poor due to smoke, fog, rain, or snow.

During limited visibility, some of the daylight techniques for engaging targets cannot be used.

Information on the use of night vision devices with the M60 machinegun during limited visibility is given in TM 11-5855-203-10.

SECTOR OF FIRE

A sector of fire is an area to be covered by fire that is assigned to an individual, a weapon, or a unit. Machineguns are normally assigned two sectors of fire: a primary sector and a secondary sector.

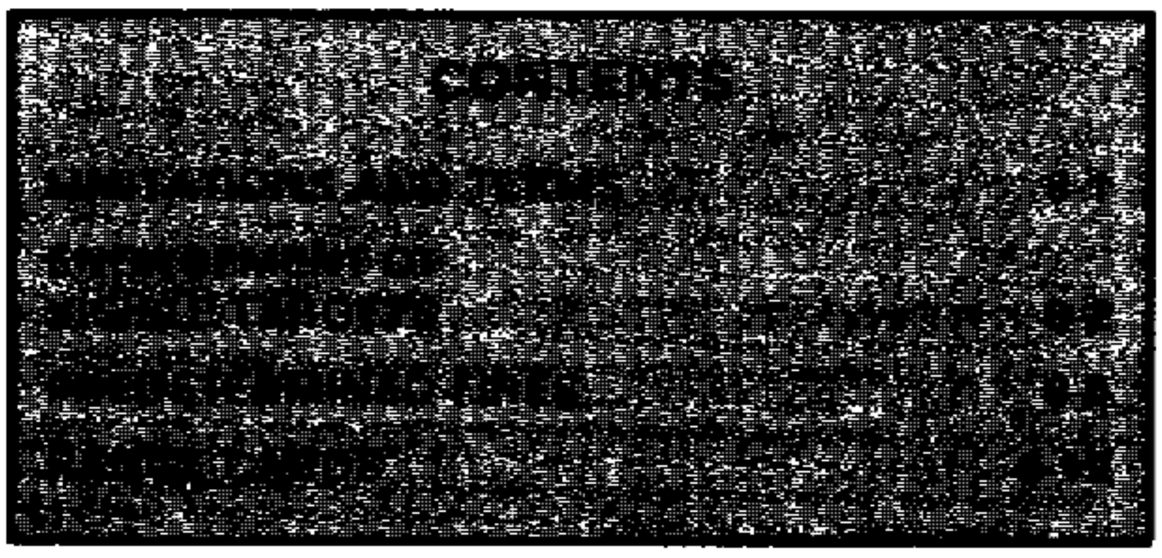
FINAL PROTECTIVE FIRES

Final protective fires (FPF) form an immediately available prearranged barrier of fire designed to stop enemy movement across defensive lines or areas. These fires consist of the fires of machineguns, mortars, and artillery, and include the machinegun final protective line (FPL) and mortar and artillery indirect fires.

FINAL PROTECTIVE LINE

An FPL is a predetermined line along which grazing fire is placed to stop an enemy assault. If an FPL is assigned the machinegun is laid on it except when other targets are being engaged. An FPL becomes the machinegun's part of the unit's final protective fires. An FPL has the following characteristics:

- **It is fixed in direction and elevation; however, a few mils of search must be employed to prevent the enemy from crawling under the FPL and to compensate for irregularities in the terrain or the sinking of the tripod rear legs into soft soil during firing.**



- **Fire can be delivered under all conditions of visibility.**
- **When two machineguns are employed on the flanks of a platoon, the FPL of each gun SHOULD correspond to the inner limit of its primary sector of fire.**

PRINCIPAL DIRECTION OF FIRE

A principal direction of fire (PDF) is a priority direction of fire assigned to cover an area which provides good fields of fire or has a likely avenue of approach. It is also used to provide mutual support to an adjacent unit. Guns are laid on the PDF if an FPL has not been assigned. If a PDF is assigned and other targets are not being engaged, guns are laid on the PDF. A PDF has the following characteristics:

- **It is used only if an FPL is not assigned; it then becomes the machinegun's part of the unit's final protective fires.**
- **When the target has width, direction is determined by laying on one edge of the target area and noting the amount of traverse necessary to cover the entire target.**
- **The gunner is responsible for the entire wedge-shaped area from the muzzle of the gun to the target, but elevation may be fixed for a priority portion of the target.**

ENGAGEMENT OF VISIBLE TARGETS

During limited visibility, it is hard to detect and identify targets. The leader's ability to control the fire of his guns is also reduced, so he may instruct the gunners to fire without command when targets become visible. Gunners should engage targets only when they can identify them, unless ordered to do otherwise. For example, if one gunner detects a target and engages it, the other gunners will observe the area fired upon and add their fire only if they can identify the target or if ordered to fire at it.

Tracer ammunition helps a gunner engage visible targets during limited visibility, and it should be used if possible. Gunners must be trained to fire low at first and adjust upward when visibility is limited. This overcomes the tendency to fire high under those conditions.

When two or more guns are engaging the same linear targets, linear targets with depth, or deep targets, no attempt is made to divide these targets as is done when visibility is good. When visibility is poor, the center and flanks of these targets may not be clearly defined; therefore, each gunner observes his tracers and covers what he believes to be the entire target.

LINEAR TARGETS

The gunner lays on what appears to be the center of mass of the target. With the tripod-mounted gun, he engages the target using swinging traverse fire and keeps his beaten zone on the base of the target. With the bipod-mounted gun, the gunner traverses rapidly back and forth across the target by selecting successive aiming points.

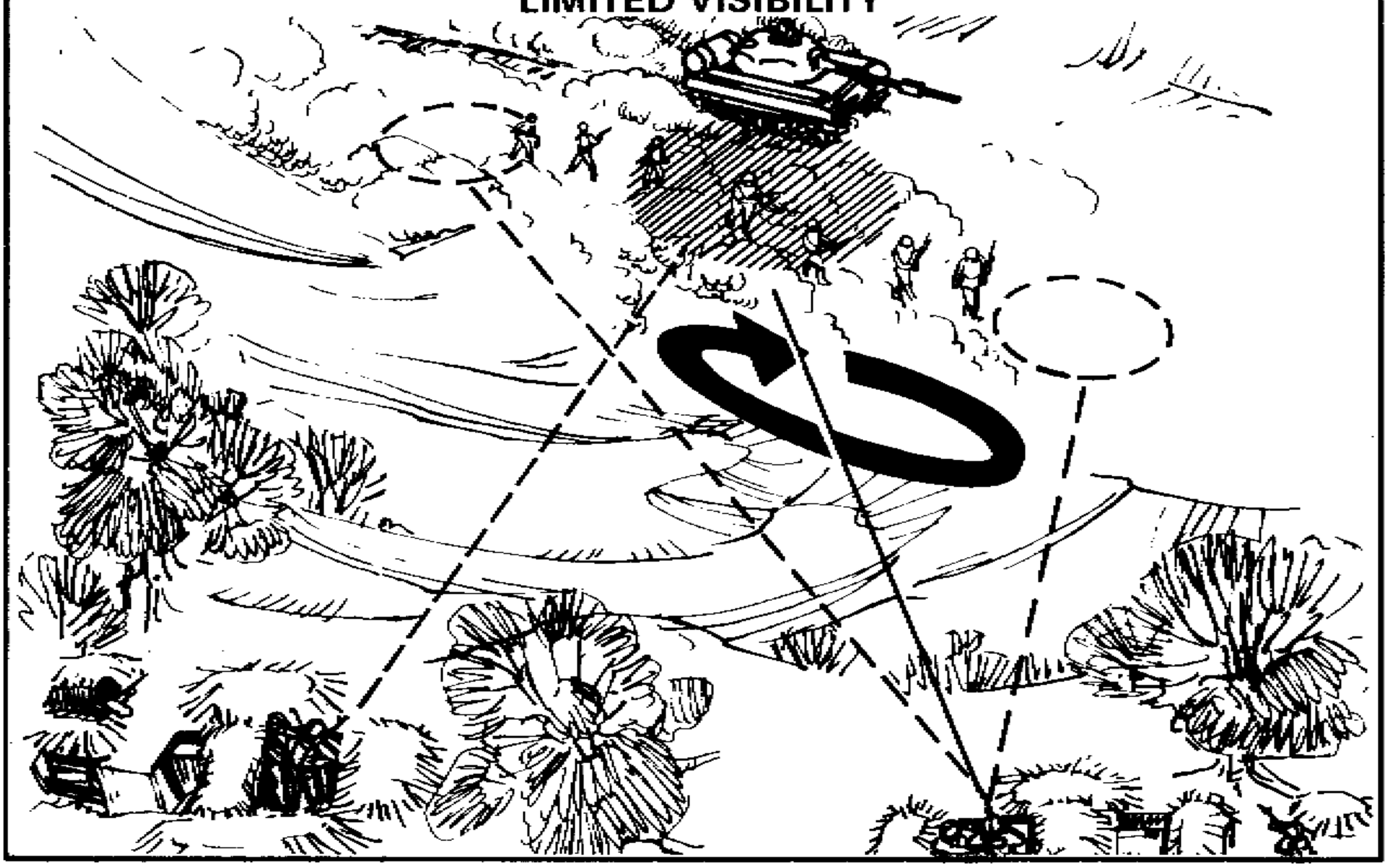
LINEAR TARGETS WITH DEPTH

The gunner lays on the center of mass of the target. He then traverses and searches the target, covering the side closest to his position first. With the tripod-mounted gun, the gunner selects successive aiming points, covering what appears to be the entire target by observing his tracers.

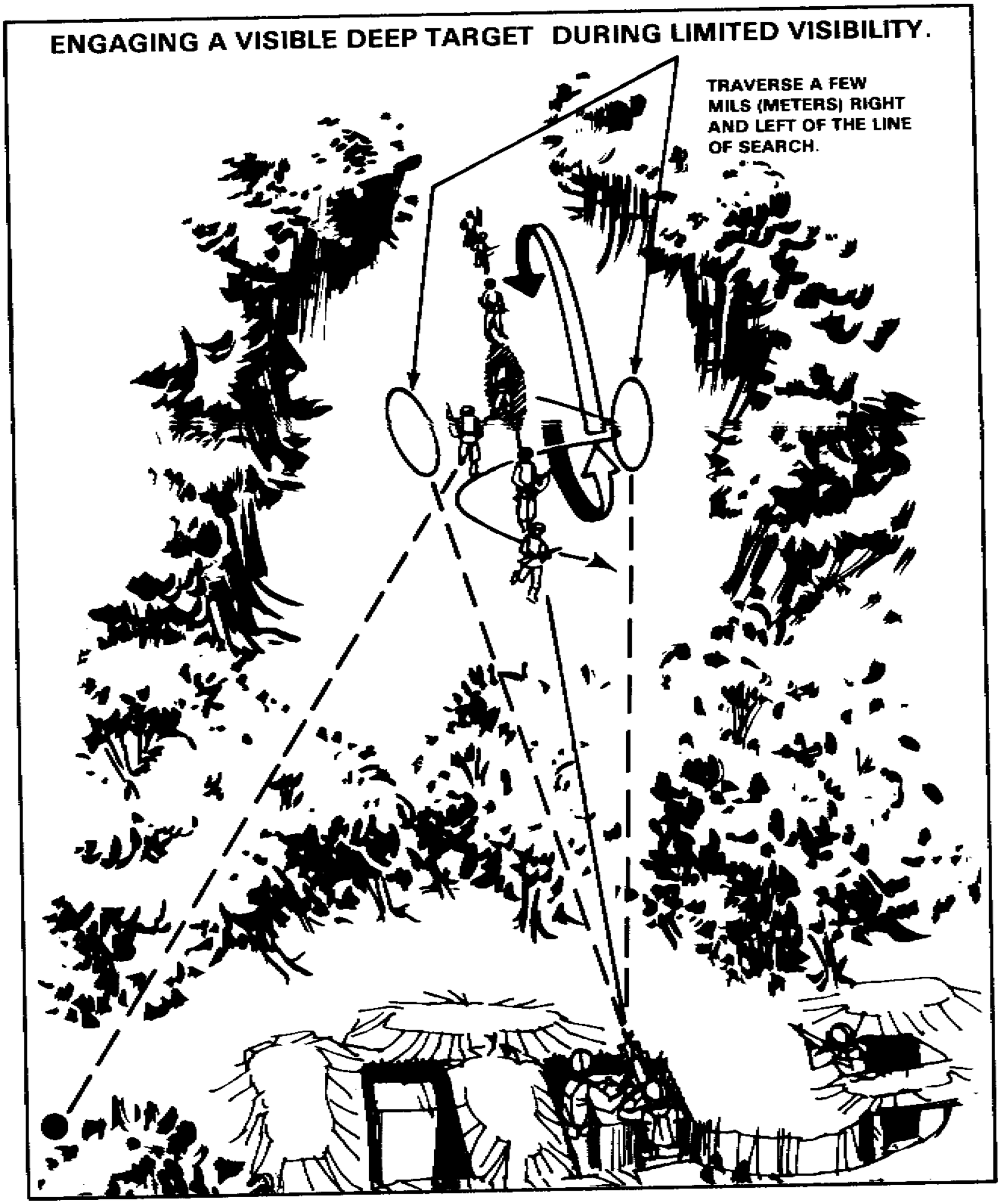
ENGAGING A VISIBLE LINEAR TARGET DURING LIMITED VISIBILITY



ENGAGING A VISIBLE LINEAR TARGET WITH DEPTH DURING LIMITED VISIBILITY



ENGAGING A VISIBLE DEEP TARGET DURING LIMITED VISIBILITY.



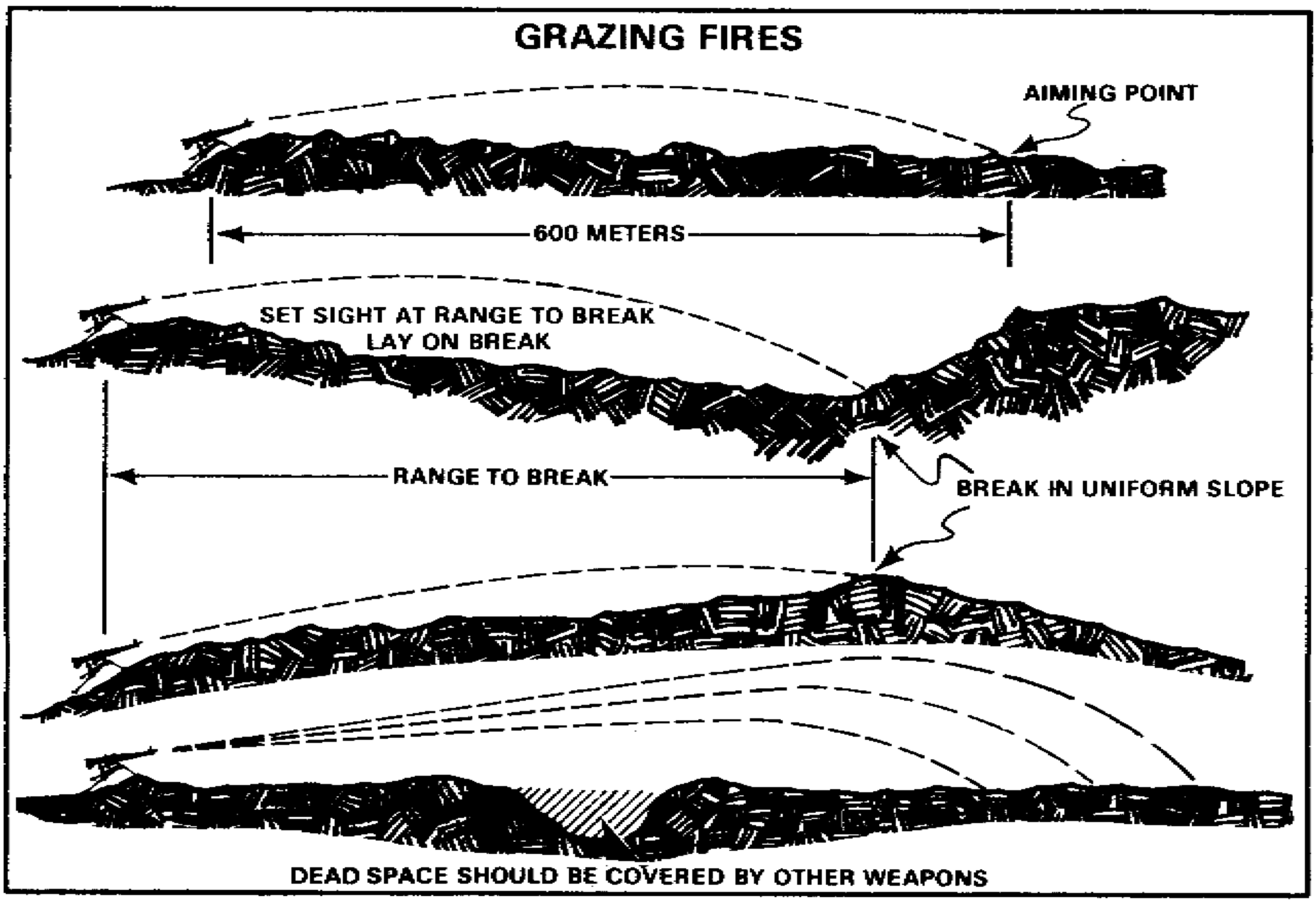
DEEP TARGETS

The gunner first lays on the center of mass of the target. He searches down to the near end and then up to the far end. With the tripod-mounted gun, the target is searched by using the elevating handwheel. To help make rapid lateral adjustments, the traversing slide is kept loose. While searching the target, the gunner traverses a few mils to either side of his line of search by applying shoulder pressure (left/right) to the stock of the gun. With the bipod-mounted gun, the gunner covers the entire target by selecting successive aiming points and observing his tracers.

One type of target for the machineguns during limited visibility is enemy crew-served weapons. These enemy weapons may be identified during limited visibility by their muzzle flashes. To engage these targets, the gunner uses his night vision device. Fire should be delivered at the rapid rate and adjusted by observing the tracer stream.

PREDETERMINED FIRES

Predetermined fires are used to cover target areas such as avenues of enemy approach, likely sites for enemy weapons, and probable enemy assault routes.



GRAZING FIRE

A good FPL covers the maximum area with grazing fire. Grazing fire can be obtained over various types of terrain to a maximum range of 600 meters.

To obtain the maximum extent of grazing fire over level or uniformly sloping terrain, the gunner sets the rear sight at 600 meters. He then selects a point on the ground which he estimates to be 600 meters from the gun, and he lays, fires, and adjusts on that point.

If the gunner cannot obtain 600 meters of grazing fire because of a break in the terrain at ranges less than 600 meters, he determines the range to the break, indexes that range on his rear sight, and then lays, fires, and adjusts on that point.

To prevent enemy troops from crawling under the 1-meter-high grazing fire, a few mils of search (downward) should be applied to the elevating handwheel on the traversing and elevating mechanism.

DEAD SPACE

The extent of grazing fire and the extent of dead space may be determined in two ways:

In the preferred method, a gun is laid for elevation and direction (and cleared). A member of the crew then walks along the FPL while the gunner looks through his sights. In places where the soldier's waist (midsection) falls below the gunner's line of aim, dead space exists. Arm-and-hand signals must be used to control the soldier who is walking and to obtain an accurate account of the dead space and its location.

Another method is to observe the flight of tracer ammunition from a position behind and to the flank of the gun.

FIRE CONTROL

Predetermined targets, including the FPL or PDF, are engaged on order or by SOP. The signal for calling for these fires is normally stated in the defense order. Fires on predetermined targets may be controlled by arm-and-hand signals, voice commands, or pyrotechnic devices.

Machineguns fire the FPL or PDF at the rapid rate of fire unless the situation calls for a higher rate. When engaging other predetermined targets, the rapid rate of fire is used unless a different rate is ordered.

METHODS OF LAYING THE GUN FOR PREDETERMINED TARGETS

The gun is laid on each target in turn. When laid on each target in the primary sector, the direction and elevation are taken from the traversing bar and the traversing and elevating mechanism. Both direction and elevation, as well as the range to each target, are recorded on the range card.

Another method for laying on predetermined targets is to use field expedients. These field expedients must be used in the secondary sector, and they can be used in the primary sector to aid the gunner.

The laying of the gun by either method may be verified by firing the gun and adjusting if necessary, by changing the data, or by moving the field expedients.

Steps to obtain direction and elevation readings are as follows:

Centering the Traversing Mechanism. With the left hand, turn the traversing handwheel TOWARD the gunner as far as it will go, then turn it AWAY two complete revolutions. This is the approximate center (50 clicks). This center may be found in the dark by counting the clicks.

Laying the Machinegun for Direction. To lay the gun for direction when an FPL has been assigned, slide the traversing slide all

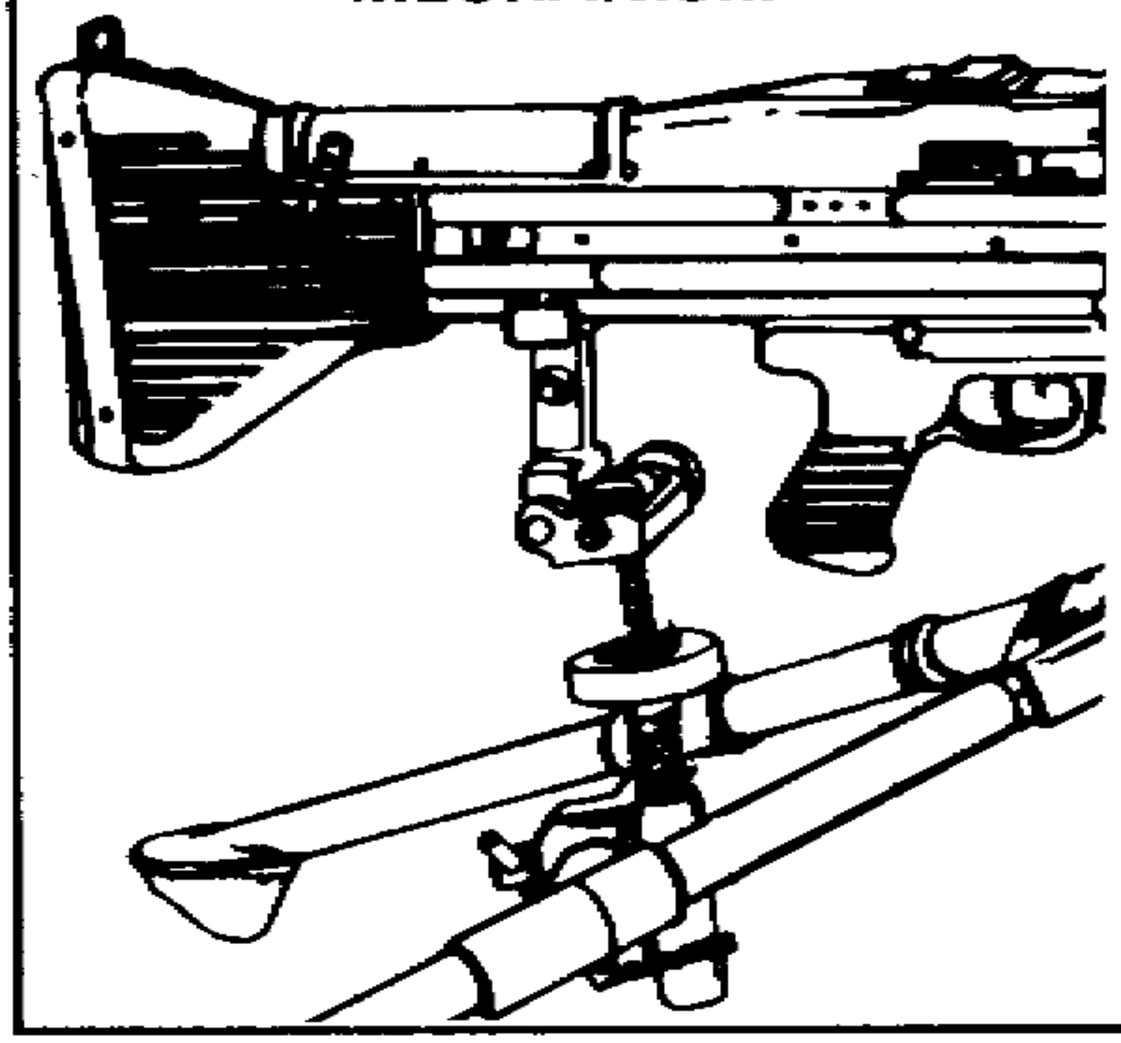
the way to the appropriate end of the traversing bar, so that metal-to-metal contact is made between the traversing slide and the tripod leg. Then, shift the tripod until the muzzle of the gun points along the FPL. If an FPL has not been assigned, lay the gun for direction on the center of the primary sector. In this case, lock the left edge of the traversing slide on the "0" graduation on the traversing bar. THE LEFT EDGE OF THE TRAVERSING SLIDE IS ALWAYS USED AS THE INDEX. Shift the tripod by moving the trailing legs until the muzzle of the gun is laid on the center of sector. Once the gun is laid for direction, emplace the tripod firmly by digging in the tripod shoes or by placing sandbags on the tripod legs. Whenever possible, the rear legs should be staked to increase stability and prevent accidental movement of the tripod. When the gun is not being used, it should be oriented on the PDF.

Recording Direction Readings. Direction readings to all targets in the primary sector of fire, with the possible exception of the FPL, are recorded on the range card. The FPL normally needs no direction reading because, in laying on the FPL, the traversing slide is positioned to the extreme right or left (metal-to-metal contact) of the traversing bar. The FPL is depicted in the sketch section of the range card by the extended machinegun symbol with a thick, shaded blade. Use the following procedure to obtain direction readings to targets other than the FPL:

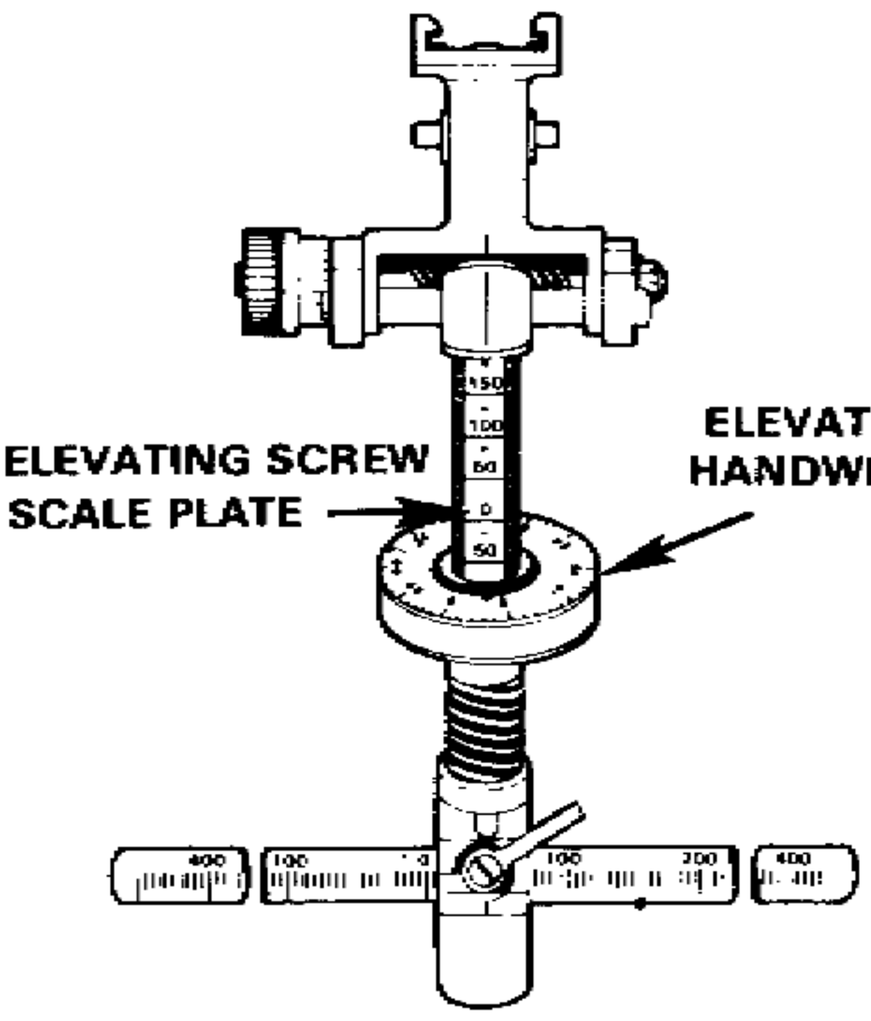
Loosen the traversing-slide-lock lever and move the traversing slide along the traversing bar until the machinegun is laid on the center base of a point target and on either flank of a linear target.

Lock the traversing slide to the traversing bar and read the direction reading from the scale on the traversing bar. IF THE LEFT EDGE OF THE TRAVERSING SLIDE DOES NOT FALL EXACTLY ON A 5-MIL GRADUATION (TICKMARK), USE THE NEAREST GRADUATION AS THE DIRECTION READING. The direction reading will be recorded as the direction in which the muzzle of the gun is pointing.

