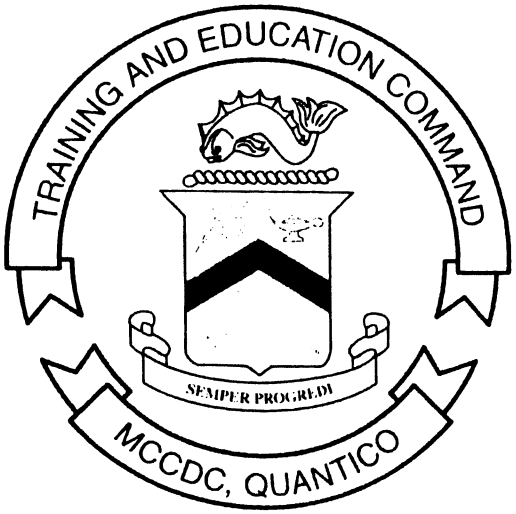
MCI 0322J

MARINE CORPS INSTITUTE



THE M252, 81MM MORTAR CREWMAN

MARINE BARRACKS
WASHINGTON, DC

UNITED STATES MARINE CORPS
MARINE CORPS INSTITUTE
912 POOR STREET SE
WASHINGTON, DC 20391-5680

IN REPLY REFER TO:
03.22j
15 Jul 97

MCI 03.22, THE M252, 81-MM MORTAR CREWMAN

1. Purpose. MCI course 03.22j, The M252, 81-MM Mortar, has been published to provide distance training to all Marines assigned as 81-MM mortar crewmen.

2. Scope. MCI 03.41 addresses all entry level tasks that should be known by any Marine who functions as a member of an M252, 81-MM mortar crew. The objective of this course is to provide the mortar crewman with a basic knowledge of the M252, 81-MM mortar. Upon completion of this course, the mortar crewman will be familiar with the following: the nomenclature and characteristics of the M252, 81-MM mortar, sighting equipment and sight manipulation, ammunition and fuzes, placing the mortar into action, and techniques of fire. The course will provide instruction in the maintenance and inspection of the M252, 81-MM mortar.

3. Applicability. This course is intended for instructional purposes only. It is designed for use by Marines in the ranks of private through sergeant who are assigned as members of an 81-MM mortar squad.

4. Recommendations. Comments and recommendations on the contents of the course text are invited and will aid in subsequent course revisions. Please complete the course evaluation questionnaire located at the end of the text and return it to:

Director (CDD # 3)
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Lieutenant Colonel, U.S. Marine Corps
Deputy Director

THE M252, 81-MM MORTAR CREWMAN

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Student Information

Number and Title	MCI 0322J THE M252, 81-MM MORTAR CREWMAN
Study Hours	12
Course Materials	Text
Review Agency	School of Infantry, Marine Corps Base, Camp Lejeune, NC School of Infantry, Marine Corps Base, Camp Pendleton, CA
Reserve Retirement Credits (RRC)	4
ACE	Not applicable to civilian training/education
Assistance	For administrative assistance, have your training officer or NCO log on to the MCI home page at www.mci.usmc.mil. Marines CONUS may call toll free 1-800-MCI-USMC. Marines worldwide may call commercial (202) 685-7596 or DSN 325-7596.

Study Guide

Congratulations

Congratulations on your enrollment in a distance learning course from the Distance Learning and Technologies Department (DLTD) of the Marine Corps Institute (MCI). Since 1920, the Marine Corps Institute has been helping tens of thousands of hard-charging Marines, like you, improve their technical job performance skills through distance training. By enrolling in this course, you have shown a desire to improve the skills you have and master new skills to enhance your job performance. The distance learning course you have chosen, MCI 03.22j, *The M252, 81-MM Mortar Crewman,* provides mortar crewmen with a basic knowledge of M252, 81-MM mortar. You will be familiar with the nomenclature and characteristics of the M252, 81-MM mortar, sighting equipment and sight manipulation, ammunition and fuzes, placing the mortar into action, and techniques of fire. This course will instruct in the maintenance and inspection of the M252, 81-MM mortar.

Your Personal Characteristics

- **YOU ARE PROPERLY MOTIVATED.** You have made a positive decision to get training on your own. Self-motivation is perhaps the most important force in learning or achieving anything. Doing whatever is necessary to learn is motivation. You have it!

- **YOU SEEK TO IMPROVE YOURSELF.** You are enrolled to improve those skills you already possess, and to learn new skills. When you improve yourself, you improve the Corps!

- **YOU HAVE THE INITIATIVE TO ACT.** By acting on your own, you have shown you are a self-starter, willing to reach out for opportunities to learn and grow.

- **YOU ACCEPT CHALLENGES.** You have self-confidence and believe in your ability to acquire knowledge and skills. You have the self-confidence to set goals and the ability to achieve them, enabling you to meet every challenge.

- **YOU ARE ABLE TO SET AND ACCOMPLISH PRACTICAL GOALS.** You are willing to commit time, effort, and the resources necessary to set and accomplish your goals. These professional traits will help you successfully complete this distance training course.

Continued on next page

Study Guide, Continued

Beginning Your Course

Before you actually begin this course of study, read the student information page. If you find any course materials missing, notify your training officer or training NCO. If you have all the required materials, you are ready to begin.

To begin your course of study, familiarize yourself with the structure of the course text. One way to do this is to read the table of contents. Notice the table of contents covers specific areas of study and the order in which they are presented. You will find the text divided into several study units. Each study unit is comprised of two or more lessons, lesson exercises, and finally, a study unit exercise.

Leafing Through the Text

Leaf through the text and look at the course. Read a few lesson exercise questions to get an idea of the type of material in the course. If the course has additional study aids, such as a handbook or plotting board, familiarize yourself with them.

The First Study Unit

Turn to the first page of study unit 1. On this page you will find an introduction to the study unit and generally the first study unit lesson. Study unit lessons contain learning objectives, lesson text, and exercises.

Reading the Learning Objectives

Learning objectives describe in concise terms what the successful learner, you, will be able to do as a result of mastering the content of the lesson text. Read the objectives for each lesson and then read the lesson text. As you read the lesson text, make notes on the points you feel are important.

Completing the Exercises

To determine your mastery of the learning objectives and text, complete the exercises developed for you. Exercises are located at the end of each lesson, and at the end of each study unit. Without referring to the text, complete the exercise questions and then check your responses against those provided.

Continued on next page

Continuing to March

Continue on to the next lesson, repeating the above process until you have completed all lessons in the study unit. Follow the same procedures for each study unit in the course.

Preparing for the Final Exam

To prepare for your final exam, you must review what you learned in the course. The following suggestions will help make the review interesting and challenging.

- **CHALLENGE YOURSELF.** Try to recall the entire learning sequence without referring to the text. Can you do it? Now look back at the text to see if you have left anything out. This review should be interesting. Undoubtedly, you'll find you were not able to recall everything. But with a little effort, you'll be able to recall a great deal of the information.

- **USE UNUSED MINUTES.** Use your spare moments to review. Read your notes or a part of a study unit, rework exercise items, review again; you can do many of these things during the unused minutes of every day.

- **APPLY WHAT YOU HAVE LEARNED.** It is always best to use the skill or knowledge you've learned as soon as possible. If it isn't possible to actually use the skill or knowledge, at least try to imagine a situation in which you would apply this learning. For example make up and solve your own problems. Or, better still, make up and solve problems that use most of the elements of a study unit.

- **USE THE "SHAKEDOWN CRUISE" TECHNIQUE.** Ask another Marine to lend a hand by asking you questions about the course. Choose a particular study unit and let your buddy "fire away." This technique can be interesting and challenging for both of you!

- **MAKE REVIEWS FUN AND BENEFICIAL.** Reviews are good habits that enhance learning. They don't have to be long and tedious. In fact, some learners find short reviews conducted more often prove more beneficial.

Continued on next page

Study Guide, Continued

Tackling the Final Exam

When you have completed your study of the course material and are confident with the results attained on your study unit exercises, take the sealed envelope marked **"FINAL EXAM"** to your unit training NCO or training officer. Your training NCO or officer will administer the final examination and return the examination and the answer sheet to MCI for grading. Before taking your final examination, read the directions on the DP-37 answer sheet carefully.

Completing Your Course

The sooner you complete your course, the sooner you can better yourself by applying what you've learned! HOWEVER--you do have 2 years from the date of enrollment to complete this course.

Graduating!

As a graduate of this distance education course and as a dedicated Marine, your job performance skills will improve, benefiting you, your unit, and the Marine Corps.

Semper Fidelis!

STUDY UNIT 1

INTRODUCTION TO THE M252, 81-MM MORTAR

Introduction. The 81-MM mortar is an indirect-fire weapon organic to the Weapons Company of the Marine infantry battalion. It is the answer to the infantry battalion commander's desire and need for a lightweight weapon capable of close and continuous fire support. In the absence of artillery, air, and naval gunfire, the battalion commander must rely upon the 81-MM mortar platoon to provide the firepower to successfully carry out the mission of the battalion. It is imperative that all personnel in the mortar platoon be thoroughly trained in their duties and understand the capabilities and limitations of the weapon, the M252, 81-MM mortar.

Lesson 1. THE 81-MM MORTAR PLATOON

LEARNING OBJECTIVES

1. State the mission of the 81-MM mortar platoon.

2. Identify the 81-MM mortar platoon organization.

3. List the members of the 81-MM mortar platoon.

4. Match the members of the 81-MM mortar platoon with the duties they perform.

1101. Mission of the 81-MM mortar platoon.

The 81-MM mortar platoon operates as a close knit unit. To do this, each Marine has to know the mission and organization of the platoon and the duties of each member of the platoon. Should one Marine become a casualty, two more should be ready to fill his place. Knowing how the platoon operates is imperative to accomplishing the mission.

The mission of the 81-MM mortar platoon is to provide continuous close fire support for the battalion's units when in the offense or the defense. The 81-MM mortar is commonly referred to as the battalion commander's personal artillery. The personnel of the mortar platoon are tactically deployed in one of three places:

(1) the mortar position (MP).
(2) the fire direction center (FDC).
(3) the forward observer teams (FO).

1102. Organization of the 81-MM mortar platoon.

The mortar platoon, within the weapons company, is made up of one officer and sixty-eight enlisted Marines. The mortar platoon is broken down into a platoon headquarters and two mortar sections. Each section has four mortar squads with one 81-MM mortar per squad.

a. The platoon headquarters consists of one officer and four enlisted Marines.

(1) Platoon Commander (1st/2nd Lt). He is responsible for the operation of the platoon. From time to time, he may also be required by the battalion commander to act as an advisor within the battalion Fire Support Coordination Center (FSCC) on the employment of the platoon while in the field.

(2) Platoon Sergeant/Operations (OPS) Chief (GySgt). He is responsible for the operation of the platoon Fire Direction Center (FDC) and assists the platoon commander with the training and movement of the platoon.

(3) Ammunition Technician (Ammo Tech) (LCpl). The ammo tech is responsible for getting ammunition for the platoon. He is an expert on ammunition and fuzes.

(4) Ammunition Man (Pvt). He provides local security for the FDC while in the field and also assists the platoon sergeant and ammo tech with various tasks.

(5) Ammunition Man/Driver (Pvt). He is responsible for the operation and maintenance of his assigned vehicle. He is also used from time to time as a messenger/runner for the platoon.

b. The mortar section consists of a section headquarters and four mortar squads. There is a total of 32 enlisted Marines in each section.

(1) The mortar section headquarters consists of eight enlisted Marines.

(a) Section leader (SSgt) - responsible for training and employment of the section.

(b) Ammunition NCO (LCpl) - responsible for getting ammunition and supplies for the section.

(c) Ammo man/driver (LCpl) - responsible for operation and maintenance of section vehicle.

(d) Plotter (Sgt)

(e) Plotter/recorder (Cpl)

(f) Recorder/driver (LCpl)

(g) Forward Observer (Cpl) - calls for fire requests and adjusts fire onto targets (2 per section).

(2) The mortar squad is the basic unit of the mortar platoon and is responsible for the operation and maintenance of the mortar and equipment assigned to the squad. The mortar squad (four per section) consists of six enlisted Marines.

(a) Squad leader (Sgt) - supervises the emplacement, laying and firing of the mortar.

(b) Gunner (Cpl) - places the firing data on the sight and lays the mortar for deflection and elevation.

(c) Assistant Gunner (LCpl) - loads and fires the mortar.

(d) 1st Ammunition man (Pvt)

(e) 2nd Ammunition man (Pvt)

(f) Ammo man/driver (Pvt)

Although not part of the platoon by T/O, the mortar platoon will have communication personnel attached to it from the Communications platoon of the Headquarters and Service Company in the battalion. These will be both radio operators and wiremen attached to the mortar platoon. Each FO attached to the rifle companies will have a radio operator accompany him and the remaining radio operators are attached to the FDC. The wiremen will also be attached to the FDC. The radio operators are responsible for establishing communications via radio in either covered or uncovered modes. While in the FDC, they will receive and relay the call for fire, authenticate the missions when required, and send the message to observer (MTO). The wiremen are responsible for establishing communication via wire and installing and concealing wire at all positions giving the squad leaders enough wire to walk in the gun positions. Additionally, all communication personnel are responsible for troubleshooting communication problems and performing additional duties as directed.

Lesson 2. CHARACTERISTICS AND COMPONENTS OF THE M252, 81-MM MORTAR

LEARNING OBJECTIVES

1. List the three identifying characteristics of the M252, 81-MM Mortar.

2. List the three main components of the M252, 81-MM Mortar.

3. Identify the physical characteristics of the M252, 81-MM Mortar.

1201. Characteristics.

The M252, 81-MM Mortar is characterized as a smooth bore, muzzle loaded, high angle of fire weapon. Smooth bore meaning it has no lands and grooves like a rifle barrel. Muzzle loaded, because you insert a round into the muzzle of the cannon, allowing gravity to pull the round down, striking the firing pin. High angle of fire because it is capable of firing from defilade over hills and other obstructions.

1202. Components.

The M252, 81-MM Mortar (fig 1-1) consists of the M253 cannon (barrel), the M177 mount, and the M3A1 baseplate.

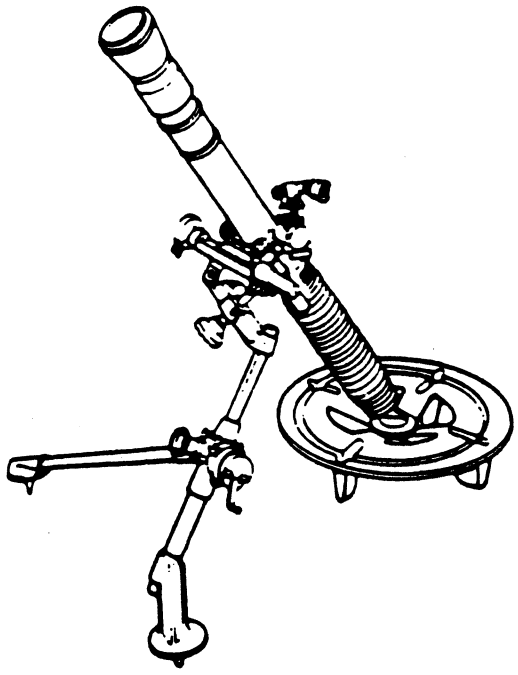


Fig 1-1. M252, 81-MM Mortar.

a. The M253 cannon (fig 1-2), consists of the barrel, sealed at the lower end with a removable breech plug that houses a removable firing pin. At the muzzle end is a cone-shaped blast attenuator device (BAD) that is fitted to reduce noise.

Fig 1-2. M253 Cannon.

b. The M177 mount (fig 1-3) is composed of three main assemblies: the leg assembly, the traversing gear assembly and the barrel clamp assembly.

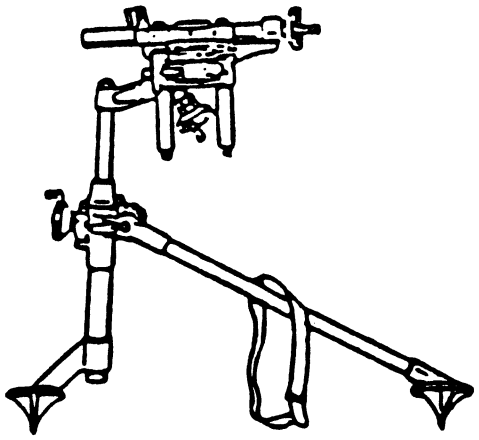


Fig 1-3. M177 Mount.

c. The M3A1 baseplate (fig 1-4) is of one-piece construction. It supports and aligns the mortar for firing. During firing, the breech plug on the barrel is sealed and locked to the rotatable socket in the baseplate.

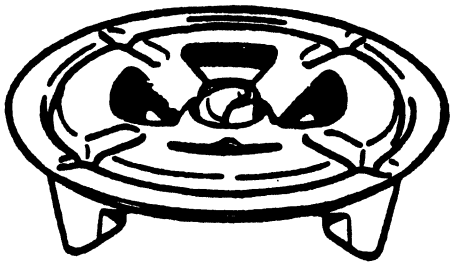


Fig 1-4. M3A1 Baseplate.

1203. Physical Characteristics.

The physical characteristics of the M252, 81-MM Mortar are:

(1) Weights.

Barrel (with blast attenuator device) . . . . . 35 lbs
Mount . . . . . 27 lbs
Baseplate . . . . . 28.5 lbs

(2) Elevation.

Elevation (approx). . . . . 0600 - 1600 mils
For each turn of elevation drum (approx). . . .10 mils
Elevation crank 50 1/2 total cranks of elevation

(3) Deflection.

Right or left from center (approx). . .100 mils (10 turns)
Total deflection, with movement of the mortar mount . . . . . 6400 mils (360 degrees)
Traversing, 28 1/2 turns total from left to right.
Minor adjustment crank, 25 total turns

(4) Performance.

Maximum range	5733 meters
Minimum range	100 meters

(5) Rate of fire.

Sustained	15 rounds/min
Maximum	30 rounds/min

Lesson 3. SPARE PARTS AND ACCESSORIES

LEARNING OBJECTIVES

1. Name the spare part normally carried by the mortar squad.

2. Name the major accessories for the M252 81-MM Mortar.

1301. Spare Parts.

Normally, the only spare part carried by the mortar squad is an extra firing pin (fig 1-5). Any other replacement of parts by the mortar squad is unauthorized.

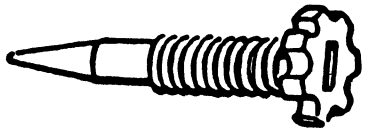


Fig 1-5. Firing pin.

1302. Accessories.

Accessories include the tools and equipment used for the operation and maintenance of the mortar. Everyday, you should take time to make sure that these accessories are present and are being properly cared for.

a. Muzzle cover (fig 1-6); the muzzle cover is made of rubber and is used to protect the blast attenuator and bore from rain, dirt, and moisture whenever the mortar is not in use.

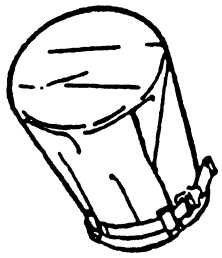


Fig 1-6. Muzzle cover.

b. M25 fuze setter (fig 1-7); the M25 fuze setter is used to set the time on the fuze of the illumination round.

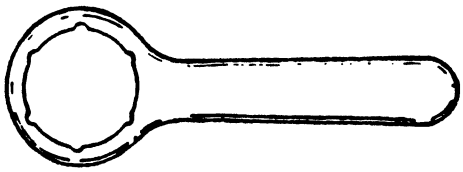


Fig 1-7. M25 Fuze Setter.

c. Firing pin wrench (fig 1-8); the firing pin wrench is used to remove the firing pin.

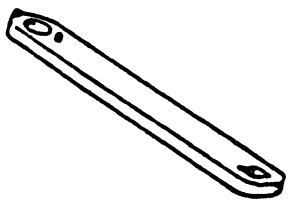


Fig 1-8. Firing pin wrench.

d. Aiming posts (fig 1-9); two aiming post cases each containing eight two foot long sections of aiming posts for a total of sixteen aiming posts sections. Aiming post sections can be joined together to make longer posts when needed due to terrain. Every other case contains a driving stake which is used when driving the aiming posts into the ground.

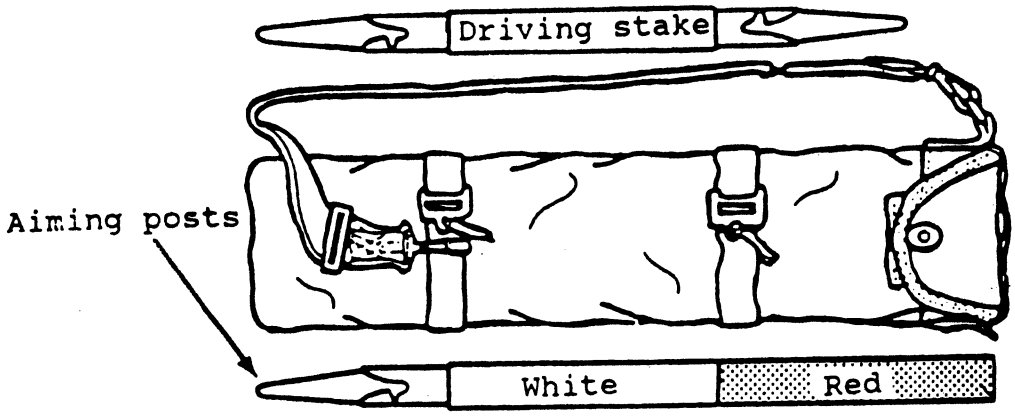


Fig 1-9. Aiming posts and carrying case.

e. Cleaning staff (fig 1-10); the cleaning staff consists of two intermediate sections, an end section and a brush section. These are assembled together and used to punch out the bore in order to loosen carbon.

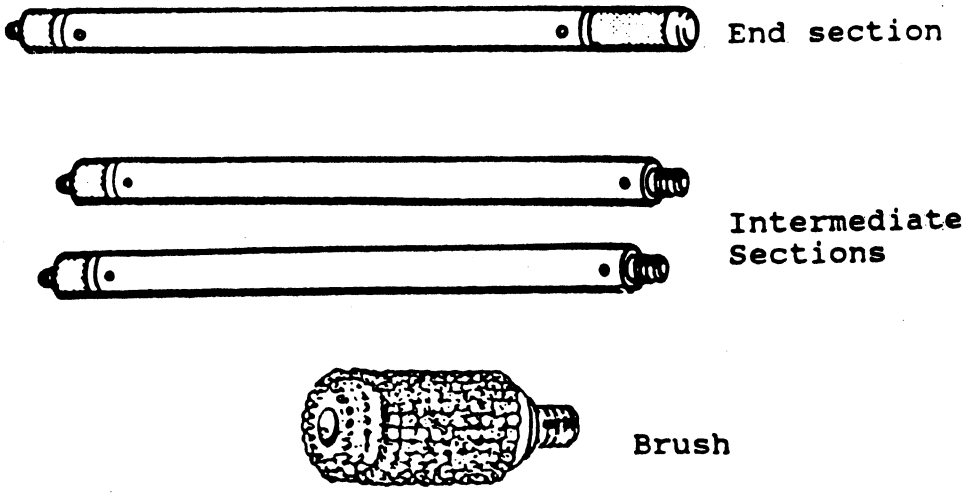


Fig 1-10. Cleaning staff.

f. M18 fuze wrench (fig 1-11); the M18 fuze wrench is a hand wrench, slotted on one end to accept a variety of fuzes. It is equipped with a screwdriver like projection on one end. The fuze wrench is used to remove and replace certain fuzes and to set fuzes with superquick and delay settings.

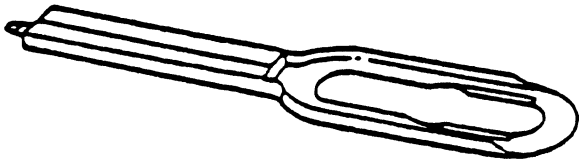


Fig 1-11. M18 fuze wrench.

g. Night firing devices (fig 1-12); the night firing devices consist of the M58 and M59 aiming post lights and are attached to the aiming posts so they can be seen at night through the sight. The near post must have a different color light than that of the far post. Aiming post lights come in a set of three--two green (M58) and one orange (M59). There is no provision for front and rear lights. An extra light is issued in case one of the other lights burns out. These lights may begin to fade after about 6 years of use. Each light has a clamp, tightened with a wingnut, for attachment to the aiming post. There is no cover to protect the light when not in use. The light does not need batteries.