TRAVERSING AND ELEVATING MECHANISM

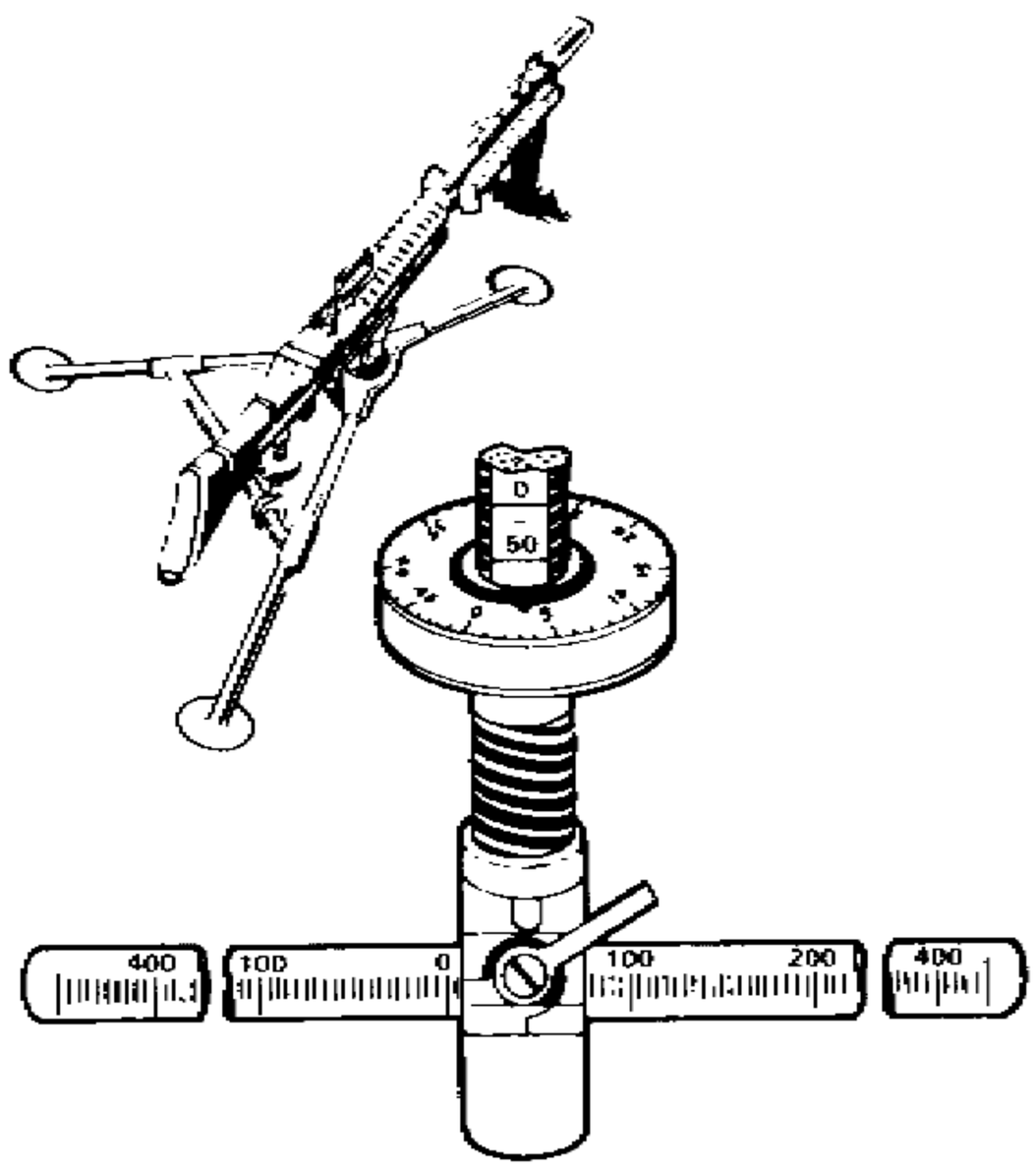


TRAVERSING BAR AND TRAVERSING AND ELEVATING MECHANISM



When the LEFT edge of the traversing slide is on a graduation to the LEFT of the "0" graduation on the traversing bar, the direction reading is recorded as RIGHT (number of mils). (The muzzle of the gun is to the right.) When the LEFT edge of the slide is to the RIGHT of the "0" graduation, the direction reading is recorded as LEFT (number of mils). (The muzzle of the gun is to the left.) The muzzle of the gun will determine if the direction is RIGHT or LEFT, not the location of the traversing-slide lock on the traversing bar.

OBTAINING DIRECTION READINGS FROM THE TRAVERSING BAR

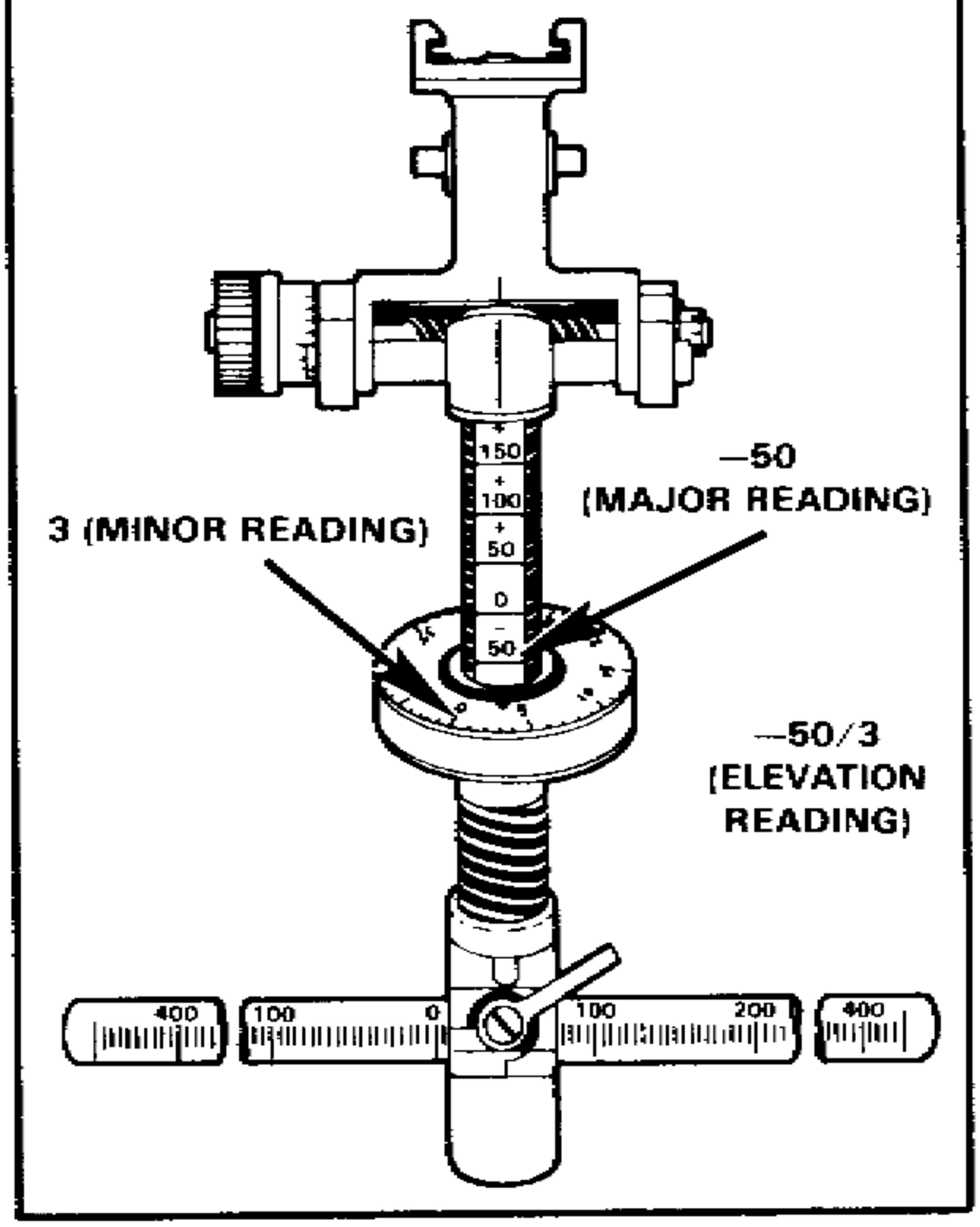


After taking a direction reading to a linear target or PDF, the width of the target may be measured by traversing from flank to flank across the target using the traversing handwheel. The traversing handwheel must be recentered before moving to another target, or else data obtained to the other target will not be accurate. To recenter, turn the traversing handwheel back to the original starting point.

Recording Elevation Readings. After getting the direction reading, the elevation reading is obtained before moving to another target. To obtain this reading, the gun is laid at the center base of the target.

The elevation reading is obtained from the two scales. The first portion (MAJOR READING) is taken from the upper elevating screw scale plate. The second portion (MINOR READING) is taken from the mil scale on top of the elevating handwheel, using the dial pointer as the index. The two portions of the elevation reading are separated by a slash (/) when they are recorded (for example, 50/3).

OBTAINING ELEVATION READINGS



The elevating scale plate on the upper elevating screw is graduated in 50-mil increments from MINUS 200 mils to PLUS 200 mils. There is an index line BELOW each number and a PLUS or MINUS sign ABOVE each, with the exception of the "0". The zero reading has NO sign. TO GET THE ELEVATION READING, THE GUNNER LOWERS HIS HEAD UNTIL HIS EYES ARE LEVEL WITH THE TOP OF THE ELEVATING HANDWHEEL. The major reading is the first number above the first visible index line above the elevating handwheel.

The mil scale on the elevating handwheel is graduated into fifty 1-mil increments. The graduation on line with the dial pointer is the minor reading. The minor reading will not be preceded by a plus or minus sign. The entire reading is recorded as -50/3. The minor reading ALWAYS indicates how many mils BELOW the major reading the gun is laid.

An elevation reading is valid only on the mechanism from which it is obtained. Used on another mechanism, even on the same mount and gun, the reading will be inaccurate. The number of threads exposed on the lower elevating screw must remain the same, when both reading and using the data. If the number of threads is increased or decreased after recording the data, fire will not be accurate.

To insure a correct elevation reading to a target, the gunner should fire and adjust on the target. However, the gunner may use the DRY-FIRE method to obtain data on targets without firing and adjusting. In this method, the range to the target is estimated, the range is placed on the rear sight, and the gun is laid on the center base of the target. The direction and elevation readings are then taken. RANGE DETERMINATION is critical in this case because any discrepancy will cause an error in elevation when the target is engaged. The dry-fire method of obtaining data is used only when firing is not possible or when the situation is such that firing would disclose the position of the gun.

FIELD-EXPEDIENT METHODS OF LAYING THE GUN

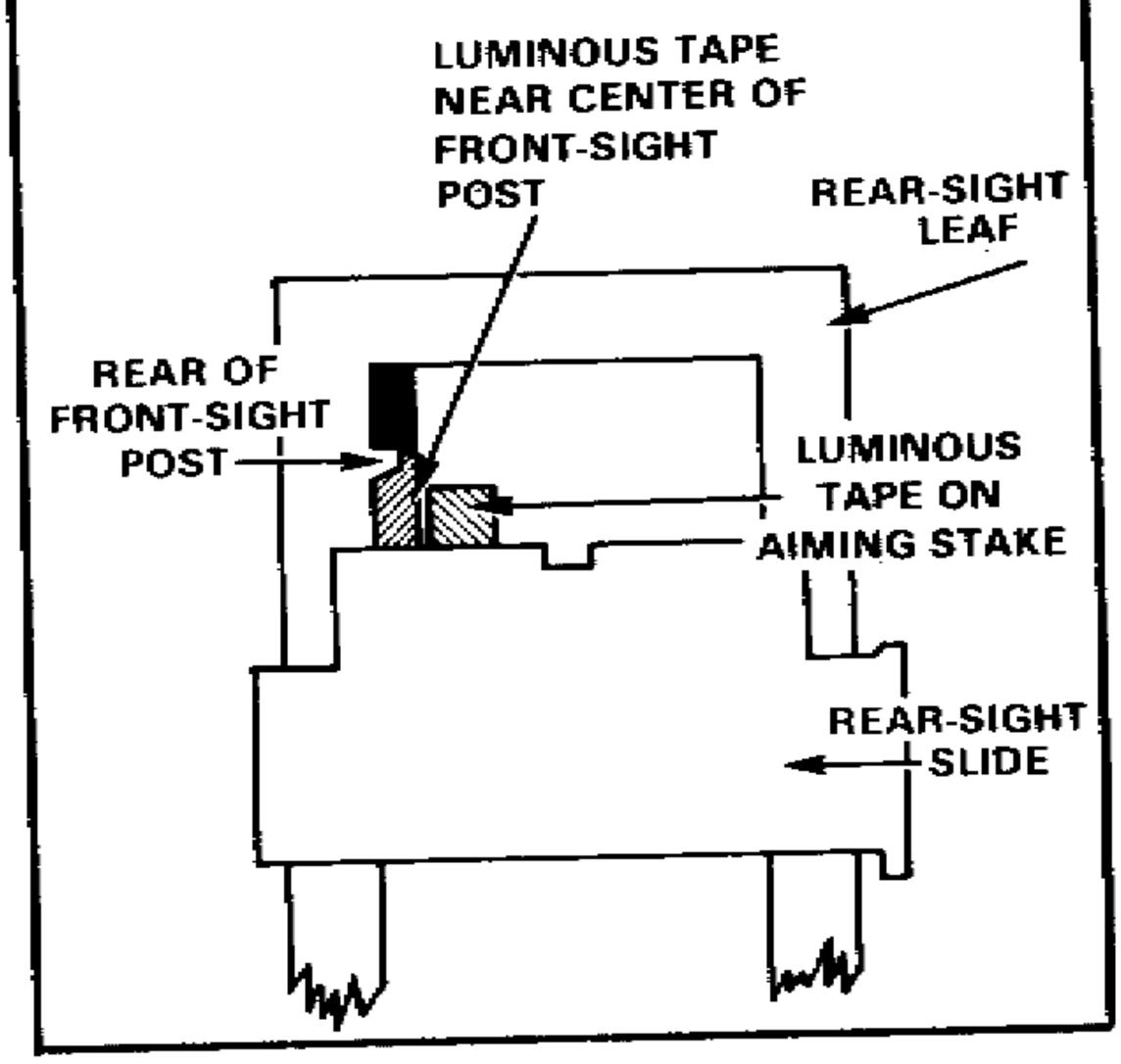
Field expedient methods SUPPLEMENT other methods and help in laying the machinegun on predetermined targets in the primary sector. These methods are not as effective as the traversing-bar and traversing-and-elevating-mechanism method, and these methods require additional material. Field expedients serve as the only means of engaging predetermined targets in secondary sectors and aiding the gunner in moving quickly from one target to another in the primary sector during limited visibility. If a crew is replaced for any reason, the field expedients being used must be explained to the relieving crew.

The Aiming-Stake Technique. The advantage of using an aiming stake in laying a machinegun is that it requires no light at the gun position during limited visibility. It is not effective when visibility is so limited that the aiming stakes cannot be seen. In this technique, the gun is laid to hit a target area, using the following steps:

- **The rear-sight slide is raised to its top position in the rear-sight-leaf assembly.**
- **A strip of luminous tape or luminous paint is placed at least halfway up the rear of the front-sight post.**
- **A short aiming stake, marked on the top with a strip of luminous tape or paint, is positioned 1 or 2 meters forward of the machinegun position.**
- **The gunner moves his head slightly to the left, causing the front-sight post to appear in the left corner of**

the rectangle formed by the rear-sight slide and rear-sight-leaf assembly. Under the gunner's direction, the stake is alined and then driven into the ground, insuring that the two pieces of luminous material are adjacent (alined for direction), and the top edges of both pieces of material are level (alined for elevation). The gunner must maintain the correct position and grip throughout the procedure and, when engaging targets, must cause the front-sight post to appear in the LEFT portion of the rear sight by again moving his head slightly to the left.

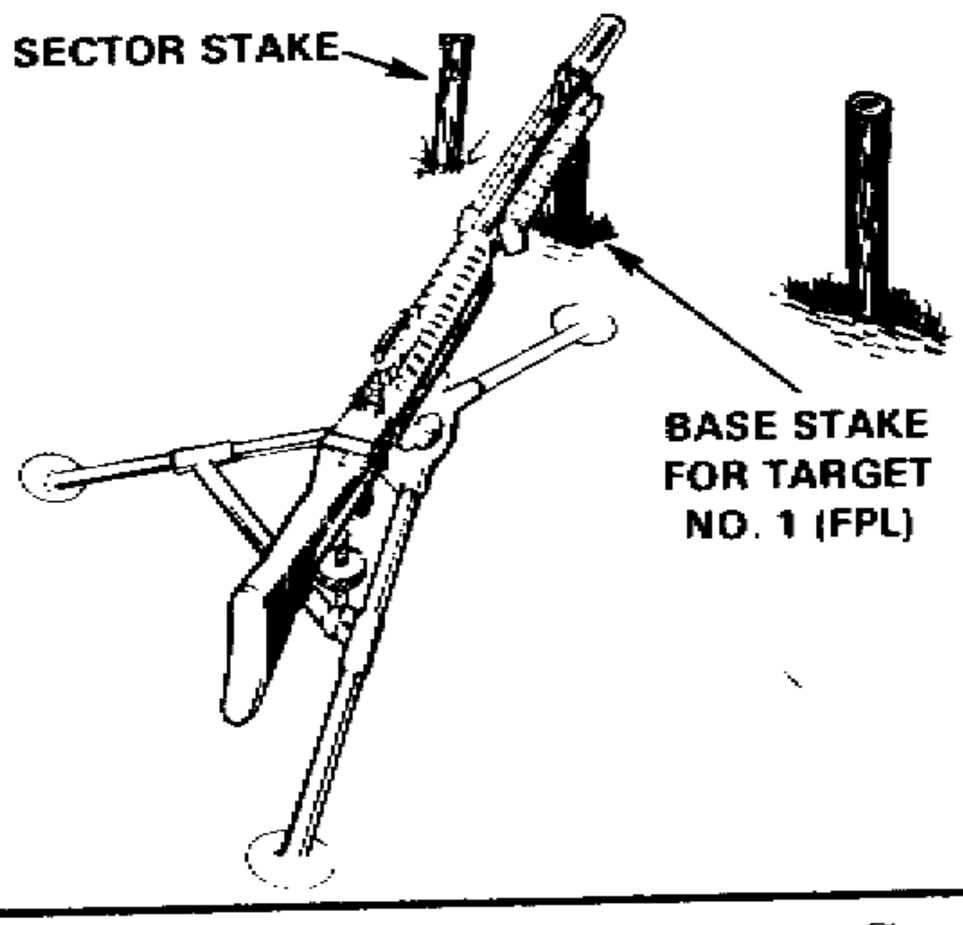
AIMING-STAKE TECHNIQUE OF ENGAGING TARGETS DURING LIMITED VISIBILITY



The Base-Stake Technique. A base stake is used to define sector limits and may provide the lay for the FPL or other predetermined targets along a primary or secondary sector limit. The base-stake method is effective in all conditions of visibility and requires little additional material. The procedures are as follows:

- Define sector limits by laying the gun for directin along one sector limit and by emplacing a stake along the outer edge of the folded bipod legs. The legs rotate slightly on the barrel, so take up the "play." Use the same procedure for placing a stake along the opposite sector limit.
- Lay the gun to engage an FPL by moving the muzzle of the gun to a sector limit. Adjust for elevation by driving a stake into the ground so that the top of the stake is under the gas-cylinder extension, allowing a few mils of depression to cover irregularities in the terrain.
- Lay the gun to engage other targets within a sector limit, in a primary sector, by using the procedure above, except keep the elevation fixed.

BASE-STAKE TECHNIQUE OF ENGAGING PRESELECTED TARGETS



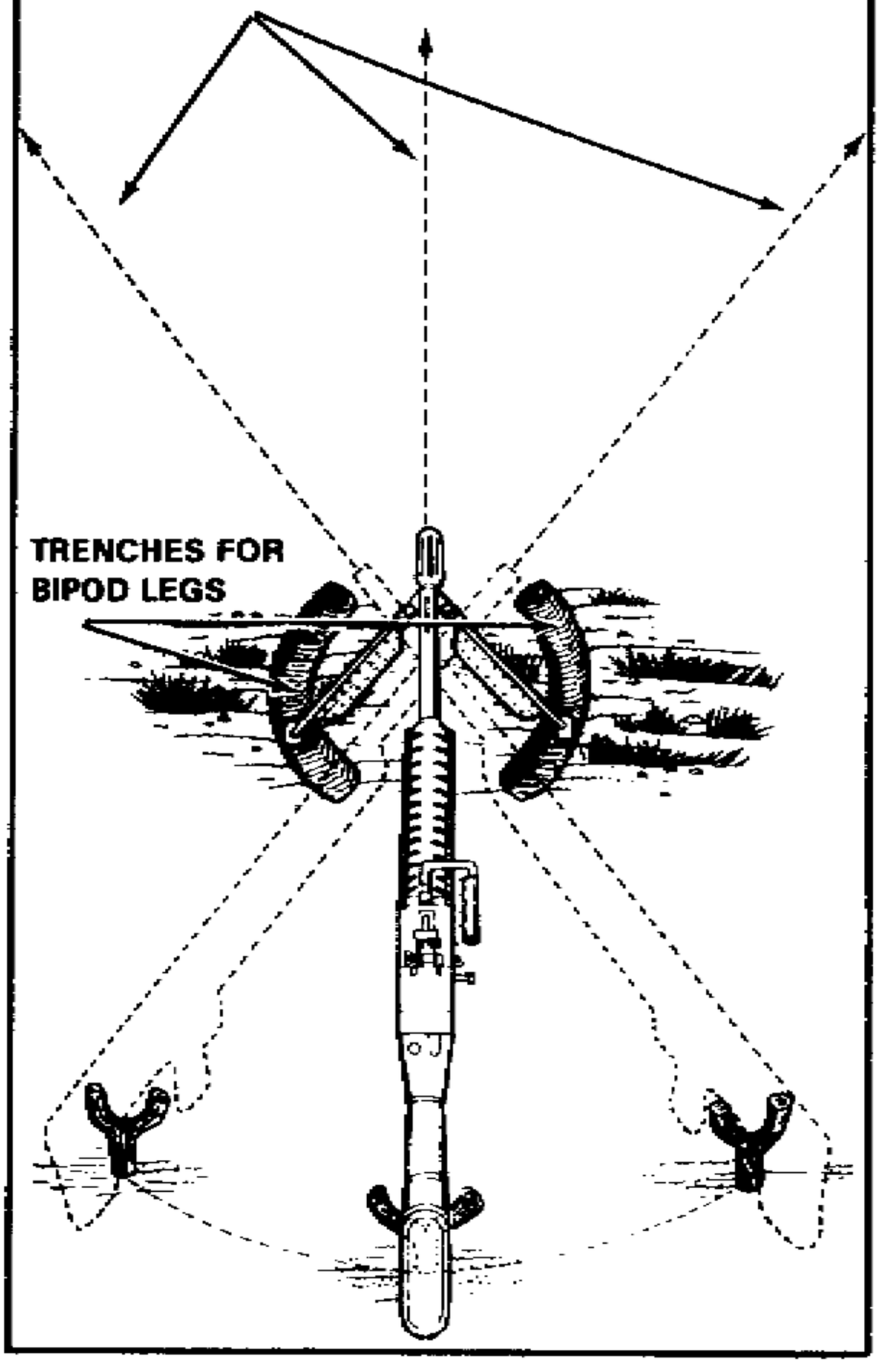
The Notched-Stake or Tree-Crotch Technique. The notched-stake or tree-crotch technique is used with the bipod-mounted gun to engage predetermined targets within a sector or to define sector limits. This

method is effective under all conditions of visibility and requires little additional material.

The stock of the gun is placed in the rest of a notched stake or tree crotch and is adjusted to hit selected targets or to define sector limits.

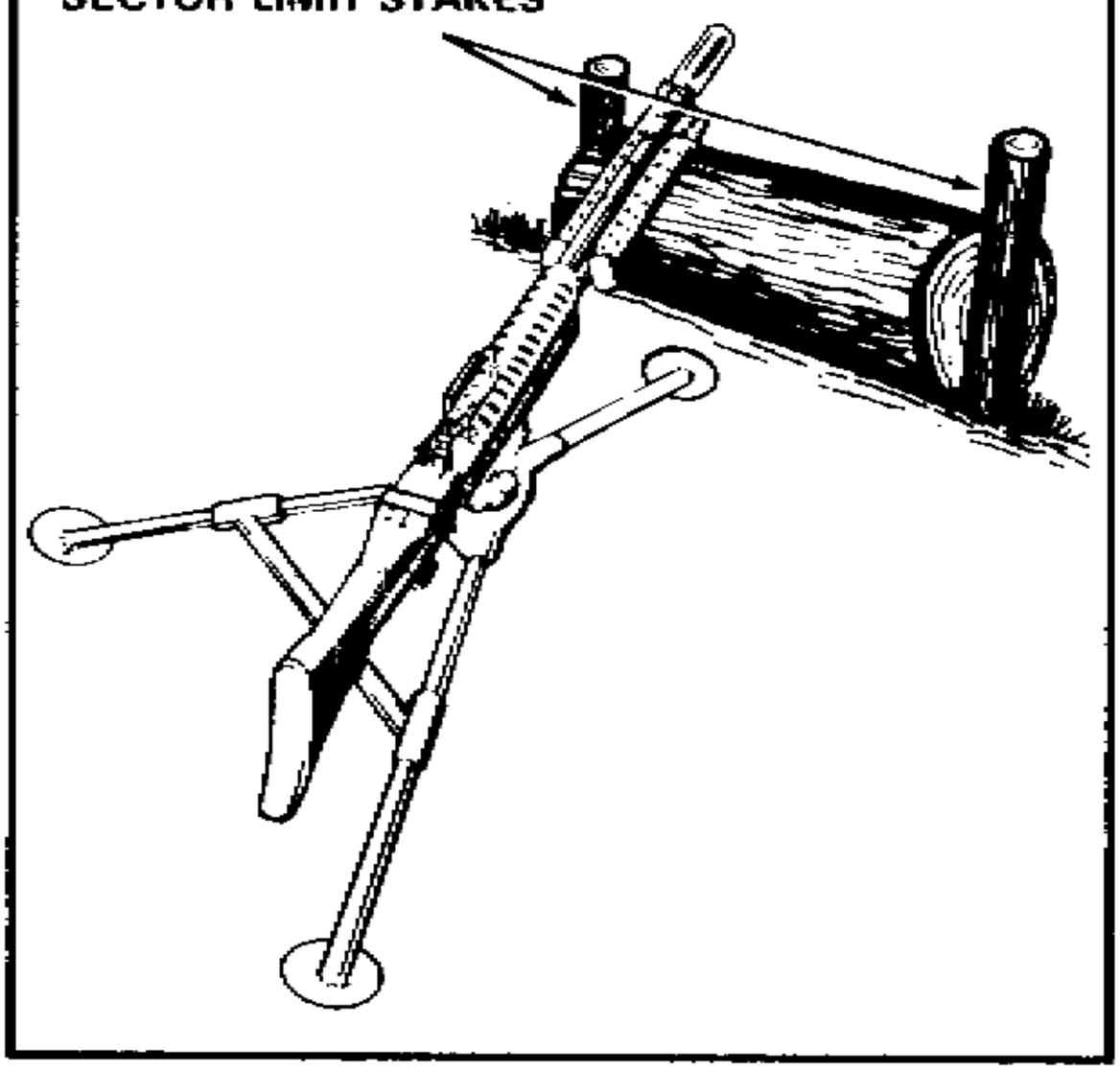
Shallow, curved trenches or grooves are dug for the bipod feet. These trenches allow rotation of the bipod feet as the stock is moved from one crotch or stake to another.

NOTCHED-STAKE OR TREE-CROTCH TECHNIQUE OF ENGAGING PRESELECTED TARGETS



The Horizontal Log or Board Technique. This technique is used with the bipod or tripod mount to mark sector limits and engage wide targets. The horizontal log or board technique is good for all conditions of visibility. It is best suited for flat, level terrain. The procedures are as follows:

HORIZONTAL LOG OR BOARD USED WITH THE TRIPOD-MOUNTED M60 MACHINEGUN



With the Bipod-Mounted Gun. Place a log or board beneath the stock of the gun so that the stock can slide across it freely. Dig shallow, curved trenches or grooves for the bipod feet to allow rotation of the feet as the stock is moved along the horizontal log or board. Adjust the bipod legs to the desired elevation. The sector limits may be marked by notching or placing stops on the horizontal log or board. Bipod firing position and grip are used.

With the Tripod-Mounted Gun. Place a log or board beneath the barrel, positioned so that the barrel, when resting on the log or board, is at the proper elevation to obtain grazing fire. The limits of sector are marked,

when appropriate, as described for the bipod in the preceding paragraph. This method is used only if a traversing and elevating mechanism is not available.

RANGE CARDS

A range card is a record of the firing data required to engage predetermined targets within a sector(s) of fire during periods of limited visibility. There are two types of range cards: one has an FPL and the other has a PDF. Predetermined targets can include likely avenues of approach, likely sites for enemy crew-served weapons, and probable enemy assault positions, as well as a PDF or FPL and other target areas. The range card may also be used as a reference to engage targets when visibility is good. It aids the platoon leader in preparing his defense plan.

The tripod-mounted gun is normally used to cover the primary sector of fire. Predetermined targets in the secondary sector are engaged by the use of field expedients.

A range card has two parts, a sketch section and a data section. The sketch is not drawn to scale, but the data referring to the targets must be accurate.

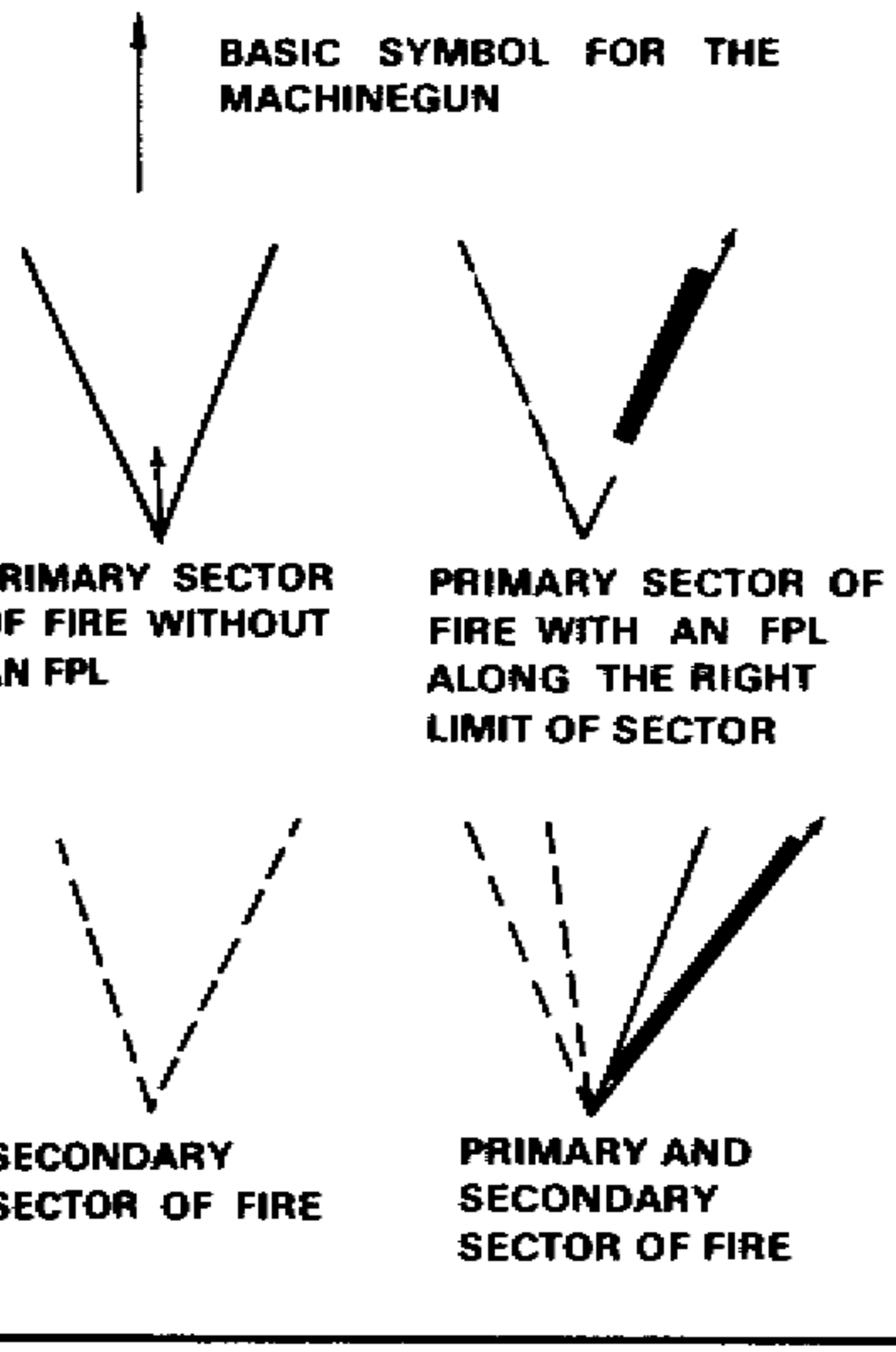
PREPARATION OF A RANGE CARD.

Range cards are prepared in DUPLICATE. One copy stays at the machinegun position, and the other is sent to the platoon headquarters. Complete range cards are prepared for primary positions, and partially completed range cards are prepared for alternate and supplementary positions. The gunner, assisted by the assistant gunner, must prepare the range card. Range cards are prepared immediately upon arrival in a position, regardless of the anticipated length of stay. Range cards will continually be revised throughout the occupation of a position. A range card is prepared as follows:

- **Mount the gun on the tripod.**
- **Position the gun with the muzzle pointing in the direction of the FPL. If an FPL is not assigned, point the muzzle in the direction of the PDF.**
- **Sketch the basic military symbol for the machinegun in the lower center portion of the card, pointing in the direction of the PDF. (See FM 21-30 for complete coverage of military symbols.)**
- **If an FPL is assigned, extend the basic symbol for the machinegun in the direction of the FPL. Include grazing fire (shaded blade).**
- **Draw in the opposite primary sector limit. No data need be recorded for the opposite sector limit in the data section unless a target is located along this line. When an FPL is assigned, it is always labeled target number 1. If the opposite side of the traversing bar cannot be used to mark the opposite side of the primary sector, a direction reading must be recorded in the sketch section of the range card.**
- **Draw in the limit of the secondary sector using a broken line. Under the frontal-parapet concept, the secondary sector limits will be depicted as a separate sector with its own right and left limits. The area between the primary and secondary sectors will be marked as dead space (nonobservable and nonfiring terrain), directly in front of the machinegun position.**
- **Draw an arrow pointing in the direction of magnetic north to the right of marginal data.**

- Orient the gun position with a prominent terrain feature (recognizable on a map) by obtaining the magnetic azimuth to or from the terrain feature to the tripod-mounted gun position. Draw a line between these two points. Place arrow barbs along this line, pointing in the direction the magnetic azimuth was taken. Record the distance in meters above the barbed line; record the magnetic azimuth in mils or degrees below the line. If a prominent terrain feature is not available, the gun position will be identified by using an eight-digit grid coordinate.

MILITARY SYMBOLS APPLICABLE TO THE M60



- As marginal data, record the gun number, unit designation, and date in one corner of the sketch. For security, no unit designation higher than company is recorded on the sketch. If in a mechanized unit, also include the squad designation.
- When an FPL is assigned, extend the basic symbol of the machinegun along that line and determine the extent of grazing fire. Sketch in a shaded blade on the inside of the FPL to represent the extent of grazing fire. If there is dead space along the FPL, it is shown by breaks in the shaded blade. Record the ranges to the near and far edges of the dead space and the extent of grazing fire along the FPL. Determine the magnetic azimuth of the FPL and record this azimuth in the sketch section below the shaded blade representing the FPL. Record the elevation reading and other pertinent data under their proper columns in the data section.

TARGETS

Targets in the primary sector are shown on the range card sketch by numbers enclosed in circles. An FPL, when assigned, is ALWAYS labeled target number 1. Other targets are assigned subsequent numbers in the order of their tactical importance.

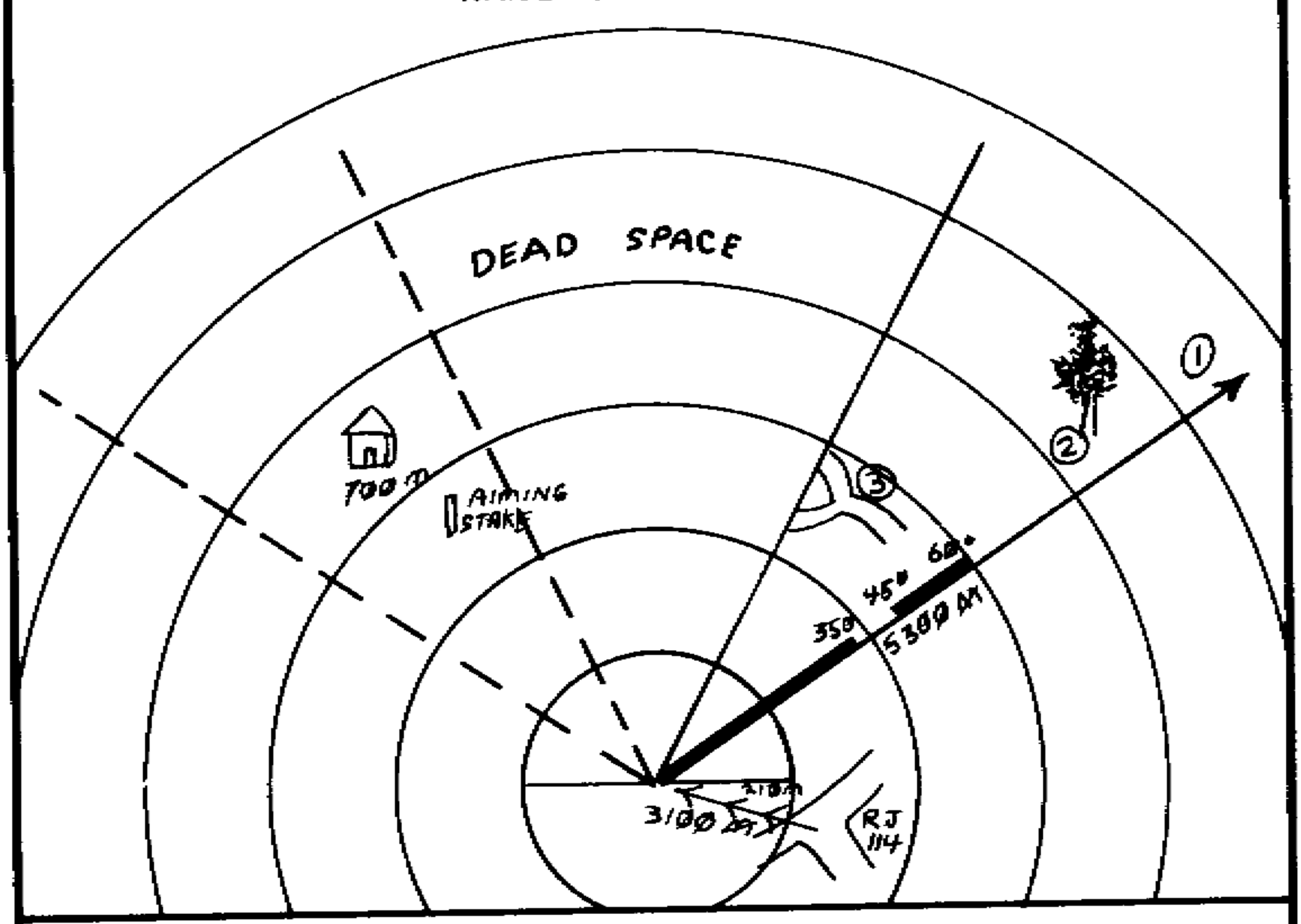
Wide targets in the primary sector are usually engaged in the center first. However, the initial burst can be positioned wherever the leader desires. The gunner first measures the entire target width. He writes the width in the data section as TW-20 (target width 20). He then lays on the point on the target where the initial burst is desired and traverses to one edge of the target while counting the clicks. The number of clicks he traverses and the direction he moves the muzzle must also be included in the data section--for example, TW-20/R7. This would tell the gunner that he

was not laid on the center of the target initially. Furthermore, after the initial burst, he must traverse right 7 clicks to reach the right edge of his target and then back left 20 clicks to cover the entire target area. If the gunner were to lay on the left edge of his target, his remark in the data section would be TW-20/R20.

When field expedients are used to engage targets, they are sketched above the drawing of the targets.

RANGE CARD WITH FINAL PROTECTIVE LINE.

RANGE CARD FORMAT



DATA SECTION

WEAPON: M60* / UNIT: 2D PLT CO A / DATE: 28 FEB	MAGNETIC NORTH

EACH CIRCLE: 200 METERS

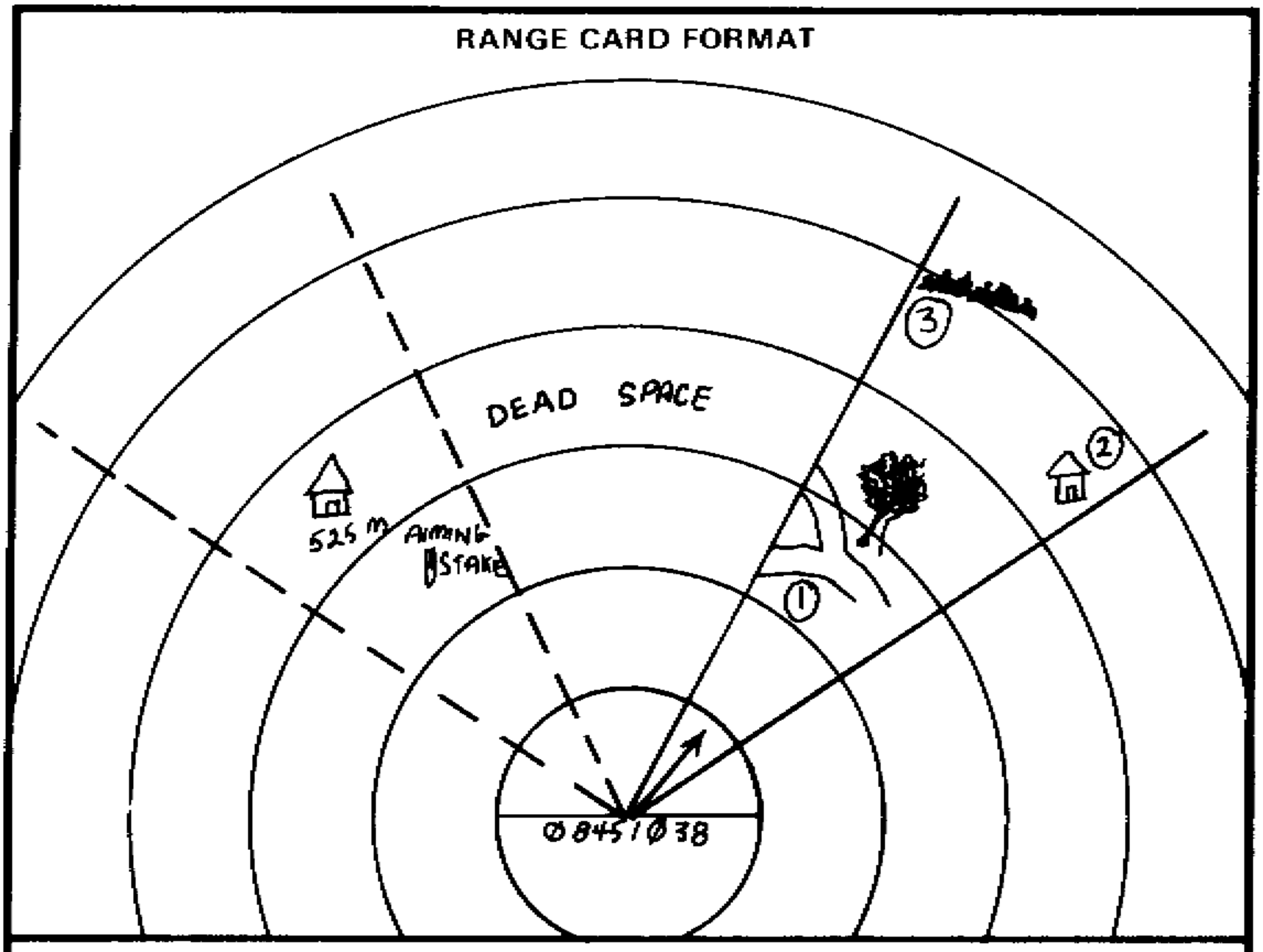
NO.	DIRECTION	ELEVATION	RANGE	DESCRIPTION	REMARKS
1		+50/3	600	FPL	— 4
2	R275	+50/45	900	LONE TREE	
3	L150	0/28	525	TRAIL JUNCTION	TW15/L7

Predetermined targets in the secondary sector are sketched on the range card, and ranges to these targets are recorded below the sketches but not in the data section. Field expedients should be used for targets in the secondary sector, since the gun must be employed in the bipod role.

NOTE: A PDF is used when grazing fire cannot be obtained, i.e., when the gun is located on rough, hilly, or broken terrain. The PDF is directed at the most likely enemy avenue of approach.

RANGE CARD WITH PRINCIPAL DIRECTION OF FIRE.

RANGE CARD FORMAT



DATA SECTION

WEAPON: M60 *2
UNIT: 2nd Plt Co B
DATE: 4 July

MAGNETIC NORTH

EACH CIRCLE: 150 METERS

NO.	DIRECTION	ELEVATION	RANGE	DESCRIPTION	REMARKS
1	L 035	Ø / 24	400	PDF (WOODED RJ)	TW 17 / R10
2	R 375	-50 / 15	625	BARN	TW 3 / L3
3	L 175	-50 / 40	725	HEDGE ROW	TW 7 / R3

464-464 O - 85 - 6 : QL 3

CHAPTER 9

Marksmanship Training

PHASES AND ORGANIZATION OF TRAINING

Machinegun marksmanship training includes qualification training on both the basic (10-meter) and the transition ranges. In this training, a gunner is taught machinegun marksmanship with the bipod and the tripod mounts. Marksmanship training is conducted in three phases: bipod instructional firing on the basic (10-meter) range, tripod instructional and record firing on the basic (10-meter) range, and instructional and record firing on the transition range. This chapter is specifically designed to assist unit commanders in the preparation and conduct of a machinegun qualification program. It lists all the equipment and personnel required to conduct basic and transition firing.

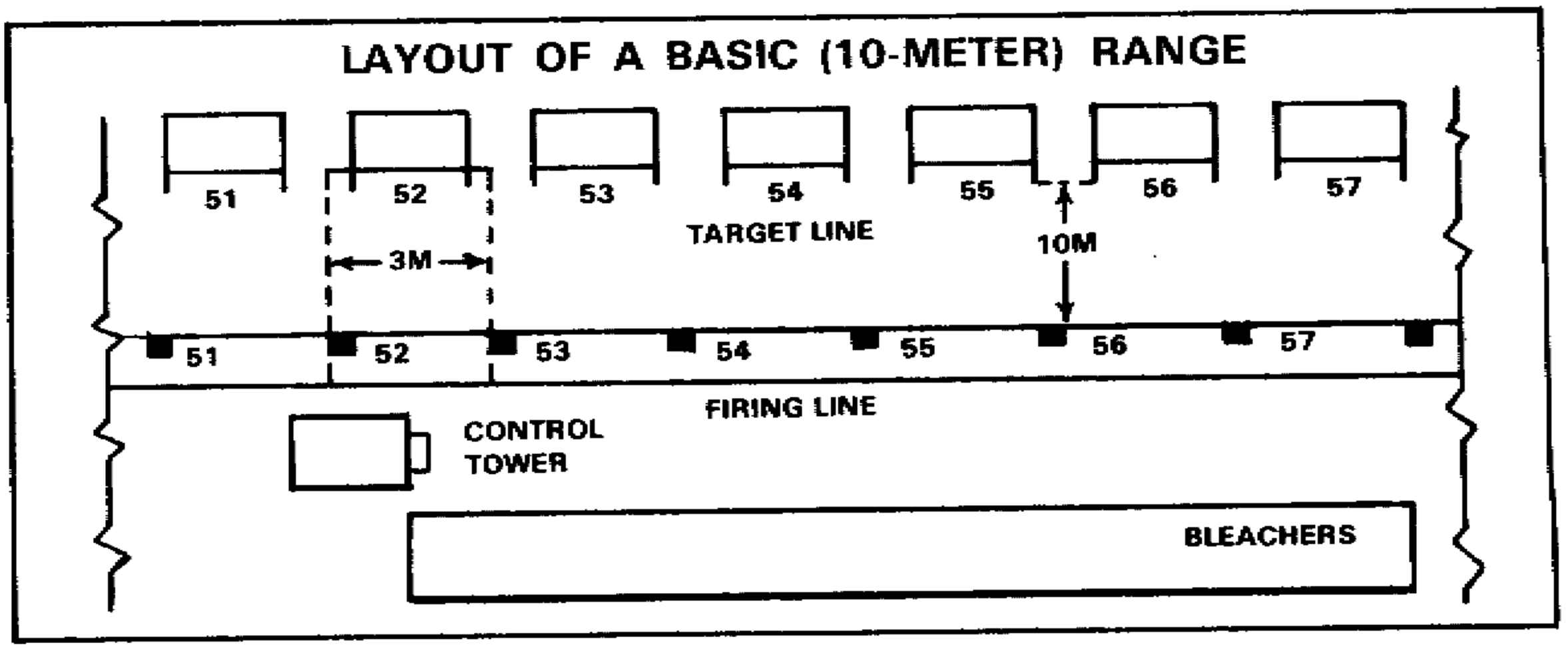
Training outlined in this chapter is applicable to a unit of 200 to 250 soldiers. The training must be modified for units of other sizes.

A standard basic (10-meter) range can accommodate a unit of about 200 to 250 soldiers at a time; therefore, concurrent training may not be required. A standard transition range (10 lanes) cannot accommodate a unit of that size at one time; therefore, concurrent training is required to make the best use of training time.

An officer assigned as the principal instructor or alternate instructor may

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OBJECTIVES 9-2
FIRE COMMANDS 9-2
TARGET ANALYSIS AND SCORING 9-3
BIPOD TRAINING 9-3
TRIPOD TRAINING 9-13
TRANSITION TRAINING 9-20



perform the duties of safety officer; however, the officer in charge cannot also act as safety officer. Chartmen and demonstrators may be used as lane or safety NCOs, group leaders, and assistant instructors, depending on the type of instruction. (Local range regulations may permit the use of an NCO as safety officer.)

OBJECTIVES

The objectives of machinegun marksmanship are as follows:

- **Obtain an accurate initial burst.**
- **Traverse and search the machine-gun effectively.**
- **Observe and adjust fire.**
- **Operate with speed.**

FIRE COMMANDS

The standard fire command is used as a means of control during marksmanship training. The fire command, as it applies to the basic range, must be explained to the gunner. The elements are given (as appropriate) before each firing exercise. The gunner takes action as directed and repeats each element as it is announced. For a detailed explanation of fire commands, refer to chapter 7.

ALERT.

The alert is given as FIRE MISSION. Upon hearing the alert, the gunner loads his gun and places the safety lever on FIRE.

DIRECTION.

Since the targets appear to the gunner's front on the basic range direction is given as FRONT.

DESCRIPTION.

Description is given as PASTER NUMBER (pasters 1 through 8 as appropriate), at which time the gunner lays on the announced paster.

RANGE.

A range setting of 500 meters on the rear-sight assembly is always used on the basic range. This is announced as FIVE HUNDRED , at which time the gunner must insure that his rear-sight assembly has the correct range setting.

METHOD OF FIRE.

Manipulation is announced as FIXED, TRAVERSE, SEARCH, or TRAVERSE AND SEARCH. Firing on the basic range with the bipod-mounted gun is at point targets, so the method of fire is announced as FIXED. The gunner fires either single rounds

or bursts of six at a rate slower than the sustained rate; therefore, the rate-of-fire element is omitted.

COMMAND TO OPEN FIRE.

This is announced as AT MY COMMAND. When the gunner is ready, he announces, UP, to the assistant gunner, who extends his right arm and hand in the READY signal. When all gunners are ready to fire, the command FIRE is given.

TARGET ANALYSIS AND SCORING

The basic machinegun marksmanship target is used on the basic range. The following explanation of the target, to include the size of the aiming pasters and scoring spaces, will aid in zeroing machineguns and will facilitate control during firing exercises.

The target consists of four sections, lettered A, B, C, and D. Each section has scoring spaces for eight fixed-fire exercises (scoring spaces 1, 2, 3, 4, 5, 6, 7, and 8) and two traversing and searching exercises (scoring spaces 5 and 6, and 7 and 8).

Each scoring space is 4 centimeters wide and 5 centimeters high.

The black aiming paster within each numbered scoring space is 1 centimeter square.

Targets are analyzed and scored to determine the gunner's proficiency and to see if more training is needed in any of the fundamentals of machinegun marksmanship.

ANALYSIS

During bipod firing, a target is best analyzed by considering the common errors of machinegun marksmanship. The illustration on page 9-4, showing common errors with the machinegun, assumes a properly zeroed weapon.

NOTE: Large shot groups are usually caused by incorrect position and grip; small shot groups outside of the scoring space are usually caused by incorrect sight alinement, sight picture, or zero.

SCORING

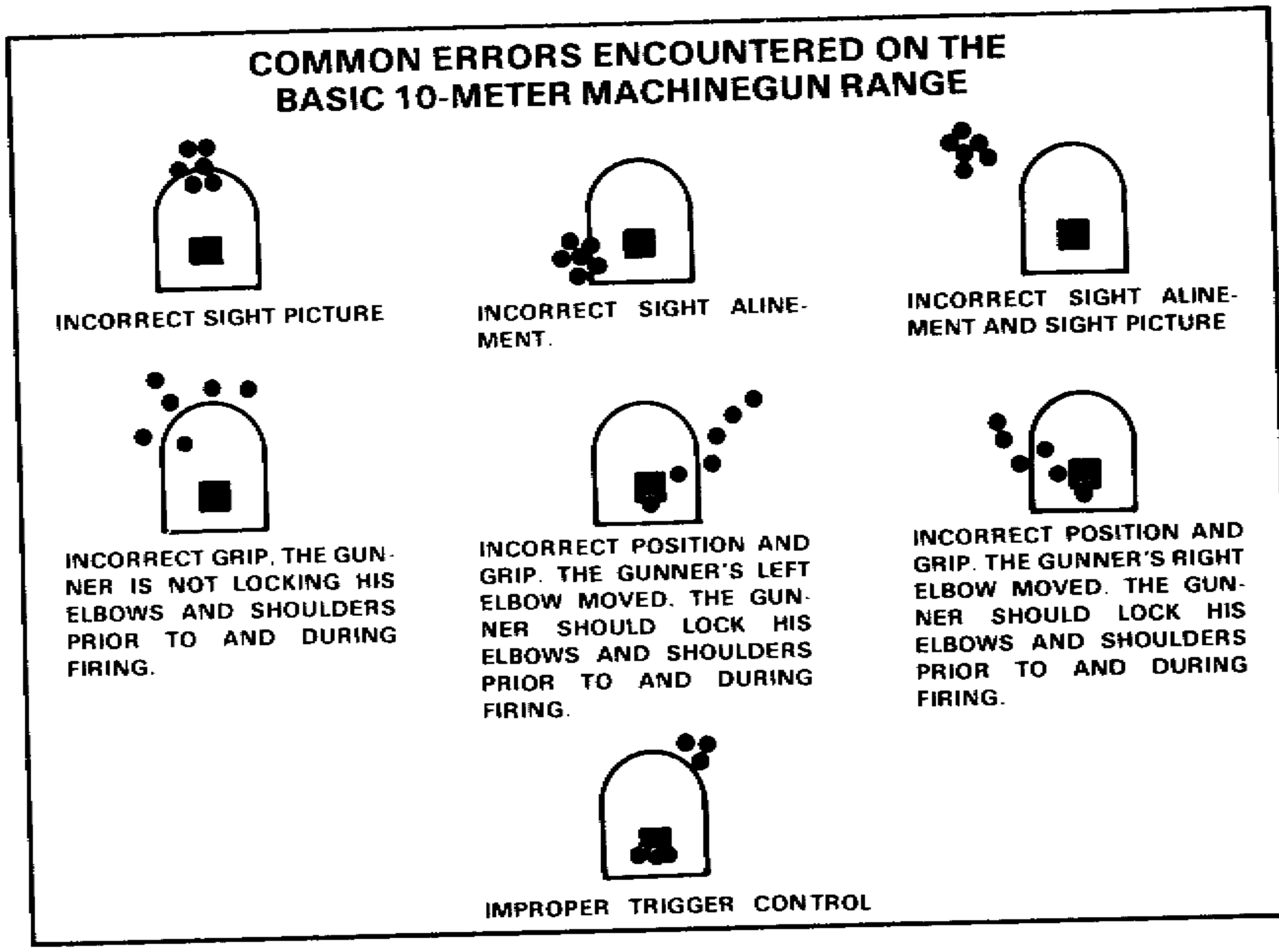
Bipod firing is scored for instructional purposes only and may be scored by the gunner. Pasters 1 and 2 are used for zeroing and are not scored. Points are earned as follows:

- **One point is given for each hit (not to exceed six) in each scoring space. Holes touching the boundaries between scoring spaces are hits and can be scored in either scoring space, whichever benefits the gunner.**
- **A bonus of two points is given for each scoring space hit, regardless of the number of rounds within the space.**
- **Since 6 scoring spaces are engaged with 36 rounds, the total possible score for Table I is 48 points. A score of 26 is satisfactory.**

BIPOD TRAINING

OBJECTIVES

During basic marksmanship training with the bipod mount, the objectives and fundamentals of machinegun marksmanship are taught and applied in live-fire exercises. The instruction also familiarizes gunners with the characteristics, noise, and recoil of the M60 machinegun during firing.