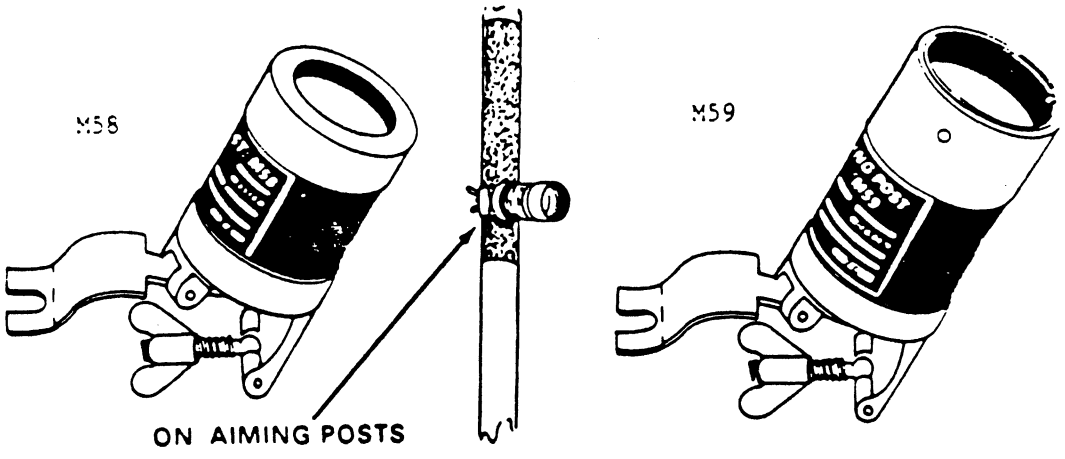


Fig 1-12. M58 and M59 aiming post lights.

h. Fuze setting wrench (9349539) (fig 1-13); the fuze setting wrench is a 1 3/4 inch open end wrench used to set the time on the M853 Illumination and the M819 Red Phosphorus round.

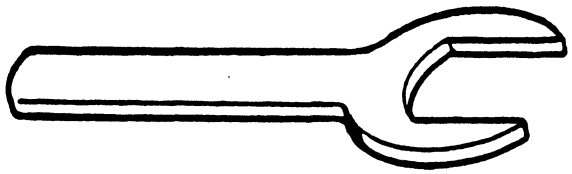


Fig 1-13. Fuze setting wrench (9349539).

i. Flat tip screwdriver (fig 1-14); a flat tip screwdriver located in the sight case is provided if you need to loosen the screws on the sight when boresighting.

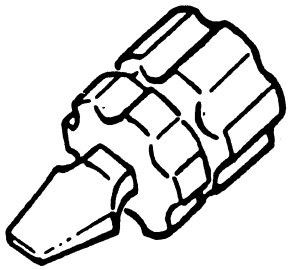


Fig 1-14. Flat tip srewdriver.

j. Sight cover; the sight cover is a nylon case with draw strings. It is used whenever the sight is mounted on the mortar and the mortar is not in use.

k. Striker Protrusion Gauge (fig 1-15); the striker protrusion gauge is used to measure the firing pin.

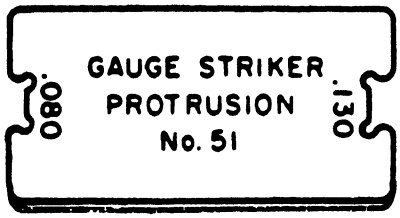


Fig 1-15. Striker protrusion gauge.

Unit Exercise: Answer the following questions and check your responses against those listed at the end of this study unit.

1. What is the mission of the 81-MM mortar platoon?

_____

_____

2. Where in the infantry battalion is the 81-MM mortar platoon located?

_____

3. How many personnel are in the 81-MM mortar platoon?

_____

4. The 81-MM mortar platoon headquarters consists of ____ officer(s) and _____ enlisted Marines.

5. How many Marines are in the 81-MM mortar section?

_____

6. The 81-MM mortar section headquarters consists of how many enlisted Marines?

_____

7. The 81-MM mortar squad consists of how many enlisted Marines?

_____

8. The members of the mortar platoon headquarters are

_____

9. The members of the mortar section headquarters are

_____

10. The members of the mortar squad are

_____

Matching: For items 11 through 22, match the 81-MM mortar platoon member in column 1 with the duties they perform in column 2. Place your responses in the spaces provided.

Column 1	Column 2
Platoon member	Duties
___ 11. Platoon Commander	a. Operation and maintenance of assigned vehicle.
___ 12. Platoon Sergeant	b. Gets ammunition for platoon.
___ 13. Ammunition Technician	c. Responsible for operation of the platoon.
___ 14. Ammunition Man	d. Responsible for operation of the FDC.
___ 15. Ammunition Man/Driver	e. Provides local security for the FDC.
___ 16. Section Leader	f. Calls for fire requests and adjusts fire onto targets.
___ 17. Ammunition NCO	g. Responsible for training and employment of the section.
___ 18. Forward Observer	h. Gets ammunition and supplies for the section.
___ 19. Squad Leader	i. Loads and fires the mortar.
___ 20. Gunner	j. Carry the ammunition and prepare it for firing.
___ 21. Assistant Gunner	k. Supervises the emplacement, laying and firing of the mortar.
___ 22. Ammunition Man	l. Places the firing data on the sight, and lays the mortar for deflection and elevation.

23. The three identifying characteristics of the M252, 81-MM mortar are

_____

_____

24. The three main components of the M252, 81-MM mortar are

_____

25. The weight of the barrel with blast attenuator device is _____ pounds.

26. The weight of the mount is _____ pounds.

27. The weight of the baseplate is _____ pounds.

28. The elevation of the M252 81-MM mortar ranges from _____ to _____ mils.

29. Each turn of the elevation drum is approximately ____ mils.

30. The elevation crank has _____ total cranks of elevation.

31. The number of mils deflection left or right from center is _____ or _____ turns.

32. The total deflection, with movement of the mortar mount is _____ mils.

33. Traversing from left to right or right to left, is _____ total turns.

34. The minor adjustment cranks is _____ total turns.

35. The maximum range of the M252 81-MM mortar is _____ meters.

36. The minimum range of the M252 81-MM mortar is _____ meters.

37. The sustained rate of fire for the M252 81-MM mortar is _____ rounds per minute.

38. The maximum rate of fire for the M252 81-MM mortar is _____ rounds per minute.

39. What is the spare part normally carried by the mortar squad?

_____

40. List the eleven major accessories for the M252 81-MM mortar.

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	

SUMMARY

Within this study unit we have covered the mission and organization of the 81-MM mortar platoon as well as the members of the platoon and duties of the members. We have also covered the characteristics and components of the M252 81-MM mortar and the spare parts and accessories. In the next study unit we will cover sighting equipment and sight manipulation.

Study Unit 1 Exercise Solutions

		Reference
1.	Provide continuous close fire support.	1101
2.	Weapons Company.	1102
3.	One officer and sixty-eight enlisted.	1102
4.	One, four	1102a
5.	32	1102b
6.	Eight	1102b(1)
7.	Six 1102b(2)	
8.	Platoon Commander, Platoon Sergeant, Ammunition Technician, Ammunition Man, Ammunition Man/Driver.	1102a
9.	Section Leader, Ammunition NCO, Forward Observer (2), Ammunition Man/Driver, Plotter, Plotter/recorder, Recorder/driver.	1102b(1)
10.	Squad Leader, Gunner, Assistant Gunner, Two Ammunition Men, Ammo man/driver.	1102b(2)
11.	C	1102a(1)
12.	D	1102a(2)
13.	B	1102a(3)
14.	E	1102a(4)
15.	A	1102a(5)
16.	G	1102b(1)(a)
17.	H	1102b(1)(b)
18.	F	1102b(1)(c)
19.	K	1102b(2)(a)
20.	L	1102b(2)(b)
21.	I	1102b(2)(c)
22.	J	1102b(2)(d)
23.	Smooth bore, muzzle loaded, high angle of fire weapon.	1201
24.	M253 cannon, M177 mount, M3A1 baseplate.	1202
25.	35	1203(1)
26.	27	1203(1)
27.	28.5	1203(1)
28.	0600 - 1600	1203(2)
29.	10	1203(2)
30.	50 1/2	1203(2)
31.	100 - 10	1203(3)
32.	6400	1203(3)

33.	28 1/2	1203(3)
34.	25	1203(3)
35.	5733	1203(4)
36.	100	1203(4)
37.	15	1203(5)
38.	30	1203(5)
39.	Firing pin	1301
40.	Muzzle cover, M25 fuze setter, aiming post cases, cleaning staff, firing pin wrench, M18 fuze wrench, night firing devices, fuze setting wrench, flat tip screwdriver, sight cover, striker protrusion gauge.	1302

STUDY UNIT 2

SIGHTING EQUIPMENT AND SIGHT MANIPULATION

Introduction. In today's era of modern warfare, new and highly effective weapons and equipment are being produced at a fast rate. One such piece of equipment is the M64A1 sight for the M252 81-MM mortar. This sight is vastly improved over its predecessors and much more accurate. Once you have mastered this piece of equipment, you will only enhance the reputation of Marine mortarmen for being speedy, accurate and deadly.

Lesson 1. THE M64A1 SIGHT

LEARNING OBJECTIVES

1. Given an illustration, identify the two major parts of the M64A1 Sight.
2. From an illustration, identify the nomenclature of the M64A1 Sight.
3. From an illustration, identify the nine parts of the sight illuminated by tritium gas.
4. Identify the procedures for mounting and dismounting the M64A1 Sight.

2101. Components of the M64A1 Sight.

The M64A1 sight is provided for laying the mortar. The crosslevel vial is used to ensure that the sight and mortar are kept upright. By using the telescope, deflection scales, and crosslevel vial, the mortar is laid for direction. By using the elevation scales, elevation vial, and crosslevel vial, the mortar is laid for elevation. The sight is illuminated by tritium gas. After the sight has been set for deflection and elevation, the mortar is elevated or depressed until the elevation bubble is level. The mortar is then traversed until a proper sight picture is seen (using the aiming posts), and the crosslevel bubble is level. The mortar is laid for deflection and elevation when all bubbles are level, and a correct sight picture is seen.

The M64A1 sight unit (fig 2-1) has two major parts: the elbow telescope and the telescope mount. The elbow telescope has an illuminated crossline. The telescope mount has a series of scales, control knobs, cranks, locking knobs, locking latch, and dovetail. The sight unit is lightweight and portable.

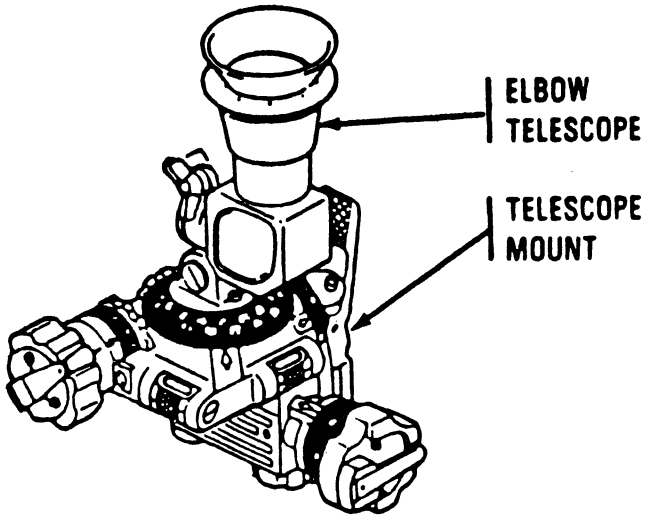


Fig 2-1. Elbow telescope and telescope mount.

2102. Nomenclature of the M64A1 Sight.

a. The Elbow Telescope. The elbow telescope (fig 2-1) consists of a clamping mechanism, rubberized eyeshield and the telescope itself. The elbow telescope is considered the sight unit's upper section.

(1) The elbow telescope is a fix focused, 1.5 power telescope. When looking through the telescope you will see a vertical and horizontal crossline. You will only concern yourself with the vertical crossline. No matter how the telescope is positioned, there will always be a vertical crossline. The elbow telescope can be placed in any one of three positions; "left", "right", or "up". As the gunner, you may use either the "left" or "up" position when aiming points are to the front of the gun or the "right" or "up" position when aiming points are to the rear. Another factor which determines what position you use is your height. A shorter gunner may wish to use the "left" or "right" position, but a taller gunner may find the "up" position more comfortable.

(2) The clamping mechanism which is located on the elbow telescope is used to secure the telescope in the desired position and to adjust the angle of sight. The clamping mechanism consists of a wing nut and the telescope locking latch.

(a) The wing nut is used to position the elbow telescope into any one of its three positions. Simply loosen the wing nut and rotate the telescope until the white index line on the telescope is aligned with the white index line of the telescope support. Once the index lines are properly aligned for the desired position, re-tighten the wing nut.

(b) The telescope locking latch is used to adjust the angle of sight. The angle of sight would need to be adjusted in the event that the aiming points would be either on higher or lower ground than the gun. You would adjust the angle of sight accordingly. Changing the angle of sight does not change the deflection or elevation in any way. When utilizing the telescope locking latch, it is important for you to remember to apply a downward pressure with one finger only. Any additional pressure may damage or break the clamping mechanism.

(3) The rubberized eyeshield is provided to protect your eye when looking through the sight and to reduce glare through the sight as well.

b. <u>The Sight Mount</u>. For instructional purposes, we will divide the mount into a center section and a lower section.

(1) The center section (fig 2-2) consists of a cross level vial, elevation knob, coarse azimuth (deflection) scale, coarse elevation scale, and a latching lever.

(a) The cross level vial is located on the rear of the center section. It is used to determine whether or not the gun has a cant.

(b) The elevation knob is located on the bottom rear of the sight. It is used to place elevation settings on the sight.

(c) The coarse azimuth (deflection) scale is located on the top of the center section. It has 64 one-hundred mil graduations and is numbered every 200 mils, from 0 to 62. It is used for reading the first two numbers of the deflection.

(d) The coarse elevation scale is located on the right side. It has 10 one-hundred mil graduations ranging from 0700 to 1600 mils. The scale is numbered on the even numbers from 0800 to 1600. It is used for reading the first two numbers of the elevation.

(e) The latching lever, commonly called the dovetail, is located on the right side of the mount and is used for mounting the sight on the bipod. With the latching lever depressed, the dovetail is inserted into the dovetail slot of the bipod until fully seated. It is locked into position by releasing the locking lever. The sight is removed by depressing the latching lever and lifting the sight out of the dovetail slot.

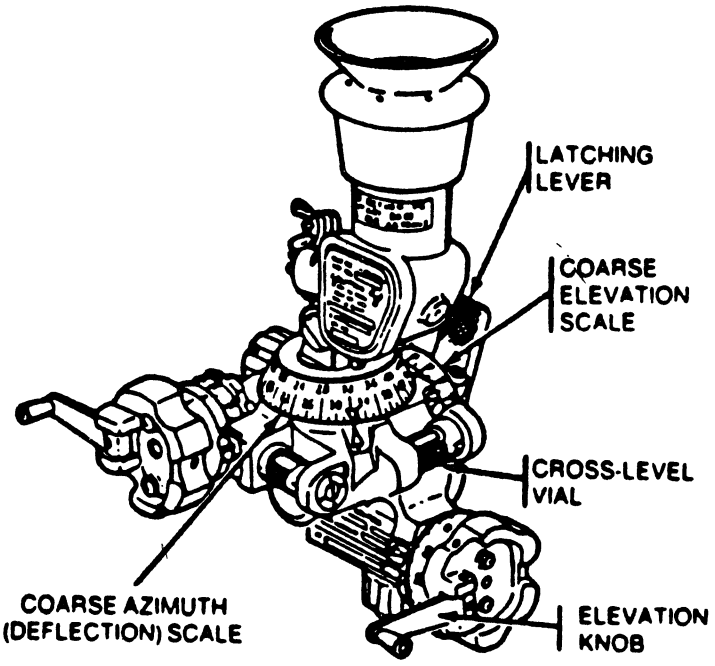


Fig 2-2. Center section of the M64A1 sight unit.

(2) The lower section (fig 2-3) consists of a fine azimuth (deflection) scale, a fine elevation scale, an elevation locking knob, an elevation vial, and an azimuth (deflection) knob.

(a) The fine azimuth (deflection) scale is located on the deflection knob. It has 100, one mil graduations. The scale is numbered every ten mils from 0 to 90. One full turn of the deflection knob equals 100 mils. It is used for reading the second two numbers in the deflection.

(b) The fine elevation scale is located on the elevation knob. It has 100, one mil graduations, numbered every ten mils from 0 to 90. One full turn of the elevation knob equals 100 mils. It is used for reading the second two numbers in the elevation.

(c) The elevation locking knob is located on the bottom of the sight unit. It is used to lock the elevation knob in place.

(d) The elevation vial is located on the left side of the lower section. It is used to determine if the gun is properly set for elevation.

(e) The azimuth (deflection) knob is located forward of the elevation vial on the left side and is used to set deflections on the sight.

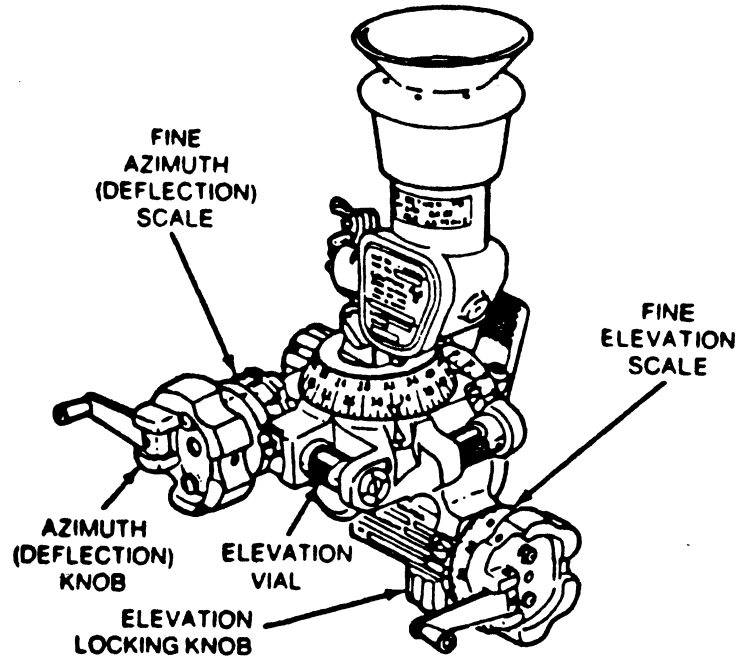


Fig 2-3. Lower section of the M64A1 sight unit.

2103. Illumination of the M64A1 Sight Unit.

Lighting for night operations using the sight unit is accomplished by radioactive tritium gas contained in phosphor coated glass vials. The gas poses no significant hazard when intact. Nine parts of the sight are illuminated by tritium gas (fig 2-4).

1. Telescope
2. Coarse elevation scale
3. Coarse elevation index arrow
4. Crosslevel vial
5. Fine elevation scale
6. Coarse deflection index arrow
7. Elevation vial
8. Fine deflection scale
9. Coarse deflection scale

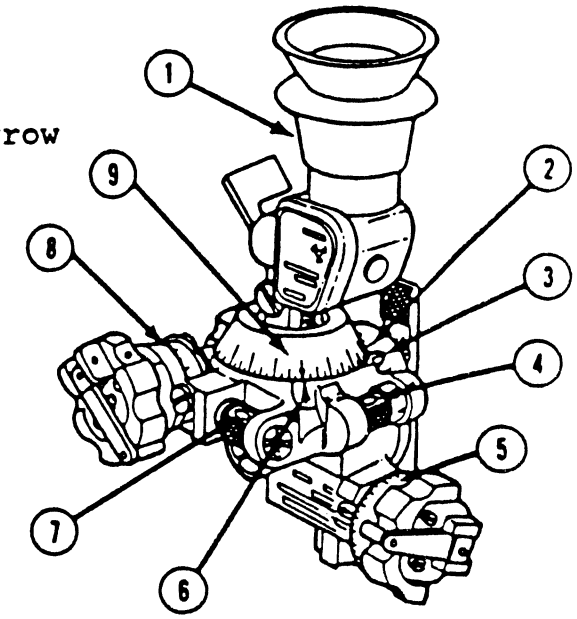


Fig 2-4. M64A1 sight unit radioluminous lamp locations.

Caution: Anytime the mortar is not in use, the sight unit should be stored in the carrying case.

Radioactive, self-luminous sources are identified by warning labels (fig 2-5). These labels should not be defaced or removed, and they should be replaced immediately if necessary.

RADIATION HAZARD

WARNING **TRITIUM (H^3)**

Fig 2-5. Warning label.

Warning: Do not try to repair or replace the radioactive material. If skin contact is made with tritium, the area should be washed immediately with nonabrasive soap and water.

2104. Mounting and dismounting the M64A1 Sight.

The functioning of the M64A1 sight consists of the procedures used for mounting the sight unit on the bipod, placing deflection and elevation settings on the sight and dismounting and stowing the sight unit in its case.

a. Mounting. The sight is always mounted on the mortar with an initial deflection of 3200 and an initial elevation of 1100.

(1) To mount the sight to the mortar, you simply depress the dovetail locking lever and insert the dovetail into the dovetail slot of the bipod.

b. Placing Deflection Settings on the Sight.

(1) Deflection settings are always placed on the sight first.

(2) Deflections are always given in four digits. For example, if the deflection to be placed on the sight is less than 1000, it will be given to you like this:

"Deflection zero eight seven four".

(a) The first two digits of the deflection are placed on the coarse deflection scale (fig 2-6). After unlocking the deflection locking knob, the first two digits are placed on the coarse deflection scale by rotating the deflection knob (fig 2-6) either clockwise or counter-clockwise and aligning the desired number with the white index arrow.

(b) The last two digits of the deflection are placed on the fine deflection scale (fig 2-6). To do this, you rotate the deflection knob clockwise until the desired number aligns with the fine deflection scale index arrow. Once you have accomplished this, lock the deflection in place with the deflection locking knob.

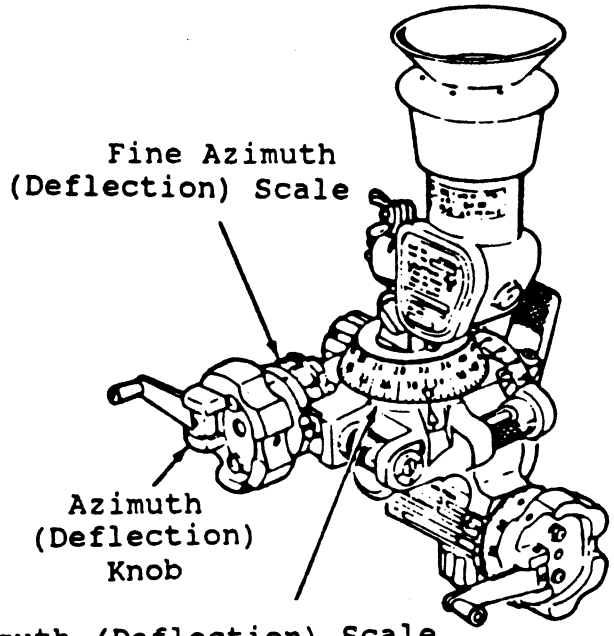


Fig 2-6. Placing deflection settings on the sight.

c. Placing Elevation Settings on the Sight.

(1) Elevation settings are placed on the sight last.

(2) Elevations are always given in four digits. For example, if the elevation to be placed on the sight is less than 1000, it will be given to you like this:

"Elevation zero nine six five".

(a) The first two digits are always placed on the coarse elevation scale (fig 2-7). You accomplish this by unlocking the elevation locking knob and rotating the elevation knob (fig 2-7) clockwise or counter-clockwise, as necessary, until the desired number is aligned with the coarse elevation scale white index arrow.

(b) The last two digits are placed on the fine elevation scale (fig 2-7). You accomplish this by rotating the elevation knob clockwise until the desired number is aligned with the fine elevation scale white index arrow. Then lock the elevation locking knob.