Obtain an Accurate Initial Burst. Machinegun fire is most effective if the gunner gets an accurate initial burst. To get such a burst, the gunner must properly apply the fundamentals of position and grip, sight alinement and sight picture, trigger manipulation, and zeroing.

Position and Grip

To get proper position and grip, the gunner gets into a prone position directly behind the gun and raises the rear sight and shoulder rest.

He places the shoulder rest on his right shoulder. A line drawn through the gun should go through his right shoulder and right hip pocket.

He spreads his legs a comfortable distance apart with his heels as close to the ground as possible.

He grasps the trigger-mechanism group with his right hand, index finger resting lightly on the trigger.

He places the fingers of his left hand on the cover, with his thumb underneath the receiver.

With both hands, he exerts a firm, steady pressure downward and rearward while aiming and firing.

He rests his cheek lightly against the feed cover or against his left hand.

He holds his shoulders level and his elbows an equal distance from the receiver.

The assistant gunner assists the gunner by making the necessary adjustments on the bipod legs to obtain proper height.

Left-handed firing with the M60 is discouraged because the ejection pattern of some guns is almost directly to the rear, and a gunner firing the tripod-mounted gun turns the traversing and elevating mechanism with his left hand.

PRONE POSITION (BIPOD)



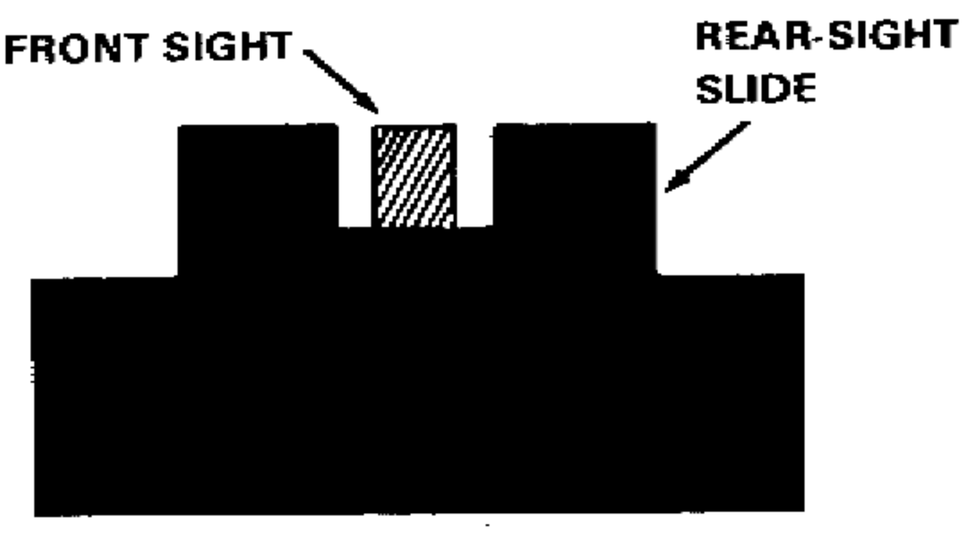
Sight Alinement and Sight Picture

To obtain correct alinement, the gunner centers the front-sight blade in the aperture of the rear-sight slide, with the top of the front-sight blade even with the top of the rear-sight slide.

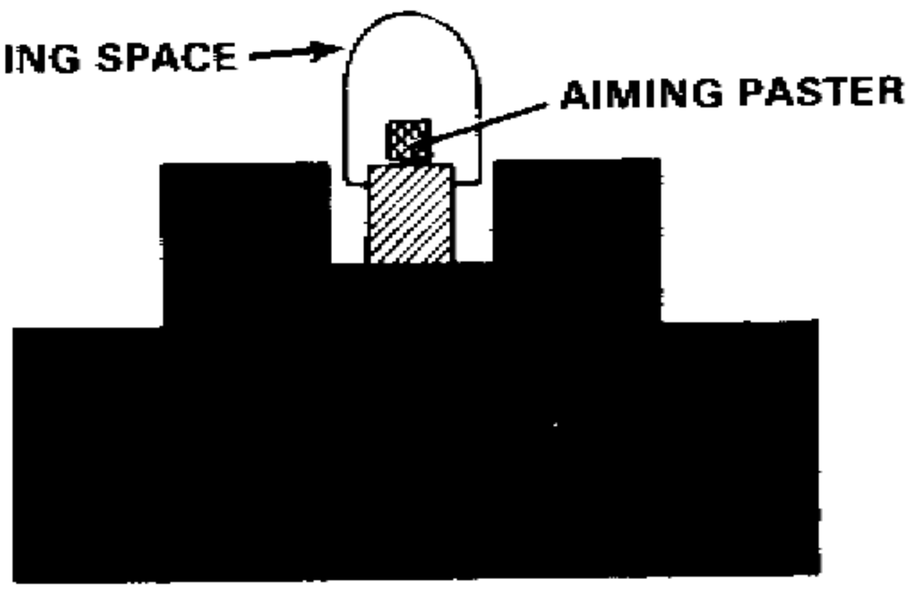
For a correct sight picture, the gunner centers the target over the front-sight blade so that it appears to rest lightly on top of the properly alined front-sight blade.

When firing the M60, the trigger is not squeezed. It is pulled quickly to the rear and released. This aids the gunner in controlling the number of rounds in each burst and

SIGHT ALINEMENT



CORRECT SIGHT ALINEMENT AND CORRECT SIGHT PICTURE



reduces wear of the sear and sear notch. To time himself in firing a six-round burst, the gunner pulls the trigger straight to the rear, says, FIRE A BURST OF SIX, and then releases the trigger.

Trigger Manipulation and Zeroing

The rear-sight assembly is adjusted until the strike of the rounds coincides with the point of aim at a given range, and then the elevation scale is adjusted to reflect that range. The procedures for zeroing the machinegun on the basic range follow:

- **Set the sights. To establish a common starting point when zeroing on the basic range, the gunner sets the elevation scale at 500 meters and alines the windage index by placing zero windage on the rear-sight assembly.**

- **Fire three rounds. Given a fire command, on the command FIRE, the gunner fires three single rounds (one round at a time) to establish a shot group. He uses the same sight alinement and sight picture each time he fires. No adjustments on the rear-sight assembly are made until he has fired three rounds. The shot group should be small enough to show where the center of the group is in relation to the aiming paster.**

- **Correct for deflection. If the center of the shot group is to the left or right of the point of aim, the gunner must correct for deflection. To correct for deflection, the gunner turns the windage knob, moving the rear sight in the direction of the desired change. Since the distance to the target is 1,000 centimeters (10 meters), a 1-click or 1-mil adjustment moves the point of aim 1 centimeter. For example, if the gunner notes that the center of the shot group is 2 centimeters (2 aiming pasters) to the right of the aiming point, he turns the windage knob 2 clicks, moving the rear sight in the direction of the aiming paster (to the left).**

- **Correct for elevation. If the center of the shot group is above or below the black aiming paster, the gunner must correct for elevation. To correct for elevation, the gunner turns the elevation knob, moving the rear-sight slide in the direction**

of the desired change. A 1-click adjustment on the elevation knob equals a 1/4-mil change, or 4 clicks equal a 1-mil change. Since the distance to the target is 1,000 centimeters (10 meters), a 4-click (1-mil) adjustment moves the point of aim 1 centimeter.

- **Confirm. After making corrections for deflection and elevation, the gunner raises his hand and is issued a confirming round. If he misses his point of aim, he treats this hit as the center of a three-round shot group, makes further adjustments as necessary, and is issued another round to confirm. He continues this procedure until he hits the point of aim, the black aiming paster. If one of these shots is a wild shot, it should be disregarded, and another shot should be fired to confirm the sight adjustment.**

- **Adjust the elevation scale and record the deflection. The gunner loosens the elevation scale screw and moves the adjustable elevation scale up or down until the 500-meter graduation coincides with the top left edge of the rear sight slide. He then tightens the elevation scale screw and records the deflection (windage) for future reference.**

Traverse and Search the Machinegun. Since machinegun targets usually have width and depth, the gunner must move the gun to distribute fire throughout the target area.

Traverse

This is moving the muzzle of the gun to the left or right to distribute fire laterally. With the bipod-mounted gun, this is done by selecting successive aiming points in the target area. The gunner makes minor changes in direction by shifting his shoulders slightly to the right orleft. To make major changes in direction, the gunner moves his elbows and realines his body to remain directly behind the gun.

Search

This is moving the muzzle of the gun up or down to distribute fire in depth. It is done by selecting successive aiming points in the target area. To make changes in elevation, the gunner moves his elbows closer together to lower the muzzle or farther apart to raise the muzzle.

Observe and Adjust Fire. Gunners must be taught to observe and rapidly adjust their fire.

Machinegun fire is observed by noting the strike of the rounds in the target area, by observing tracers in their flight, or in the case of the 10-meter range, by noting the holes made in the target. Assistant gunners should also observe fire and assist in the adjustment of fire.

To adjust fire when firing the bipod-mounted gun, gross errors in range are corrected by adjusting the rear-sight slide to obtain the correct range setting. Minor errors are corrected by the use of the adjusted-aiming-point technique.

Operate with Speed. Gunners must be able to deliver fire on a target with speed, but they must first be proficient in obtaining an accurate initial burst, traversing and searching, and observing and adjusting fire. Proficiency is never sacrificed for speed.

RANGE FACILITIES

A standard basic range for bipod training should consist of the following:

Firing Line

A firing line long enough to emplace 100 or more machineguns, allowing approximately 3 meters between positions. For control, each position should be numbered.

Targets

A target line 10 meters in front of the firing line. The machinegun marksmanship target is a paper target pasted onto target cloth which is stretched over a wooden frame. One target is set up for each position and is numbered to correspond with the number of the position.

Instruction Site

Bleachers to the rear of the firing line.

Control Tower

A control tower located to the immediate rear and center of the firing line.

The following list includes the minimum personnel required to operate a basic (10-meter) range.

- **Personnel**

One officer in charge.

One safety officer.

One principal instructor.

One alternate principal instructor.

Ordnance personnel.

One NCO in charge.

Medical personnel.

One group instructor per 40 to 50 soldiers.

One assistant instructor per 10 soldiers.

Two demonstrators (one gunner and one assistant gunner).

One ammunition NCO.

One chartman.

One tower operator.

The following list includes the minimum equipment required to operate the range. More equipment may be required by range regulations, safety regulations, and unit SOP.

- **Equipment**

One public address system.

Six machineguns per 10 soldiers (one gun is used as a reserve for each five guns on line).

One cleaning rod per assistant instructor.

One spare-barrel case per two lanes.

One screwdriver per two guns.

One machinegun marksmanship target per soldier. (One section for bipod firing, one section for tripod practice, one section for record practice, and one section for record firing.)

Twelve stopwatches (two in the control tower and two per group instructor).

One scorecard per soldier--DA Form 85.

Medical evacuation capability.

Communications equipment. Wire or radio as required to operate the range.

Targets. Basic machinegun marksmanship target NSN 6920-00-078-5728. One per firer.

One asbestos glove per two weapons.

One M60 tripod per lane. Spares should be available.

One M60 pintle per lane. Spares should be available.

One M60 traversing and elevating mechanism per lane. Spares should be available.

SCORECARD--DA FORM 85

SCORING

BASIC RANGE

BONUS- 2 POINTS FOR EACH SCORING SPACE HIT.

EXERCISE- 1 POINT WILL BE SCORED PER HIT TO A MAXIMUM OF 6 POINTS PER SCORING SPACE

FIXED EXERCISE- NOT SCORED

TRANSITION

TARGET ENGAGED ◯ TARGET HIT ●

10 POINTS WILL BE SCORED FOR EACH TARGET HIT.

NO SCORE IS ALLOWED UNLESS ALL TARGETS HAVE BEEN ENGAGED WITHIN THE PRESCRIBED TIME LIMIT

* M60 - QUALIFICATION OR FAMILIARIZATION.

** CAL. 30 - A/B/FAM

* U S GOVERNMENT PRINTING OFFICE 1962 OF 861659

MACHINE GUN MARKSMANSHIP
For use of this form, see FM 23-67; the proponent agency is the USA TRADOC

SCORE CARD COURSE
M60 CAL 30
Q/F * A/B/F AM**

LAST NAME - FIRST NAME -- MIDDLE INITIAL: DOE JOHN C

SERVICE NUMBER/SSAN: 237 42 2200

ORDER | BASIC RANGE | TARGET

PRACTICE	BONUS	EXERCISE 1-2-3-4	EXERCISE 5-6	EXERCISE 7-8	TOTAL SCORE
1 ST	26		23	39	88
2 D					
3 D					
4 TH					
5 TH					
6 TH					
RECORD	26		28	44	98

SIGNATURES (Record)

SCORER: J. Barnes | FIRER: John C. Doe

ORDER | TRANSITION | LANE

TARGET	PRACTICE 1 ST	PRACTICE 2 D	PRACTICE 3 D	RECORD
1	●			●
2	○			●
3	○			●
4	●			●
5	●			●
6	○			●
7	○			○
8	●			●
NO TARGETS ENGAGED	8			8
SCORE TARGETS HIT X10	40			70

SIGNATURES (Record)

SCORER: M/Sgt James T. Ross | FIRER: John C. Doe

QUALIFICATION: EXPERT | AGGREGATE SCORE: 168

DATE: 27 JUNE 80 | CERTIFIED CORRECT: SAMUEL JONES

DA FORM 1 SEP 62 85 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

The following display charts and mockup, (which can be provided by the local TASC), can be incorporated in all instruction on bipod marksmanship training:

CHART, MARKSMANSHIP OBJECTIVES

OBJECTIVES
OF MACHINEGUN MARKSMANSHIP

1. ACCURATE INITIAL BURST
   - a SIGHT ALINEMENT AND SIGHT PICTURE
   - b POSITION AND GRIP
   - c ZERO
2. TRAVERSE AND SEARCH
3. OBSERVE AND ADJUST STRIKE TRACERS
4. SPEED OF OPERATION

CHART, FIRE COMMAND

FIRE COMMAND

ALERT

DIRECTION

DESCRIPTION

RANGE

METHOD OF FIRE

a. MANIPULATION

b. RATE OF FIRE

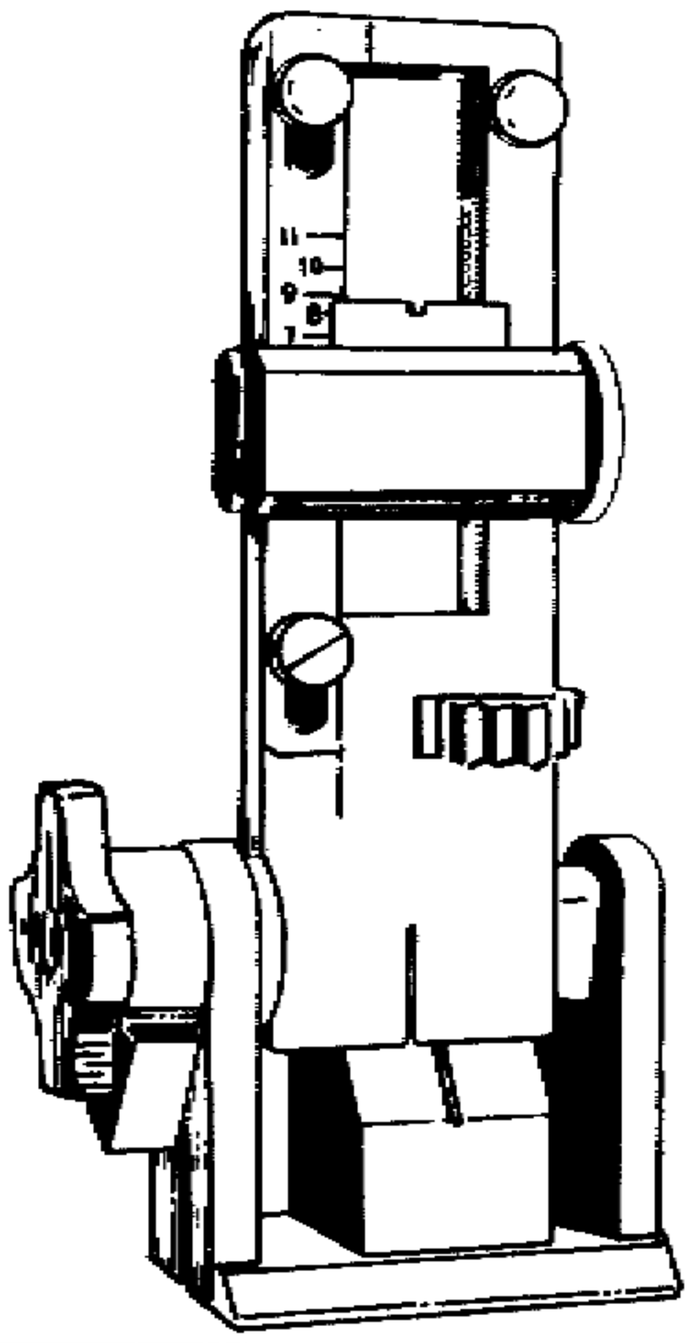
COMMAND TO COMMENCE FIRING

CHART, M60 ZEROING

M-60 ZEROING

I. SET SIGHTS
II. FIRE 3 ROUNDS
III. CORRECT FOR DEFLECTION
IV. CORRECT FOR ELEVATION
V. CONFIRM
VI. ADJUST RANGE PLATE AND RECORD DEFLECTION ZERO

REAR SIGHT MOCKUP



CONDUCT OF BIPOD INSTRUCTION

The unit is assembled and instructed on the objectives and fundamentals, fire commands used on the basic range, basic machinegun marksmanship target, analyzing and scoring the target, and the following:

Course of Fire. Bipod firing on the basic range consists of firing 42 rounds as described in BASIC (10-METER) MARKSMANSHIP-BIPOD FIRING.

The gunner zeroes by firing three rounds at paster 1 and his confirming rounds at paster 2.

The gunner then fires six belts of six rounds each at pasters 3, 4, 5, 6, 7, and 8. He attempts to fire a six-round burst into each of the scoring spaces. A fire command is given for zeroing and for firing each belt of six rounds.

BASIC (10-METER) MARKSMANSHIP—BIPOD FIRING

TIME	ROUNDS PER MAN	TARGET	TYPE AMMO	TYPE FIRE
NO LIMIT	6	BASIC MACHINEGUN PASTERS 1 AND 2	BALL	ZEROING (SINGLE RDS)
NO LIMIT	6	BASIC MACHINEGUN PASTER 3	BALL	FIXED—ONE BURST
NO LIMIT	6	BASIC MACHINEGUN PASTER 4	BALL	FIXED—ONE BURST
NO LIMIT	6	BASIC MACHINEGUN PASTER 5	BALL	FIXED—ONE BURST
NO LIMIT	6	BASIC MACHINEGUN PASTER 6	BALL	FIXED—ONE BURST
NO LIMIT	6	BASIC MACHINEGUN PASTER 7	BALL	FIXED—ONE BURST
NO LIMIT	6	BASIC MACHINEGUN PASTER 8	BALL	FIXED—ONE BURST
TOTAL	42			

Prefire Checks. Before any gun is fired, all prefire checks are performed as described in chapter 6. This procedure should be explained and demonstrated.

Clearing the Machinegun. The procedure for clearing the gun as outlined in appendix C must be explained and demonstrated to the gunners.

Assistant Gunner's Duties. In bipod firing, the assistant gunner lies beside and to the left of the gunner. His duties include the following:

- **Assisting the gunner during prefire checks.**
- **Checking the gunner's position and grip.**

- **Assisting in loading.**
- **Relaying the READY signal when he gets an UP from the gunner.**
- **Assisting in zeroing.**
- **Pointing out gunner errors, such as failing to repeat the elements of the fire commands, firing an incorrect exercise, or failing to clear the gun.**
- **Assisting in the observation and adjustment of fire.**

Organization for Firing. The unit is organized into five equal groups for firing. Each group is divided into two orders. One order becomes gunners, and the other order becomes assistant gunners.

Firing. The gunners and assistant gunners at each position set up their guns and perform prefire checks.

The gunner assumes the correct position and aims at paster 1. The assistant gunner checks the gunner's position and has him describe his sight alinement and sight picture.

The gunner is then given fire commands that require him to place range settings on the rear-sight assembly. This is done to practice moving the rear-sight slide and setting the range. The assistant gunner checks the range settings for correctness and points out any errors.

On command, the first order zeros.

At the completion of zeroing, individual fire commands are given to require the gunners to engage each of the six remaining numbered scoring spaces. Time is allowed between bursts to permit gunners to observe and adjust their fire.

After the first order has fired, the second order fires the course in the same manner.

After both orders have fired, the guns are cleared.

After the guns have been cleared, both orders move to the target line, where they analyze and score their targets.

The firing is critiqued by instructors.

TRIPOD TRAINING

Basic marksmanship training with the tripod mount is the first step in qualification and is a continuation of training with the bipod. The gunner is taught techniques applicable to the tripod-mounted gun. He then applies them during manipulation and dry-fire exercises, and during practice and record firing on the basic (10-meter) range.

Training requirements for tripod instructional and record firing are the same as for the bipod phase with the exception that one tripod mount, a traversing and elevating mechanism, and a pintle assembly are required for each gun for tripod firing.

OBJECTIVES

The four objectives of training with the tripod, as noted, are generally the same as those of training with the bipod. However, the techniques of application are somewhat different in achieving the objectives with the tripod.

Obtain an Accurate Initial Burst. To get an accurate initial burst with the tripod-mounted gun, the fundamentals of position and grip, sight alinement and sight picture, trigger manipulation, and zeroing must be properly applied.

Position and Grip

The gunner gets into a prone position behind the gun, so that a straight line drawn through the gun would go through his right shoulder and his right hip pocket.

He spreads his legs a comfortable distance apart, with his heels down.

PRONE POSITION (TRIPOD)



He grasps the trigger-mechanism group with his right hand, index finger resting lightly on the trigger.

With his left hand, palm down, he grasps the elevating handwheel. He exerts a firm downward pressure with both hands while aiming and firing.

He rests his cheek lightly (if at all) against the cover.

He puts his elbows lightly against the stock, but he does not apply any pressure (shoulder rest is not used).

He has his shoulder lightly against the stock, but he does not apply any pressure (shoulder rest is not used).

Sight Alinement/Sight Picture Trigger Manipulation, and Zeroing

Sight Alinement/Sight Picture Trigger Manipulation, and Zeroing. These aspects of obtaining an accurate initial burst are the same for tripod training as discussed for bipod training.

Traverse and Search the Machinegun. All changes, or manipulations, on the tripod-mounted gun are made with the left hand. Changes in direction are made first, and then changes in elevation are made. The manipulations are traverse, search, and traverse and search. (Traverse refers to changes in direction.) (Search refers to changes in elevation.)

To move the muzzle of the gun to the right, the gunner puts his left hand on the traversing handwheel, thumb up, and pushes his thumb away from his body (PUSH RIGHT).

To move the muzzle to the left, the gunner pulls his thumb toward his body (PULL LEFT).

To move the muzzle up, the gunner grasps the elevating handwheel with his left hand and pushes his thumb away from his body (PUSH ADD).

To move the muzzle down, he pulls his thumb toward his body (PULL DROP).

Observe and Adjust Fire. Gunners, with the help of the assistant gunner, must learn to observe and rapidly adjust their fire. To adjust fire when firing the tripod-mounted gun, the gunner makes adjustments by manipulating the traversing and elevating handwheels. A 1-click adjustment on either handwheel equals a 1-mil change and will move the strike of the round 1 centimeter (the width or height of the black aiming paster) on the 10-meter range. A rapid check of the sight picture is made after each traversing and searching adjustment.

Operate with Speed. As in bipod training, gunners using the tripod-mounted gun must

be able to deliver fire on a target with speed, but they must first be proficient in the first three objectives. The only timed exercises are record practice firing and record firing.

MOUNTING AND EMPLACING THE MACHINEGUN

For accurate delivery of fire, the gun must be properly mounted and emplaced.

TO MOUNT THE MACHINEGUN: Place the tripod mount on the ground with the front leg pointing toward the center of the target.

Place the pintle in the pintle bushing and lock it.

Place the gun on the mount.

Center the traversing and elevating mechanism and clamp the left edge of the traversing slide on the zero graduation on the traversing bar.

TO EMPLACE THE MACHINEGUN: Aline the gun and the tripod mount for direction by shifting the rear legs until the gun is pointing at the center of the target.

Loosen the dirt around and under the tripod shoes and firmly emplace the shoes in the ground.

If the traversing bar is not level, remove enough dirt from under the rear shoes to level it. Make sure that only the tripod shoes, and not the legs, are in contact with the ground. Also make sure that dirt is removed from under the traversing bar so that the slide can be moved freely across the bar.

ANALYZING AND SCORING THE TARGET AND MAINTAINING THE SCORECARD

Targets are analyzed to determine in which fundamentals the gunners need more training. The targets are scored to determine the degree of proficiency of the gunner, and a scorecard is filled out and retained as a record.

Analyzing the Target. Large shot groups are usually caused by incorrect position and grip or improper emplacement of the gun.

A small initial shot group outside the first scoring space is usually caused by incorrect sight alinement, sight picture, or zero.

Subsequent bursts outside the scoring spaces are caused by a failure to properly traverse or search the gun.

Small shot groups fired continuously high, low, right, or left of each scoring space indicate a failure to observe and adjust fire properly.

Failure to complete a firing exercise on time (from lack of speed) shows a need for more training in the first three objectives.

Scoring the Target. During all firing except record firing, the gunner may score his target. Only exercises 7-8 and 5-6 are scored.

One point is given for each hit, not to exceed six in each scoring space. Holes touching the boundary between scoring spaces are hits but can be counted in only one scoring space.

A bonus of two points is given for each scoring space hit, regardless of the number of hits within the spaee.

When firing exercise 7-8, the 8 scoring spaces are engaged with 48 rounds. The total possible score, including bonus points, is 64. When firing exercise 5-6, the 5 spaces are engaged with 30 rounds. The total possible score, including bonus points, is 40.

The total possible score for exercises 7-8 and 5-6 is 104 points. At least 65 points are required to qualify on the basic range.

Maintaining the Scorecard. A scorecard is issued to each gunner. All scores are entered

by instructors and are made in ink. No erasures are allowed.

FIRING FOR RECORD

Record firing may be conducted on the day following practice firing. It will be necessary for gunners to emplace and zero their machineguns. Before record firing is conducted, all soldiers (gunners and instructors) must be familiar with the time and ammunition allowances, procedures to follow in the event of a stoppage, and penalties imposed. The assistant gunner will be utilized to help observe and adjust fire.

Time and Ammunition Allowances. Each gunner is allotted six rounds to zero. He is then given individual fire commands, and he fires four belts of six rounds at pasters 1, 2, 3, and 4, for practice in firing six-round bursts. He is then allowed 50 seconds to fire 48 rounds in exercise 7-8 on command, and 40 seconds to fire 30 rounds in exercise 5-6 on command.

Stoppages. If a stoppage occurs, the gunner must apply immediate action. If the stoppage is reduced, he continues to fire the course. To complete firing the exercise, the gunner is allowed an additional 15 seconds for each application of immediate action.

If a stoppage occurs which cannot be reduced by immediate action, the gunner raises his hand and announces, TIME.

When a gunner announces, TIME, the assistant instructor notes the time, insures that a real stoppage exists, and helps the gunner reduce it. He then directs the gunner to complete firing, using the remaining time after the gunner called time, plus an additional 15 seconds.

If a stoppage is caused by an error on the part of the gunner, additional time is not permitted. The gunner then receives the score he earned before the stoppage occurred.

If it is necessary to replace the entire machinegun, the gunner is allotted six rounds to zero the new gun. He may refire the exercise.

Gunners who cannot complete firing in the time allowed (because of malfunctions) can finish the exercise in an "alibi run" after all other gunners complete firing.

Penalties. A penalty of five points is deducted from the score of any gunner who fails to stop firing at the command or signal to cease fire.

One additional point is deducted for each round in excess of three fired after the command CEASE FIRE is given.

If a gunner fires at the wrong target or exercise, he loses the points for those rounds. A gunner whose target was fired upon by another gunner is permitted to refire the exercise.

PREPARATORY TRAINING

Instruction. Prior to conducting live-fire exercises, the unit is assembled in the bleachers and instructed in mounting and emplacing the machinegun, position and grip, and traversing and searching.

The manipulation exercise is also demonstrated to give the gunner practice in traversing and searching the gun. The basic (10-meter) range is used to conduct manipulation exercises.

Sight alinement, sight picture, trigger manipulation, zeroing, fire commands, and the basic marksmanship target are reviewed. Marksmen are made during preparatory training. No man is allowed to fire on the range until he has received thorough training in preparatory marksmanship.

For manipulation exercises and dry-fire (spotter) exercises, the unit is organized into five groups, and each group is divided into two orders: one order of gunners and one of assistant gunners.

Manipulation Exercises. Upon command, the gunner takes his position behind the gun. The assistant gunner moves to a position about 10 steps to the gunner's front and slowly moves his hand right, left, up, and down, requiring the gunner to follow these movements with the gun by manipulating the traversing and elevating handwheels.

When the gunner can traverse and search correctly and with ease, the assistant gunner becomes the gunner and the exercise is repeated.

Dry-Fire (Spotter) Exercises. The gunner takes his position behind the gun. The assistant gunner takes a position to the gunner's left.

The gunner is given a fire command. He lays on the announced paster and says, UP, to the assistant gunner when he is ready to fire.

The assistant gunner does the following:

- **Checks the gunner's sight setting and, after satisfying himself that the setting is correct, announces, SIGHT SETTING CORRECT.**
- **Assumes the firing position and confirms that the sight picture is correct.**
- **Checks the gunner's position and grip, makes corrections if necessary, and then announces, POSITION AND GRIP CORRECT.**
- **Changes the lay of the gun for direction by moving the traversing handwheel not less than 5 or more than 10 clicks (mils). If the gunner is dry-firing exercise 7-8, the assistant gunner lays the gun off to the left; and when dry-firing exercise 5-6, he lays off to the right. This is to require the gunner to traverse in the direction of paster 5 or paster 7 as appropriate and to take the slack from the traversing mechanism.**
- **Picks up a spotter, goes to the target line, and assumes his position behind the target.**

On the command, FIRE, the exercise is conducted as follows:

- **The gunner re-lays and aims at paster 7 and announces, AIM.**
- **While he simulates firing a six-round burst, he announces, FIRE A BURST OF SIX. The assistant gunner then places the spotter in the center of paster 7.**
- **The gunner then raises his head to observe this fire and announces, LOOK.**
- **When the gunner observes the spotter in the center of paster 7, he must traverse to the right 4 clicks (4 mils) to engage the next scoring space. While he does this, he announces, RIGHT FOUR.**
- **He then simulates firing another six-round burst and announces, FIRE A BURST OF SIX.**
- **The assistant gunner places the spotter in the center of the next scoring space, and the exercise is continued in this manner until the gunner reaches the elbow of exercise 7-8. Then the gunner traverses to the right in 4-mil increments, searches up in 2-mil increments, and announces, LOOK, RIGHT FOUR, ADD TWO, throughout the remainder of the exercise.**

Additional Training. For additional training, the spotter may be placed outside a

given scoring space. This requires the gunner to observe and make adjustments. When the gunner sees that he has missed a scoring space with a six-round burst, he relays on the scoring space missed and splits his next six-round burst. He fires a three-round burst at the space missed and a three-round burst at the next scoring space. This is done to insure complete target coverage. The gunner announces his adjustments aloud--for example, RIGHT SIX, ADD FIVE, FIRE A BURST OF THREE.

To fire exercise 5-6, the gunner relays and aims at paster 5. If an accurate initial burst is obtained (spotter on center of black aiming paster), the gunner traverses LEFT TWO, DROP FIVE until the exercise is completed, using the same procedure as for exercise 7-8.

After conducting one exercise (7-8 or 5-6), the gunner and assistant gunner rotate duties and perform another exercise.

CONDUCT OF FIRING

Live-fire exercises give gunners practice in the fundamentals of marksmanship. During practice firing, the assistant gunner performs the same duties he performed during the dry-fire exercises, except that he does not move forward of the firing line.

Instruction. The unit is assembled in the bleachers and instructed on the courses of fire, scoring and analyzing the target, record firing procedures, and safety (app C).

Courses of Fire. The unit is organized into five groups, and each group is divided into two orders: One order of gunners and one of assistant gunners.

Practice Firing. Tripod firing (practice) on the basic range is not timed and consists of firing 108 rounds as outlined in BASIC (10-METER) MARKSMANSHIP - TRIPOD FIRING PRACTICE TABLE.

The gunner and assistant gunner at each machinegun position set up their gun and perform the prefire checks.

Each gunner is issued 6 single rounds, 4 belts of 6 rounds, 1 belt of 48 rounds, and 1 belt of 30 rounds.

The gunner zeroes.

Fire commands are given, requiring the gunner to fire four belts of six rounds each at pasters 1, 2, 3, and 4 to give him additional practice in firing six-round bursts.

The gunner is then commanded to fire the 48-round belt in exercise 7-8; he tries to place a six-round burst in each of the eight scoring spaces.

The gunner is then commanded to fire the 30-round belt in exercise 5-7; he tries to place a six-round burst in each of the eight scoring spaces.

The machinegun is cleared, and the gunner moves to the target line to score and analyze his target. While the gunners are scoring and analyzing their targets, assistant instructors critique each gunner individually.

After the scoring, analysis, and critique of the first order, the gunner and assistant gunner change over and the second order fires the exercises.

Record Practice Firing. This is a timed exercise to practice operating with speed and to familiarize the gunner with record firing procedures. This firing immediately follows practice firing and consists of firing 78 rounds as outlined in BASIC (10-METER) MARKSMANSHIP TRIPOD FIRING, RECORD PRACTICE.

The gunner has 50 seconds to fire exercise 7-8 and 40 seconds to fire exercise 5-6.

During this firing, the assistant gunner performs no checks.

BASIC (10-METER) MARKSMANSHIP TRIPOD FIRING PRACTICE

TIME	ROUNDS PER MAN	TARGET	TYPE AMMO	TYPE FIRE
NO LIMIT	6	BASIC MACHINEGUN PASTERS 1 AND 2	BALL	ZEROING (SINGLE RDS)
NO LIMIT	24	BASIC MACHINEGUN PASTERS 1, 2, 3	BALL	FIXED (FOUR BURSTS OF SIX ROUNDS EACH)
NO LIMIT	48	BASIC MACHINEGUN EXERCISE 7-8	BALL	TRAVERSE AND SEARCH (SIX-ROUND BURSTS AT EACH SCORING SPACE)
NO LIMIT	30	BASIC MACHINEGUN EXERCISE 5-6	BALL	TRAVERSE AND SEARCH (SIX-ROUND BURSTS AT EACH SCORING SPACE)
TOTAL	108			

Before each exercise is fired, instructors lay the machineguns off for direction (to the left of paster 7 when firing 7-8, and to the right of paster 5 when firing 5-6).

The assistant gunner must observe the control tower or other control personnel, such as flagmen, to insure that the gunner cease fire on command. He taps the gunner on the back when he gets the cease fire signal.

Record Firing. This firing is conducted on a day following practice firing and consists of firing 108 rounds as outlined in BASIC (10-METER) MARKSMANSHIP-TRIPOD FIRING, RECORD.

BASIC (10-METER) MARKSMANSHIP TRIPOD FIRING, RECORD PRACTICE

TIME (SEC)	ROUNDS PER MAN	TARGET	TYPE AMMO	TYPE FIRE
50	48	BASIC MACHINEGUN EXERCISE 7-8	BALL	TRAVERSE AND SEARCH (SIX-ROUND BURSTS AT EACH SCORING SPACE)
40	30	BASIC MACHINEGUN EXERCISE 5-6	BALL	TRAVERSE AND SEARCH (SIX-ROUND BURSTS AT EACH SCORING SPACE)
TOTAL	78			

The unit is organized into five groups, and each group is divided into two orders. Each group should be assigned a minimum of two assistant instructors to insure that proper guidance is given each student.

The gunners and assistant gunners emplace their machineguns and perform the prefire checks.

The first order zeros the guns.

After zeroing, the left half of each group fires for record, and the right half of each group dry-fires the course BASIC (10-METEF) MARKSMANSHIP TRIPOD FIRING, RECORD.

Then the right half of each group fires for record, and the left half of each group dry-fires the course.

After the first order has fired, the gunners and assistants change over, and the second order zeros and fires for record.

On completion of all firing, the firing line is cleared and instructors score the targets, record the scores, and conduct a final critique.

TRANSITION TRAINING

Bipod firing on the basic (10-meter) marksmanship range teaches the gunner fundamentals of firing the bipod-mounted gun. Later, when the gunner moves to the transition range, he is taught to engage targets at long ranges with the bipod-mounted gun.

Transition firing gives the gunner the experience necessary to progress from the basic (10-meter) range firing to field firing. It is also the final phase of a gunner's qualification. A standard transition range (10 lanes) can accommodate about 75 men; therefore, concurrent training must be conducted when larger groups are trained.

During transition firing, the soldier is trained not only on the bipod-mounted gun;

BASIC (10-METER) MARKSMANSHIP TRIPOD FIRING, RECORD

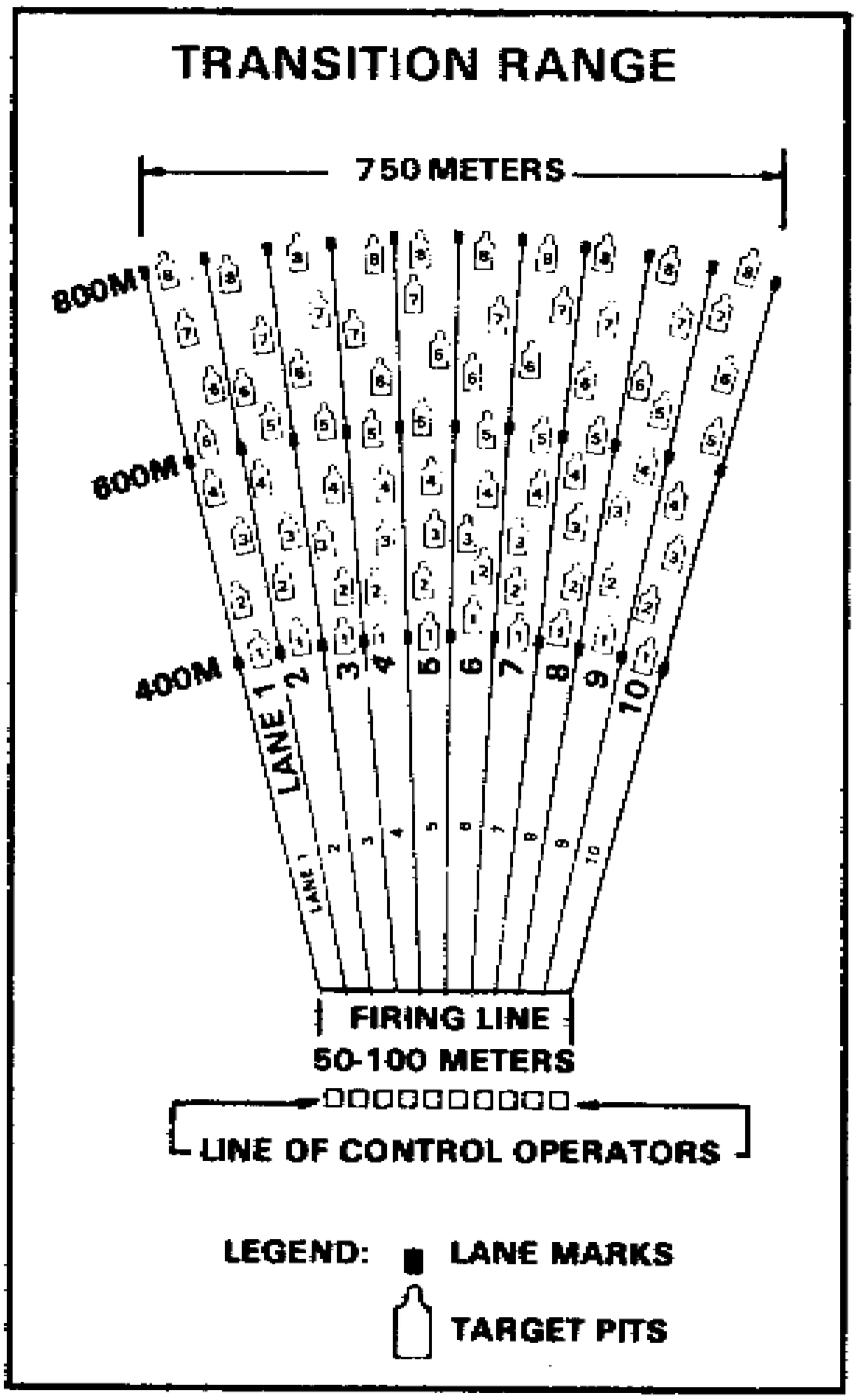
TIME (SEC)	ROUNDS PER MAN	TARGET	TYPE AMMO	TYPE FIRE
NO LIMIT	6	BASIC MACHINEGUN PASTERS 1 AND 2	BALL	ZEROING (SINGLE RD)
NO LIMIT	24	BASIC MACHINEGUN PASTERS 1, 2, 3 AND 4	BALL	FIXED (FOUR BURSTS OF SIX ROUNDS EACH)
50	48	BASIC MACHINEGUN EXERCISE 7-8	BALL	TRAVERSE AND SEARCH (SIX-ROUND BURSTS AT EACH SCORING SPACE)
40	30	BASIC MACHINEGUN EXERCISE 5-6	BALL	TRAVERSE AND SEARCH (SIX-ROUND BURSTS AT EACH SCORING SPACE)
TOTAL	108			

he is also trained in long-range target engagement, to include characteristics of fire, field zeroing, range determination, and the adjusted-aiming-point method of fire adjustment.

RANGE FACILITIES

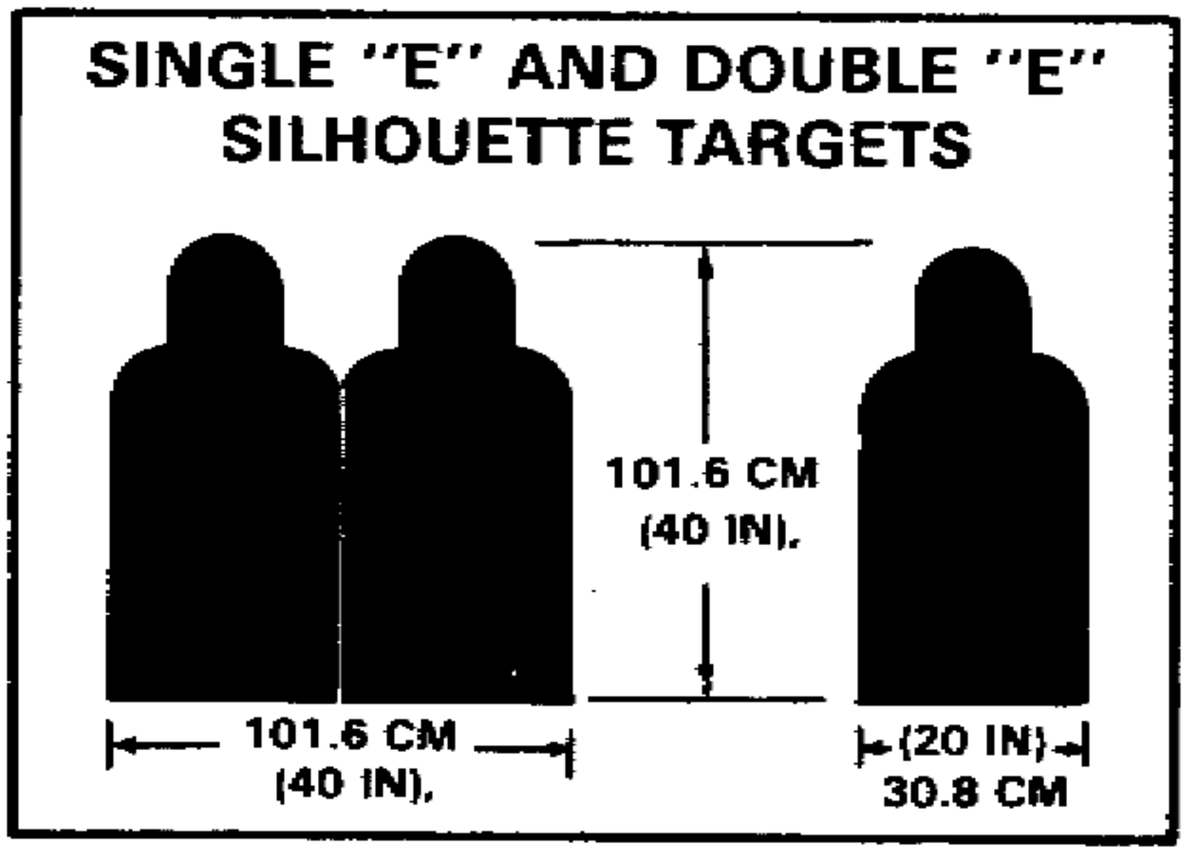
A standard transition range should consist of the firing range and concurrent training areas.

A standard transition firing range has 10 lanes. The gunner fires twice, once for practice and once for record. Firing for practice and record cannot be accomplished on the same lane; therefore, at least two lanes are required for all units.



Firing Lanes. Each firing lane of a transition range should be 5 to 10 meters wide at the firing line and 75 meters wide at the greatest range (800 meters).

Targets and Their Locations. Either eight single "E" silhouette targets or eight double "E" silhouette targets may be used in each lane (double "E" silhouettes are preferred). The target closest to the firing line is target number 1, and it is placed at a range of 400 meters. The target farthest from the firing line is target number 8 at a range of 800 meters. The remaining six targets are located at various ranges between target number 1 and target number 8. Any two of these targets, as they appear to a gunner from the firing line, must be at least 5 mils apart in width or 150 meters apart in depth. This spacing of the target requires gunners to make a major change in either direction or elevation when engaging any two successive targets. All targets must be plainly seen from the firing position.



Target Devices. Electrical target devices (M30 or M31A1) are desirable; however, targets which are raised and lowered manually by pit men may be used. The disadvantage of the manual system is that at least 80 men are required to operate the pits on a standard (10-lane) range; also, communications must be established between each pit within a given lane and the target control operator for that lane. In wet

weather, electrical target devices may malfunction. If this happens, a minimum of five of the eight targets must work in each lane to run qualification. Three targets may be shown twice.

Target Control Points. Whether the targets are operated electrically or manually, each lane must have a control point about 10 meters behind the firing line to control raising and lowering the targets and to facilitate scoring.

Instruction Site. Bleachers are desirable to the rear of the firing line.

Control Tower. An elevated platform or control tower is desirable, centrally located to the rear of the firing line to control the firing line.

Concurrent Training Areas. At least three concurrent training areas are desirable, located 500 to 800 meters behind the firing line. Each of these areas must have room to seat approximately 75 soldiers.

The following personnel are necessary for operation and control of the transition range:

- **Personnel (Firing Line).**

  One officer in charge.

  One principal instructor.

  One safety officer.

  One alternate principal instructor.

  One NCO in charge.

  One assistant instructor per 10 soldiers.

  One group instructor per 40 to 50 soldiers.

  Two demonstrators (one gunner and one assistant gunner).

  One ammunition NCO.

  Ordnance personnel.

  Medical personnel.

The following equipment is necessary for operation and control of the transition range:

- **Equipment (Firing Line).**

  One public address system.

  Three machineguns per lane.

  One cleaning rod per assistant instructor.

  One screwdriver per lane.

  Twelve stopwatches (two in the control tower and two per group instructor).

  One scorecard per soldier--DA Form 85 (the same scorecard is used on the transition range and on the basic range).

The following display charts will aid in instruction on the transition range:

- **Training Aids and Devices (Firing Line).**

  Adjusted Aiming Point.

  Cone of Fire.

  Beaten Zone.

  Mil Relation.

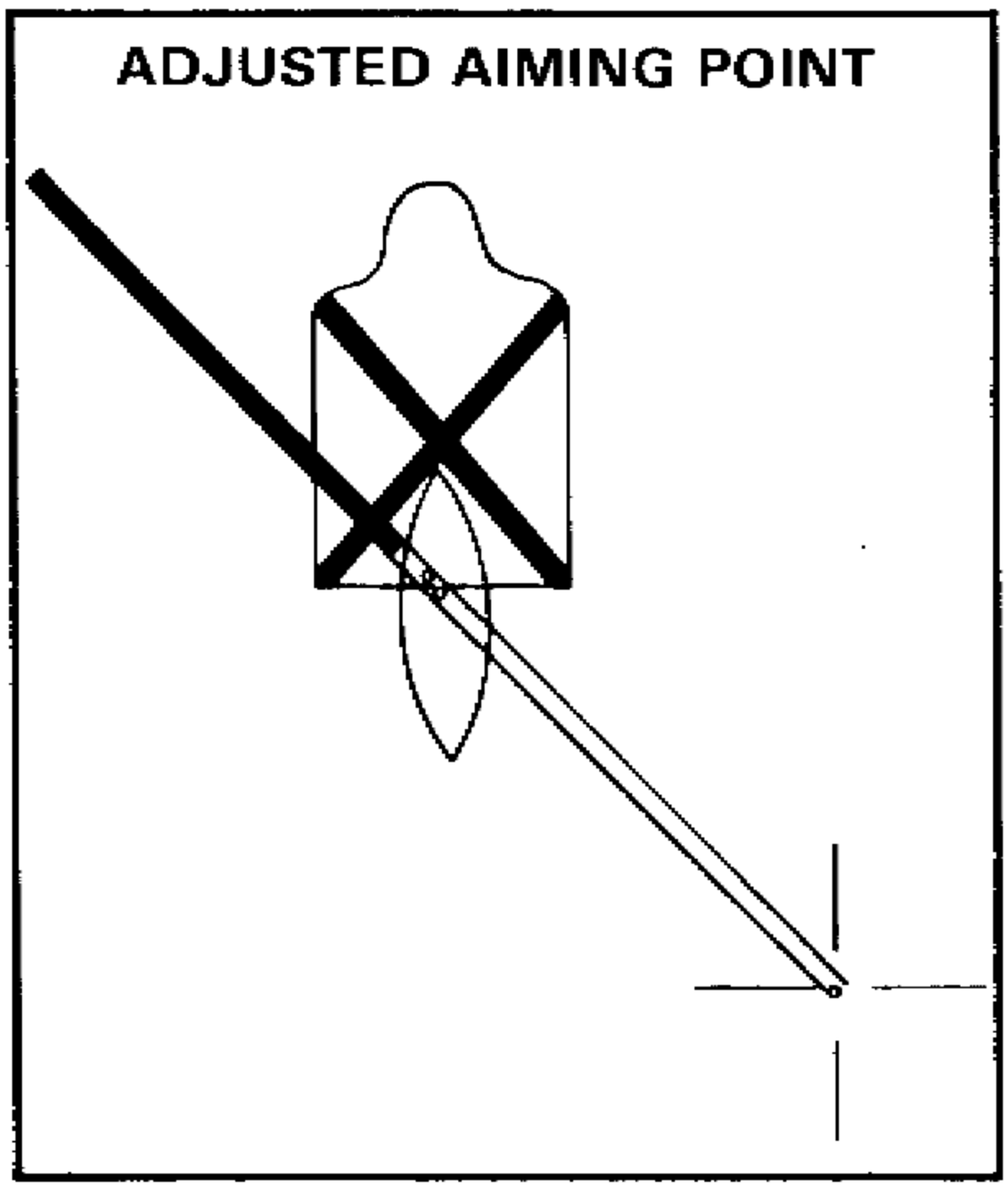
FIELD ZEROING

Gunners must be taught how to zero the gun at long ranges.

When field zeroing, a target between 300 and 700 meters should be selected. Range graduations on the rear-sight assembly of the M60 machinegun begin at 300 meters, making it impossible to place a lesser range

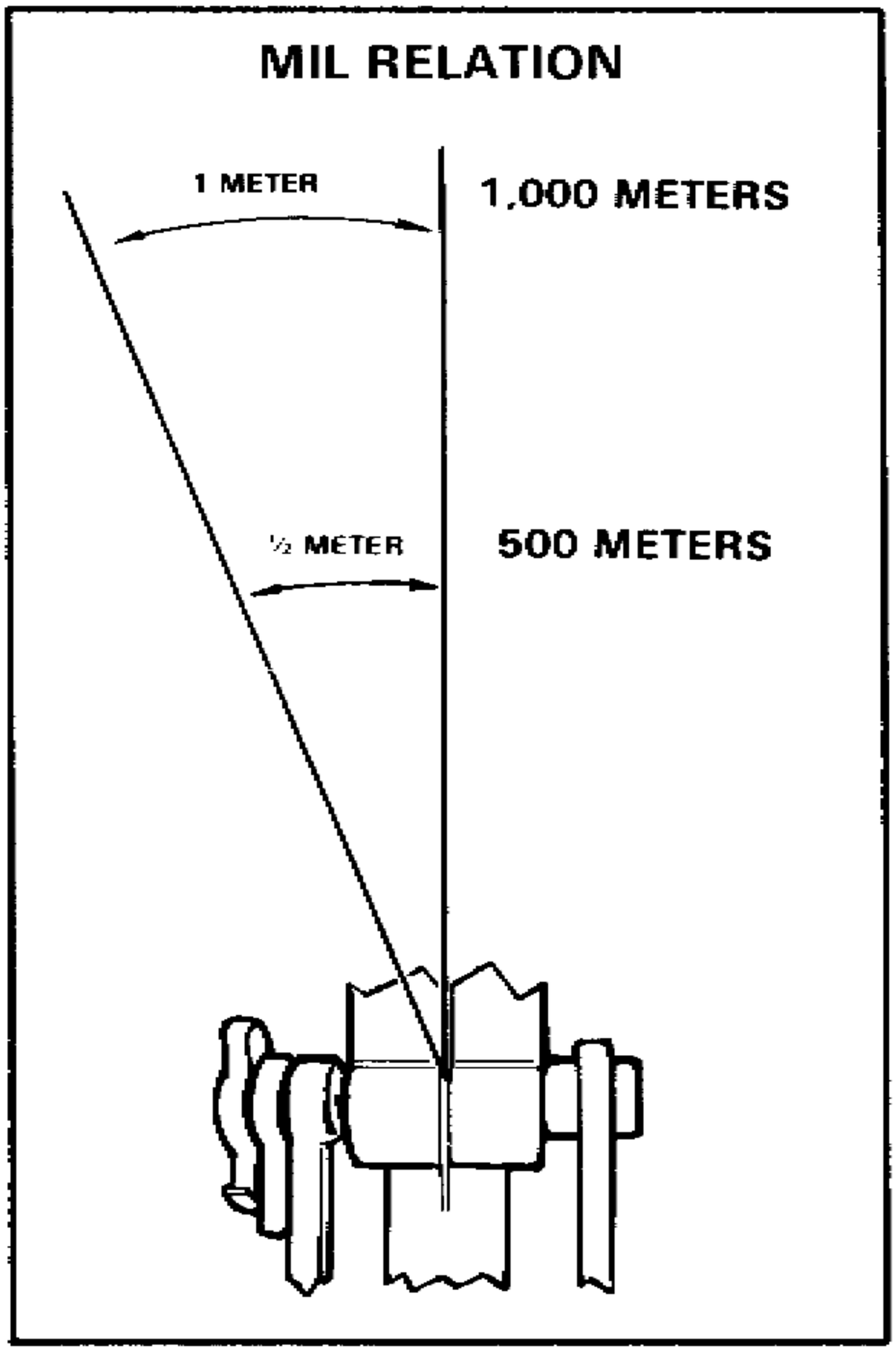
setting on the rear sight. At ranges greater than 700 meters, it would be difficult to determine where the center of the beaten zone is falling in relation to the target.

After determining the range to the target on which he is going to zero, the gunner indexes this range on the rear-sight assembly and alines the windage index (zero windage). The 500-meter target on the transition range is recommended because of the ease of determining deflection adjustments at that range.



The gunner fires a six- to nine-round burst at the center base of the target and notes where the burst hits.

The gunner then makes any necessary corrections for direction. One click or 1 mil on the windage knob moves the line of aim 1 meter at 1,000 meters. He makes corrections for deflection by moving the rear sight the necessary number of clicks in the direction of the target. For example, if the gunner is zeroing at a range of 500 meters, and the center of the beaten zone is 1 meter to the left of the target, he will move the rear sight 2 clicks (mils) in the opposite direction (to the right).



The gunner estimates how high or low the center of the beaten zone is in relation to the target and makes elevation changes accordingly. Because determining that relationship is difficult, gunners will have to rely on trial and error until they gain sufficient experience to make reliable estimates.

After correcting for deflection and elevation, the gunner fires a confirming burst. If his adjustments are correct, he then adjusts the elevation scale to reflect the range to the target.

If the gunner does not hit the target with the confirming burst, he repeats the

procedure, treating each subsequent burst as if it were the initial burst.

EFFECTS OF WIND

Gunners must learn that wind will alter the normal strike of the beaten zone. The beaten zone will be shifted in the direction that the wind is blowing.

The following table shows the approximate shift in impact for a 10 mph wind from 3 or 9 o'clock.

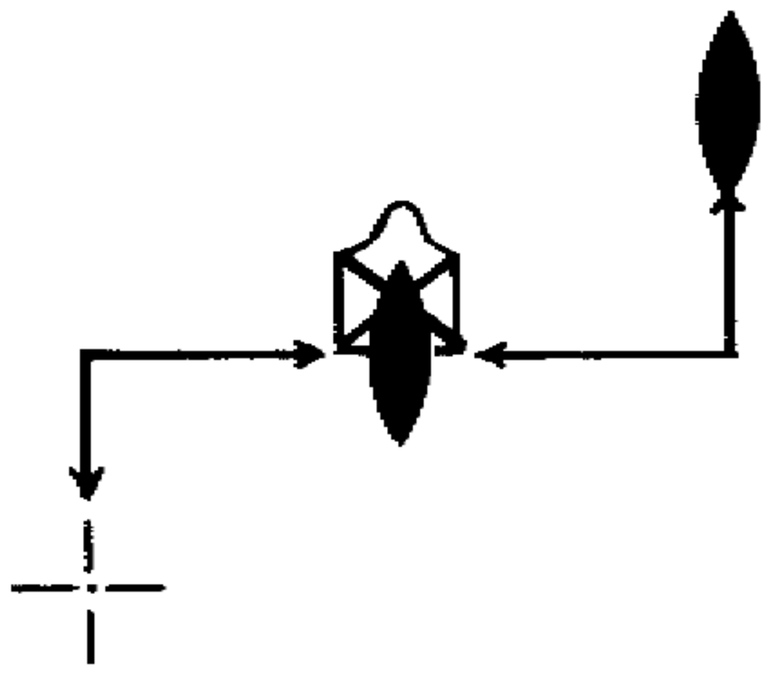
RANGE (METERS)	WIND DRIFT (Mils)
500	2
700	3
900	4
1100	6

Stronger winds will show a proportionately greater effect. For example, a 20 mph wind will shift the strike of the beaten zone double the amounts shown.