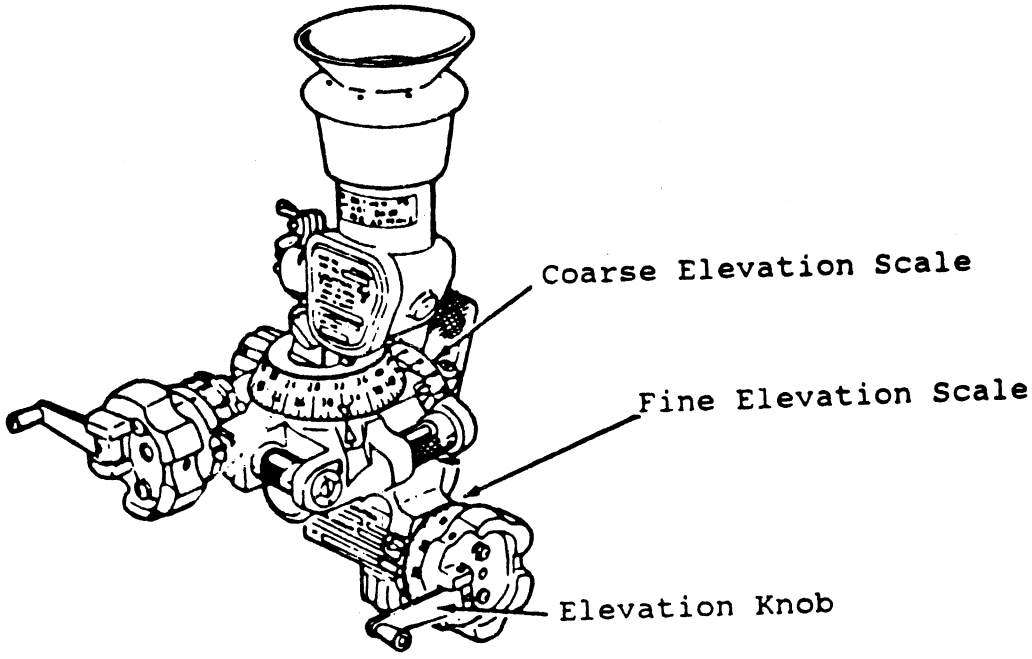


Fig 2-7. Placing elevation settings on the sight.

Note:	The mortar is never fired with an elevation setting lower than 0800 mils. An elevation setting of 0800 mils puts the barrel at a 45 degree angle, which allows for maximum range. The mortar is never fired with an elevation setting higher than 1500 mils. Elevation settings of 1500 or higher will only be used in an emergency situation because it points the barrel straight up.

d. Dismounting and Stowing of the Sight.

Dismounting and stowing of the sight may not seem as important as mounting, but if you have to displace from your position in a hurry, being able to dismount and stow the sight quickly will help you to mount it and be prepared for your next fire mission when you get to your new position.

(1) Before dismounting the sight, place a deflection of 3200 mils and an elevation of 0800 mils on the sight. Next, loosen the wingnut and place the elbow telescope in the rest position. Do NOT retighten the wingnut. Depress the dovetail locking lever and lift the sight up off the bipod. Place the sight into the indentations in the case. Directions are affixed to the inside of the case if needed. Close and lock the case.

Lesson 2. BORESIGHTING THE 81-MM MORTAR

LEARNING OBJECTIVES

1. State the purpose of boresighting the 81-MM mortar.

2. Match the steps of the procedure for boresighting the sight for elevation, using the M45 boresight, with their proper sequence.

3. Match the steps of the procedure for boresighting the sight for deflection, using the M45 boresight, with their proper sequence.

4 Match the steps of the procedure for removing the M45 boresight from the barrel with their proper sequence.

2201. Purpose of Boresighting the 81-MM Mortar.

Imagine if you were in combat and had to fire a 30 round fire for effect and all your rounds were off the target by 200 meters. A whole platoon of friendly troops were just wiped out and you are going crazy trying to figure out what happened. You know there is nothing wrong with the sight because it is brand new. The platoon sergeant comes over to you and asks "Did you boresight that new sight"? What can you say, "It's new Gunny, why should it be boresighted"?

The purpose of boresighting is to ensure that the deflection and elevation on the sight are an accurate indication of what is on the gun.

To be able to properly and accurately engage targets with the 81-MM mortar, you must first boresight the M64A1 sight unit to the mortar. This procedure in effect matches the sight to the rest of the mortar, making it one precision weapon system.

Since no two mortars are exactly alike, each sight must be calibrated on its own mortar. Anytime a new sight or a different sight is used, it must be calibrated on the mortar on which it is going to be used. This is necessary since the sight socket and bracket are machined parts and vary in accuracy with each mortar. There is no set rule for how often to boresight. The sight should be boresighted each time the mortar is mounted at a new location, since movement may disturb the setting of the elevation or deflection scales. The time available and the accuracy desired will dictate how often to boresight.

2202. Boresighting the sight for elevation.

After the mortar has been mounted securely, the M64A1 sight is placed into the bracket. A deflection of 0 mils and an elevation of 0800 mils is set onto the sight and the bubbles are leveled.

The M45 boresight is pre-set for an elevation of 0800 mils. When the boresight is mounted on the mortar, the line of sight through the telescope of the boresight is the same as if you looked straight through the barrel.

Note:	Whenever boresighting the mortar, you always boresight for elevation first and deflection last.

To boresight for elevation, perform the following steps:

a. Attach the M45 boresight to the barrel below and touching the upper stop band (fig 2-8).

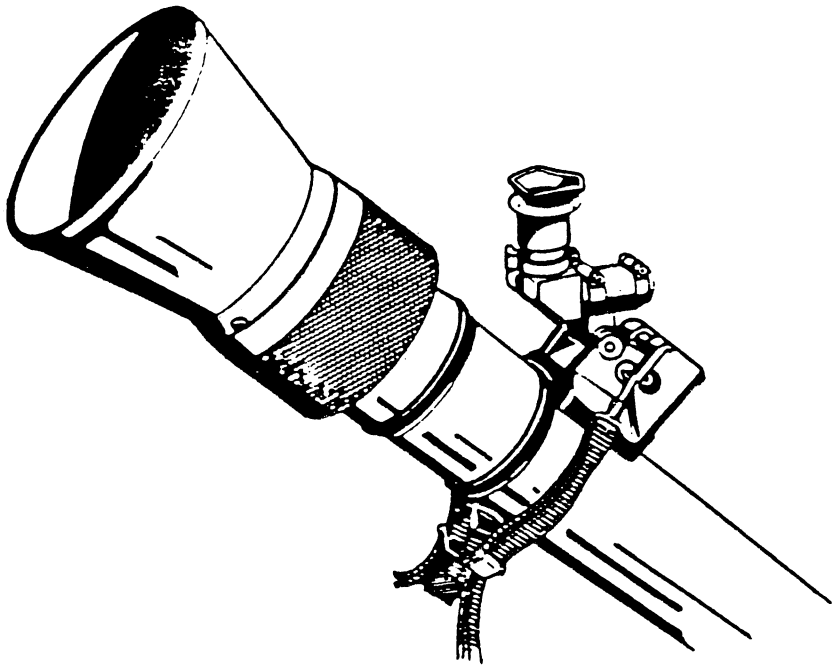


Fig 2-8. Attaching the M45 boresight.

b. Center the crosslevel vial by slightly rotating the boresight around the mortar barrel. Slight movements may be made by loosening the clamp screw and lightly tapping the boresight body. When the bubble centers, tighten the clamp screw.

c. Elevate/depress the barrel until the elevation vial on the M45 boresight is centered. The mortar is now set at 0800 mils elevation.

d. Rotate the elevation knob on the sight until the elevation bubble is centered (fig 2-9). If necessary, level the crosslevel bubble.

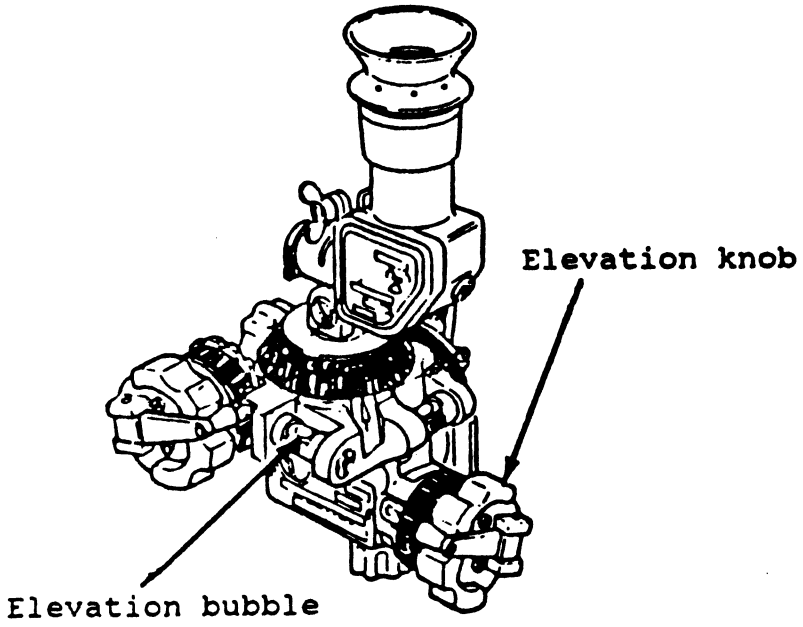


Fig 2-9. Elevation knob and elevation bubble.

e. Recheck all level vials.

Note: If the elevation scale does not read 0800 mils, adjust as follows:

(a) Loosen the two slot-headed screws on the outside of the elevation knob. Slip the fine elevation scale until the 0 mark on the scale aligns with the reference mark on the housing. Tighten the two screws to secure the scale (fig 2-10).

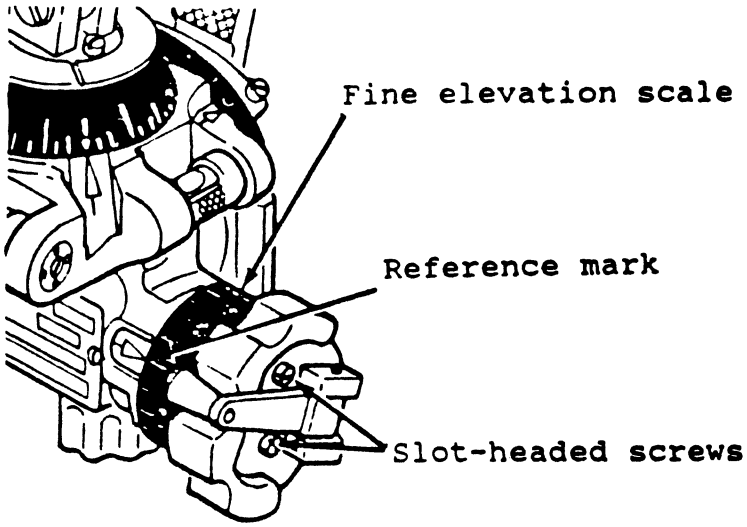


Fig 2-10. Adjusting elevation scale to read 0800 mils.

(b) Recheck all level vials.

2203. Boresighting the sight for deflection.

To boresight for deflection, perform the following steps:

a. Attach the M45 boresight to the barrel below and touching the upper stop band as shown in figure 2-8.

b. Ensure the sight is set at a deflection of 0 mils.

c. Select a distant aiming point that is as far from the mortar as possible and not less than 200 meters.

d. By traversing the mortar, align the vertical crossline of the boresight onto the distant aiming point.

e. Ensure that the crosslevel bubble remains centered, as the mortar may cant as it is traversed. (If the mortar is initially mounted on the distant aiming point, it will decrease the amount of traverse necessary to align the crossline on the distant aiming point). With the boresight aligned on the distant aiming point, level the sight by centering the crosslevel bubble.

f. With the boresight aligned on the distant aiming point and all the bubbles on the sight and the boresight centered, ensure the vertical crossline of the sight is aligned with the distant aiming point. If it is not, proceed as follows:

(1) Turn the fine deflection knob (fig 2-11) until the crossline is aligned with the distant aiming point. Lock the deflection knob.

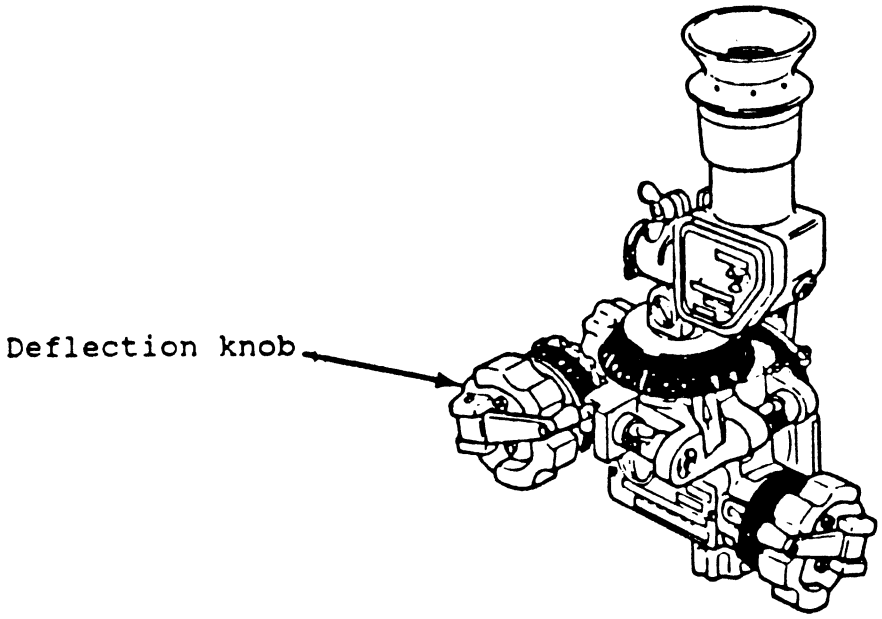


Fig 2-11. Fine deflection knob.

(2) Slip the coarse deflection scale to read 0 mils against the white arrow below the scale by pushing down the scale and rotating it. Once set at 0 mils, release the scale so that the internal springs return it to the locked position (fig 2-12).

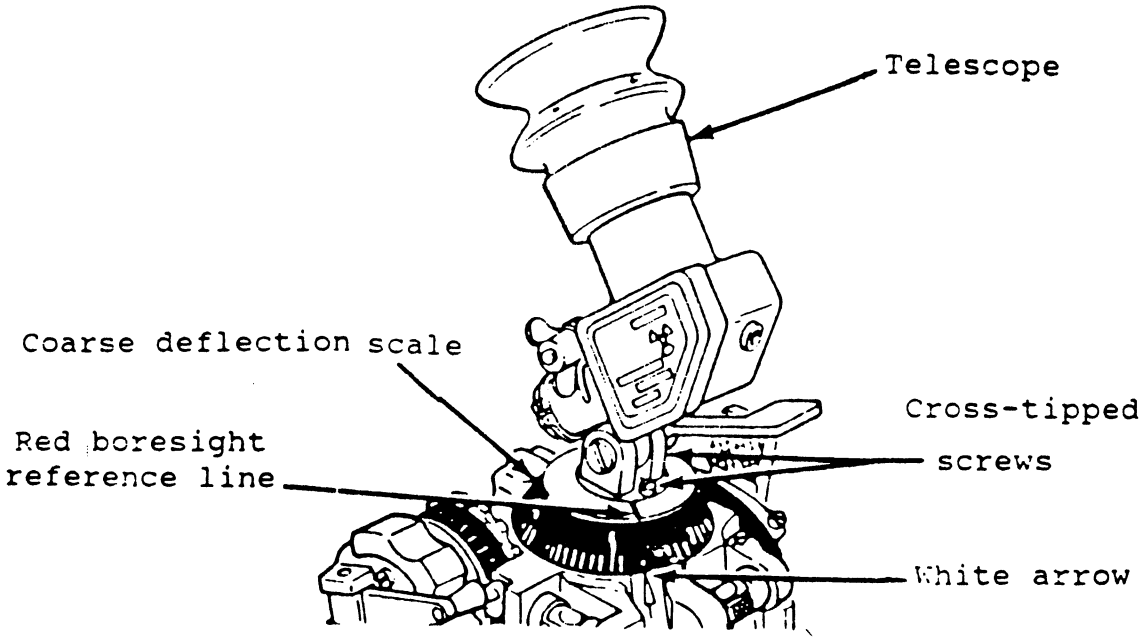


Fig 2-12. Coarse deflection scale and white arrow.

(3) Slip the fine deflection scale by pushing the scalloped rim of the fine scale towards the sight body and turning it until the fine scale reads 0 mils against the black scale (fig 2-13). Allow the springs to return it to the locked position.

(4) Ensure the red boresight reference line on the outer edge of the fine deflection scale is aligned with the inner (fixed) red mark. If it does not, loosen the slot head screws on the outer edge of the knob and align (fig 2-13). Similarly, ensure the red boresight reference above the coarse deflection scale is aligned with 0. Use the two cross-tipped screws for this adjustment. Move the telescope in order to give access to the screws (refer to fig 2-12).

(5) If any adjustments are made, repeat the steps for boresighting for deflection.

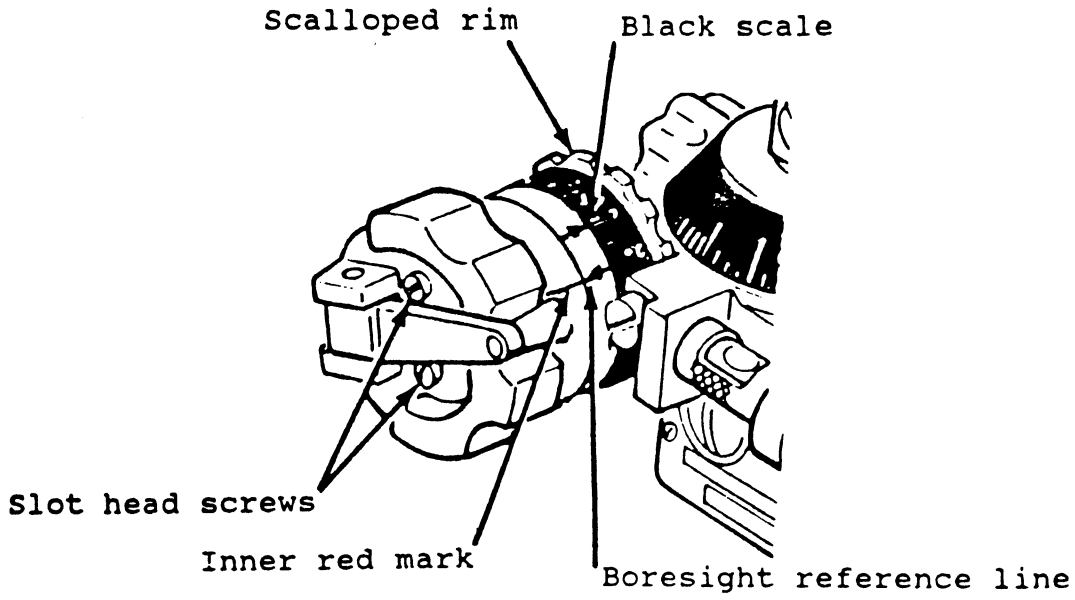


Fig 2-13. Aligning the fine deflection scale.

Note: The M45 boresight is adjusted by the manufacturer, and it should not need readjustment as a result of normal field handling. If inaccurate, it should be turned in to direct support maintenance.

2204. Removing the M45 boresight from the barrel.

To remove the boresight from the barrel, perform the following steps:

a. Loosen the clamp screw, releasing the boresight from the barrel.

b. Swing the elbow telescope until it is about parallel with the elevation bubble.

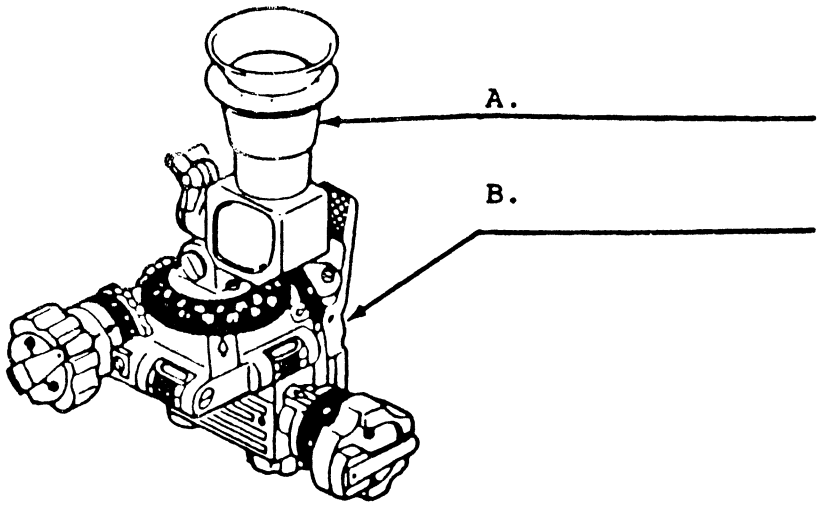
c. Release the clamp assembly and straps by removing the ring from the hook and the strap shaft.

d. Stow the clamp assembly and straps in the corner compartment and put the boresight in the center compartment of the carrying case.

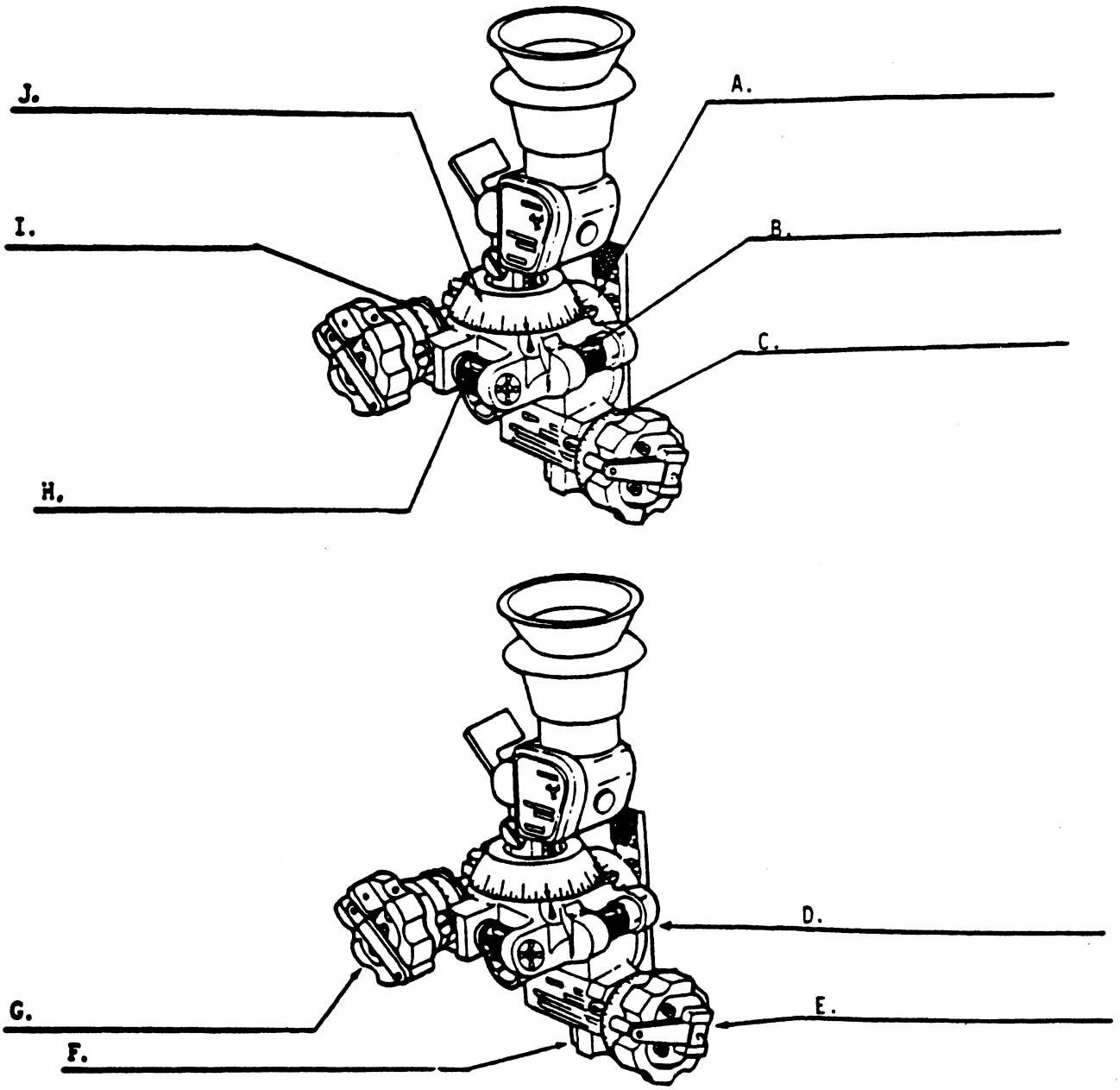
- -

Unit Exercise: Complete items 1 through 32 by performing the action required. Check your responses against those listed at the end of this study unit.

1. From the illustration below, label the two major parts of the M64A1 sight.

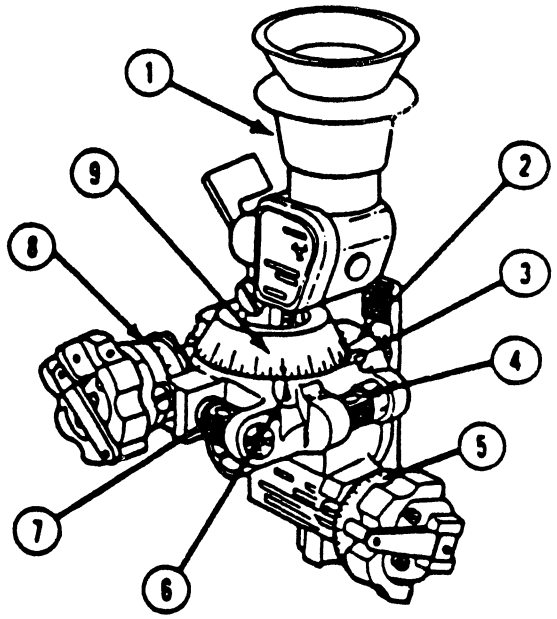


2. **On the illustrations of the M64A1 sight below, identify the nomenclature of the indicated parts by labeling them.**



3. On the illustration below, identify from the numbers the nine parts of the sight illuminated by tritium gas.

(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)



4. The sight is always mounted on the mortar with an initial deflection of _____ and an initial elevation of _____.

5. To mount the sight to the mortar, you simply depress the dovetail locking lever and insert the _____ into the dovetail slot of the bipod.

6. Deflection settings are always placed on the sight _____.

7. Deflections are always given in _____ digits.

8. Elevation settings are placed on the sight _____.

9. Elevations are always given in _____ digits.

10. The mortar is never fired with an elevation setting lower than _____ mils.

11. The mortar is never fired with an elevation setting higher than _____ mils.

Questions 12 through 16 pertain to dismounting and stowing of the sight. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 12. Depress the dovetail locking lever and lift the sight up off the bipod.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5
___ 13. Close and lock the case.	
___ 14. Place a deflection of 3200 mils and an elevation of 0800 mils on the sight.	
___ 15. Place the sight into the indentations in the case.	
___ 16. Loosen the wingnut and place the elbow telescope in the rest position.	

17. What is the purpose of boresighting the 81-MM mortar?

_____

_____

Questions 18 through 22 pertain to boresighting the sight for elevation. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 18. Recheck all level vials.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5
___ 19. Center the crosslevel vial by slightly rotating the boresight around the mortar barrel.	
___ 20. Attach the M45 boresight to the barrel below and touching the upper stop band.	
___ 21. Rotate the elevation knob on the sight until the elevation bubble is centered.	
___ 22. Elevate/depress the barrel until the elevation vial on the M45 boresight is centered.	

Questions 23 through 28 pertain to boresighting the sight for deflection. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 23. Ensure the sight is set at a deflection of 0 mils.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5 f. Step 6
___ 24. Ensure the vertical crossline of the sight is aligned with the distant aiming point.	
___ 25. Attach the M45 boresight to the barrel below and touching the upper stop band.	
___ 26. With the boresight aligned on the distant aiming point, level the sight by centering the crosslevel bubble.	
___ 27. Align the vertical crossline of the boresight onto the distant aiming point.	
___ 28. Select a distant aiming point that is as far from the mortar as possible and not less than 200 meters.	

Questions 29 through 32 pertain to removing the M45 boresight from the barrel. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 29. Swing the elbow telescope until it is about parallel with elevation bubble.	a. Step 1 b. Step 2 c. Step 3 d. Step 4
___ 30. Stow the clamp assembly and straps in the corner compartment and the boresight in the center compartment of the carrying case.	
___ 31. Loosen the clamp screw, releasing the boresight from the barrel.	
___ 32. Release the clamp assembly and straps by removing the ring from the hook and the strap shaft.	

SUMMARY

Marine Corps mortarmen have the capability to engage targets with a level of accuracy not available to Marines in the past, and still not available to soldiers of other countries. This is due to the quality of sighting equipment issued with the M252 81-MM mortar. As a mortarman, it is very important that you become proficient in utilizing the maximum extent of this accuracy. In this study unit, you have become acquainted with the sighting equipment normally used by the mortar crew, the nomenclature of their parts, and their operation. In addition, you have been introduced to the procedures for boresighting the M64A1 sight for deflection and elevation.

In the following study unit, you will be provided with information about the types of ammunition and fuzes which are used by the 81-MM mortar crew.

Study Unit 2 Exercise Solutions	Reference
1. Refer to fig 2-1.	2101
2. Refer to figs 2-2 and 2-3.	2102
3. Refer to fig 2-4.	2103
4. 3200, 1100	2104a
5. Dovetail	2104a(1)
6. First	2104b(1)
7. Four	2104b(2)
8. Last	2104c(1)
9. Four	2104c(2)
10. 0800	2104c
11. 1500	2104c
12. C	2104d(1)
13. E	2104d(1)
14. A	2104d(1)
15. D	2104d(1)
16. B	2104d(1)
17. To ensure that the deflection and elevation on the sight are an accurate indication of what is on the gun.	2201
18. E	2202
19. B	2202
20. A	2202
21. D	2202
22. C	2202

23. B	2203
24. F	2203
25. A	2203
26. E	2203
27. D	2203
28. C	2203
29. B	2204
30. D	2204
31. A	2204
32. C	2204

STUDY UNIT 3

AMMUNITION, FUZES, AND PROPELLING CHARGES

Introduction. As with any weapon, simply firing it is not enough. The weapon and its ammunition must be understood in order to effectively engage any target. The 81-MM mortar has a variety of ammunition which can be used to totally annihilate the enemy.

Lesson 1. 81-MM MORTAR AMMUNITION

LEARNING OBJECTIVES

1. State the classification of 81-MM mortar rounds.
2. List the three main assemblies of a typical mortar round
3. Identify the function of each of the three main assemblies of a typical mortar round.

3101. Classification of 81-MM mortar rounds.

Ammunition for the 81-MM mortar is classified as semifixed because the propellant charges can be detached and varied in number for firing, and the safety wire must be removed before firing.

3102. Three main assemblies of a typical mortar round.

An 81-MM mortar round consists of three main assemblies; the body assembly, the fuze assembly, and the fin assembly (fig 3-1).

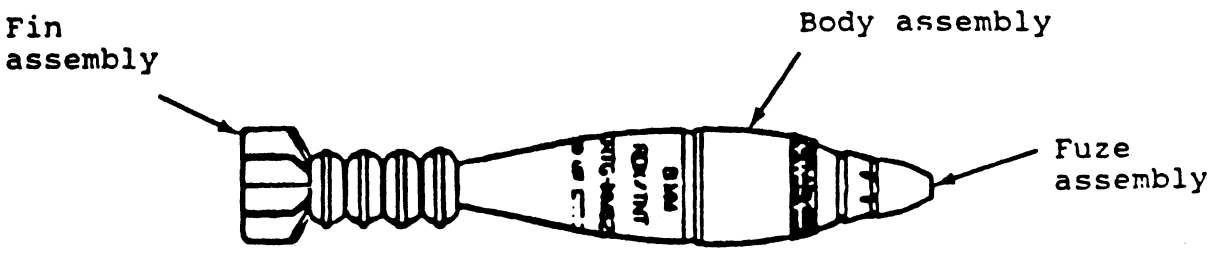


Fig 3-1. A typical mortar round.

a. The body is the main component of the round, and contains the material (explosive charge, illuminating charge, or smoke) which produces the desired effect of the round.

b. The fuze assembly controls the method of exploding the shell.

c. The fin assembly stabilizes the round in flight and causes the round to strike with the fuze end first. A propelling charge is attached to or near the fin assembly of the projectile.

When the mortar round is fired, it will carry all of its components with it, allowing the mortar to be ready to fire the next round.

Lesson 2. TYPES OF AMMUNITION

LEARNING OBJECTIVES

1. List the six types of 81-MM mortar rounds.
2. Match the types of rounds with their color codes.
3. List the markings which appear on each mortar shell.
4. Match the types of 81-MM mortar ammunition with their correct uses.

3201. Ammunition types.

There are six different types of 81-MM mortar ammunition. They are:

a. High Explosive. Commonly called HE, high explosive ammunition is used for both fragmentation and blast effect against personnel and light material.

b. White Phosphorus. Commonly called WP, white phosphorus is used for screening, producing casualties, creating incendiary effects, and signaling.

c. Red Phosphorus. Commonly called RP, red phosphorus is also used for screening, producing casualties, creating incendiary effects, and signaling.

d. Illumination. Commonly called illume, illumination rounds are used for battlefield illumination and signaling.

e. Training Practice. Commonly called TP, training practice rounds are used only for training.

f. Training. Training rounds are used to train mortar crews in the loading and firing of ammunition.

Note:	The differences between training practice rounds and training rounds will be explained later in this lesson.

3202. 81-MM mortar ammunition color codes.

All mortar rounds are painted for identification and to prevent rust. The color of the body will identify the type of round.

a. The high explosive round is colored olive drab with yellow markings (fig 3-2).

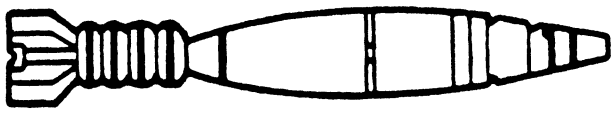


Fig 3-2. High explosive round.

b. The white phosphorus round is colored light green with red markings (fig 3-3).

Fig 3-3. White phosphorus round.

c. The red phosphorus round is colored light green with black markings with one brown band (fig 3-4).

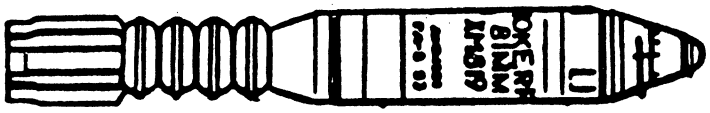


Fig 3-4. Red phosphorus round.

d. Illumination rounds are colored white with black markings (fig 3-5).

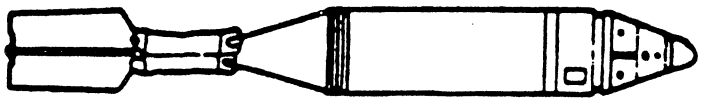


Fig 3-5. Illumination round.

e. The training practice round is colored blue with white markings (fig 3-6).

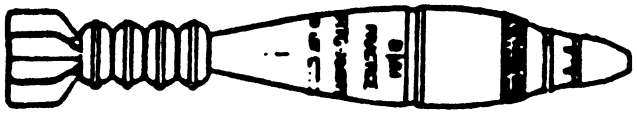


Fig 3-6. Training practice round.

f. The training round is colored black with white markings (fig 3-7).

Fig 3-7. Training round.

3203. Markings on 81-MM mortar rounds.

All 81-MM mortar rounds have markings stenciled on them. The information stenciled on a round gives you details concerning that particular round (fig 3-8).

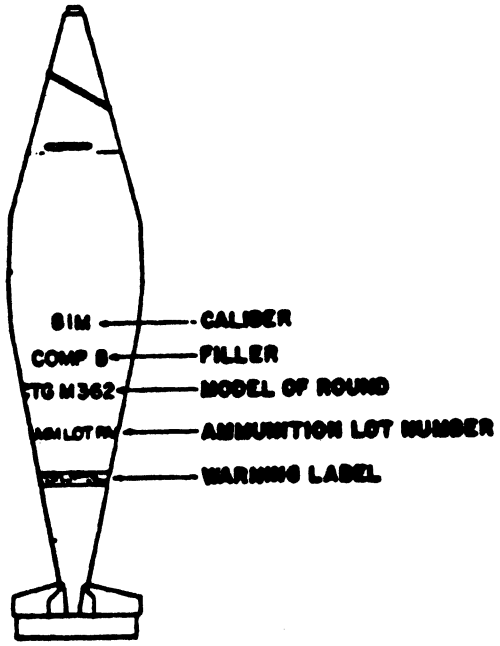


Fig 3-8. Markings on rounds.

Each mortar round has the following information stenciled on the body of the round:

a. Caliber of the mortar in which the round is to be fired (81-MM).

b. Type of filler (TNT, Composition B, Smoke WP, Illume).

c. Type of cartridge (M821, M889, M819, M375A3, M853, M68).

d. Ammunition lot number (AMM LOT PA-36-339). An ammunition lot number is assigned to each lot of ammunition. The number is marked on each cartridge and on the packing container. It is used for record purposes to include reports on condition, malfunctions, and accidents.

Note:	Some mortar rounds have a warning label fixed on the body of the round. This warning label specifies the maximum propellant charge to be used when firing these rounds.

3204. 81-MM mortar ammunition and its uses.

The 81-MM mortar ammunition authorized for use in the Marine Corps is listed below. The range given for each type of round is approximate to the nearest 50 meters, and will vary with the weight of the round. The rounds will vary slightly in weight because of differences in fuze modifications and ammunition lots.

a. High explosive (HE). High explosive ammunition is used to destroy or inflict casualties on enemy personnel, emplacements, and vehicles. High explosive ammunition causes damage by blast, fire, and fragmentation of the metal body.

(1) The M374, M374A1, and M374A2 HE cartridges have a maximum range of 4500 meters. They come with nine increments, weigh 9.03 pounds and produce casualties by fragmentation. They have a bursting radius of 34 meters.

(2) The M374A3 HE cartridge has a maximum range of 4789 meters. It comes with four increments, weighs 9.05 pounds and produces casualties by fragmentation. It has a bursting radius of 34 meters.

(3) The M889 HE cartridge has a maximum range of 5733 meters. It comes with four increments, weighs 9.03 pounds and produces casualties by fragmentation. It has a bursting radius of 40 meters.

(4) The M821 HE cartridge is the same as the M889 except it has the M734 multioption fuze.

Note:	Different types of fuzes will be discussed in the next lesson.

b. Smoke ammunition (WP, RP). Smoke ammunition is used for smoke screening, casualty-producing, incendiary (burning) action, and signaling. The newest of these rounds is filled with plasticized white phosphorus (PWP). PWP provides a more dense and longer lasting smoke.

(1) The M375, M375A1 and M375A2 (WP) smoke cartridges have a maximum range of 4500 meters. They come with nine increments, weigh 9.12 pounds and are used for screening and signaling. They have an incendiary action and can cause casualties by burning.

(2) The M375A3 smoke cartridge (WP), has a maximum range of 4800 meters. It comes with four increments, weighs 9.05 pounds and is used for screening and signaling. It has an incendiary action and can cause casualties by burning.

(3) The M819 smoke cartridge (RP), has a maximum range of 5100 meters. It comes with four increments, weighs 10.6 pounds and is used for screening only. It has an airburst/impact fuze and releases red phosphorus pellets that produce white smoke, which spread out when ignited, causing a faster, more wide-spread smoke screen.

c. Illumination. Illumination ammunition contains a flare attached to a parachute and is used for battlefield illumination and signaling.

(1) The M301A1 and M301A2 illumination cartridges weigh 10.7 pounds, have a minimum range of 100 meters and a maximum range of 2150 meters. They come with 4 increments and have a graduated time fuze which can be set from 0 to 50 seconds. The flare burns for approximately 60 seconds with 500,000 candlepower, and will illuminate an area of approximately 1100 meters in diameter.

(2) The M301A3 illumination cartridge has a minimum range of 300 meters and a maximum range of 2950 meters. It comes with eight increments and weighs 10.1 pounds. It has a graduated time fuze which can be set from 0 to 50 seconds. The flare burns for approximately 60 seconds with 500,000 candlepower, and will illuminate an area of approximately 1100 meters in diameter.

(3) The M853 illumination cartridge weighs 9.1 pounds, has a minimum range of 300 meters and a maximum range of 5150 meters. It comes with four increments and has a mechanical time fuze which can be set from 4 to 55 seconds. The flare burns for approximately 60 seconds with 600,000 candlepower and will illuminate an area of 1200 meters in diameter.

d. Training ammunition.

(1) The M879 training practice round has a maximum range of 5600 meters. It comes with four increments and is similar to the high explosive round but does not have a high explosive filler. It is used to train mortar crews in the loading and firing of ammunition.

(2) The M880 practice cartridge has a hollow body and is a short-range training cartridge. The propelling charge is the ignition cartridge only. The range of the cartridge is reduced by removing plastic plugs from the body of the cartridge, which allows gasses to escape through the cartridge body.

(3) The M68 training round, has a maximum range of 280 meters. It has a solid cast iron body and is used to train mortar crews in the loading and firing of ammunition. It has no increments and is fired with an ignition cartridge only. The round can be re-used, however, the ignition cartridge and the primer must be replaced.

Lesson 3. TYPES OF FUZES

LEARNING OBJECTIVES

1. List the five types of fuzes used with 81-MM mortar ammunition.

2. Match the type of fuze used with 81-MM mortar ammunition with its purpose.

3301. Types of 81-MM mortar fuzes.

The fuzes that are used with 81MM mortar ammunition consist of the standard impact fuze, a powder-train time fuze, a mechanical time fuze, a multioption fuze, and a radio doppler fuze (VT).

Let's break down the types of fuzes even further by discussing the different varieties available to you for your particular fire missions.

a. **Impact fuzes:**

(1) The M524 Series Fuze (fig 3-9), has two function settings: superquick (SQ) and delay (D). When set at SQ, the fuze functions on point impact or graze contact. When set at D, the fuze train causes a 0.05 second delay before functioning.

(a) The fuze contains a delayed arming feature that ensures the fuze will remained unarmed and detonator safe for a minimum of 1.25 seconds of flight. It will arm with a maximum of 2.50 seconds.

(b) To prepare for firing, you align the slot in the striker head with SQ or D using the M18 fuze wrench. The fuze has a double safety wire that must be removed just before inserting the cartridge into the mortar. This fuze comes standard on the M374 series HE and the M375 series WP.

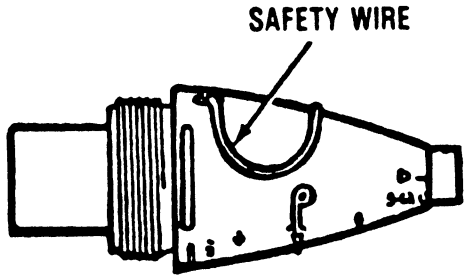


Fig 3-9. M524 Series Fuze.

Note:	If, upon removal of the safety wire, a buzzing sound in the fuze is heard, the cartridge should not be used. The cartridge is still safe to handle and transport if the safety wire is reinserted.

Warning:	If the plunger safety pin (upper pin) cannot be reinserted, the fuze may be armed. An armed fuze must not be fired since it will be premature. It should be handled with extreme care, and explosive ordnance disposal (EOD) personnel notified immediately.

(2) The M567 Series Fuze (fig 3-10) has a SQ or D function. It comes preset to function on SQ and the selector slot should align with the with the SQ mark.

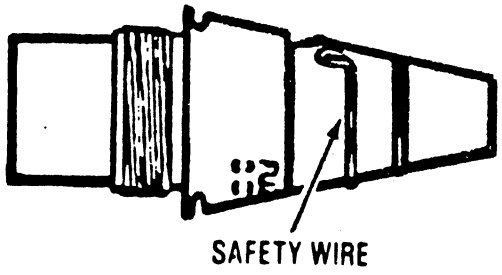


Fig 3-10. M567 series fuze.

(a) To set for delay (D), the selector slot should be rotated clockwise until it is aligned with the D mark. An M18 fuze wrench is used to change settings. The fuze has a safety wire that must be removed before firing. This fuze is an upgrade of the M524 and comes standard on the M374 series HE and M375 series WP.

(3) The M935 fuze (fig 3-11) has two function settings: impact and delay. It is set using the bladed end of the M18 fuze wrench. It is fitted with a standard pull wire and safety pin that are removed immediately before firing.

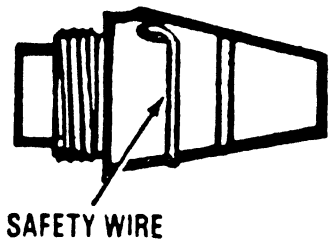


Fig 3-11. M935 fuze.

(4) The M526 series fuze (fig 3-12) has a SQ/IMP function only. It is fitted with a safety wire and bore-riding pin that is removed immediately before firing.

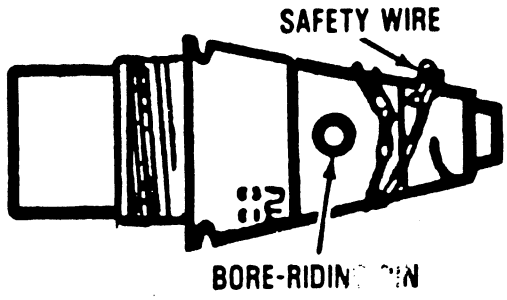


Fig 3-12. M526 series fuze.

b. Powder-train time fuzes:

(1) The M768 fuze (fig 3-13) is a powder-train time fuze used with the M853 illumination cartridge. It can be set from 3 to 55 seconds at one second intervals. The correct setting is obtained from range tables and applied using a wrench (number 9349539) or a 1 3/4 inch open-end wrench. This fuze has a safety wire that must be removed before firing.

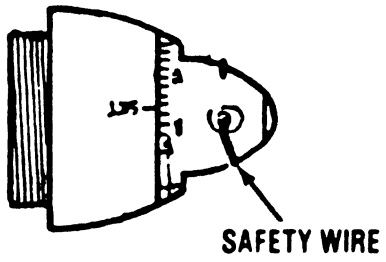


Fig 3-13. M768 fuze.

(2) The M84 and M84A1 fuzes (fig 3-14) are powder-train time fuzes used with the M301 series illumination cartridges. The fuze can be set from 0 to 25 seconds (M84) or 0 to 50 seconds (M84A1). The correct setting is obtained from range tables and applied using an M25 fuze setter. The safety wire must be removed before firing.

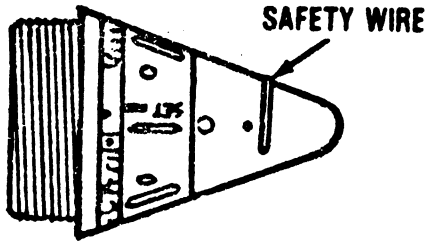


Fig 3-14. M84 fuze.

c. The mechanical time fuze:

(1) The M772 fuze (fig 3-15), is a mechanical time fuze. It can be set from 4 to 55 seconds at half second intervals. The settings are obtained from range tables and are applied using a wrench (number 9349539) or a 1 3/4 inch open end wrench. This fuze has a safety wire that must be removed before firing. This fuze comes standard on the M819 RP round and is also found on the M853 illumination round.

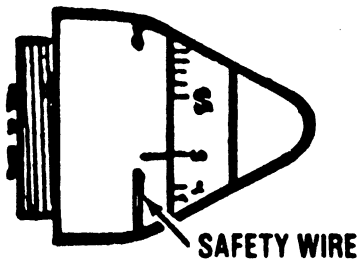


Fig 3-15. M772 fuze.

d. The multioption fuze:

(1) The M734 multioption fuze (fig 3-16), has four function settings. PRX (proximity) causes the cartridge to explode between 3 and 13 feet above the ground. NSB (near surface burst) causes the cartridge to explode between 0 and 3 feet above the ground. IM (impact) causes the cartridge to explode on contact. DL (delay) incorporates a 0.05 second delay in the fuze train before exploding the cartridge. No tools are needed to set the fuze, and the setting can be changed several times without damaging the fuze. It has no safety pins or wires to reduce preparation time. If the fuze does not function as set, it will automatically function at the next lower setting. This fuze is found only on the M821 HE round.

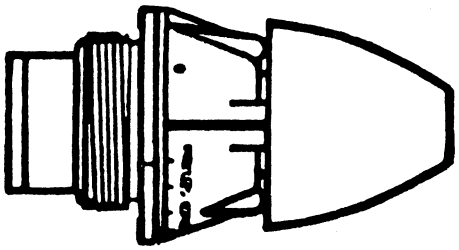


Fig 3-16. M734 multioption fuze.

e. The radio doppler fuze:

(1) The M532 (VT) fuze (fig 3-17), is a radio doppler fuze that has a proximity or SQ/IMP function. Once you set it to act as an impact fuze, the mechanism cannot be reset for PROX. To convert the fuze from PROX to SQ/IMP, you must rotate the top of the fuze 1/3 of a turn in either direction. This action breaks an internal sheer pin and an internal wire thereby disabling the proximity function. This fuze comes separately and is used to replace the M524 and M567 fuzes on the HE round only.