ADJUSTED-AIMING-POINT METHOD OF FIRE ADJUSTMENT

Gunners should try for an accurate initial burst. However, the initial burst may not always be accurate; therefore, gunners must have a means of rapidly and accurately adjusting their fire onto the target without making sight adjustments.

ADJUSTED-AIMING-POINT METHOD OF FIRE ADJUSTMENT



If the gunner misses the target with his initial burst, he must select a new aiming point the same distance from the target as the center of impact of the initial burst, but in the opposite direction, and fire a second burst.

CONCURRENT TRAINING

The unit is assembled in one location (bleachers preferred) and instructed in the following:

BASIC MARKSMANSHIP FIRING—TRANSITION RANGE, PRACTICE OR RECORD

RANGE	TIME (MIN)	RDS PER INDV	TARGET	TYPE AMMO	TYPE FIRE
400-700 METERS	NO LIMIT	20	ONE DOUBLE "E" SILHOUETTE BETWEEN 400 AND 700 METERS.	4-1	ZEROING (TWO TO THREE SIX- TO NINE-ROUND BURSTS.
400-800 METERS	4	120	EIGHT DOUBLE "E" SILHOUETTES.	4-1	FIXED (A MAXIMUM OF TWO BURSTS ALLOWED AT EACH TARGET)
TOTAL (140 PRACTICE, 140 RECORD)					

- **Target detection techniques (FM 23-9, chap 6).**
- **Position and grip with the bipod-mounted machinegun.**
- **Characteristics of fire, to include trajectory, cone of fire, and beaten zone.**
- **Field zeroing at long ranges.**
- **Range determination.**
- **Adjusted-aiming-point method of fire adjustment.**

At the completion of the instruction, the unit is divided into equal groups. One group stays on the firing line; the others go to concurrent training stations.

The county fair system of movement through concurrent training stations is recommended. Subjects covered in concurrent training stations should be related to the machinegun. Recommended subjects and a list of personnel, equipment, and training aids necessary for conduct of concurrent training instruction are as follows:

Concurrent Training Station for General or Detailed Disassembly and Assembly.

- Personnel

  One NCO in charge.

  One principal instructor.

  One alternate principal instructor.

  One group instructor per 10 soldiers.

- Equipment

  One public address system.

  One complete tripod-mounted machinegun per two soldiers.

- **Training Aids and Devices**

  One nomenclature mat.

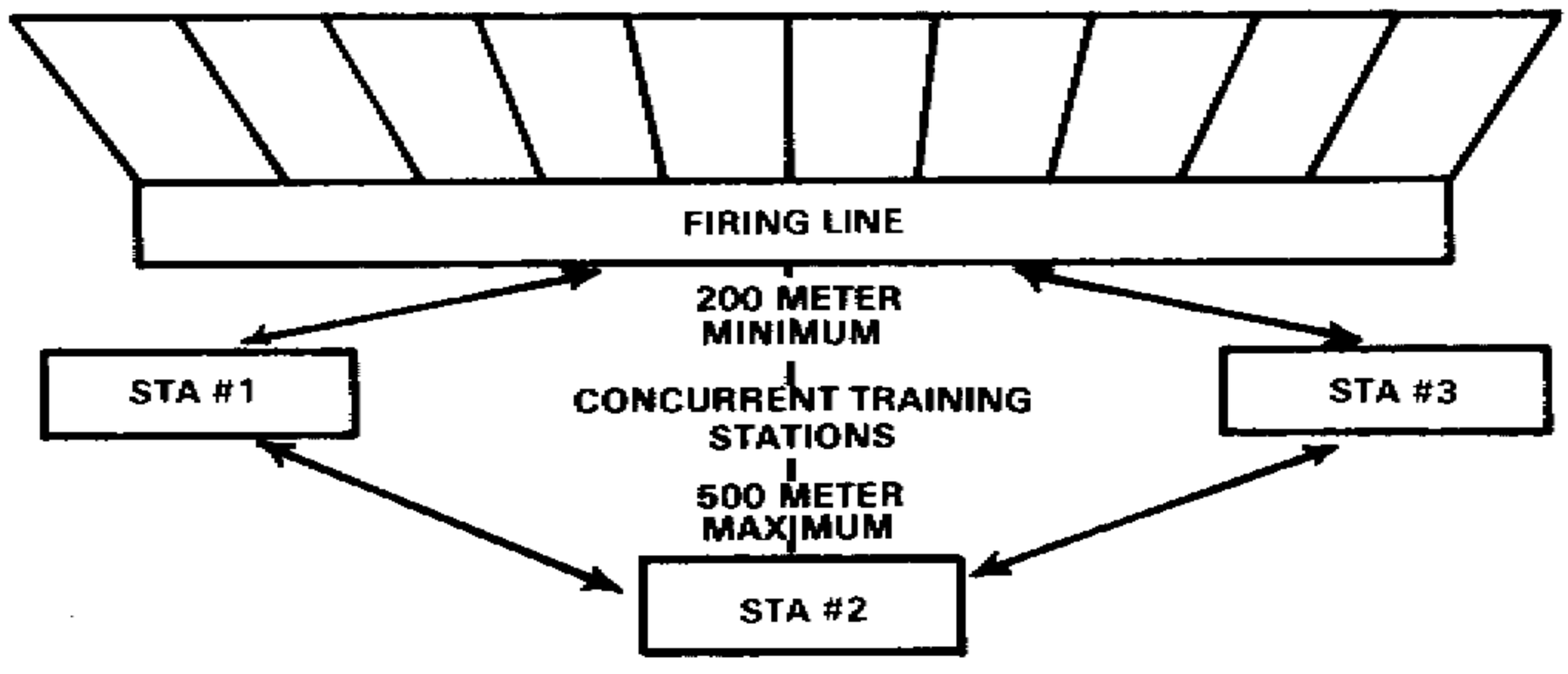
  One belt of six dummy rounds per gun.

Concurrent Training Station for Direction and Elevation Readings.

- **Personnel**

  One principal instructor.

MACHINEGUN TRANSITION RANGE ORGANIZATION



One alternate principal instructor.

One demonstrator.

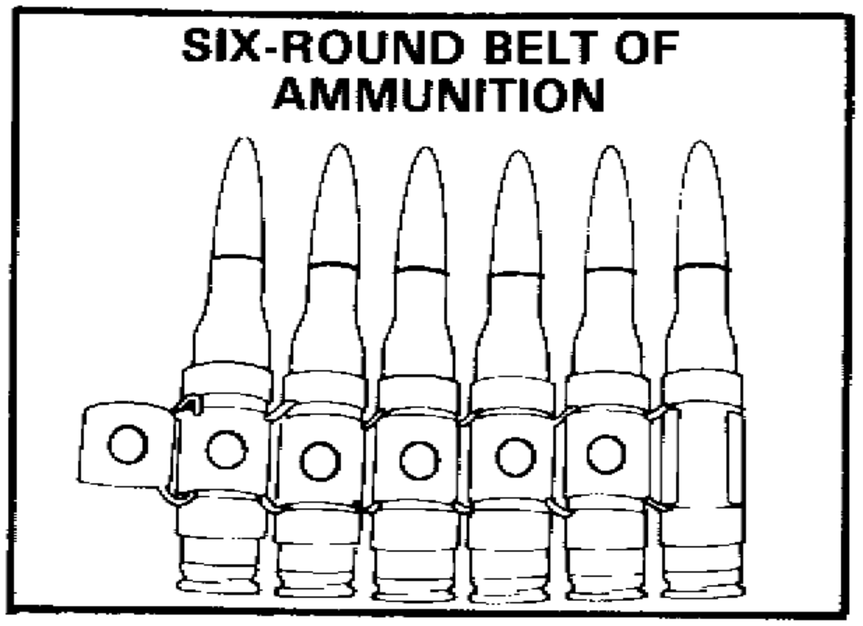
One group instructor per 10 soldiers.

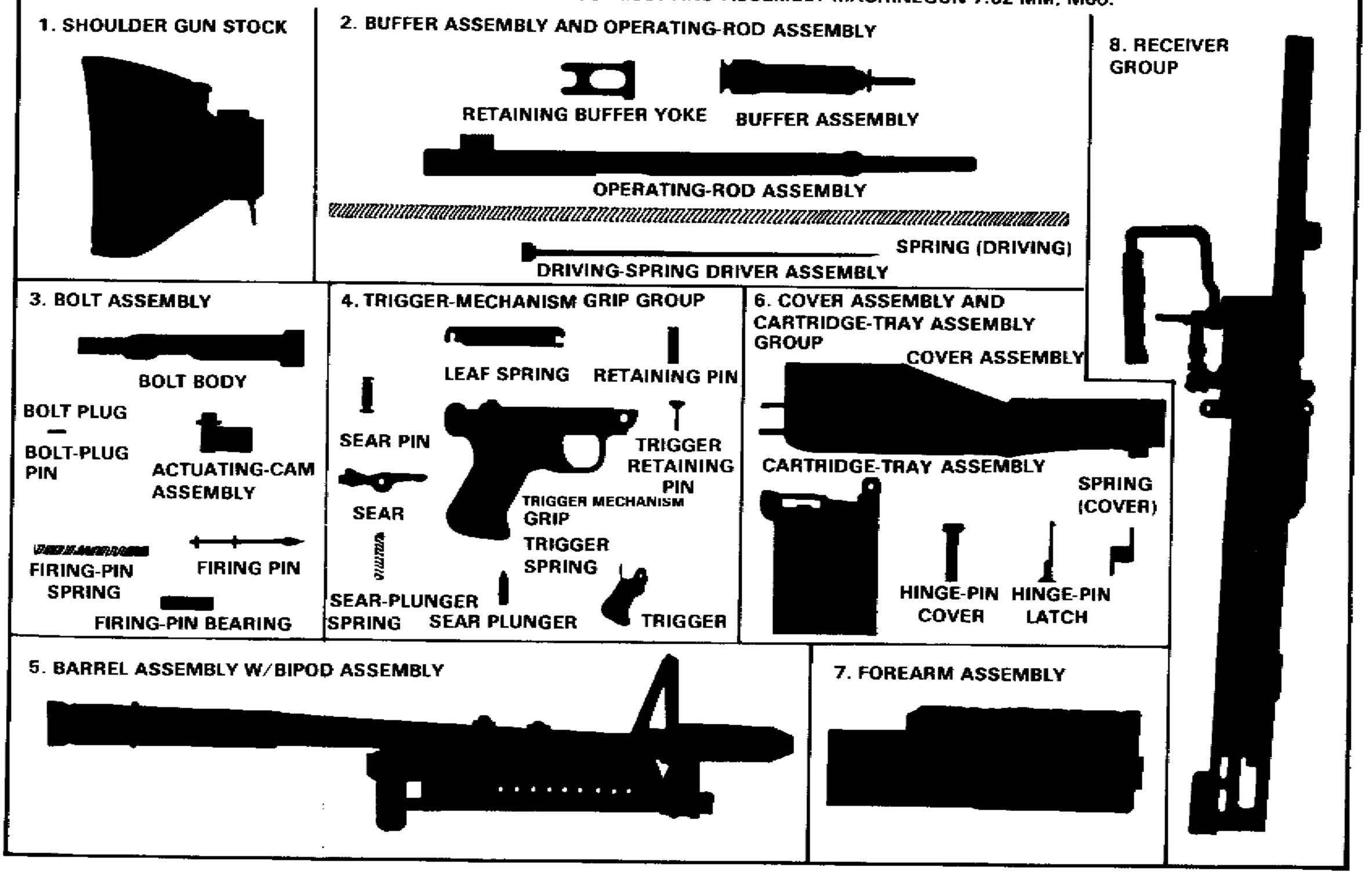
- Equipment

One public address system.

One complete tripod-mounted machinegun.

One traversing and elevating mechanism per soldier.





● **Training Aids and Devices**

Landscape target.

Chalkboard used to record direction and elevation readings.

Concurrent Training Station for Techniques of fire.

● **Personnel**

One principal instructor.

One alternate principal instructor.

One chartman.

● **Equipment**

One public address system.

● **Training Aids and Devices**

Chart, Maximum Ordinate.

Chart, Plunging and Grazing Fire.

Chart, Classes of Fire with Respect to the Machinegun.

Punchboard training aid or chalkboard.

CONDUCT OF FIRING

Gunners must fire the transition course BASIC MARKSMANSHIP FIRING-TRANSITION RANGE, PRACTICE RANGE, as a minimum, once for practice and once for record.

Firing Line. Two machinegun positions are established in each lane, and a three-man crew consisting of a gunner, assistant gunner, and ammunition bearer is assigned to each position. Each lane is controlled by an NCO.

One target control operator is assigned to each lane. If the targets are operated electrically, he will raise and lower them as necessary. If the targets are operated manually, he will telephone instructions to pit personnel.

See appendix C for safety considerations.

Rules. As each group reports to the firing line, the following rules are explained. These rules apply to a transition course with double "E" silhouette targets.

Each gunner is given 120 rounds and 4 minutes to engage the 8 targets in his lane. He may fire a maximum of two bursts (any number of rounds is considered a burst) at each target, but he fires the second burst only if he fails to hit the target with his first burst. If single "E" silhouette targets are used, gunners should be allotted 180 rounds and a maximum of three bursts per target to compensate for the greater difficulty in engaging them.

Gunners will not fire for record in the same lane in which they fire practice.

The assistant gunner will assist the gunner in locating targets as they appear, in determining their range, and in adjusting fire.

Target number 1 (400 meters) is raised prior to the command to commence firing and is always the first target engaged.

Target number 8 (800 meters) must be one of the next three targets raised.

The remaining six targets are raised in any sequence, but target operators must have at least three different sequences for raising targets so the gunner will not know which target to expect next.

If a stoppage occurs, the gunner must apply immediate action and, if the stoppage is reduced, continue to fire the course. He may be allowed an additional 15 seconds for each application of immediate action. If a stoppage occurs which cannot be reduced by immediate action, the gunner announces, TIME, and with the assistance of the lane NCO reduces the stoppage. When a gunner announces, TIME, the lane NCO notes how

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many targets the gunner has not engaged. After the stoppage has been reduced, the lane NCO allows the gunner 30 seconds to engage each of the remaining targets.

To qualify, the gunner must engage all 8 targets within the time limit and score a minimum of 50 points (5 hits).

Firing the Course. Each gunner field zeros his machinegun prior to firing the course.

Within each lane, one gunner fires while the other gunner dry-fires. Both gunners follow the same procedure. THEY DETERMINE THE RANGE TO EACH TARGET AS IT APPEARS, PLACE THIS SETTING ON THEIR REAR-SIGHT ASSEMBLY, ASSUME PROPER POSITION AND GRIP, OBTAIN CORRECT SIGHT ALINEMENT AND SIGHT PICTURE, AND FIRE SIX- TO NINE-ROUND BURSTS (DRY-FIRE GUNNER SIMULATES FIRING).

If the gunner fails to hit the target with his initial burst, he must use the adjusted-aiming-point method of fire adjustment to try to hit the target with his next burst.

Scoring. A gunner is credited with 10 points for each target he hits. He receives no credit for unfired ammunition.

Scoring is done by the target control operator in each lane and is recorded in the place provided on the same scorecard (DA Form 85) used to record the gunner's score on the basic (10-meter) range.

QUALIFICATION SCORES (BASIC AND TRANSITION FIRING)

The score a gunner receives on the basic (10-meter) range is computed as described in the paragraph on maintaining the scorecard. It is recorded on the same scorecard (DA Form 85) used to record the score on the transition range.

Transition firing is the second phase of a gunner's qualification. To qualify on the transition range, gunners must engage eight targets within the prescribed time limit, hitting a minimum of five.

NOTE: If single "E" silhouette targets are used, the gunner should be allocated 180 rounds of 4-1 ammunition and a maximum of 3 bursts at each target for both practice and record firing.

If a gunner qualifies on the basic and transition ranges, his overall machinegun qualification is computed as follows:

Add the basic (10-meter) score to the transition score to get the total score.

Determine the qualification (expert, first-class gunner, second-class gunner) from the following information:

	BASIC RANGE		TRANSITION RANGE		TOTAL
QUALIFICATION	MIN	MAX	MIN	MAX	TOTAL POINTS*
EXPERT	65	104	50	80	155-184
FIRST CLASS	65	104	50	80	140-154
SECOND CLASS	65	104	50	80	115-139
UNQUALIFIED					Below 115

*Total points used for qualification must reflect a minimum score from both ranges; for example, a gunner who gets an aggregate score of 140 points by scoring 60 points on the basic range and 80 points on the transition range is considered unqualified.

APPENDIX A

References

REQUIRED PUBLICATIONS

Required publications are sources which users must read in order to understand and use FM 23-67.

TECHNICAL MANUAL (TM)

9-1005-224-10 **Operator's Manual for M60, 7.62-mm Machine Gun**

RELATED PUBLICATIONS

Related publications are sources of additional information. Users do not have to read them to understand FM 23-67.

ARMY REGULATIONS (AR)

310-25	**Dictionary of United States Army Terms**
310-50	**Catalog of Abbreviations and Brevity Codes**
350-4	**Qualification and Familiarization with Weapons and Weapon Systems**
385-63	**Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat**

DEPARTMENT OF THE ARMY PAMPHLET (DA PAM)

108-1	**Index of Army Motion Pictures and Related Audio-Visual Aids.**

FIELD MANUALS (FM)

5-15	**Field Fortifications**
7-7 (HTF)	**The Mechanized Infantry Platoon and Squad (How to Fight)**
7-8 (HTF)	**The Infantry Platoon and Squad (Infantry, Airborne, Air Assault, Ranger) (How to Fight)**
7-10 (HTF)	**The Infantry Rifle Company (Infantry, Airborne, Air Assault, Ranger) (How to Fight)**

7-20 (HTF)	The Infantry Battalion (Infantry, Airborne, Air Assault, Ranger) (How to Fight)
21-26	Map Reading
21-30	Military Symbols
21-60	Visual Symbols
31-70	Basic Cold Weather Manual
71-1 (HTF)	Tank and Mechanized Infantry Company Team (How to Fight)
71-2 (HTF)	The Tank and Mechanized Infantry Battalion Task Force

TECHNICAL MANUALS (TM)

3-220	Chemical, Biological, and Radiological (CBR) Decontamination
9-1005-224-24	Organizational, Direct Support, and General Support Maintenance Manual (including Repair Parts and Special Tools List) for Machine Gun, 7.62-mm, M60 W/E (NSN 1005-00-605-7710) and Mount, Tripod, Machine Gun, 7.62-mm, M122 (1005-00-710-5599)
9-1300-206	Ammunition and Explosives Standards
11-5855-203-10	Operator's Manual for Night Vision Sight, Individual Served Weapon AN/PVS-2 (NSN 5855-00-087-2947), AN/PVS-2A (5855-00-179-3708) and AN/PVS-2B (5855-00-760-3869)

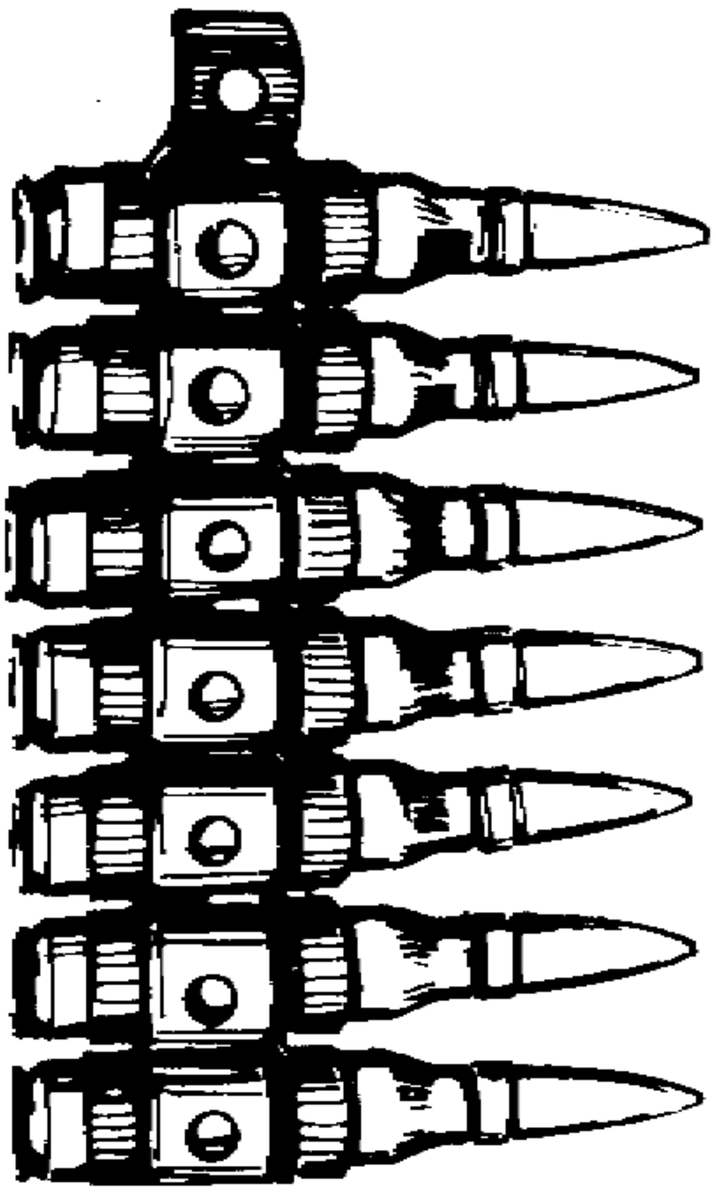
APPENDIX B

Ammunition

This appendix describes the ammunition to be used in the M60 machinegun and gives a summary of ammunition requirements for the firing courses in this manual.

Ammunition is issued in a disintegrating, metallic, split-linked belt.

7.62-MM AMMUNITION IN METALLIC BELT



*Not authorized for training.

AMMUNITION DATA

CLASSIFICATION

M60 machinegun ammunition is classified as follows:

Ball Cartridge — for use against light materials and personnel, and for range training.

Armor-Piercing Cartridge* — for use against lightly armored targets.

Tracer Cartridge — for observation of fire, incendiary effects, signaling, and use during training.

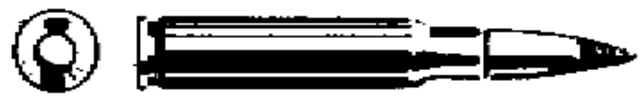
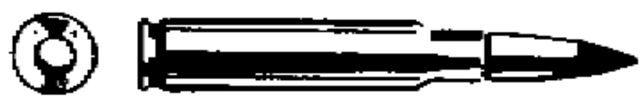
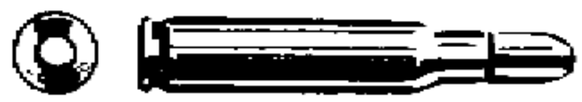
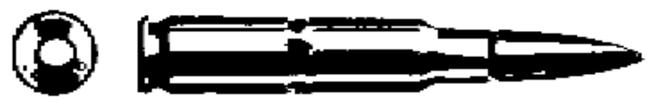
Dummy Cartridge — for use during mechanical training.

Blank Cartridge — for use during training when simulated live fire is desired. A blank firing attachment must be used to fire this ammunition.

IDENTIFICATION

The 7.62-mm NATO cartridge may be identified by its appearance, the painting of the projectile tips, the stamping of the manufacturer's initials and year of manufacture on the base of the cartridge case, and the markings on the packing containers.

When removed from the original packing container, the cartridge may be identified by its physical characteristics.

CARTRIDGES FOR THE M60 MACHINEGUN		
TYPES	**DISTINGUISHING CHARACTERISTICS**	**PHYSICAL APPEARANCE**
CARTRIDGE 7.62-MM BALL NATO	GILDED METAL JACKET ON PROJECTILE.	
CARTRIDGE 7.62-MM TRACER NATO	TIP OF PROJECTILE IS PAINTED ORANGE.	
CARTRIDGE 7.62-MM ARMOR-PIERCING NATO*	TIP OF PROJECTILE IS PAINTED BLACK.	
CARTRIDGE 7.62-MM BLANK NATO	GILDED METAL CASE AND NO PROJECTILE.	
CARTRIDGE 7.62-MM DUMMY NATO	CORRUGATED OR THREE HOLES IN BODY OF CARTRIDGE CASE.	
*NOT AUTHORIZED FOR TRAINING.		

STORAGE

Ammunition should be stored under cover. If it is necessary to leave ammunition in the open, keep it at least 15 cm (6 in) from the ground and covered with a double thickness of tarpaulin. Place the cover so that it protects the ammunition and allows ventilation. Dig trenches to prevent water from flowing under the ammunition.

CARE, HANDLING, AND PRESERVATION

Ammunition containers should not be opened until the ammunition is to be used. Ammunition removed from the airtight containers, particularly in damp climates, is likely to corrode.

Protect ammunition from mud, dirt, and water. If ammunition gets wet or dirty, wipe it off before using. Wipe off lightly corroded cartridges as soon as the corrosion is discovered. Heavily corroded cartridges, dented cartridges, and cartridges with loose projectiles should not be fired.

Do not expose ammunition to the direct rays of the sun. If the powder is hot, excessive pressure may be developed when the round is fired.

Do not oil ammunition. If it is oiled, dust and other abrasives will collect on it and possibly damage the operating parts of the gun.

PACKAGING

Ammunition is packaged in a metal box containing two bandoleers. Each bandoleer contains 100 rounds and weighs approximately 3.8 kg (7 lbs). Ammunition in the bandoleers may be removed for firing.

AMMUNITION REQUIREMENTS FOR MACHINEGUN TRAINING

This data is furnished as a guide to be used in conjunction with tables of allowances.

PREDETERMINED DATA (RANGE CARD)				
TIME	**TOTAL ROUNDS PER THREE-MAN CREW**	**TARGET**	**TYPE AMMO**	**TYPE FIRE**
		DAY FIRING		
NO LIMIT	20	POINT	4-1	ZERO—THREE SIX- TO NINE-ROUND BURSTS.
NO LIMIT	40	FPL	4-1	OBTAIN DIRECTION AND ELEVATION READINGS TO FPL.
NO LIMIT	40	POINT	4-1	OBTAIN DIRECTION AND ELEVATION READING TO ENGAGE POINT TARGET.
NO LIMIT	40	LINEAR	4-1	OBTAIN DIRECTION AND ELEVATION READINGS TO ENGAGE LINEAR TARGET.
SUBTOTAL	140			
		NIGHT FIRING		
NO LIMIT	20	LINEAR	4-1	PREDETERMINED DATA
NO LIMIT	20	POINT	4-1	PREDETERMINED DATA
NO LIMIT	20	FPL	4-1	PREDETERMINED DATA
SUBTOTAL	60			
TOTAL 200 ROUNDS PER THREE-MAN CREW.				

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SUMMARY OF AMMUNITION		
TABLE	TOTAL ROUNDS PER MAN	TYPE OF AMMUNITION
BASIC - BIPOD	42	BALL
PRACTICE - TRIPOD	108	BALL
RECORD PRACTICE	78	BALL
RECORD FIRE	108	BALL
TRANSITION FIRE	280 (140 PRACTICE) (140 RECORD)	4-1
DAY DEFENSIVE FIRE	200	4-1
ASSAULT FIRE	100	4-1
PREDETERMINED DATA	200	4-1
TOTAL	1,116	

FAMILIARIZATION COURSE			
RANGE	PERIOD	TOTAL ROUNDS PER MAN	TYPE AMMO
BIPOD/TRIPOD			
BASIC (10-METER)	1	120	BALL
TRANSITION	2	140	4-1
DAY DEFENSIVE FIELD FIRING	3	200	4-1
ASSAULT FIRING	4	100	4-1
PREDETERMINED FIRING	4	60	TRACER
TOTAL		620	

APPENDIX C

Safety

Safety precautions must be observed during all marksmanship training. This appendix recommends safety precautions for the ranges described in this manual, but this information is not intended to replace AR 385-63 or local regulations. Range safety requirements will vary because of the different requirements of the courses of fire.

SAFETY PRECAUTIONS

The following precautions will be observed:

- A red flag will be displayed at the entrance to the range or in some other prominent location on the range during firing.
- It will always be assumed that guns are loaded until they have been thoroughly examined and found to contain no ammunition.
- Firing limits will be marked with red and white striped poles visible to all firers.
- Obstructions will never be placed in the muzzles of guns about to be fired.
- When not in use, all guns will be kept in a prescribed area with proper safeguards.
- No smoking will be permitted near ammunition, explosives, or flammables.
- Hearing protection devices will be worn by all personnel during firing.