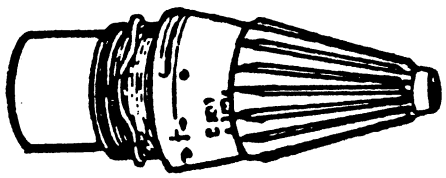


Fig 3-17. M532 (VT) fuze.

Lesson 4. PROPELLING CHARGES

LEARNING OBJECTIVES

1. List the three components of a propelling charge.

2. Identify the procedure for disposing of unused increments.

3401. Components of propelling charges.

The propelling charges on the rounds (except the training round) consist of a primer, an ignition cartridge, and bundles of powder called increments.

a. The primer; hits the firing pin, detonates, and ignites the ignition cartridge.

b. The ignition cartridge; provides a basic propellent charge and also ignites the increments.

c. The increments; are bundles of powder in bags attached to the fin assembly or horseshoe-shaped cardboard filled with powder, depending on which series of rounds are being used.

The increments must be protected from rain and moisture as short or unpredictable rounds may occur if they get wet.

Rounds are shipped with a complete propelling charge (primer, ignition cartridge, and increments). Firing tables are used to determine the correct charge for firing. The number of increments required are positioned towards the rear of the fin assembly when you are firing cartridges with horseshoe-shaped increments at less than full charge (fig 3-18).

Fig 3-18. Mortar round with increments attached.

Note:	Propelling charges are not interchangeable and should not be mixed or substituted. Do NOT mix lots.

3402. Disposal of unused increments.

The increments you remove from the rounds before firing should be placed in a metal or wooden container located outside the firing vehicle/position at a safe distance (25 meters). You should not allow excess increments to accumulate near the mortar positions. They are removed to a designated place of burning and destroyed as follows:

(1) Select a place at least 100 meters from the mortar position, parked vehicles, and ammunition piles.

(2) Preburn all dead grass or brush within 30 meters around the burning place. Do not burn increments in piles but spread them in a train 1 to 2 inches deep, 4 to 6 inches wide, and as long as necessary.

(3) From this train, extend a starting train of single increments laid end to end. End this starting train with not less than 1 meter of inert material (dry grass, leaves, or newspapers).

(4) Ignite the inert material.

Note: Do not leave unused increments unburned in combat operational areas. The enemy will use them. Burn all unused increments.

Lesson 5. CARE, HANDLING AND STORAGE OF AMMUNITION

LEARNING OBJECTIVES

1. Identify the proper procedures for caring for and handling ammunition in the field.

2. Identify the proper procedures for storing ammunition in the field.

3501. Care and handling of ammunition.

Ammunition is made and packed to withstand all conditions ordinarily encountered in the field. However, since explosives are affected by moisture and high temperature, they must be protected. Special consideration must be given to the high explosive round as it is adversely affected by shock, moisture and extreme temperature changes.

a. Before-firing Checks.

(1) You should check to ensure ammunition is free of moisture, rust, and dirt.

(2) The fin and fuze assembly must be checked for tightness and/or damage.

(3) Charges must be kept dry.

(4) Any extra increments are removed if the round is to be fired at less than full charge.

(5) With the exception of a few unused increments (within the same ammunition lot number) as replacements for defective increments, you should remove excess powder bags from the mortar position.

(6) The primer is checked for damage or dampness.

b. Complete cartridges, being fuzed, are always handled with care. The explosive elements in the primers and fuzes are sensitive to shock and high temperature.

c. The moisture-resistant seal of the container is broken when you are ready to use the ammunition. When a large number of rounds are needed for a mission, you may remove them from the containers and prepare them for firing. Propelling charges are covered or protected from dampness or heat.

d. Fuzes should not be disassembled.

e. You should protect the ammunition from mud, sand, dirt, and water. The cartridge should be free of foreign matter before firing. If it gets wet or dirty, you should wipe it off at once.

f. The ammunition, particularly the powder increments, should not be exposed to direct sunlight. More uniform firing is obtained if the cartridges are kept at the same temperature.

g. The pull wire and safety wire are removed from the fuze <u>just before firing</u>. When cartridges have been prepared for firing, but are not used, all powder increments and safety wires are replaced and the cartridges are returned to their original containers. These cartridges are used first in subsequent firing so that once-opened stocks can be kept to a minimum.

h. DUDS MUST NOT BE HANDLED!

3502. Storing of ammunition in the field.

There are two types of ammunition storage used for 81MM mortar ammunition:

a. Depot storage, where ammunition can be stored for long periods of time and still be serviceable. This type of storage is found in ammunition depots that are permanent. This is the best type of storage because the temperature and humidity can be controlled.

b. Field storage, which is used by the mortar crew. The following guidelines should be followed at all times when storing ammunition in the field:

(1) Ammunition should be stored under cover. If it is necessary to leave the ammunition uncovered, it should be raised on logs or some other type of dry material at least 6 inches above the ground. You should cover the pile with tarpaulin of double thickness. You should also dig trenches around the ammunition storage area to prevent water from flowing under the pile.

(2) In arctic weather, you should store ammunition in its original box or crate. It is placed on pallets and covered with a double thickness of tarpaulin.

(3) White phosphorus rounds are stored with the fuze end up. Since phosphorus liquifies at about 100 degrees F, the ammunition is protected against an uneven rehardening of the filler. If an air cavity forms on one side of the cartridge, it will unbalance it and can cause instability in flight.

(4) You should always check ammunition for serviceability before you need it.

Unit Exercise: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Ammunition for the 81-MM mortar is classified as _____ because the propellant charges can be detached and varied in number for firing, and the safety wire must be removed before firing.

2. What are the three main assemblies of a typical mortar round?

   _____ _____ _____

3. What is the assembly that is the main component of the round, and contains the material which produces the desired effect of the round?

   _____

4. What is the assembly that controls the method of exploding the shell?

   _____

5. What is the assembly that stabilizes the round in flight and causes it to strike with the fuze end first?

   _____

6. What are the six types of 81-MM mortar rounds?

   _____ _____ _____

   _____ _____ _____

7. What are the markings which appear on each mortar shell?

_____

_____

_____

_____

Matching: For items 8 through 13, match the type of round in column 1 with its color code in column 2. Place your responses in the spaces provided.

Column 1	Column 2
Round	Color code
___ 8. High explosive	a. White with black markings.
___ 9. White phosphorus	b. Black with white markings.
___ 10. Red phosphorus	c. Olive drab with yellow markings.
___ 11. Illumination	d. Blue with white markings.
___ 12. Training practice	e. Light green with black markings.
___ 13. Training	f. Light green with red markings.

Matching: For items 14 through 17, match the type of round in column 1 with its correct use in column 2. Place your responses in the spaces provided.

Column 1	Column 2
Round	Correct use
___ 14. High explosive	a. Battlefield illumination and signaling.
___ 15. Smoke ammunition	b. Train mortar crews in loading and firing.
___ 16. Illumination	c. Screening, casualty producing, incendiary action, and signaling.
___ 17. Training	d. Cause casualties to enemy personnel, destroy vehicles/emplacements by blast and fragmentation.

18. What are the five types of fuzes used with 81-MM mortar ammunition?

_____ _____

_____ _____

_____

Matching: For items 19 through 23, match the type of fuze in column 1 with its purpose in column 2. Place your responses in the spaces provided.

Column 1	Column 2
Type of fuze	Purpose
___ 19. Impact fuze	a. PRX, NSB, IM, or DL. Found only on the M821 HE round.
___ 20. Powder-train time fuze	b. 4 to 55 seconds at half second intervals; used with the RP round and M853 illumination round.
___ 21. Mechanical time fuze	c. SQ and D. Comes standard on the M374 series HE and the M375 series WP.
___ 22. Multioption fuze	d. PRX or SQ/IMP. Replaces the M524 and M567 fuzes on HE only.
___ 23. Radio doppler fuze	e. Used to set time on M853 and the M301 series illumination rounds.

24. What are the three components of a propelling charge?

_____ _____ _____

Questions 25 through 28 pertain to disposing of unused increments. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 25. Extend a starting train of single increments laid end to end. End this starting train with not less than 1 meter of inert material.	a. Step 1 b. Step 2 c. Step 3 d. Step 4
___ 26. Preburn all dead grass or brush within 30 meters around the burning place.	
___ 27. Ignite the inert material.	
___ 28. Select a place at least 100 meters from the mortar position, parked vehicles, and ammunition piles.	

29. When checking ammunition before firing, you should check to ensure it is free of _____, _____, and _____.

30. The fin and fuze assembly must be checked for _____ and/or _____.

31. The primer is checked for _____ or _____.

32. The _____ and _____ are removed from the fuze just before firing.

33. What are the two types of ammunition storage used for 81-MM mortar ammunition?

34. When storing ammunition in a field storage, you should always store it under _____.

35. White phosphorus rounds are stored with the fuze end _____.

SUMMARY

Within this study unit, you have been shown the different types of rounds used with the 81-MM mortar, their nomenclature, and their use. In addition, you have been shown the various fuzes used with mortar ammunition, as well as propelling charges, care, handling and storage of ammunition, and safety precautions which must be observed.

In the next study unit, you will be provided with information concerning placing the mortar into action.

Study Unit 3 Exercise Solutions	Reference
1. Semifixed	3101
2. Body, fuze, and fin assembly	3102
3. Body	3102a
4. Fuze	3102b
5. Fin assembly	3102c
6. High explosive, white phosphorus, red phosphorus, illumination, training practice, training.	3201
7. Caliber, type of filler, type of cartridge, ammunition lot number.	3203
8. C.	3202a
9. F.	3202b
10. E.	3202c
11. A.	3202d
12. D.	3202e
13. B.	3202f
14. D.	3204a
15. C.	3204b
16. A.	3204c
17. B.	3204d
18. Impact fuze, powder-train time fuze, mechanical time fuze, multioption fuze, radio doppler fuze.	3301
19. C.	3301a
20. E.	3301b
21. B.	3301c
22. A.	3301d
23. D.	3301e
24. Primer, ignition cartridge, increments	3401
25. C.	3402(3)
26. B.	3402(2)
27. D.	3402(4)
28. A.	3402(1)
29. Moisture, rust, dirt	3501a(1)
30. Tightness, damage	3501a(2)
31. Damage, dampness	3501a(6)
32. Pull wire, safety wire	3501g
33. Depot storage, field storage	3502
34. Cover	3502b(1)
35. Up	3502b(3)

STUDY UNIT 4

PLACING THE MORTAR INTO ACTION

Introduction. The M252 mortar is only as good as the crew which is using it. To take full advantage of its high degree of accuracy you must first be able to mount it on an initial direction of lay. The more accurate that you have laid on this initial direction, the less adjusting shots it will take to get on target. Many times the effectiveness of your mortar fire will depend on how many rounds you are able to get down range on target prior to the enemy being able to take effective cover. If he is caught without prior warning in the open, he will sustain many casualties. But, if he has time to take cover prior to the rounds being adjusted onto his position he will take only light casualties. The ideal situation is for your first rounds to be in effect, catching the enemy completely by surprise. Not only will the number of casualties be higher but the enemy will be psychologically shocked by the violence reeked upon him without warning from an unseen foe.

Lesson 1. SELECTING THE MORTAR POSITION

LEARNING OBJECTIVES

1. List the five common characteristics used for selecting a mortar position.
2. State the reason for positioning the mortar in defilade.
3. State the purpose of camouflage.
4. List the materials used for camouflaging the mortar position.

4101. Characteristics of a mortar position.

Selecting a firing position can be just as important as firing the mission itself. There are certain things you must look for and accomplish before you even set up your guns. When selecting the location of the mortar position, certain common methods are used. These common methods maximize the efficiency of the mortar unit, maximize their effects on the enemy and minimize the danger of enemy counter-mortar fire. These common characteristics are as follows:

a. Defilade. The idea behind positioning the mortar in defilade is to provide cover and concealment from enemy observation and direct fire, regardless of the tactical situation. Moreover, placing the mortar position in defilade reduces or eliminates the enemy's ability to attack the mortar position with direct fire weapons.

b. Dispersion. The 81-MM mortar round has a bursting area of approximately 35 meters. Thus if all the mortars were positioned within a 30 meter area, one enemy mortar round landing inside that area could destroy the entire mortar unit. For this reason, the mortars, whenever possible should be arranged in a "Lazy W" formation with all mortar pits 35 to 40 meters apart.

c. Resupply. During periods of heavy firing, the mortars will rapidly use up their available ammunition and will require resupply. In order to ensure that this resupply can take place rapidly and efficiently, the mortars must have an accessible and easy to use route into and out of their position. Thus, by positioning the mortars near a road, trail or helicopter landing zone, resupply efficiency can be maximized.

d. Stable firing platform. When the mortar is fired, the baseplate takes up much of the recoil. Thus the ground on which the baseplate is placed becomes an important consideration. If the ground is too soft, the mortar will actually sink as the weapon recoils, causing erratic rounds. If the ground is too hard, the recoil will cause the baseplate to bounce. this too will cause erratic rounds. The ground on which the mortar is positioned must be able to absorb the recoil of firing while not allowing the weapon to sink and bounce. Here are some other considerations for these conditions.

(1) Soft surfaces. Fill sandbags with dirt dug from the baseplate pit, place the sandbags back into the hole with the baseplate on top of the sandbags. You can even fill an ammunition box full of dirt and use it as a backstop. Both will slow down the sinking of the baseplate (fig 4-1).

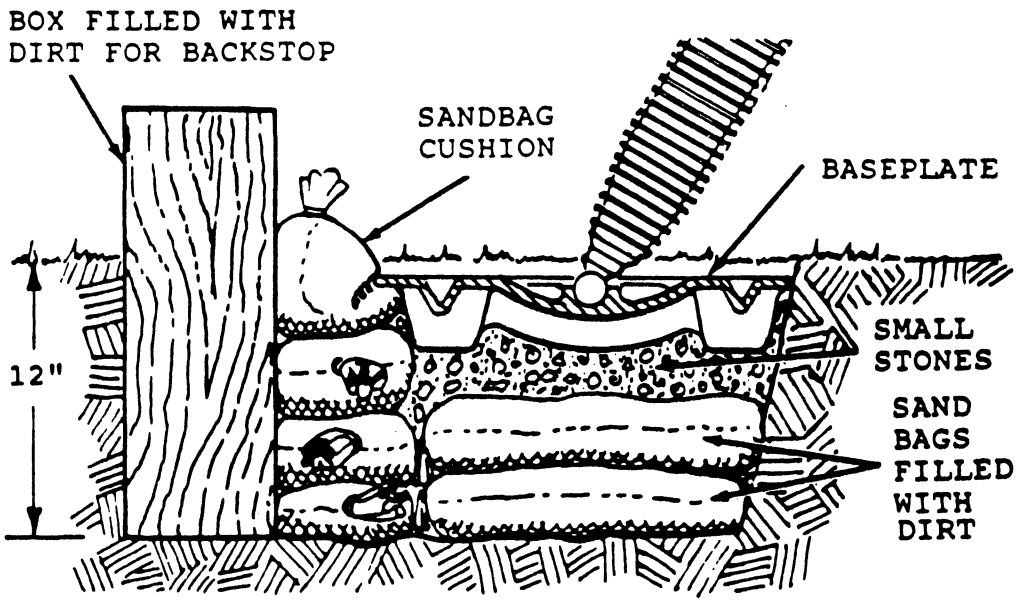


Fig 4-1. Firing platform for soft surface.

(a) If no sandbags are available, dig out the baseplate pit and fill an ammunition box with the dirt. Place the ammo box into the baseplate pit and cover it with more dirt and place the baseplate on top of it. The ammo box may break up during firing, but it will not damage the baseplate.

(2) Hard surfaces. Once again fill sandbags with dirt/soil. Stack the sandbags at least two bags high. Cover the area for bipod movement (approx 3 ft). Using a backstop would also help in ensuring the baseplate does not shift (fig 4-2).

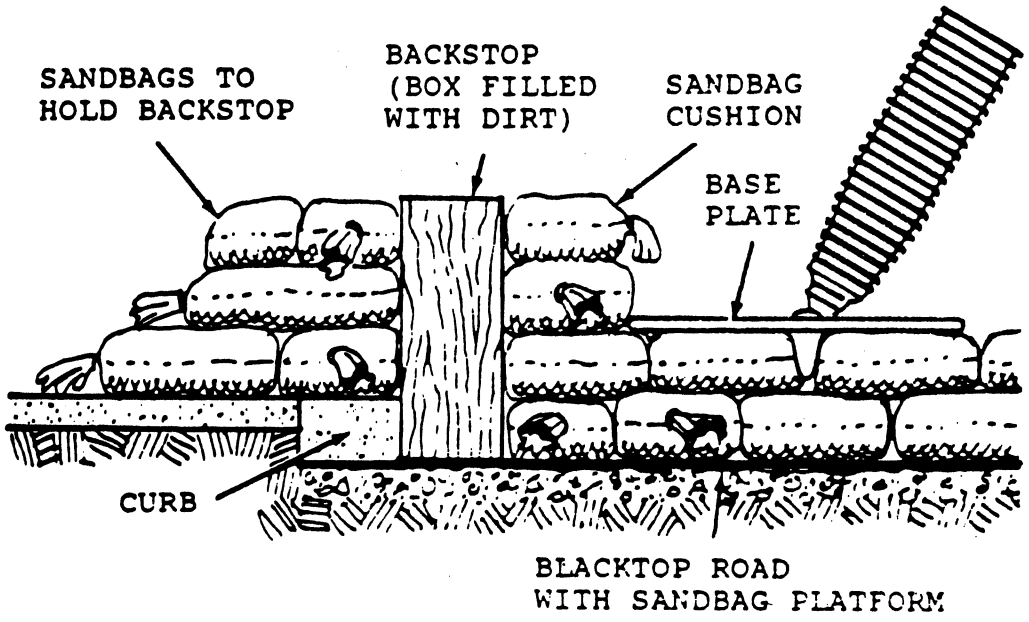


Fig 4-2. Firing platform for hard surface.

(a) If sandbags are not available on hard surfaces, chip away the hard surface, and place the chips back into the baseplate pit. This will reform the hole into the shape of the baseplate.

(3) Frozen surfaces. Fill sandbags with frozen chippings of soil dug from the baseplate pit and use the same procedure as hard surfaces.

e. Mask and overhead clearance. When positioning the mortars in defilade, mask and overhead clearance are by far the most important factors. Mask, such as a small knoll or low thick underbrush prevents the gunner from seeing his aiming points through his sight. Overhead obstacles include any solid substance that prevents the fired round from free flight. In other words, without overhead clearance the fired round would strike the overhead obstacle and detonate in the mortar area. Selection for the location of a mortar pit should ensure a clear view through the sight at the aiming points and clear overhead. If brush is to be removed, ensure that the natural cover and concealment is not destroyed.

4102. Purpose of camouflage.

The purpose of camouflage in the military is to deny the enemy information and to deceive him as to our intentions. The enemy looks for our mortar positions for the following reasons:

a. To render them ineffective.

b. To plan his action so as to avoid our mortar fire.

c. To estimate our plan of maneuver through location of our mortar position.

If you do not camouflage your mortar position or if you do a poor job camouflaging it, you not only reduce the effectiveness of the mortars, you also give the enemy insight as to our intentions based on their location.

4103. Camouflaging the mortar position.

Camouflaging the mortar position should be started immediately upon occupation of the position. The mortar position should be camouflaged with natural vegetation if the situation and time permit. But in most cases a camouflage net will be used. Camouflage nets are used because it is easier to remove for fire missions. If natural vegetation is used, it should be cut from outside the mortar position. Aiming posts may be painted green to aid camouflage. Mortar crewmen must be careful when moving from the mortar pit to the aiming posts because of paths that may be worn. These paths will tend to look like spider webs from the air and will disclose the mortar position.

Lesson 2. MOUNTING AND DISMOUNTING THE MORTAR

LEARNING OBJECTIVES

1. Identify the steps for ground mounting the 81-MM mortar.
2. Match the piece of mortar equipment with the crewman who is responsible for carrying it.
3. State the command for mounting the mortar.
4. Identify the steps for dismounting a ground mounted 81-MM mortar.
5. Identify the steps for mounting the 81-MM mortar in the LAV-M.
6. Identify the steps for preparing the 81-MM mortar on the LAV-M for displacement.

4201. Preparation for mounting.

Figure 4-3 on the following page, shows how your equipment will be laid out when preparing to mount the mortar as in gun drill. You should keep in mind that in a combat environment, the situation will not allow you to take the time to lay out and inspect your equipment before occupying a firing position. You will need to get to your position and be prepared for fire missions as soon as possible and also be safety conscious during the entire process.

You will be assigned as a member of a four man gun team. The gun team stands in line in the following order:

a. The first man in line is the first ammunition man and carries the baseplate.

b. The second man in line is the assistant gunner and he carries the barrel (in the port arms position).

c. The third man in line is the gunner and he carries the bipod. He will hold the bipod in the modified port arms position, with his right hand on the elevation shaft and his left hand on the fixed leg.

d. The fourth man in line is the squad leader and he carries the sight case. He will take the sight case and two aiming posts and move to the exact position where the mortar is to be mounted. He places the sight case and the aiming posts to the left front of the mortar position. He points to the exact spot where the mortar is to be mounted. He will also indicate the initial direction of fire by pointing in that direction.

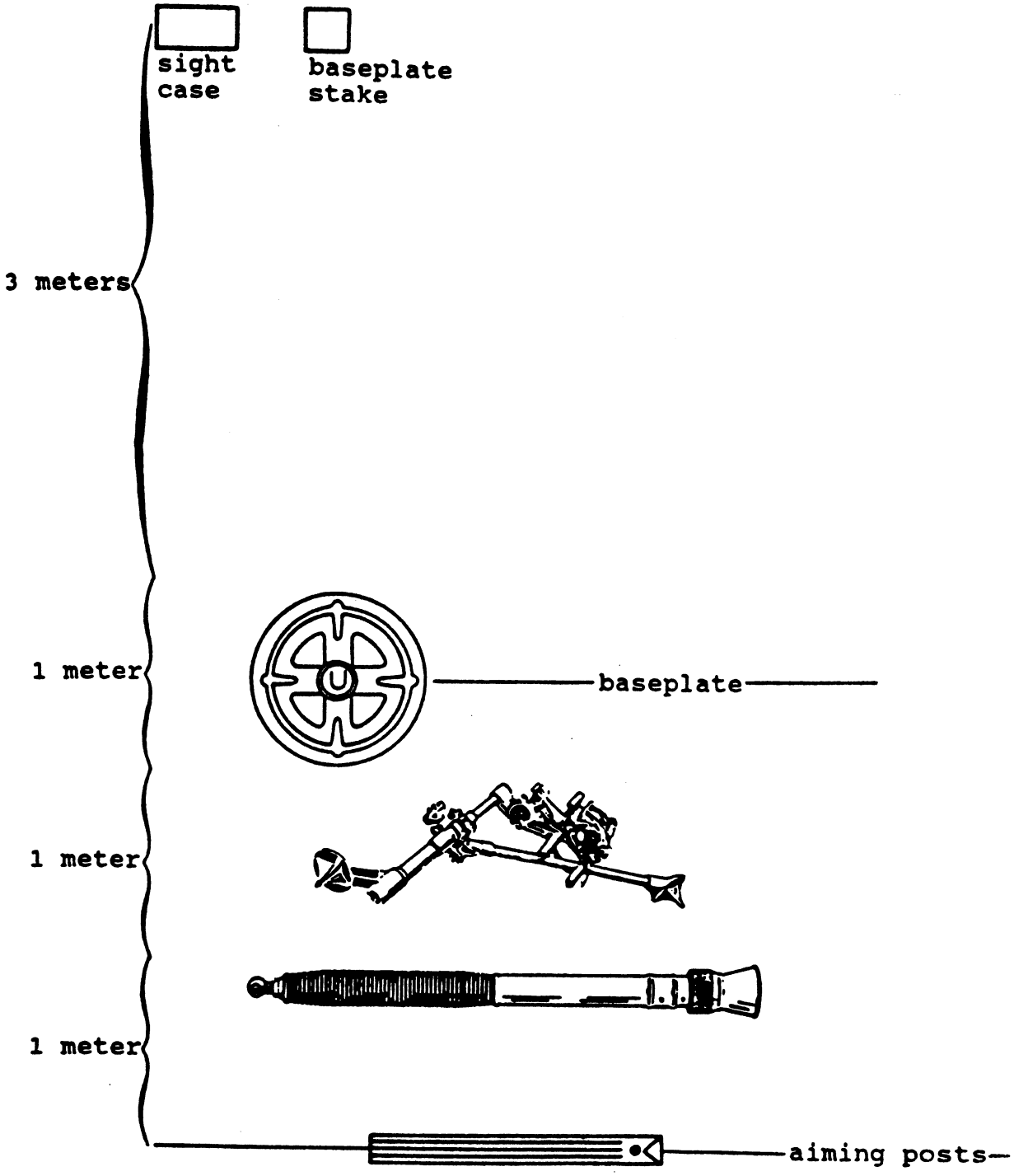


Fig 4-3. Mortar equipment laid out for mounting.

The first command you will receive is "Gunners check gun and equipment for gun drill".

(1) Everyone will repeat the command.

(2) Each man will check the piece of equipment that they are holding.

(a) The baseplate:

(1) The ammunition man ensures the socket is free to move in a complete circle.

(2) The baseplate ribs and braces have no breaks, cracks or dents.

(3) The retaining ring is correctly located securing the rotating socket to the baseplate.

(4) The socket is pointing in the direction of fire.

(b) The cannon:

(1) The assistant gunner ensures that the barrel is clean and free from grease and oil both inside and out.

(2) The breech plug is screwed tightly to the barrel.

(3) The firing pin is secured correctly.

(4) The blast attenuator device is secured correctly.

(c) The bipod:

(1) The gunner checks to see that the barrel clamp is closed.

(2) The securing strap is correctly located, securing the barrel clamps and the buffers to the fixed leg.

(3) The leg locking knob is hand tight.

(4) There is 4 inches of elevation shaft exposed and the shaft is not bent.

(5) The traversing gear assembly is centered (12 complete turns from either side).

(6) There are 2 fingers of minor adjust (this will leave 12 turns from the left side).

Once all the gunners have made these checks, they stand by and sound off in sequence, starting with gun number one, "Gun # _____ gun and equipment all correct".

These are still just premounting checks. Let's continue on and see just how you mount this mortar.

4202. Procedures for ground mounting the mortar.

Once all gunners have sounded off, the next command given is "On line, to your direct front, action"! (This command is not repeated). After the command action, the crewman take the following action.

(1) The baseplate man will move forward to the predesignated area and set the baseplate on the ground approximately 2 feet to the right and forward of the sight case. He must ensure that the open end of the socket is pointing in the direction of fire.

(2) The assistant gunner will move forward and insert the spherical projection of the barrel into the socket of the baseplate. He will rotate the barrel 90 degrees left or right to lock it to the baseplate. The assistant gunner must ensure that the firing pin is pointed upwards.

(3) The gunner will standfast and prepare the bipods for mounting using the following procedure:

(a) The gunner will lower the bipod down to the ground on the foot of the elevating leg.

(b) He will then undo the web strap and loosen the locking knob.

(c) Next the gunner will lower the fixed leg until he hears the leg locking lever click indicating that the fixed leg is in the proper position. He will then secure the leg by tightening the leg locking knob ensuring that the teeth are meshed properly.

(d) The gunner will then press in on the barrel clamp locking lever and lift up on the barrel clamp handle.

(e) Once this is accomplished the gunner will undo the locking rod by lifting up on the barrel clamp latch and open the barrel clamp.

(f) With his right hand, the gunner will reach straight down and pick up the bipod between both legs. He will ensure that his right arm is holding down the upper half of the barrel clamp to keep it from swinging. He will then double time to where the ammunition man and assistant gunner are waiting.

(g) The gunner will place the bipod approximately two feet in front of the baseplate.

(h) The assistant gunner will place the cannon on the gunner's right shoulder.

(i) With his left hand the gunner will raise the lower section of the barrel clamp assembly until it is flush with the cannon. With his right hand he will place the upper half of the barrel clamp over the top of the barrel and place the locking rod in its recess. The locking latch is then closed with the left thumb.

(j) The gunner slides the barrel clamp assembly down the barrel until it is flush with the lower stop band and with his right hand he will press down on the barrel clamp handle to lock it.

(k) You as the gunner will then go to the sight case and lift the sight unit up by holding the elbow telescope. You place the elbow telescope in the up position and tighten the wing nut. With your right hand you set the elevation to 1100 by turning the elevation knob three turns away from you. Once you have your sight prepared, you will mount it to the mortar.

(1) As you are preparing the sight unit, your assistant gunner will kneel in front of the gun, open all cranks and run up the elevation 12 turns or until there is approximately eight inches of elevation shaft showing (a fist and a thumb).

(l) Once you have mounted your sight, you must then sight in on your direction stake. To do this you will utilize the following five steps:

(1) Bisect: You lift the bipod legs off the ground and move the gun until the vertical crossline of the sight is aligned with the left edge of the direction stake (fig 4-4).

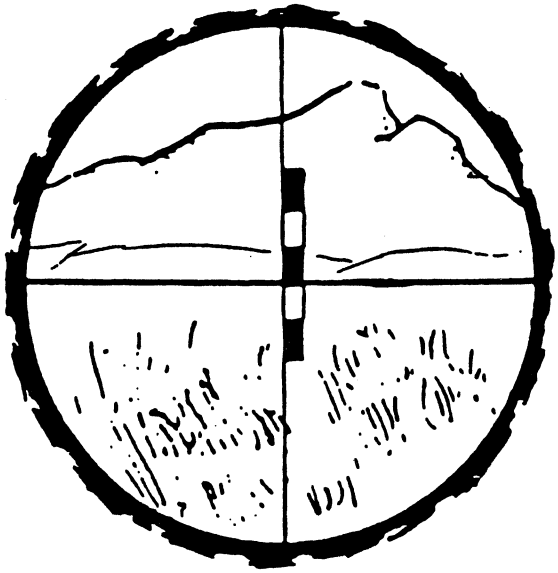


Fig 4-4. Aligning on the direction stake.

(2) Rough level: You will remove any major cants from the gun by looking at the crosslevel bubble and moving the fixed leg in or out until the bubble just floats to the opposite side.

(3) Level the Elevation: You level the elevation bubble by turning the elevation crank either up or down until the bubble is within the outside red lines (Fig 4-5).

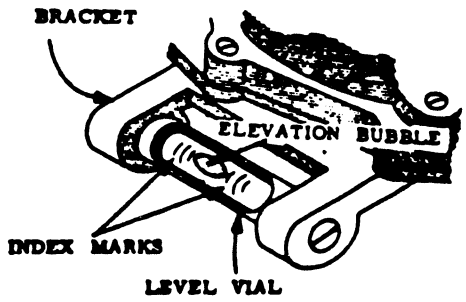


Fig 4-5. Elevation vial.

(4) Level the Crosslevel: You level the crosslevel bubble by turning the crossleveling mechanism until the bubble is within the outside red lines.

(5) Traverse halfway and minor adjust: You will now look into the sight. If you are within 20 mils of your direction stake, turn the traversing handwheel forward or backward (whichever is necessary) until the vertical crossline moves half the distance to the direction stake. You then look at the crosslevel bubble and crosslevel the gun using the crosslevel mechanism. Repeat this procedure until the vertical crossline of your sight is within 2 mils of the left edge of the direction stake (see fig 4-4).

Note:	If the vertical crossline is more than 20 mils off the left edge of the direction stake, you must repeat the first four steps before performing the fifth.

(m) Once the vertical crossline is within 2 mils of the left edge of the direction stake and both bubbles are level you will announce "Gun # _____ up".

4203. Procedure for dismounting the mortar.

The command for dismounting the mortar is "Out of action". This command is not repeated. You use the following procedure to dismount the mortar.

a. The gunner puts the elbow telescope in the rest position, places an elevation of 0800 mils on the sight, ensures the deflection is set at 3200 mils and removes the sight and stows it in the case.

b. The assistant gunner will lower the elevation and close all cranks on the bipod.

c. The gunner then moves around to the front of the gun, opens the barrel clamp assembly and supports the bipod. The assistant gunner then removes the cannon.

d. The gunner will then center the traversing mechanism and crossleveling mechanism. He loosens the locking knob, pushes in on the leg locking lever and raises the fixed leg. He will then lock the locking knob and secure the fixed leg with the web strap.

e. The assistant gunner will rotate the cannon 90 degrees left or right to unlock it from the baseplate. He will pick up the barrel and return to his original position as if to mount the mortar.

f. The baseplate man will then pick up the baseplate and join the assistant gunner in line in his original position. Once the gunner has completed preparing the bipod he joins the assistant gunner and baseplate man.

g. Once everyone is back in line with all their gear, the gunner will announce "Gun # _____ out of action".

4204. Mounting the mortar in the LAV-M.

As a mortarman, it is possible you could be assigned to the mortar platoon of an LAI Battalion. Therefore it is important that you know the procedures for operating the M252 81-MM mortar which is mounted in the LAV-M (fig 4-6).

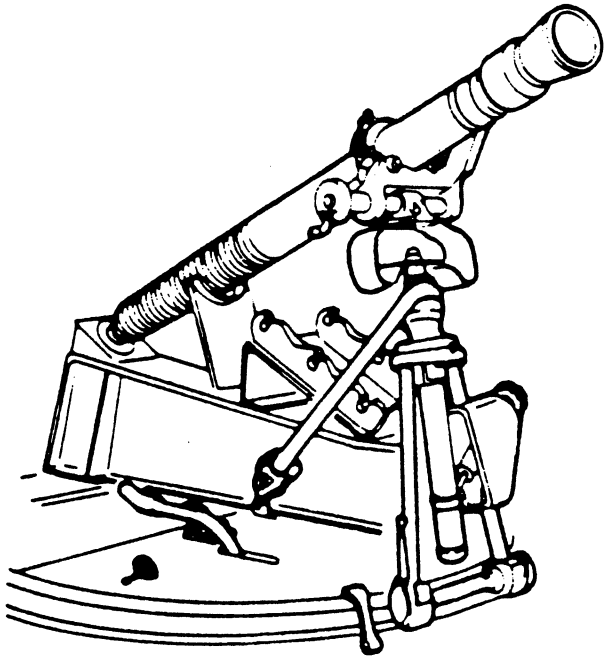


Fig 4-6. Mortar mounted in the LAV-M.

To mount the mortar in the LAV-M, you perform the following steps (refer to fig 4-7):

1. Push the handle safety latch (1) back and pull on the turntable lock handle (2) to unlock the turntable.

2. Pull on the traversing straps (3) until the turntable is at the desired position.

3. Open the roof hatch.

4. Remove the tie-down strap (4) and store it in the mortar equipment bag.

5. Lift the bipod assembly (5) and set it in the desired bipod support slot (6).

> **Note:** The bipod support has three slots for the bipod. Each slot has a minimum and maximum elevation. See table 4-1 for elevation and bipod support information.

6. Lock the bipod assembly in place by pushing down on the bipod locking handle (7).

7. Remove the muzzle cover (8) and store it in the mortar equipment bag.

8. Install the sight extension (9) by inserting it into the dovetail slot on the mortar.

9. Turn the crossleveling handwheel (10) until the bubble is centered in the mortar sight mechanism.

10. Elevate the mortar cannon (11) to the correct setting by turning the elevating handle (12).

11. Traverse the mortar to the desired setting by turning the traversing wheel (13).

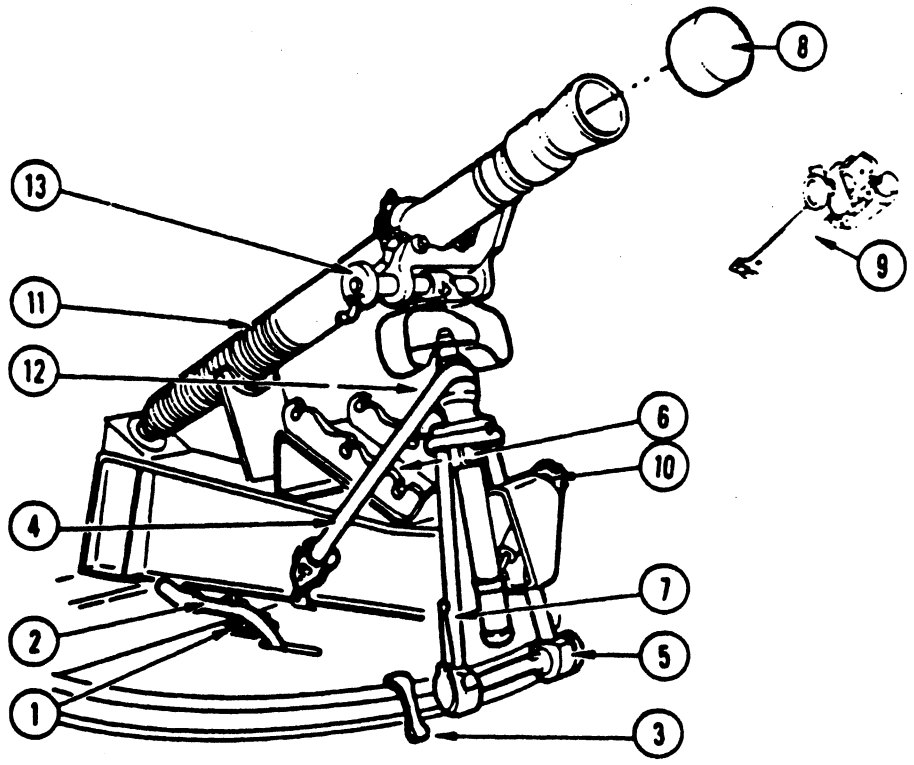


Fig 4-7. Mortar mounted in LAV-M.

Table 4-1 Elevation Data

Bipod support position	Barrel ring location	Bipod assembly elevating mechanism	Elevation degrees-approx	Elevation mils-approx
Lower Position:				
Minimum	Raised	Fully depressed	40	712
	Centered	Fully depressed	42	748
	Centered	Fully elevated	66	1,174
Maximum	Lowered	Fully elevated	68	1,209
Center Position:				
Minimum	Raised	Fully depressed	46	819
	Centered	Fully depressed	48	854
	Centered	Fully elevated	75	1,333
Maximum	Lowered	Fully elevated	78	1,388
Upper Position:				
Minimum	Raised	Fully depressed	51 1/2	915
	Centered	Fully depressed	55	979
	Centered	Fully elevated	86	1,530
Maximum	Lowered	Fully elevated	90	1,600

4205. Preparing the mortar on the LAV-M for displacement.

To prepare the mortar on the LAV-M for displacement, you will use the following steps (refer to fig 4-8).

1. Remove the mortar tie-down strap (1) from the mortar equipment bag.

2. Release the bipod locking handle (2), remove the bipod assembly (3) from its support mount (4), and set the assembly on the floor.

3. Hook the ratchet end of the tie-down strap (1) into the pad eye (5) on either side of the mortar mount.

4. Wrap the tie-down strap (1) around the elevating mechanism of the bipod assembly (3), below the springs (6).

5. Hook the other end of the tie-down strap into the pad eye (5) on the opposite side of the mortar mount.

6. Operate the ratchet handle (7) up and down until the tie-down strap is tight.

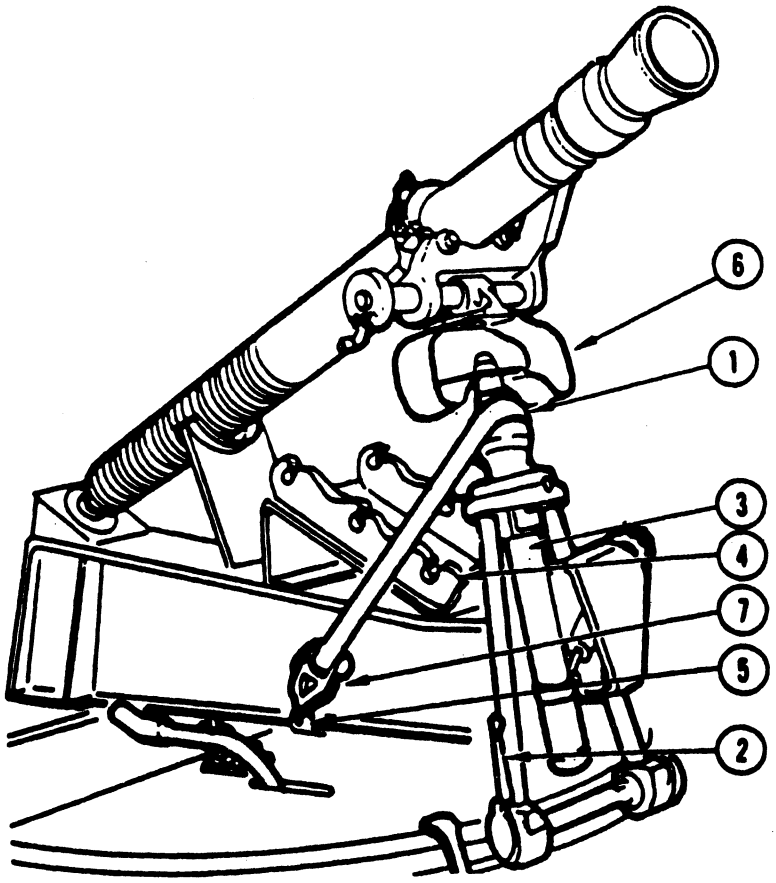


Fig 4-8. Mortar mounted in the LAV-M.

Lesson 3. INITIAL DIRECTION AND LAYING OF THE MORTAR PLATOON

LEARNING OBJECTIVES

1. State the two methods to determine initial direction of fire most commonly used by the mortar platoon.

2. List the three methods used for parallel laying.

3. Identify the sequence of steps used to lay the mortar for direction using the compass method.

4. Identify the sequence of steps used to lay the mortar for direction using the aiming circle method.

5. Identify the sequence of steps used to lay the mortar for direction using the M64A1 sight method.

6. State the two conditions under which you can use direct lay of the 81-MM mortar.

7. State what is meant by referring the sight.

8. Identify the method used to place out aiming posts.

9. From an illustration, identify the hand and arm signals used in placing out the aiming posts for the mortars.

4301. Determining initial directions.

The initial direction of fire for a mortar is the center of the sector in which mortar fire is to be placed. This is the direction in which the mortar is first pointed. The two methods to determine initial direction of fire most commonly used by the mortar platoon are the compass method and the map method.

a. Compass method. This method is used when the sector of fire is visible from the mortar position. A compass is used to read a direction from the mortar position to the center of the sector of fire. The mortar is then mounted and laid on this direction.

b. Map method. This is used when the sector of fire is NOT visible from the mortar position. On the map, you locate the mortar position and the center of the sector of fire. Connect these two points with a straight line, and measure the grid azimuth of the line with a protractor. The direction of this line is the initial direction of fire. You convert the grid azimuth to magnetic azimuth and the mortar is then mounted and laid on this direction.

4302. Parallel laying the mortars.

It is important that when more than one mortar is used to fire a mission, they are mounted and laid parallel (fig 4-9). This will ensure proper target coverage and accurate destruction of the targets when they are engaged. The three methods used to lay mortars parallel are the compass azimuth method, aiming circle method and the M64A1 sight method.

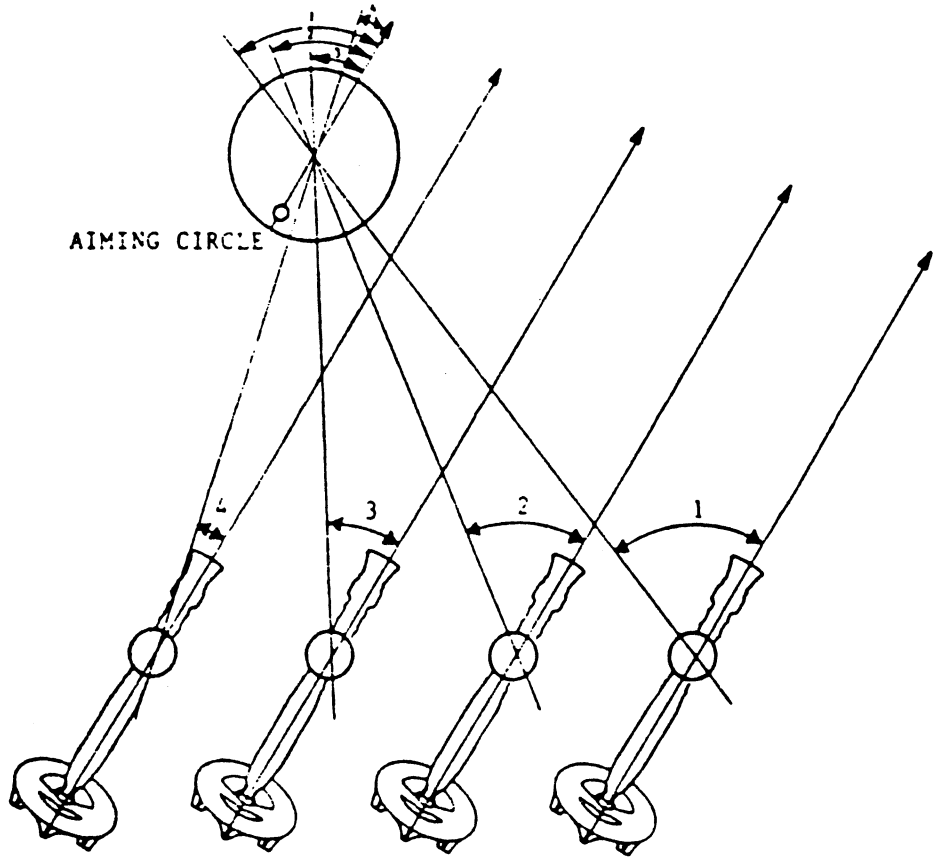


Fig 4-9. Mortars mounted and laid parallel.

a. Compass azimuth method. The most rapid but least accurate method of laying the mortars parallel is by using the compass. The squad leader receives the direction of fire from the fire direction center or the section leader.

(1) Each squad leader places a baseplate stake to mark the exact location of his mortar.

(2) The squad leader places the compass on top of the baseplate stake and rotates it until he can sight along the direction of fire.

(3) The ammunition man designated to be the direction stake /aiming post man moves approximately 25 meters out in front of the mortar position with the direction stake. The squad leader, with the use of hand and arm signals, has the ammunition man place the direction stake exactly on the azimuth (fig 4-10).

(4) The mortars are then mounted on this azimuth.

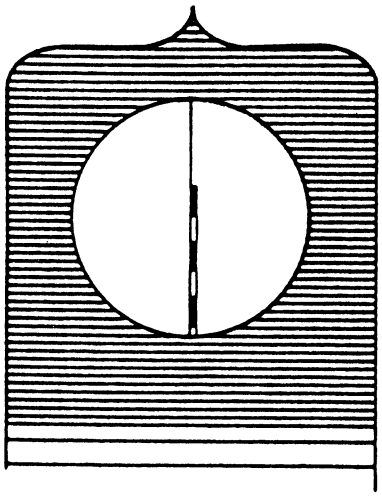


Fig 4-10. Compass user's view of direction stake.

b. Aiming circle method. The aiming circle method of laying the mortars is more commonly called reciprocal laying. Reciprocal laying is the most accurate method of laying the mortars. However, it has one drawback, it is time consuming. In combat, when time is essential, we will initially use the compass method of laying the mortars. If the same firing position will be used for a period of time, the mortars will be re-laid using the aiming circle as soon as time permits. The setting up and operation of the aiming circle by the individual Marine is beyond the scope of this course. However, every member of the mortar platoon should be trained in the gunner's function when the mortar platoon is laid parallel using the aiming circle. As a gunner there are only two parts of the aiming circle that you must remember, one is the lens and the other, which is located just above the lens, is the reflector. The lens is the primary aiming point for the gunner. When the aiming circle is turned so that you cannot see the lens, you will use the reflector as your aiming point.

Now that we know a couple of things about the M2 aiming circle, let's get into the procedure for reciprocal laying.

(1) The aiming circle operator will mount and level the aiming circle at a point from which he can observe the sights of all the mortars in the platoon (normally the left front or left rear of the platoon).

(2) The aiming circle operator will indicate the general direction of fire by pointing. Once he has done this, the mortar crews will mount the mortars in that direction and level them up.

(3) After the mortars are mounted, the aiming circle operator will begin to lay the mortars using the aiming circle.