RANGE PROCEDURES

BEFORE FIRING

- All prescribed roadblocks and barriers will be closed and necessary guards posted.
- All guns will be checked to insure that they are clear of ammunition and obstructions and that the covers are UP to show they are cleared.
- All individuals will be briefed on the firing limits of the range and firing lanes.
- Range clearance will be obtained from installation range-control office.
- The downrange area will be checked prior to firing to insure that all personnel and equipment are clear of the area.
- A complete first aid kit will be on the range.

- Medical personnel will be located on the range or nearby where they can be contacted quickly.
- All guns will be checked by an officer or noncommissioned officer to insure that they are operational.
- Guns will not be handled except on command from the tower operator or the officer in charge.
- Ammunition will be drawn and issued only on command of the officer in charge. When two or more lots of ammunition are used for firing, the officer in charge must insure that the lots are separated and properly identified so that identification can be made by lot numbers in case of an accident or malfunction.
- All ammunition must be protected from the direct rays of the sun.
- No one will move forward of the firing line without permission of the tower operator, safety officer, or officer in charge.

DURING FIRING

- Should an unsafe condition be noted during firing, the person noting the condition will immediately call, CEASE FIRE. Firing will not resume until directed by the officer in charge.
- Assistant gunners will not be permitted to have their heads forward of the front sling swivel during firing. This is to prevent injury to the assistant gunners by the muzzle blast of the gun.
- During basic firing, all personnel on the range must be aware of the danger in moving forward of the firing line to score their targets. Before the firing line is clear and anyone is allowed forward, all machineguns will be cleared by the officer in charge or the safety officer.
- In clearing the machinegun, the gunner pulls the cocking handle to the rear, places the safety lever on the SAFE position, and pushes the cocking handle forward. He then raises the cover and inspects the tray assembly and chamber. If it is clear, he declares, CHAMBER CLEAR. An assistant instructor (officer) then runs a cleaning rod through the barrel until he sees the end of the rod in the receiver; he then withdraws it. If the gun is clear, the gunner pulls the cocking handle to the rear, places the safety lever in the FIRE position, pulls the trigger, and eases the bolt forward. After the bolt has gone forward, he places the safety lever on the SAFE position, and the procedure is complete.

During transition firing, if pit men are used on the transition range, the following safety precautions apply:

- Communication between each pit and the firing line must be established and maintained throughout firing.
- Pit men must remain in the pits at all times unless directed otherwise by the officer in charge.
- When personnel are downrange and not in their pit, a red flag, clearly visible from the firing line, will be displayed in the vicinity of that pit.
- If a red flag appears downrange during firing, the command, CEASE FIRE, will be given immediately, and all guns will be cleared.
- Steel helmets will be worn by all pit personnel.

During assault firing, the following safety precautions apply:

- No one will move onto or forward of the firing line until ordered to do so by the officer in charge.

  Gunners will fire only in their lanes. Lanes must be clearly marked.

- Each gunner will be accompanied by a lane NCO. The lane NCO will instruct the gunner to place the gun on SAFE, keep it pointed up and downrange, and continue moving through the course if: the gunner gets too far ahead or behind the line of other gunners; the gunner moves out of the marked path in his lane; the gunner shoots wildly; or the gunner stops for any reason at any point other than the first or second phase line.

- If the gunner falls or stumbles, the lane NCO will secure the gun, place it on SAFE, keep it pointed up and downrange, and direct the gunner to continue moving through the course.

- If a gun fails to fire, the gunner will continue to move and will dry-fire until he reaches a phase line. Immediate action is applied only at the firing line or the first or second phase line. When immediate action is applied, the gun must be placed on the ground.

- The lane NCO halts the gunner at the first and second phase line. At the first phase line, the gunner moves forward only on command from the officer in charge. At the second phase line, the guns are cleared and unexpended ammunition is collected. Lane NCOs report in sequence to the officer in charge when their points are cleared.

- A whistle is used as an emergency signal. If the whistle is blown during the conduct of an exercise, all gunners will halt, place their guns on SAFE, point them up and downrange, and wait for orders from the officer in charge.

- All personnel moving in the assault will wear steel helmets.

When firing during darkness, the following special precautions apply:

- The downrange area will be checked before firing to insure that all personnel and equipment are clear of the area. This will be done by asking three times over a public address system, IS THERE ANYONE DOWNRANGE? pausing each time long enough to permit a response.

- A blinking red light must be used in addition to the red flag. It should be displayed at the entrance to the range or at some other prominent location.

- Two red lights will be mounted on the striped poles marking the limits of fire. They must be visible to all firers.

- No one will move from position until told to do so by the officer in charge.

AFTER FIRING

- Safety personnel will inspect all guns to insure that they are clear. A check will be conducted to determine if any brass, links, or live ammunition is in possession of the troops.

- When guns have been cleared, they will be kept in a prescribed area with the bolt forward, safety lever on the SAFE position, and the feed cover raised.

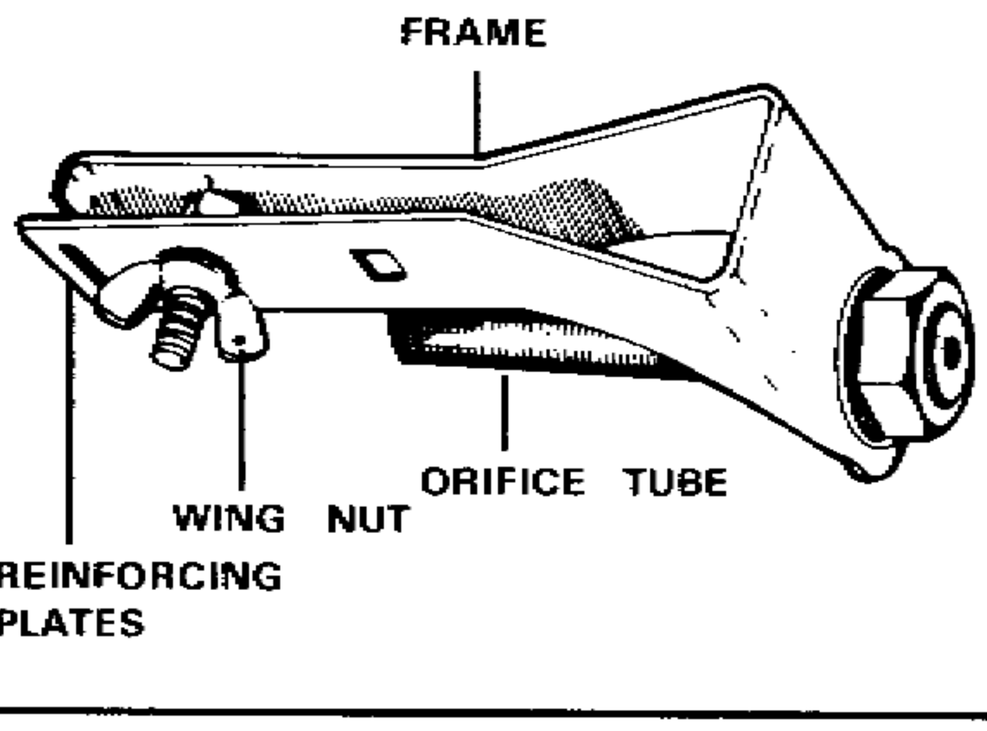
APPENDIX D

Blank Firing Attachment, M13

INSTALLATION OF THE M13

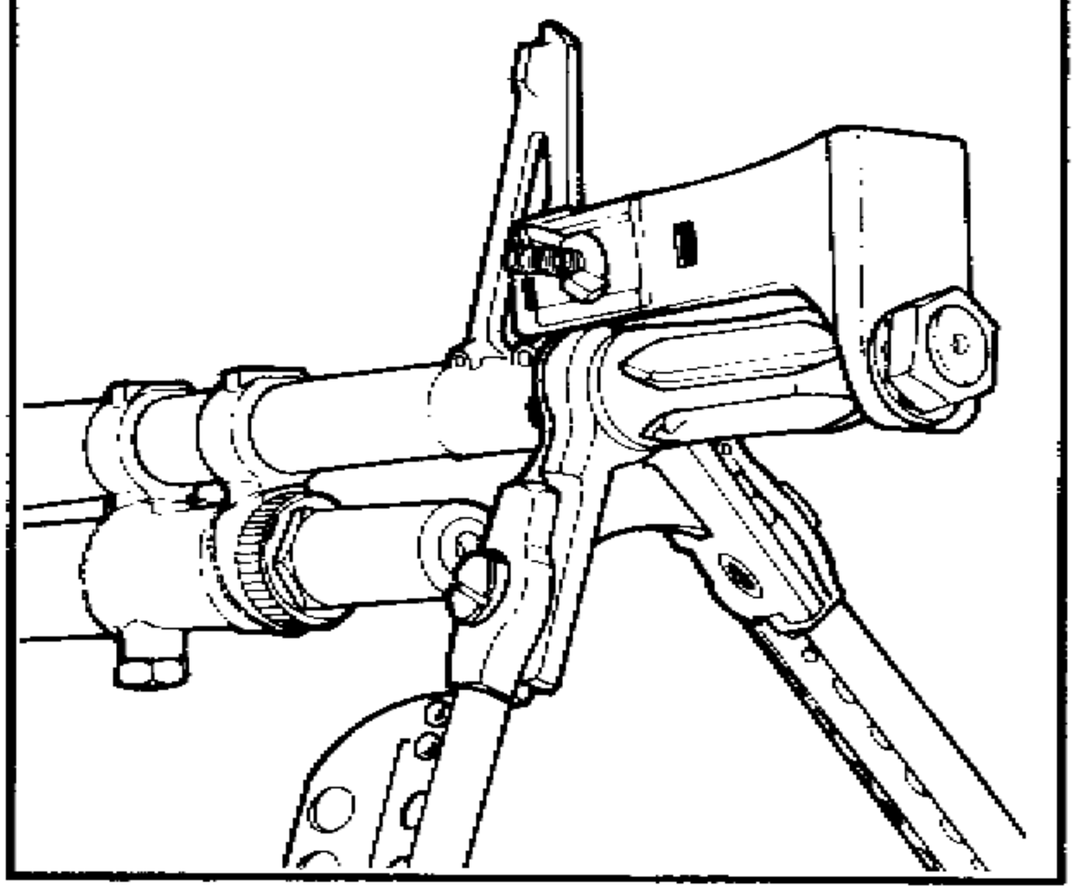
The M13 blank firing attachment (BFA) is used on the M60 machinegun when blank cartridges are fired to simulate live firing where live firing is not practical.

BLANK FIRING ATTACHMENT



The BFA must be adjusted to fit the machinegun barrel. The orifice tube fits inside the flash suppressor, flush against the gun muzzle and flush with the forward end of the flash suppressor. The BFA is clamped tightly to the front sight. When properly adjusted, it will fit snugly against the muzzle, thus preventing the escape of gas during firing. When the BFA is manufactured, the distance the orifice tube screws into the restricter bushing is fixed and fitted by "staking" the restricter bushing. This fixed distance, set in the restricter bushing, does not provide the correct adjustment for every machinegun, because the distance from the muzzle to the forward end of the flash suppressor varies from gun to gun. It is necessary, in some instances, to break the "stake" mark, adjust the orifice tube to fit the gun barrel, and then restake it.

BLANK FIRING ATTACHMENT MOUNTED ON THE M60



The BFA is adjusted by organizational maintenance personnel, using the following procedure:

- Insure that the large nut on the front of the BFA is tight.
- Unscrew the orifice tube with a pair of large pliers. Fit it into the barrel until the clamp will barely start over the front sight.
- With the BFA installed on the barrel, pinch the clamp tightly behind the wingnut with the fingers and rap the top front of the BFA above the large nut with a machinegun combination tool; the clamp will snap into place.
- Tighten the wingnut. When the adjustment is correct, there will be no end movement of the BFA on the barrel.

CARE OF THE M60 MACHINEGUN WHILE USING THE M13

A buildup of carbon inside the gun causes friction between the moving parts. Carbon deposits build rapidly when blanks are fired. When these deposits become excessive, stoppages occur. Keeping the gun clean (particularly the gas system and chamber) during blank firing is very important.

To get the best performance when using the BFA:

- Inspect the gun for damaged parts, excessive wear, cleanliness, and proper lubrication prior to firing.
- When feasible, test-fire the gun using ball ammunition BEFORE attaching the BFA.
- Adjust the BFA to fit the gun.
- Apply proper immediate action when stoppages occur.
- Clean the gas system after firing 500 rounds.
- Clean and lubricate the entire gun after 1,000 rounds.

WARNING

1. UNDER NO CIRCUMSTANCES WILL ANY TYPE OF AMMUNITION OTHER THAN BLANK BE LOADED INTO THE GUN WHEN THE BLANK FIRING ATTACHMENT IS IN PLACE.

2. MINIMUM SAFE DISTANCE FOR PERSONNEL IN FRONT OF A BFA-FITTED GUN WHEN FIRING BLANK AMMUNITION IS 25 METERS.

APPENDIX E
Training Program

This appendix discusses how to train the soldier to achieve proficiency with the M60 machinegun. It should be used at company level.

TRAINING OBJECTIVES AND INTERMEDIATE TRAINING OBJECTIVES

TRAINING OBJECTIVE 1

Qualify with the M60 machinegun on a 10-meter range.

TASK: Engage targets for qualification on a 10-meter range.

CONDITIONS: As a gunner, on a 10-meter range in daylight, given an M60 machinegun, scorecard, targets, and ammunition.

STANDARD: The gunner must get a minimum score of 65 points on the 10-meter range, IAW chapter 9.

INTERMEDIATE TRAINING OBJECTIVES (ITO)

ITO 1: Mount the M60 machinegun on a tripod.

CONDITIONS: As a gunner, on a 10-meter range in daylight, given an M122 tripod, an M60 machinegun, and target.

STANDARD: The gunner must:

1. Extend the tripod front leg.
2. Extend and lock the tripod rear legs.
3. Place the tripod on the ground, front leg pointing downrange.
4. Lock the pintle (and platform group) into the pintle bushing.
5. Attach the gun to the pintle (or platform).
6. Center the traversing and elevating handwheels on the traversing and elevating mechanism.
7. Attach the traversing and elevating mechanism to the gun.
8. Lower the gun and attach the bottom of the traversing and elevating mechanism to the tripod (indexed at zero).
9. Lift the rear legs of the tripod and shift them until the muzzle of the gun points at the 10-meter target.
10. Emplace the tripod feet firmly into the ground.

11. Place one sandbag on the front leg of the tripod.

ITO 2: Zero the M60 machinegun.

CONDITIONS: As a gunner, on a 10-meter range in daylight, given a tripod-mounted M60 machinegun, target, ammunition, and a safety briefing.

STANDARD: The gunner must:

1. Load the gun.

2. Use the proper position and grip (tripod).

3. Set rear sight at 500 meters and zero windage.

4. Obtain proper sight alinement and sight picture on paster number 1 by turning the traversing and elevating mechanism.

5. Fire three single rounds.

6. Locate the center of the shot group.

7. Calculate and apply sight correctins.

8. Fire a single round on paster number 1.

9. Calculate and apply sight corrections.

10. Fire a single round on paster number 1.

11. Calculate and apply sight corrections.

12. Fire a confirming round on paster number 2.

13. Adjust the range plate scale to read 500 meters.

ITO 3: Perform immediate action.

CONDITIONS: As a gunner, on a 10-meter range in daylight or limited visibility, given a tripod-mounted M60 machinegun, ammunition, and targets.

STANDARD: The gunner must:

1. Pull the cocking handle to the rear and observe the ejection port.

2. Return cocking handle to its forward position.

3. Re-lay on target and attempt to fire.

NOTE: If the gun still fails to fire, the gunner should raise his hand and get assistance from safety personnel.

ITO 4: Engage four targets.

CONDITIONS: As a gunner, on a 10-meter range in daylight, given a tripod-mounted M60 machinegun, targets, and four 6-round belts of ammunition.

STANDARD: The gunner must get the feel of firing a six-round burst by:

1. Obtaining proper sight alinement and sight picture on paster number 1.

2. Pulling the trigger and firing six rounds.

3. Repeating fire on pasters 2, 3, and 4.

ITO 5: Engage five targets.

CONDITIONS: As a gunner, on a 10-meter range in daylight, given a tripod-mounted M60 machinegun loaded with a 30-round belt of ammunition, and targets.

1. Obtain proper sight alinement and sight picture on paster number 5.

2. Fire a burst of six rounds.

3. Traverse and search through the next seven targets, firing a burst of six rounds at each.

4. Cease firing after engaging paster number 6.

ITO 6: Engage eight targets.

CONDITIONS: As a gunner, on a 10-meter range in daylight, given a tripod-mounted M60 machinegun loaded with a 48-round belt of ammunition, and targets.

STANDARS: Within 50 seconds, the gunner must:

1. Obtain proper sight alinement and sight picture on paster number 7.

2. Fire a burst of six rounds.

3. Traverse and search through the next seven targets, firing a burst of six rounds at each.

4. Cease firing after engaging paster number 8.

ITO 7: Score the basic (10-meter) machinegun qualification target.

CONDITIONS: As a scorer, on a 10-meter range in daylight, given a 10-meter target which has been fired on.

STANDARD: Scorer must score the target IAW chapter 9.

TRAINING OBJECTIVE 2

Qualify with the M60 machinegun on a transition range.

TASK: Engage targets for qualification on a transition range.

CONDITIONS: Acting as a gunner, on a transition range in daylight, given an M60 machinegun, scorecards, targets, and ammunition.

STANDARD: The gunner must get a minimum score of 50 points on the transition range, IAW chapter 9.

INTERMEDIATE TRAINING OBJECTIVES

ITO 1: Field zero the M60 machinegun.

CONDITIONS: As a gunner, on a transition range in daylight, given a bipod-mounted M60 machinegun, target, ammunition, and safety briefing.

STANDARD: The gunner must follow procedures IAW chapter 9.

ITO 2: Engage long-range targets.

CONDITIONS: As a gunner, on a transition range in daylight, given a bipod-mounted M60 machinegun, eight electrical targets, and 120 rounds of ammunition.

STANDARD: Within 4 minutes the gunner must:

1. Locate the first exposed target.

2. Estimate the range to the target.

3. Apply the estimated range to the rear sight.

4. Aim and fire a six- to nine-round burst.

5. Observe the beaten zone.

6. Obtain an adjusted aiming point.

7. Aim at the adjusted aiming point and fire a six- to nine-round burst.

8. Repeat steps 1 through 7 on each of the remaining seven targets.

NOTE: Steps 6 and 7 are omitted if the initial burst hits the target.

TRAINING OBJECTIVE 3

Perform detailed disassembly and assembly on an M60 machinegun.

TASK: Perform detailed disassembly and assembly.

CONDITIONS: As a gunner, given an M60 machinegun, assembled and in working order, and one round of dummy 7.62-mm ammunition.

STANDARD: Within 16 minutes, the gunner must disassemble and then assemble the machinegun; the machinegun must be functional after assembly is completed.

ITO: Inspect an M60 machinegun for operator maintenance.

CONDITIONS: In a field environment, given a disassembled M60 machinegun.

STANDARD: Individual must inspect the following:

1. Buffer.
2. Operating group.
3. Trigger-housing group.
4. Barrel group.
5. Receiver group.
6. Mount (M122 tripod mount).
7. Spare-barrel case.

All parts needing repair, replacement, or maintenance must be identified, and corrective action must be taken so that the gun will function properly when assembled.

TRAINING OBJECTIVE 4

Read and record direction and elevation from the traversing and elevating mechanism, M122 tripod mount.

TASK: Read direction and elevation from the traversing and elevating mechanism, M122 tripod mount, and record the data on a range card.

CONDITIONS: Given a tripod-mounted M60 machinegun, and a range card.

STANDARD: Read direction and elevation from the traversing and elevating mechanism, M122 tripod mount, and correctly record the data on the range card.

1. Read direction from traversing slide bar.
2. Read elevation from the traversing and elevating mechanism.
3. Measure width of target (traversing handwheel).

ITO: Read directin and elevation from a range card and set the data on an M122 tripod mount.

CONDITIONS: Given a tripod-mounted M60 machinegun, and a range card.

STANDARD: Read direction and elevation from the range card and correctly set the data on M122 tripod mount.

1. Read direction.
2. Read elevation (major and minor).
3. Remarks (wide targets).

TRAINING OBJECTIVE 5

Engage point and area targets in the defense with an M60 machinegun.

TASK: Engage point and area targets.

CONDITIONS: As a gunner, on a day defensive range, operating with a pair of machineguns under the control of a leader, given an M60 machinegun, assistant gunner, ammunition, and targets.

STANDARD: All targets must be engaged and hit IAW chapter 7.

INTERMEDIATE TRAINING OBJECTIVES

ITO 1. Engage a point target.

CONDITIONS: As gunner, on a day defensive range, under the control of a leader, given an M60 machinegun, assistant gunner, ammunition, and target.

STANDARD: The gunner must:

1. Receive and repeat the fire command.
2. Locate the target.
3. Apply the announced range to his sight.
4. Fire on command.
5. Adjust his fire, using his observations and the instructions of the assistant gunner.
6. Cease fire on command.

ITO 2: Engage three area targets.

CONDITIONS: As a gunner, on a day defensive range, under the control of a leader, given an M60 machinegun, ammunition, and three targets: one linear target, one linear-with-depth target, and one deep target.

STANDARD: The gunner must accomplish the following for each target:

1. Receive and repeat the fire command.
2. Locate the target.
3. Apply the announced range to his sight.
4. Aim at the center of the target.
5. Fire on command.
6. Traverse, search, or traverse and search fire throughout the entire target area, IAW chapter 7.
7. Adjust his fire, using his own observations and the instructions of the assistant gunner.
8. Cease fire on command.

TRAINING OBJECTIVE 6

Engage point and area targets with the M60 machinegun in the dismounted attack.

TASK: Engage point and area targets.

CONDITIONS: As a gunner, in the dismounted attack, on an assault fire range, given an M60 machinegun, ammunition, and targets.

STANDARD: Targets must be engaged IAW chapter 7.

INTERMEDIATE TRAINING OBJECTIVES

ITO 1: Engage a point target.

CONDITIONS: As a gunner, in the dismounted attack, on an assault fire range, using the shoulder firing position, given an M60 machinegun, 40 rounds of ammunition, and a target.

STANDARD: The target must be engaged and hit IAW chapter 7.

ITO 2: Engage an area target.

CONDITIONS: As a gunner, in the dismounted attack, on an assault fire range, using the underarm firing position, given an M60 machinegun, 30 rounds of ammunition, and a target.

STANDARD: The entire target must be engaged IAW chapter 7.

ITO 3: Engage an area target.

CONDITIONS: As a gunner, in the dismounted attack, on an assault fire range, using the hip firing position, given an M60 machinegun, 30 rounds of ammunition, and a target.

STANDARD: The entire target must be engaged IAW chapter 7.

TRAINING OBJECTIVE 7

Engage targets during limited visibility.

TASK: Engage targets during limited visibility.

CONDITIONS: As a gunner in an infantry fighting position, on a predetermined fire range, given an M60 machinegun, assistant gunner, ammunition, and an AN/PVS-4 night vision device.

STANDARDS: Targets must be engaged by suing a range card, the AN/PVS-4, and field expedients.

INTERMEDIATE TRAINING OBJECTIVES

ITO 1: Construct an infantry fighting position for the M60 machinegun.

CONDITIONS: As a gunner, on a predetermined fire range in daylight, given an M60 machinegun, tripod, assistant gunner, and entrenching tools.

STANDARD: Construction must be IAW FM 7-7.

ITO 2: Construct a machinegun range card.

CONDITIONS: As a gunner, on a predetermined fire range in daylight, given an M60 machinegun, tripod, assistant gunner, pencil, paper, and 40 rounds of ammunition.

STANDARD: Within 15 minutes, the gunner must:

1. Complete the sketch section IAW chapter 8.

2. Lay on each probable target and read direction and elevation IAW chapter 8.

3. Complete the data section IAW chapter 8.

ITO 3: Mount and zero the AN/PVS-4 night vision device on the M60 machinegun.

CONDITIONS: As a gunner, on a predetermined fire range in daylight, given a tripod-mounted M60 machinegun, assistant gunner, AN/PVS-4, and 30 rounds of ammunition.

STANDARD: Within 25 minutes, the gunner must:

1. Attach the AN/PVS-4 to its mount on the M60 machinegun.

2. Put the AN/PVS-4 into operation.

3. Lay the gun on a target at a range between 100 and 300 meters using the machinegun iron sights.

4. Fire to confirm the lay.

5. Without moving the gun, aline the AN/PVS-4 sight reticle on the target.

6. Fire to confirm the zero of the AN/PVS-4.

7. Make adjustments as required.

ITO: 4: Construct field expedients for controlling the fire of an M60 Machinegun.

CONDITIONS: As a gunner, on a petermined fire range in daylight, given an M60 machinegun, tripod, assistant gunner, luminous tape, bayonet, assorted tree limbs, and 40 rounds of ammunition.

STANDARD: The gunner must construct three field expedients, IAW chapter 8.

TRAINING OBJECTIVE 8

Engage targets with suppressive fire from a moving vehicle, using the M60 machinegun.

TASK: Suppress targets from a moving vehicle.

CONDITIONS: As a gunner, on a machinegun range in daylight, firing from a vehicle moving at 10 mph over level ground; given an M60 machinegun mounted on an M151 1/4-ton or M113A1 armored personnel carrier (as described in chapter 3), 100 rounds of ammunition, and a 500-meter double "E" silhouette target.

STANDARD: The gunner must hit the target once within 30 seconds. Firing should be done IAW chapter 3.

TRAINING OBJECTIVE 9

Engage aircraft.

TASK: Engage aircraft.

CONDITIONS: As a gunner, on a machinegun range in daylight, given an M60 machinegun, ammunition, remote-controlled model aircraft.

STANDARD: The gunner must engage the remote-controlled model aircraft first using the football-field technique and then using the reference-point technique, IAW appendix F, and TC 23-44.

TRAINING OBJECTIVE 10

Engage targets while wearing the protective mask.

TASK: Engage targets while wearing the protective mask.

CONDITIONS: As a gunner, on a machinegun range, while wearing the protective mask, given an M60 machinegun, 100 rounds of ammunition, and targets.

STANDARD: Gunner must engage targets at 300, 400, and 800 meters, firing a maximum of three bursts at each target, within 4 minutes. The gunner must hit each target at least once.

GENERAL TRAINING SCHEDULE

This schedule is a guide to help the leader in determining his training needs and how to organize his training to meet those needs.

Training is divided into three phases and into periods within phases. Phase I is designed to determine through qualification which soldiers should be gunners. Phase II deals with the mechanical aspects of the M60 machinegun. Phase III is set up to make gunners expert in all aspects of firing the M60 machinegun.

The performance evaluations are based on the standards set for training and will determine if the standards have been met. An explanation of each practical exercise is given in the paragraph on General Guidance.

Phase I, Period 1 (4 hours) - 10-Meter Basic Course.

Introduction to the M60 machinegun, to include characteristics, nomenclature, capabilities, and functioning ..... 10 minutes

Mounting the machinegun on its tripod, and manipulation of the traversing and elevating mechanism ..... 10 minutes

Preparatory marksmanship instruction to include sight alinement, sight picture, trigger control, bipod and tripod position, and grip ..... 10 minutes

Prefire checks, function checks, loading, immediate action, clearing, and range safety ..... 10 minutes

10-meter basic machinegun firing, to include zeroing on the 10-meter target, engaging the target, and scoring the target ..... 20 minutes

Zeroing and practice and record firing on the 10-meter range (practical exercise) ..... 180 minutes

TOTAL 240 minutes

Phase I, Period 2 (3 hours) - Machinegun Transition Course.

NOTE: Only those gunners who have scored 65 points on the record firing during period 1 should advance to period 2.

Introduction to field firing, to include transition range setup and operation ..... 15 minutes

Preparatory marksmanship training, to include bipod position, grip, field zeroing, observing and adjusting fire, target detection, the adjusted-aiming-point technique of fire, and range estimation ..... 165 minutes

TOTAL 180 minutes

Phase II, Period 1 (2 hours) - Detailed Disassembly and Assembly.

NOTE: Only those gunners who have qualified with the M60 during Phase I should advance to Phase II.

Detailed disassembly ..... 20 minutes

Inspection ..... 5 minutes

Cleaning ..... 5 minutes

Lubrication ..... 5 minutes

Maintenance ..... 5 minutes

Assembly ..... 20 minutes

Detailed disassembly and assembly (practical exercise) ..... 60 minutes

TOTAL 120 minutes

Phase II, Period 2 (1 hour) - Obtaining Predetermined Data.