(a) The aiming circle operator will announce "Aiming point this instrument".

(b) At this time the gunners will refer their sights to the aiming circle and bisect the vertical crossline of the sight on the lens or reflector of the aiming circle (fig 4-11). The elevation will remain on 1100. Both the elevation bubble and crosslevel bubble must be level during <u>every</u> phase of laying with the aiming circle.

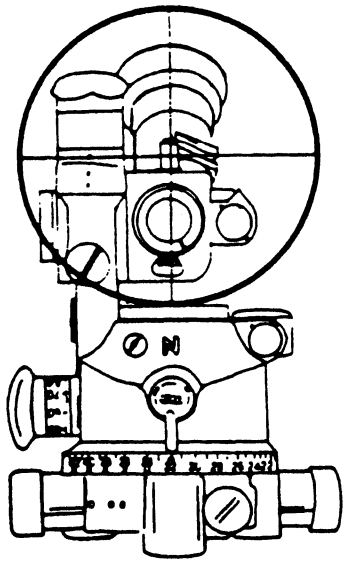


Fig 4-11. Mortar sight referred to aiming circle.

(c) Once this is done, you will respond "Gun number _____, aiming point identified".

(d) The aiming circle operator will then bisect the lens of the sight with the aiming circle (fig 4-12) and announces "Gun number _____, deflection _____".

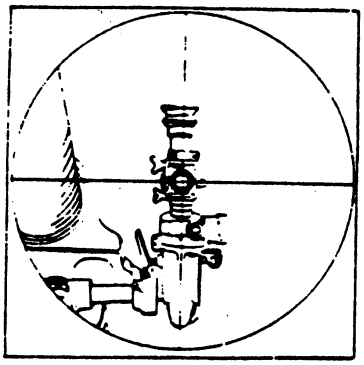


Fig 4-12. Aiming circle bisecting the mortar sight.

(e) You repeat the deflection and place the deflection on the sight.

(f) With the aid of the a-gunner, you move the bipod, if necessary, until you again have the vertical crossline of the sight bisecting the lens or reflector of the aiming circle. The mortar is laid accurately by elevating, traversing and crossleveling until the vertical crossline of the sight is bisecting the lens or reflector (fig 4-10).

(g) You then respond "Gun number _____ ready for recheck".

(h) The aiming circle operator will again refer the aiming circle to the sight (fig 4-12) and give you another deflection by announcing "Gun number _____, deflection _____".

(i) You will repeat the new deflection, place it on the sight, and re-lay the mortar on the lens or reflector of the aiming circle and then announce "Gun number _____, ready for recheck".

(j) The aiming circle operator and the gunner repeat the procedure until the sight and aiming circle are sighted on each other with a difference in deflection readings of not more than one mil.

(k) Upon receiving a deflection from the aiming circle operator that is the same, or within one mil of the deflection on the sight, your mortar is laid. To notify the aiming circle operator that your mortar is laid, you will respond with one of the following responses:

1. "Gun number _____, zero mils out, gun laid" or;

2. "Gun number _____, one mil out, gun laid", whichever is appropriate.

(l) The next command you will receive from the aiming circle operator is "Gun number _____, deflection 2800, place out aiming posts".

(m) As each gunner receives this command, without disturbing the lay of the mortar, he will refer his sight to 2800 mils deflection and direct his aiming post man in placing out the aiming posts.

c. M64A1 sight method. The mortar platoon can be laid parallel by using the mortar sights. For this method, it is best to have the mortars positioned so that all sights are visible from the base mortar. The base mortar (normally number 4) is laid in the desired direction of fire by compass or by registration on a known point. After the base mortar is laid for direction, the remaining mortars are laid parallel to it as follows:

(1) The platoon commander or platoon sergeant moves to the mortar sight of the base mortar and commands "Platoon, aiming point this instrument". The gunners of the other mortars refer their sights to the sight of the base mortar (fig 4-13) and announce "Aiming point identified".

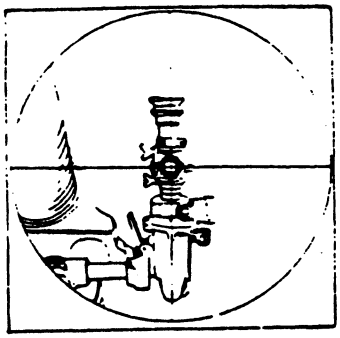


Fig 4-13. Sighting on the base mortar sight.

(2) The platoon commander or platoon sergeant refers the sight of the base mortar to the lens of each of the other sights in turn, reads the deflection to each mortar, and immediately announces the deflection, for example, "Number one, deflection zero nine two five; number three, deflection zero nine seven three".

(3) Each gunner, when the deflection to his mortar is announced, places that deflection on his sight and re-lays his sight on the sight of the base mortar. He then announces "Number ____, ready for recheck".

(4) The platoon commander or platoon sergeant reads and announces the new deflection to the mortar ready for recheck. The gunner re-lays his mortar with the new deflection. This procedure is continued until the difference between the deflections on the two sights is 1 mil or less. When each mortar is laid, the gunner announces "Number _____, zero (or one) mil(s) out, gun laid". The mortar is now laid parallel to the base mortar. The platoon commander or platoon sergeant will command "Deflection 2800, refer, place out aiming posts".

4303. Direct lay of the 81-MM Mortar.

Up to this point we have learned how to employ the mortar for indirect lay. Suppose though that the enemy were to become visible through your sight. In some cases the outcome of a close range battle can depend on a single mortar crew's ability to rapidly bring fire on the enemy. In this case you will need to use the method of engagement known as direct lay. Direct lay can be used whenever you can see the target through your sight. The mortar can also be used in a direct lay role when enemy troops attack the mortar position. This is accomplished by initial and subsequent laying for deflection and elevation, and firing for effect.

Let's take a look at the first step in this procedure.

a. Initial Laying.

(1) Initial deflection. The initial deflection is always 3200 mils. This aims the sight and barrel in the same direction. The deflection is placed on the M64A1 sight and the gun is laid on the target with the vertical crossline of the sight reticle bisecting the center of the target.

(2) Initial elevation and charge. The squad leader estimates the range to the target and determines from the firing tables the initial elevation and charge to be used. Once the squad leader makes his determination, he gives the elevation to the gunner and the ammunition man sets the charge on the round.

(a) The gunner places the elevation received from the squad leader on the sight.

(b) With the correct elevation on the sight, he then levels the elevation bubble.

Having covered that, we will look at what you need to do if the first round doesn't hit the target.

b. Subsequent Laying.

(1) Subsequent deflection. Subsequent laying for the deflection is done to compensate for any error in deflection.

(a) The gunner observes the burst of the fired round through the sight.

(b) The gunner will refer the sight (using the deflection knob) until the vertical crossline bisects the burst. This is done without disturbing the lay of the mortar.

(c) The gunner then traverses or moves the bipod until the vertical crossline of the sight again bisects the target with the crosslevel bubble level.

(2) This is accomplished at the same time as correcting for elevation error.

(a) The squad leader will estimate the distance that the round was over or short of the target.

(b) The squad leader refers to the firing tables and obtains the corrected elevation and charge and gives the corrected elevation to the gunner.

(c) The gunner places the corrected elevation on the sight and levels the elevation bubble.

(d) The gunner then checks to make sure that the crosslevel bubble is still level and that the vertical crossline of the sight is still bisecting the target.

(e) This completes the procedure for subsequent laying of the mortar. The mortar is now ready for the next round to be fired.

(f) The procedure for subsequent laying is repeated as many times as necessary until a hit on the target is made.

4304. Referring the sight and placing out aiming posts.

Referring the sight simply means to place a deflection on the sight without disturbing the lay of the mortar. For example, the sight is normally referred to an initial deflection of 2800 mils to establish an aiming line on which to place out aiming posts. To refer the sight, the deflection micrometer knob is turned until a given deflection is set or until the sight is laid on a given aiming point.

To be able to establish a good aiming line which can be used accurately for more directions than the center of the sector of fire, you must use a pair of aiming posts. This is because the sight does not directly line up with the cannon tube when mounted. When you fire missions that require deflections which are 400 mils or more from the initial direction of fire, this error will be far enough off to require usually an extra adjusting round or possibly more. When you use a pair of aiming posts, you will be able to compensate for the error in the sight not being located directly in line with the cannon tube.

When the platoon commander announces, "Platoon, deflection 2800, refer sights, place out aiming posts", you will follow the steps listed below in the sequence given.

a. Place out the far aiming post approximately 50 meters in front of the mortar position. The far post is always placed out first. By the use of hand and arm signals, you will direct the aiming post man until the far post is aligned with the vertical crossline of the sight exactly on the left edge of the far post.

Note: Usually the direct front is used. If for reasons of security or rough terrain, the direct front can not be used, any direction can be used.

b. When the far post is satisfactory, you will have the aiming post man move forward and place out the near post in the same manner 25 meters in front of the mortar position. When the near post is satisfactory, you will direct the aiming post man to return to the gun position. When the aiming posts have been placed out correctly and you look through the sight, you should see what appears to be one aiming post with the vertical crossline of the sight running up and down the left edge of the aiming post (fig 4-14).

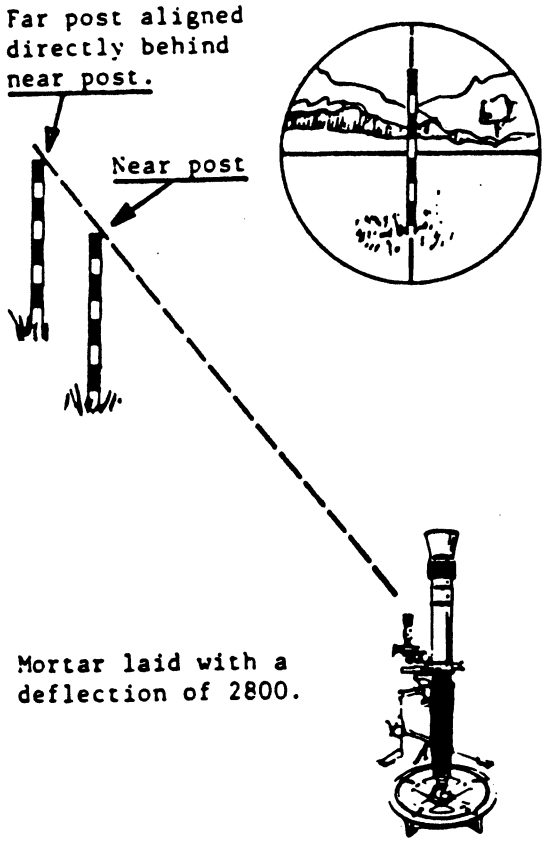


Fig 4-14. Sight picture with one aiming post visible.

> Note: If for reasons of security or rough terrain, the aiming posts cannot be placed out 50 and 25 meters, the distance can be changed. If the distances are shortened, the important thing to remember is that the near aiming post must be as close as possible to half the distance to the far aiming post.

4305. Hand and Arm signals.

Often it is tactically unwise to yell commands back and forth from one person to the other. The noise level and tactical situation in combat can make it impossible to use any method other than hand and arm signals to pass information from one person to the next. In order to place aiming posts along a new line of sight, you must use hand and arm signals to ensure proper emplacement and security. Each member of the mortar platoon should be very familiar with the standard signals and should avoid creating new signals. When a new man arrives in your unit he has enough to remember without having to learn your new hand and arm signals. Figure 4-15 shows illustrations of the correct standard hand and arm signals and their meanings.

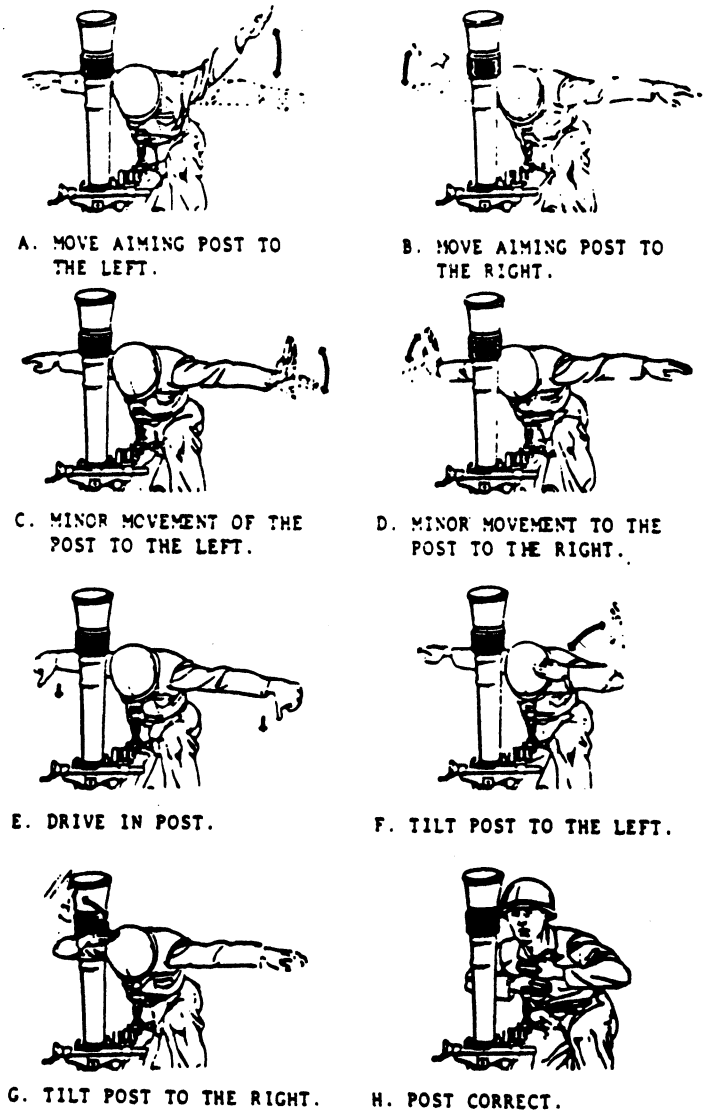


Fig 4-15. Hand and arm signals used to place aiming posts.

Lesson 4. DEFLECTION AND ELEVATION CHANGES

LEARNING OBJECTIVES

1. Given a list of the steps used to lay a mortar for a small deflection and elevation change, arrange them in the correct sequence.

2. Given a list of the steps used to lay a mortar for a large deflection and elevation change, arrange them in the correct sequence.

3. Identify from illustrations an aligned sight picture and a compensated sight picture.

4. Given a list of the steps used to make a large deflection and elevation change on the LAV-M, arrange them in the correct sequence.

4401. Small deflection and elevation changes.

Often, you will be given fire missions in which the deflection is very close to the initial direction of fire. In these cases you can manipulate the mortar without shifting the bipod legs. When this happens it is considered a small deflection change. Additionally, the deflection change in most subsequent missions is less than what would require you to shift the legs of the bipods, and these too are considered small deflection changes.

To lay the mortar for a small deflection change you will follow, in this sequence, the steps listed below.

a. Repeat the fire command. All members of the gun crew will repeat the fire command in unison. This is done to ensure that all crewmen know that a mission is being fired and that they know the exact details of the mission. Often, a crewman will not clearly hear the initial fire command, but everyone should be able to clearly hear what the crewman right next to him repeats.

b. The gunner sets the sight for deflection. Turn the deflection micrometer knob until the first two digits of the deflection align with the index mark on the coarse deflection scale and the last two digits align with the index line on the micrometer scale.

c. The gunner sets the sight for elevation. Turn the elevation micrometer knob until the first two digits align with the coarse scale index line and the second two digits align with the micrometer scale index line.

d. The gunner levels the mortar for elevation. Elevate or depress the cannon until the elevation bubble on the sight is centered. If the bubble is to the right side of the vial, you must elevate the cannon. If the bubble is to the left side, you must depress the cannon. Turn the elevation handwheel clockwise to elevate the cannon and counterclockwise to depress the cannon.

e. The gunner cross-levels the mortar. Observe the cross-level vial as you adjust the cross-level mechanism, until the bubble is centered in the vial.

f. The gunner will traverse the mortar. While observing the sight picture in the sight, turn the traversing handwheel until the verticle crosshair has moved half the distance required to obtain the correct sight picture. You only traverse half the distance because traversing will cause the mortar to lose the level attitude you previously set during cross-leveling.

g. The gunner levels up. During this phase of manipulation, repeat the fourth and fifth steps. As you cross-level for the second time, you will discover that you have disturbed the sight picture that you had obtained in the first traverse.

h. The gunner will again traverse the mortar. During the final phase of manipulation, you will again be repeating a step. As you repeat the sixth step, you must remember again to only move half the distance. Continue to cross-level and traverse until you have both the correct sight picture and a level attitude on the mortar. Once these two conditions have been obtained announce, "Gun number _____ up".

> Note: One way to remember the correct sequence for mortar manipulation, is to remember the acronym "DEED"; Deflection on the sight, Elevation on the sight, Elevation on the mortar, Deflection on the mortar.

4402. Large deflection and elevation changes.

Anytime there is a substantial change of target location in relation to the direction of fire, you may receive a deflection change of 100 mils or more. In this case, you will have to shift the bipod legs in order to relay the mortar on the aiming posts.

To lay the mortar for a large deflection change you will follow, in this sequence, the steps listed below.

a. Place the deflection on the sight, center the traversing mechanism and get two fingers minor adjust.

b. When looking through the sight, you may not be able to see your new aiming point. The assistant gunner, sighting along the side of the elbow telescope will tap the gunner on the shoulder, in which direction the bipod needs to be moved.

c. The gunner will move the bipod keeping in mind the "DEED" method and compensated sight pictures. We are going to use the five steps we learned in mounting. We'll quickly go over them once again.

(1) Bisect - means touching the target, or aiming point with the vertical crossline.

(2) Rough level - means to get the crosslevel bubble close to floating, so we don't have to use up so much minor adjust. Do this by moving the fixed leg in or out.

(3) Level elevation - a large elevation change is 100 mils or more and may require the bipod feet to be moved in or out to level the elevation bubbles.

(4) Crosslevel - this means leveling the crosslevel vial by using the minor adjustment knob.

(5) Traverse/minor adjust - if you are 20 mils or less away from your target, you can now traverse half the distance and minor adjust until you are within 2 mils of the left edge of your aiming post or have the appropriate compensated sight picture.

(a) If, for some reason, you are over 20 mils when it comes to step 5, you must start over again with step 1.

(b) You are only allowed to use two turns of traverse for a large deflection change. Anything over two turns, and you must recenter your traverse, get two fingers minor adjust and start over with step 1.

4403. Compensated sight picture.

In most cases, when you are given a fire mission, the view through the sight that you first see will be that of both aiming posts (near and far). For each mission, the farther your direction of fire is from the initial direction of lay, the greater the distance will be between the images of the posts. The sight picture that we first discussed during initial laying procedures (aligned sight picture) is the one you will want to use if you only see one post. If you can see both posts, obviously, something must be done to compensate for the error in the posts' alignment.

a. Remember that when aiming a mortar you align the vertical cross-hair of the sight with the left edge of your aiming point or post. This is shown in figure 4-16.

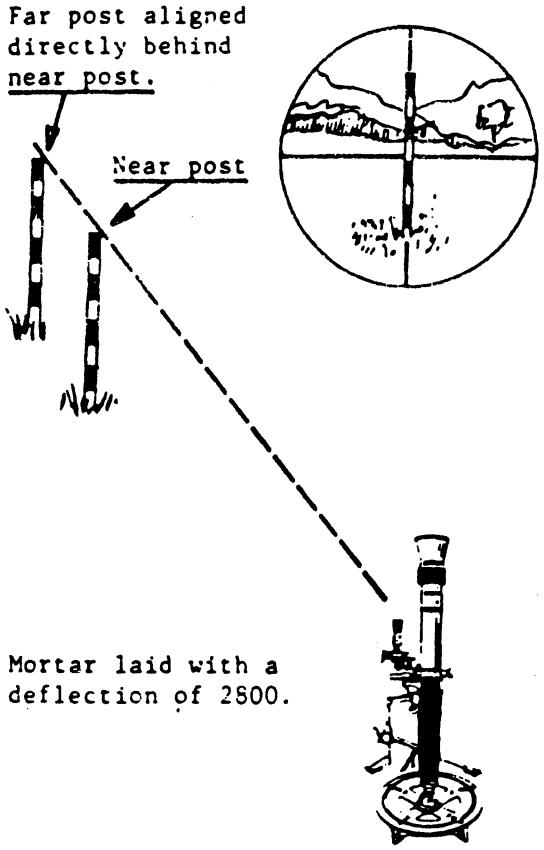


Fig 4-16. Aligned sight picture.

b. When you must use a compensated sight picture, you manipulate the mortar in order to align the vertical cross-hair, by estimation of the eye, to a point where the left edge of the near aiming post and the cross-hair are the same distance from the left edge of the far aiming post. The sight picture that you will see should look like the one shown in figure 4-17 on the following page.

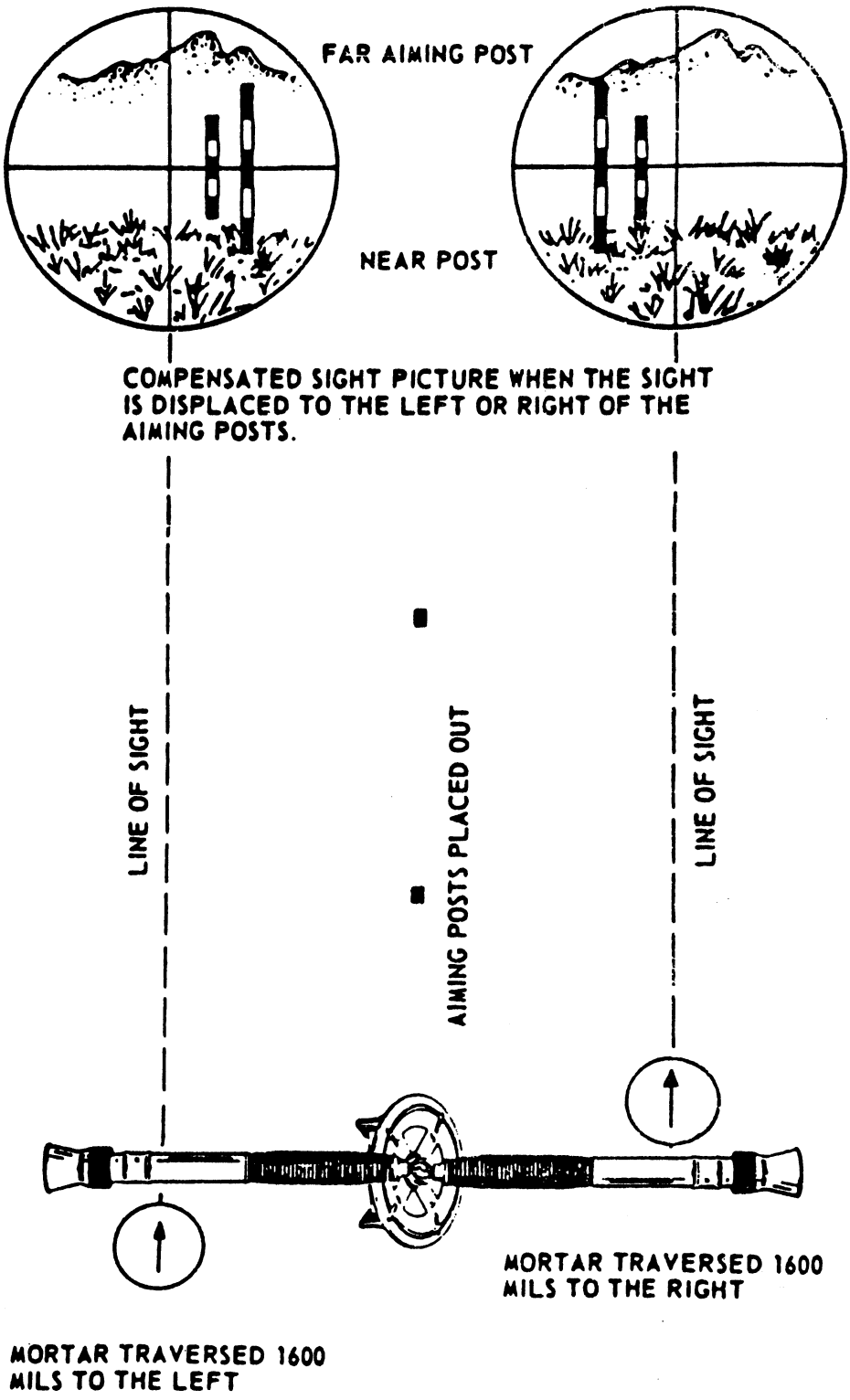


Fig 4-17. Compensated sight picture.