Obtaining direction readings from the M122 tripod for a range card ..... 10 minutes

Obtaining elevation readings from the traversing and elevating mechanism for a range card ..... 20 minutes

Obtaining direction and elevation readings to probable target areas (practical exercise) ..... 30 minutes

TOTAL 60 minutes

Phase III, Period 1 (3 hours)–Day Defensive Course:

Introduction to day defensive firing, to include techniques of engaging point and area targets independently or as one of a pair of machineguns .....30 minutes

Controlling machinegun fires, to include fire commands and arm-and-hand signals ..... 15 minutes

Day defensive firing (practical exercise) ..... 135 minutes

TOTAL 180 minutes

Phase III, Period 2 (1 hour) - Assault Firing Course.

Introduction to assault firing, to include positions, rates of fire, tactical employment, observation, and adjustment of fire ..... 20 minutes

Assault firing (practical exercise)...40 minutes

TOTAL 60 minutes

Phase III, Period 3 (4 hours) - Night Firing.

Introduction to predetermined and night firing, to include the range card, field expedients, AN/PVS-4, and infantry fighting position ..... 25 minutes

Range card construction .. 60 minutes

Mounting and zeroing the AN/PVS-4 Night Vision Device ..... 10 minutes

Constructing field expedients to control machinegun fire ..... 20 minutes

Predetermined and night firing (practical exercise)..... 125 minutes

TOTAL 240 minutes

Introduction to moving firing, to include position and grip, rate and technique of fire, effective ranges, and the vehicular mount ..... 30 minutes

Moving firing (practical exercise).. 150 minutes

TOTAL 180 minutes

Phase III, Period 5 (2 hours) - Air Defense Firing.

Introduction to air defense firing, to include passive and active measures, rule of engagement, and techniques of fire ..... 30 minutes

Aircraft engagement firing (practical exercise) ..... 90 minutes

TOTAL 120 minutes

Phase III, Period 6 (1 hour) - Masked Firing (NBC).

Introduction to operating the M60 under NBC conditions ..... 30 minutes

Masked firing (practical exercise) ..30 minutes

TOTAL 60 minutes

Summary of Total Hours

Phase I, Period 1	4 hours
Phase I, Period 2	3 hours
TOTAL	7 hours
Phase II, Period 1	2 hours
Phase II, Period 2	1 hour
TOTAL	3 hours
Phase III, Period 1	3 hours
Phase III, Period 2	1 hour
Phase III, Period 3	4 hours
Phase III, Period 4	3 hours
Phase III, Period 5	2 hours
Phase III, Period 6	1 hour
TOTAL	14 hours

TRAINING TIME 24 HOURS

The training program is based on performance-oriented training. time devoted to conference, explanation, and demonstration has been minimized. The soldier will learn by doing rather than by listening and watching. Emphasis is on the small-group, hands-on method of achieving the training objectives. Soldiers should practice the action in the training objectives until they become proficient. When the soldier appears proficient, he should be tested by a non-commissioned officer on a pass/fail or GO/NO GO basis. If the soldier fails an evaluation test, he should continue to practice and be retested. those soldiers who have passed the evaluation tests may be used to assist in the training/evaluation of the soldiers experiencing difficulty. The recommended soldier to instructor ratio is 4:1. The training program, as written, is compressed to minimum time. When scheduled, consideration must be given to poor weather, training equipment availability, and soldier/instructor ratio greater than 4:1. Any of these conditions will dictate additional time. Recommend normal scheduling of 7 hours per day.

The training program should be conducted semiannually. This is necessary since the M60 machinegun, in some units, may not be assigned a dedicated gunner. As a minimum, it is recommended that the

platoon leader, all leader noncommissioned officers in the platoon, and three soldiers per squad be proficient with the M60 machinegun.

TRAINING AIDS AND EQUIPMENT

The M60 machinegun is the best training aid available for conducting training. Other training aids may be constructed using the illustrations in this field manual. These training aids should not limit the instructor's imagination or replace any other training aids which may be available or listed in training catalogs. Whenever possible, local training and audiovisual support centers (TASCs) should be utilized to obtain desired training aids and devices. TASCs will lend and/or fabricate the required aids and devices.

NOTE: Although specific targets are cited in the tables in chapter 9 and 10, the local availability of targets is a consideration. Therefore, any meaningful and realistic target may be constructed or used. Targets should be placed at the ranges specified.

Facilities. Ranges (with bleachers) which are suitable for firing the M60 machinegun. Ranges should also be capable of supporting practical exercises and concurrent training stations. Figures throughout this manual show schematic diagrams and dimensions of machinegun ranges.

Personnel. One instructor per four soldiers. Should more than four soldiers be taught by an instructor, the time to conduct the training program may be increased. A trained safety officer/noncommissioned officer must be present during all firing.

Ammunition. The recommended amounts of ammunition to be fired in each exercise can be found in the tables for firing each type of range throughout the manual. Soldiers should fire 100 rounds while moving, 200 rounds at the aircraft, and 100 rounds while wearing the protective mask.

GENERAL GUIDANCE FOR PRACTICAL EXERCISES

Phase I, Period 1 (4 hours)--10-Meter Basic Course: See chapter 9.

Phase I, Period 2 (3 hours)--Machinegun Transition Course: See chapter 9.

Phase II, Period 1 (2 hours)--Detailed Disassembly and Assembly: See chapter 2.

Phase II, Period 2 (1 hour)--Obtaining Predetermined Data: See chapter 10.

Phase III, Period 1 (3 hours)--Day Defensive Course: See chapter 10.

Phase III, Period 2 (1 hour)--Assault Firing Course: See chapter 10.

Phase III, Period 3 (4 hours)--Night Firing (Predetermined Firing Course): See chapters 8 and 10.

Phase III, Period 4 (3 hours)--Firing on the Move:

- A local range with a 200-meter firing line over which a vehicle can be driven. Ideally, the vehicle should be able to move 100 meters downrange.
- Gunners should fire 200 rounds over the side of the vehicle and 100 rounds forward.
- The vehicle should move at least 10 mph.

Phase III, Period 5 (2 hours) - Air Defense Firing:

- Use a remote controlled model aircraft.
- Fly the aircraft about 200 meters downrange and parallel to the firing line.
- On the first pass, use the football field technique of fire.

- On the next pass, use the reference point technique.
- Fly the aircraft from 600 meters downrange directly at the firing line. Gunners should aim above the nose of the aircraft.
- Fire a minimum of two M60 machineguns on each pass. M16A1 rifles and other weapons may be incorporated into the firing.

Phase III, Period 6 (1 hour) - Masked Firing (NBC): See training objective 10.

APPENDIX F

M60 in Air Defense

This appendix describes the use of the M60 machinegun in an air defense role, including the concept and the two techniques. Also discussed are the rules of engagement and firing positions.

PASSIVE AND ACTIVE MEASURES

A unit can take passive and active measures to defend itself against enemy air attack. Passive measures are those that help the unit identify enemy aircraft before they locate the unit, make the unit difficult to locate, and make the unit less vulnerable when attacked. The unit must develop and practice camouflage as a passive measure. Concealment from the air must be considered when selecting routes of travel or defensive positions. The use of air guards is important to give the unit time to react. Air guards should be used to cover intelocking sectors of visible air space.

Active measures for appropriate reactions to an air attack should be prescribed in unit SOPs. There are two techniques involved when using active measures, each of which is based on delivering a heavy volume of fire ahead of the target. Accuracy is not the major concern. The idea is to have every soldier in the unit engage the target. To achieve volume fire, soldiers armed with machineguns should fire at the cyclic rate.

Although volume fire is the key and accuracy is not the major concern, there is a need to get the fire coordinated and accurate.

If an aircraft is attacking his position, the soldier sees the aircraft in a head-on or diving view. To engage this aircraft, the soldier would fire slightly above its nose. Adjacent units would see the aircraft in a crossing view. To engage the aircraft, these units would have to apply a proper lead. The method of applying lead depends on the technique used.

The first technique is the football-field technique, used primarily in the offensive. When engaging high-performance aircraft (those flying in excess of 200 mph), gunners should apply a one-football-field lead in front of the target and fire at the cyclic rate until the target passes through the tracer stream.

If the target is a low-performance aircraft, such as a helicopter, with a speed of 200 mph or less, gunners should apply a one-half football-field lead in front of the target, again firing the cyclic rate. With all soldiers firing, a curtain of fire is formed. This is due

to slight differences in each soldier's estimate of the distance and lead (football-field lead).

The next technique is the reference-point technique, which is used primarily in the defense. The unit leader designates terrain features as reference points. Upon spotting enemy aircraft, the leader commands, ENEMY AIR, REFERENCE-POINT 1. At this time, the soldier points his gun at reference point 1, elevates the gun approximately 45 degrees above the ground, and fires on command. Once the gunner sights the target, he can make minor adjustments to aline his fire on the target.

RULES OF ENGAGEMENT

When planning for air defense, it is important to consider the use of tracers so that the gunner can observe the tracer stream and better aline his fire on the target.

A unit may engage an attacking aircraft without command. If an aircraft is not attacking, the unit may not fire on it unless ordered to fire. The unit leader will have the authority to make the decision to fire, and the decision will be based on the estimate of situation, guidance from higher headquarters, and identification of the aircraft as hostile.

FIRING POSITION

When firing the M60 machinegun in an air defense role, the gunner should fire from a protected position if possible. He must get the gun pointed in the air and choose a firing support. In a real emergency, another soldier can act as a hasty firing support. If the gun is mounted on a ¼-ton truck or an APC, the gunner just elevates the gun and fires on the target. In the offensive, the hip firing position is recommended.

APPENDIX G

Mounting and Zeroing the Night Vision Devices

This appendix deals with mounting and zeroing the AN/PVS-4 and the AN/PVS-2 (starlight scopes) on the M60 machinegun.

MOUNTING AND ZEROING THE AN/PVS-4

MOUNTING

Remove the M60 hinge-pin latch and hinge pin from the cover assembly by pressing on the latch (open end of pin) with an empty cartridge case, and separate the latch and pin. Place the pin and latch in the aiming guides on the left side of the mounting bracket and press together.

Position the mounting-bracket assembly on top of the machinegun cover so that the holes in the front of the bracket aline with the cover-assembly pin holes.

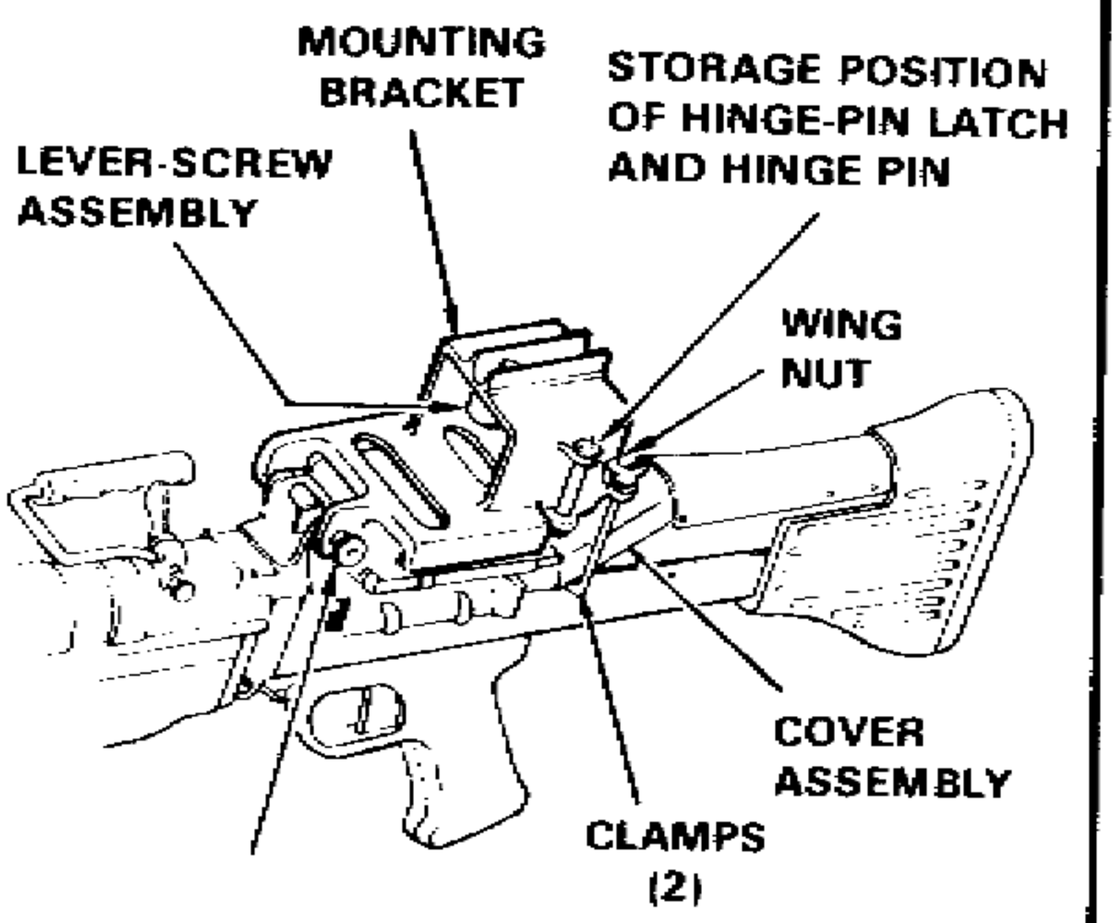
Insert the longer hinge pin supplied with the bracket through the bracket-and-cover assembly, and secure by inserting the hinge-pin latch.

Loosen the wingnuts on both leg clamps and position the clamps under the cover assembly. Secure the mounting bracket by tightening the wingnuts firmly.

NOTE: Place the split washer next to the wingnut, and the flat washer next to the bracket.

Install the sight on the M60 mounting-bracket assembly by positioning it in the groove on trop of the bracket so that the scribed line on the bracket is alined with the scribed line on the sight-mounting adapter. Tighten the lever-screw assembly to secure the sight to the bracket. Use an empty cartridge case placed over the lever arm to increase leverage as the screw is tightened.

INSTALLATION OF MOUNTING BRACKET

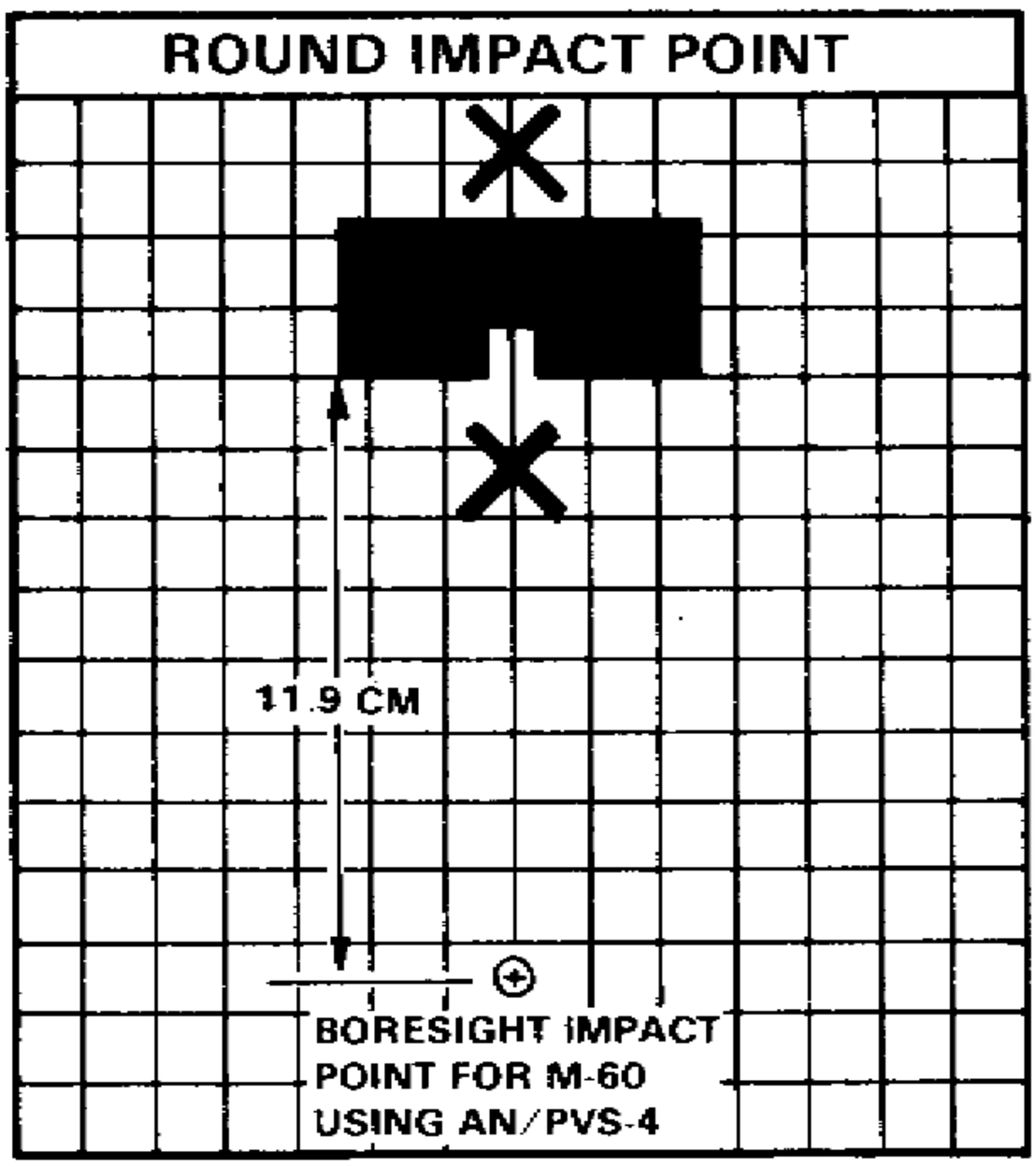


HINGE-PIN LATCH AND HINGE-PIN IN POSITION

ZEROING

The procedures for zeroing the AN/PVS-4 are basically the same as those for the M16 rifle.

- **Select a target with an aiming point at a range of 25 meters.**
- **Support the gun in a stable firing position.**
- **Place the sight in operation and adjust the azimuth and elevation controls so that the reticle aiming point is about in the center of the field-of-view of the sight.**
- **Fire a few rounds to seat the sight on the gun. Re-tighten the mounting knob.**
- **Place the zeroing range aiming point of the reticle on the target aiming point and fire enough rounds to get a good shot group. Locate the center of the shot group.**
- **Adjust the reticle until the center of the shot group is 11.9 cm directly below the target aiming point.**



MOUNTING AND ZEROING THE AN/PVS-2

MOUNTING

The AN/PVS-2 is mounted on the M60 machinegun adapter bracket. To mount the scope, rotate the lock knobs of the boresight-mount assembly forward (toward objective lens) until they come to a stop on the pins located on the assembly. Slide the boresight-mount assembly onto the guide rail of the adapter bracket from the rear until it is positioned against the pin stop of the guide rail. Lock the scope to the adapter bracket by rotating the two locking knobs of the boresight-mount assembly rearward.

ZEROING

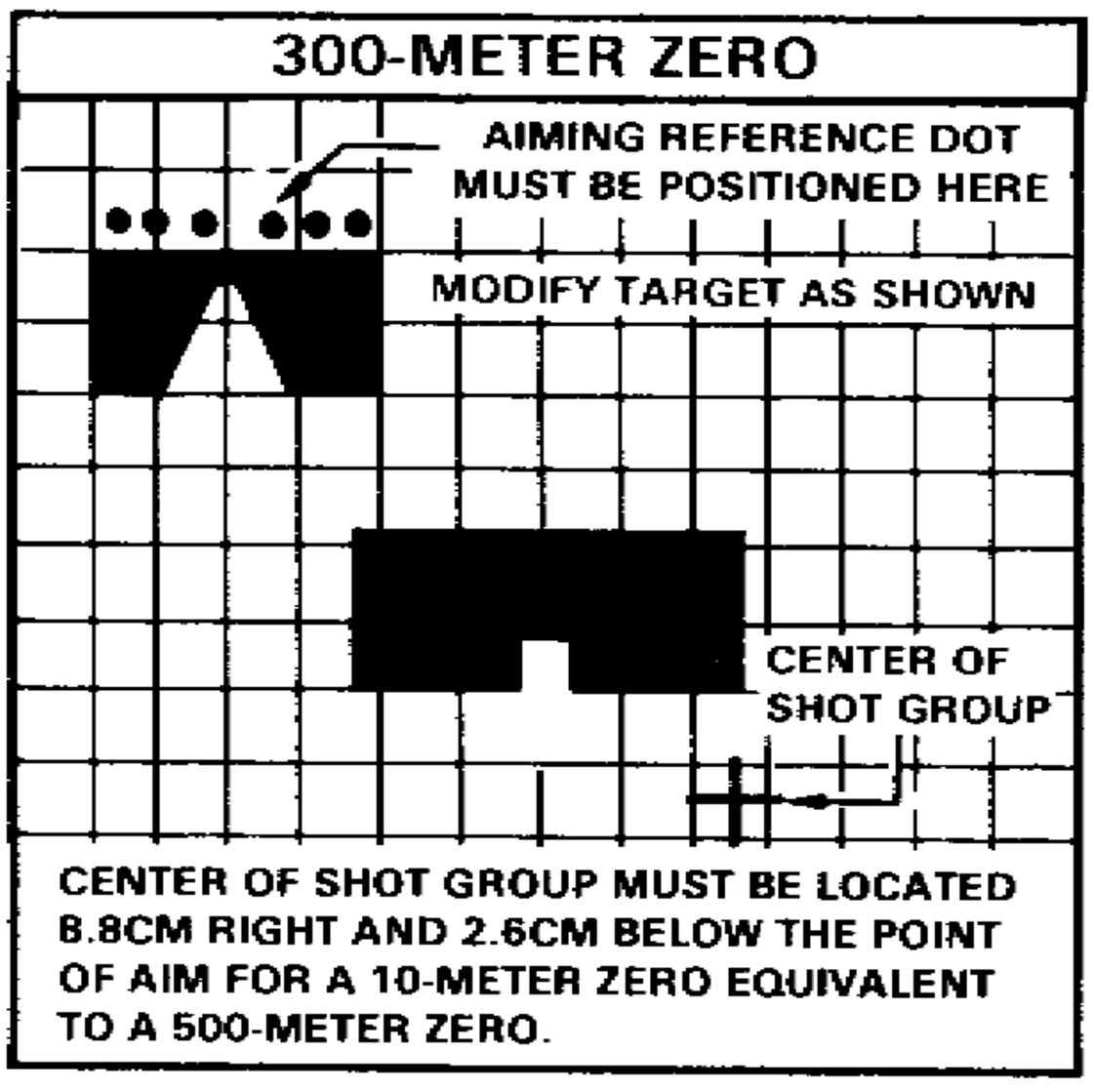
The procedures used to zero the AN/PVS-2 to the M60 machinegun are basically the same as those for the rifle. Zeroing can be accomplished using the basic (10-meter) method, known-distance method, or the field-expedient method. Regardless of which procedure is used, the basic marksmanship techniques as described in chapter 9 will apply.

Basic (10-Meter) Zero. This method of zeroing is equivalent to a 300-meter zero and may be used when engaging targets at ranges of 500 meters or less. The standard 25-meter target, modified as shown, is used instead of the standard machinegun target; however, the target is still positioned 10 meters from the muzzle of the gun. Zeroing is accomplished as follows:

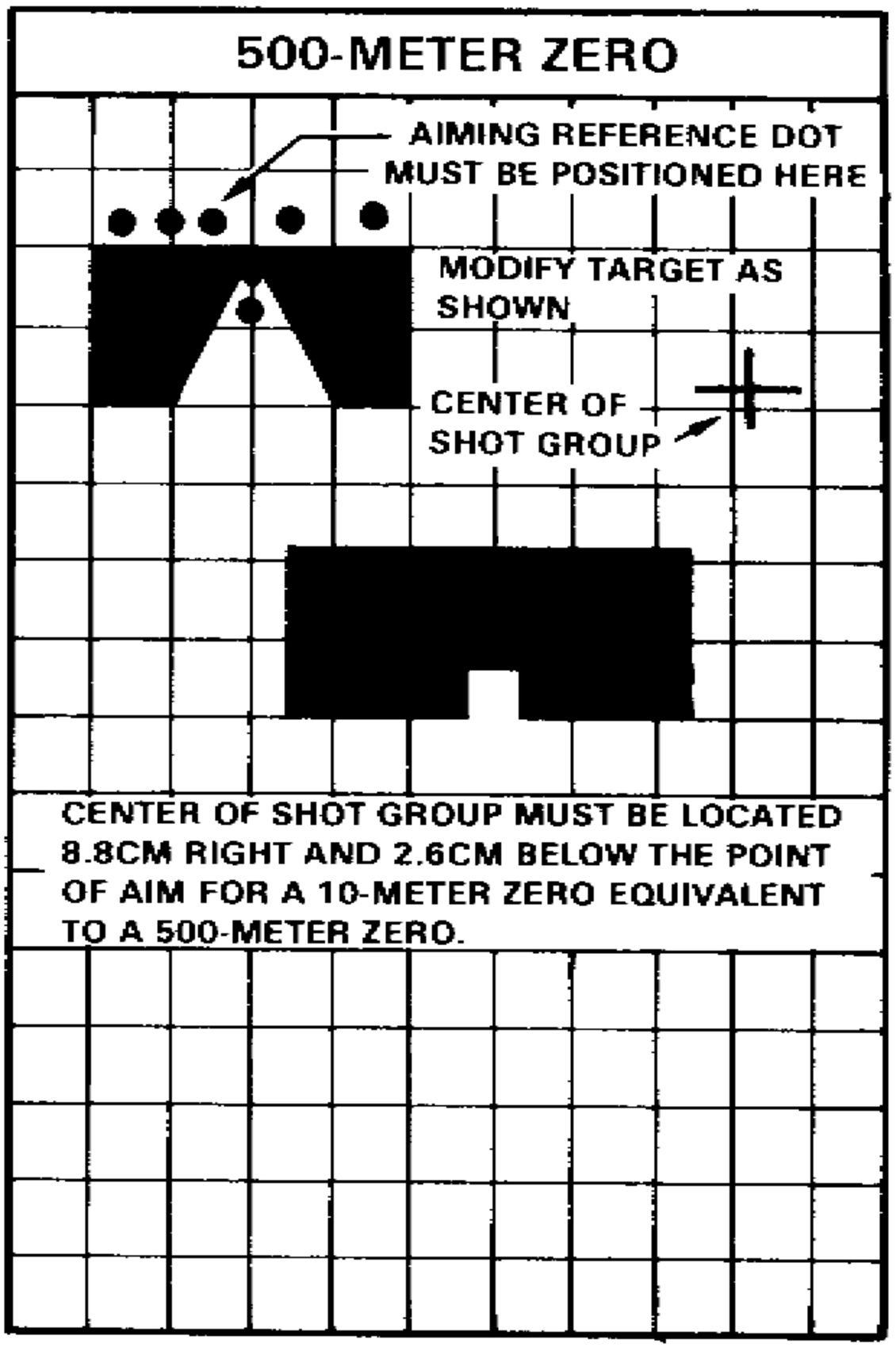
- **Zero the machinegun first, then mount the AN/PVS-2 as previously described.**
- **Sight through the AN/PVS-2 and position the aiming reference dot of the sight reticle on the target. Fire three rounds (single shot) to establish a shot group. Insure that the aiming reference dot is positioned at the same point of aim each time a round is fired.**

- **Check the target to determine the location of the center of the shot group in relation to where the rounds must strike the target for an accurate zero. The correct relationship between the point of aim and the center of the shot group must be obtained to have an accurate 10-meter zero. If the center of the shot group is not correct, then the operator must adjust the elevation and/or azimuth adjustment knob of the AN/PVS-2 to bring the point of aim and the center of the shot group into proper alinement.**

- **After making adjustments for elevation and/or deflection, re-lay on the target and fire a confirming round. If the round does not strike the target at the desired location, treat this hit as the center of a three-round shot group, make further adjustments as necessary, and fire another round. Continue this procedure until the point of aim and the strike of the round are in the proper relationship.**



The AN/PVS-2 may also be zeroed to the M60 machinegun at 10 meters to correspond to a 500-meter zero. This is accomplished by following the procedures as outlined for 300-meter zeroing; however, the point of aim and the center of the shot group must be alined.



Known-Distance Target Method. When using this method to zero the M60 machinegun, the tripod should be used. If the tripod is not available, a stable rest must be provided for the gun and AN/PVS-2 combination.

- **Zero the machinegun.**

- **Mount the AN/PVS-2 and carry out operating instructions as previously described.**
- **Select a target at a known distance. Place this range setting on the rear sight and aline the sight on the distant aiming point.**
- **Without disturbing the lay of the gun, sight through the AN/PVS-2 and aline the aiming reference dot on the same point of aim.**
- **Recheck to insure that the lay of the gun has not been disturbed and that both sights are alined on the same point of aim on the target.**
- **If the situation permits, fire a few rounds to confirm the zero.**

Field-Expedient Zero. With an observer, a field-expedient zero is accomplished on a distant target. The gunner places the reference dot on the point of aim and fires one round. The observer notes the strike of the round (with binoculars during daylight, and a starlight scope during darkness). He gives the elevation and deflection change necessary to bring the strike to the point of aim. He continues this procedure until zeroed for that range. Because the gunner is making a sight change based on one shot, it is extremely important that the shot be well-aimed and correctly fired. He should use his most stable firing position.

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