Note:	One way to know you have a correct compensated sight picture is to remember the letters NFL, Near post, Far post, Line.

4404. Large deflection and elevation changes on the LAV-M.

A change of target location effect the mortar in the LAV-M the same it effects a ground mounted mortar. However, the procedure you use for the change is a little different. The following steps are to be used to make a large deflection and elevation change on the LAV-M mortar:

a. Ensure the mortar is properly mounted and the sight laid on the aiming posts with a referred deflection of 2800 mils and an elevation of 1100 mils.

b. You will receive the deflection and elevation in the form of a fire command.

c. Place the data on the sight, elevate the mortar, and center the traversing bearing.

d. The assistant gunner will unlock the turntable locking lever, and the gunner and A-gunner rotate the turntable until the crossline falls on the aiming posts.

e. The A-gunner will secure the turntable using the turntable locking lever.

f. Level the mortar and, when you are satisfied with the sight picture and both bubbles are leveled, announce "Gun up".

Lesson 5. REFER AND REALIGN

LEARNING OBJECTIVES

1. State the two reasons for referring and realigning.

2. Identify the sequence of steps in the procedure for referring and realigning the 81-MM mortar.

4501. Referring the sight and realigning the aiming posts.

You have the gun all laid in and you receive a fire mission. You drop that first round down the tube and the base plate shifts 6 to 8 inches off to the side. When you look into the sight, the aiming posts are no longer aligned. So you yell help and use a compensated sight picture, right? Wrong! It is not uncommon for a baseplate to shift in areas where there are rocks and soft ground mixed. This brings us to the procedure known as refer and realign.

To refer and realign means to refer your sight to a given deflection and realign your aiming posts on that deflection. The two reasons for referring and realigning are:

a. To re-lay your mortar if the baseplate should shift while firing because your gun would no longer be pointing in the proper direction.

b. To converge or extend the coverage on a target after registration.

The following procedure is used to refer and realign.

The mortar will be mounted with the aiming posts positioned at the normal distance from the gun, with 2800 deflection and 1100 elevation on the sight. You will receive an administrative fire command (to simulate the shifting of the baseplate).

1. The gunner will re-lay the mortar on the aiming posts by traversing rather than moving the bipod.

2. When the gunner is ready, the aiming post man will be directed to stand by the near post. Upon hearing the command, "Refer and realign aiming posts", he will knock down the near post and run to the far post, remove it from the ground and stand facing the gunner with the aiming post in his hand and follow the hand and arm signals of the gunner.

3. The gunner repeats each element of the command, and sets the sight with the given data. He then directs the aiming post man in realigning the aiming posts on the vertical crossline of the sight.

4. Once the aiming posts have been realigned, the gunner will center the traversing mechanism and re-lay the mortar on the aiming posts by using the five steps learned for mounting the mortar.

5. When the gunner has the mortar relaid on the aiming posts, he will command "Gun up".

This procedure will ensure that the mortar has full traversing capabilities for following fire missions.

Lesson 6. TRAVERSING AND SEARCHING FIRES

LEARNING OBJECTIVES

1. State the purpose of traversing fire.

2. List in sequence, the steps in the procedure for traversing fire.

3. State the purpose of searching fire.

4. List in sequence, the steps in the procedure for searching fire.

4601. Traversing fire.

In combat, coverage on a target can mean the difference between an attacking company taking their objective, or being repelled. To provide the necessary target coverage, whether in support of a company or firing on a target of opportunity, the fire direction center can employ different types of manipulation fire. You as a gunner will be required to execute these different types of manipulation fire when called for by the FDC.

There are two types of manipulation that can be employed with the 81-MM mortar. They are traversing fire and searching fire. Searching fire will be covered later.

The purpose of traversing fire is to distribute fire laterally across a target in width. The only limitation during a traversing fire mission is the limited traverse capability of the traversing mechanism.

There are two methods by which a traversing fire mission can be initiated.

a. The first method uses the base mortar for adjustment on to the target, while the remaining mortars follow the fire commands and make the corrections as they are given to the base mortar. The platoon will fire for effect when the base mortar has adjusted on to the target.

(1) With the base mortar adjusted on to the target, the platoon would be given a traversing fire mission with the data on the sight from the last round fired in adjust.

b. The second method is to employ the mortars on a target of opportunity using an initial fire command and an immediate fire for effect without adjustment on to the target.

The actual procedures for traversing fire will go like this.

Upon receiving the preparatory command, "Prepare to traverse right (or left)", the gunner will traverse all the way to the opposite side and back off two turns.

(1) The two turns are allowed for adjustment on to the aiming posts when the bipod is moved.

(2) A subsequent fire command will be given and will include the number of rounds, number of turns between rounds, charge and elevation.

EXAMPLE: Three rounds, traverse right (or left) three turns, charge 2, elevation 1230.

(3) While the command is being given, the gunner will move the bipod and relay the gun on the aiming posts.

(4) As the elevation is received, it is placed on the sight and the elevation bubble is then leveled.

(5) The gunner rechecks the gun to ensure that the bubbles are level and that he has a correct sight picture (within 5 mils left or right of the aiming posts). Once he has done this, he commands, "Fire one". He then traverses the specified number of turns, crosslevels and commands, "Fire two". This procedure is continued until the specified number of rounds have been fired.

(6) Upon firing the last of the specified number of rounds, the gunner will sound off, "Rounds complete, gun _____ up".

4602. Searching fire.

The purpose of searching fire is to distribute fire over a target in depth. The methods of initiating a searching fire mission are the same as those used for a traversing fire mission. In a searching fire mission, instead of traversing as you did in a traversing fire mission, you will raise or lower the elevation a specified number of turns between each round.

The procedure for searching fire will go like this.

a. Upon receiving either an initial or subsequent fire command, the gunner will execute each element as it is received, ensuring that he has enough elevation to raise or lower the elevation that specified number of turns.

(1) If he is going to be elevating (going up) during the fire mission, the elevation should only be about 1/4 of the way up when the gun is level. If he is going to depress the barrel (going down), the elevation should be about 3/4 of the way up when the gun is level (approximately 37 turns).

b. When the gun is laid, the gunner commands, "Fire one". He then elevates or depresses the barrel the specified number of turns by using the elevation crank, and crosslevels only. He then commands "Fire two".

(1) This procedure is continued until the specified number of rounds have been fired.

(2) Upon firing the last of the specified number of rounds, the gunner will sound off, "Rounds complete, gun ___ up".

- -

Unit Exercise: Answer the following questions and check your responses against those listed at the end of this study unit.

1. What are the five common characteristics used for selecting a mortar position?

_____

_____

2. What is the reason for positioning the mortar in defilade?

_____

_____

3. What is the purpose of camouflage?

_____

_____

4. What are the materials used for camouflaging the mortar position?

_____

Questions 5 through 11 pertain to ground mounting the 81-MM mortar. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 5. The gunner will sight in on the direction stake.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5 f. Step 6 g. Step 7
___ 6. The baseplate man sets the baseplate on the ground.	
___ 7. The A-gunner places the cannon in the gunners right shoulder.	
___ 8. The gunner prepares the bipod for mounting.	
___ 9. The A-gunner inserts the barrel into the baseplate.	
___ 10. The gunner places the sight on the mortar.	
___ 11. The gunner attaches the barrel to the bipod.	

Matching: For items 12 through 15, match the piece of mortar equipment in column 1 with the crewman responsible for carrying it in column 2. Place your responses in the spaces provided.

Column 1	Column 2
Mortar equipment	Crewman
___ 12. Baseplate	a. Squad Leader
___ 13. Barrel	b. Gunner
___ 14. Bipod	c. Assistant Gunner
___ 15. Sight case	d. Ammunition man

16. What is the command for mounting the mortar?

_____

_____

Questions 17 through 23 pertain to dismounting a ground mounted 81-MM mortar. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 17. The A-gunner removes the barrel from the baseplate.	a. Step 1
___ 18. The A-gunner removes the cannon from the bipod.	b. Step 2
___ 19. The Gunner announces "Gun #_____ out of action".	c. Step 3
___ 20. The gunner removes the sight and stows it in the case.	d. Step 4
___ 21. The baseplate man picks up the baseplate and returns to position.	e. Step 5
___ 22. The A-gunner lowers the elevation and closes all cranks on the bipod.	f. Step 6
___ 23. The gunner prepares the bipod for carrying.	g. Step 7

Questions 24 through 34 pertain to mounting the 81-MM mortar in the LAV-M. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 24. Remove the tie-down strap.	a. Step 1
___ 25. Elevate the mortar cannon.	b. Step 2
___ 26. Unlock the turntable.	c. Step 3
___ 27. Open the roof hatch.	d. Step 4
___ 28. Insert the sight extension into the dovetail slot.	e. Step 5
___ 29. Pull on the traversing straps until the turntable is at the desired position.	f. Step 6
___ 30. Lock the bipod assembly in place.	g. Step 7
___ 31. Traverse the mortar to the desired setting.	h. Step 8
___ 32. Turn the crossleveling handwheel until the bubble is centered.	i. Step 9
___ 33. Lift the bipod assembly and set it in the desired bipod support slot.	j. Step 10
___ 34. Remove the muzzle cover.	k. Step 11

Questions 35 through 40 pertain to preparing the 81-MM mortar on the LAV-M for displacement. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 35. Wrap the tie-down strap around the elevating mechanism of the bipod assembly.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5 f. Step 6
___ 36. Operate the ratchet handle up and down until the tie-down strap is tight.	
___ 37. Remove the mortar tie-down strap from the mortar equipment bag.	
___ 38. Hook the ratchet end of the tie-down strap into the pad eye on either side of the mount.	
___ 39. Release the bipod locking handle, remove the bipod assembly from its support mount, and set the assembly on the floor.	
___ 40. Hook the other end of the tie-down strap into the pad eye on the opposite side of the mount.	

41. What are the two methods to determine initial direction of fire most commonly used by the mortar platoon?

_____

42. What are the three methods used for parallel laying the mortars?

_____

43. When placing out your aiming posts, at what distance from the mortar should the far aiming post be?

_____

44. When placing out your aiming posts, at what distance from the mortar should the near aiming post be?

_____

45. What is meant by referring the sight?

_____

_____

Questions 46 through 49 pertain to laying the mortar for direction using the compass method. Match each action in column 1 with its applicable step number in column 2.

	Column 1	Column 2
___	46. The mortars are mounted on the azimuth of fire.	a. Step 1
___	47. The squad leader places the compass on top of the baseplate stake and rotates it until he can sight along the direction of fire.	b. Step 2
___	48. The ammo man moves approximately 25 meters out in front of the mortar and the squad leader, using hand and arm signals, has the ammo man place the direction stake exactly on the azimuth.	c. Step 3
___	49. The squad leader places a baseplate stake to mark the exact location of his mortar.	d. Step 4

Listed below in scrambled order are the first six steps for laying the mortar for direction using the aiming circle method.

(1) The aiming circle operator bisects the lens of the sight and announces "Gun number ____, deflection _____".
(2) You move the bipod until you have the vertical crossline of the sight bisecting the lens or reflector of the aiming circle.
(3) The aiming circle operator will announce "Aiming point this instrument".
(4) You repeat the deflection and place the deflection on the sight.
(5) You will respond "Gun number _____, aiming point identified".
(6) You refer your sight to the aiming circle and bisect the vertical crossline of the sight on the lens or reflector of the aiming circle.

50. Which of the sequences below of the first six steps for laying the mortar for direction using the aiming circle method is correct?

a. 5,1,3,2,6,4
b. 3,6,5,1,4,2
c. 6,3,5,1,4,2
d. 1,4,6,2,3,5

Listed below in scrambled order are the last seven steps for laying the mortar for direction using the aiming circle method.

(7) You receive the command "Gun number ____, deflection 2800, place out aiming posts".
(8) You respond "Gun number ____ ready for recheck".
(9) You refer you sight to 2800 mils and direct your aiming post man to place out aiming posts.
(10) The aiming circle operator again refers the aiming circle to the sight and gives you another deflection.
(11) Upon receiving a deflection that is the same, or within one mil of the deflection on the sight, you announce your mortar is laid.
(12) The aiming circle operator and the gunner repeat the procedure until the sight and aiming circle are sighted on each other with a difference in deflection readings of not more than one mil.
(13) You repeat the new deflection, place it on the sight, and re-lay the mortar on the lens or reflector of the aiming circle.

51. Which of the sequences of the last seven steps for laying the mortar for direction using the aiming circle method below is correct?

a. 9,13,7,10,12,8,11
b. 12,7,9,13,11,8,10
c. 8,10,13,12,11,7,9
d. 7,11,8,12,9,13,10

Questions 52 through 55 pertain to laying the mortar for direction using the M64A1 sight method. Match each action in column 1 with its applicable step number in column 2.

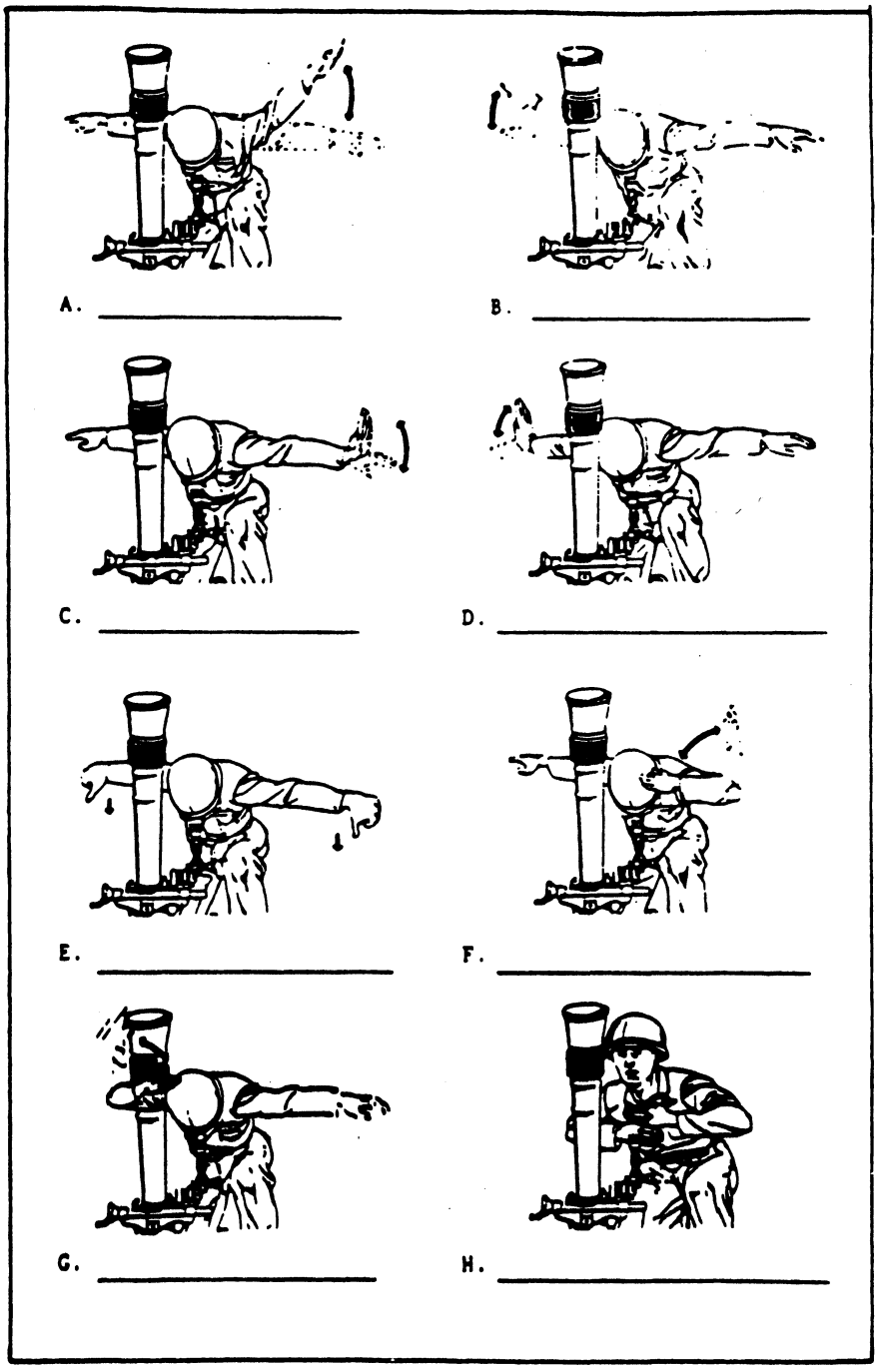
Column 1	Column 2
___ 52. Each gunner places the deflection on his sight and re-lays on the sight of the base mortar.	a. Step 1 b. Step 2 c. Step 3 d. Step 4
___ 53. The platoon commander or platoon sergeant moves the sight of the base mortar and commands "Aiming point this instrument".	
___ 54. The platoon commander or platoon sergeant announces the new deflection and the gunner re-lays his mortar with the new deflection continuing this procedure until the difference between the deflections on the two sights is one mil or less.	
___ 55. The platoon commander or platoon sergeant refers the sight of the base mortar to the lens of each of the other sights and announces the deflection.	

56. What are the two conditions under which you can use [illegible] of the 81-MM mortar?

_____

_____

57. Identify the hand and arm signals used in placing out aiming posts for the mortars by placing the meaning of the signal under the illustration shown.



A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____

Questions 58 through 65 pertain to laying a mortar for a small deflection and elevation change. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 58. The gunner sets the sight for elevation.	a. Step 1
___ 59. The gunner will traverse the mortar.	b. Step 2
___ 60. Repeat the fire command.	c. Step 3
___ 61. The gunner levels the mortar for elevation.	d. Step 4
___ 62. The gunner levels up.	e. Step 5
___ 63. The gunner cross-levels the mortar.	f. Step 6
___ 64. The gunner will again traverse the mortar.	g. Step 7
___ 65. The gunner sets the sight for deflection.	h. Step 8

Questions 66 through 73 pertain to laying a mortar for a large deflection and elevation change. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 66. The gunner will move the bipod keeping in mind the "DEED" method and compensated sight pictures.	a. Step 1
___ 67. Level elevation.	b. Step 2
___ 68. Traverse/minor adjust.	c. Step 3
___ 69. Place the deflection on the sight, center the traversing mechanism and get two fingers minor adjust.	d. Step 4
___ 70. Crosslevel.	e. Step 5
___ 71. Rough level.	f. Step 6
___ 72. The A-gunner will tap the gunner on the shoulder in the direction the bipod needs to be moved.	g. Step 7
___ 73. Bisect.	h. Step 8

74. What are the two reasons for referring and realigning?

_____

_____

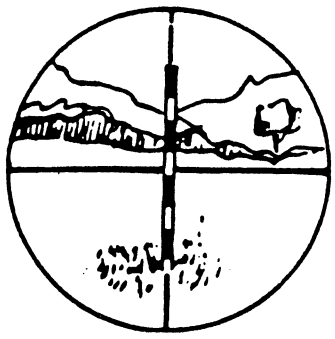
_____

_____

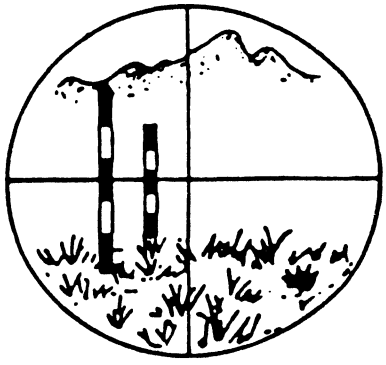
Questions 75 through 80 pertain to making a large deflection and elevation change on the LAV-M. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 75. The A-gunner will secure the turntable utilizing the turntable locking lever.	a. Step 1
___ 76. You receive the deflection and elevation in the form of a fire command.	b. Step 2
___ 77. Level the mortar and when you are satisfied with the sight picture and both bubbles are leveled, announce "Gun up".	c. Step 3
___ 78. Place the data on the sight, elevate the mortar, and center the traversing bearing.	d. Step 4
___ 79. Ensure the mortar is properly mounted and the sight laid on the aiming posts with a referred deflection of 2800 mils and an elevation of 1100 mils.	e. Step 5
___ 80. The A-gunner will unlock the turntable locking lever, and the gunner and A-gunner rotate the turntable until until the crossline falls on the aiming posts.	f. Step 6

81. Which of the illustrations below shows an aligned sight picture?

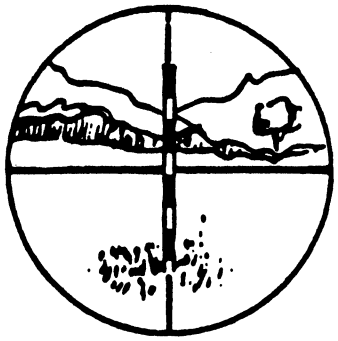


a.

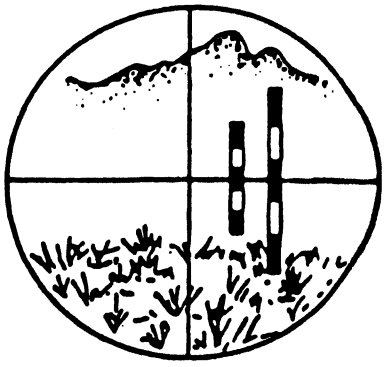


b.

82. Which of the illustrations below shows a compensated sight picture?



a.



b.

Listed below in scrambled order are the steps in the procedure for referring and realigning the 81-MM mortar.

(1) The gunner repeats each element of the command and sets the sight with the given data. He then directs the aiming post man in realigning the aiming posts on the vertical crossline of the sight.
(2) When the gunner has the mortar relaid on the aiming posts, he will command "Gun up".
(3) The gunner will relay the mortar on the aiming posts by traversing and not moving the bipod.
(4) Once the aiming posts have been realigned, the gunner will center the traversing mechanism and relay the mortar on the aiming posts by using the five steps learned for mounting the mortar.
(5) Upon hearing the command "Refer and realign aiming posts", the aiming post man will knock down the near post and run to the far post, remove it from the ground and stand facing the gunner with the aiming post in his hand and follow the hand and arm signals of the gunner.

83. Which of the sequences below of the steps in the procedure for referring and realigning the 81-MM mortar is correct?

a. 3,5,1,4,2
b. 5,2,3,1,4
c. 4,1,2,5,3
d. 1,3,4,2,5

84. What is the purpose of traversing fire?

Questions 85 through 90 pertain to traversing fire. Match each action in column 1 with its applicable step number in column 2.

Column 1		Column 2
___	85. The gunner will move the bipod and relay the gun on the aiming posts.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5 f. Step 6
___	86. Upon firing the last of the specified number of rounds, the gunner will sound off "Rounds complete, gun ____ up".	
___	87. As the elevation is received, it is placed on the sight and the elevation bubble is leveled.	
___	88. Upon receiving the preparatory command "Prepare to traverse right (or left)", the gunner will traverse all the way to the opposite side and back off two turns.	
___	89. A subsequent fire command will be given and will include the number of rounds, number of turns between rounds, charge and elevation.	
___	90. The gunner rechecks the gun to ensure the bubbles are level and he has a correct sight picture. He then commands "Fire one", traverses the specified number of turns, crosslevels and commands "Fire two", continuing this procedure until the specified number of rounds have been fired.	

91. What is the purpose of searching fire?

_____

Questions 92 through 96 pertain to searching fire. Match each action in column 1 with its applicable step number in column 2.

Column 1	Column 2
___ 92. Upon firing the last of the specified number of rounds, the gunner will sound off "Rounds complete, gun ___ up".	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5
___ 93. The gunner commands "Fire two".	
___ 94. Upon receiving either an initial or subsequent fire command, the gunner will execute each element as it is received, ensuring he has enough elevation to raise or lower the elevation the specified number of turns.	
___ 95. This procedure is continued until the specified number of rounds have been fired.	
___ 96. When the gun is laid, the gunner commands "Fire one", elevates or depresses the barrel the specified number of turns by using the elevation cranks, and crosslevels only.	

SUMMARY

Within this study unit, you have been shown how to select a mortar position, the procedures for mounting and dismounting the mortar and initial direction and laying of the mortar platoon. You have also been introduced to deflection and elevation changes, refer and realign, and traversing and searching fires.

In the next study unit you will be introduced to the techniques of fire for the 81-MM mortar; including fire commands, safety checks and misfire procedures.

Study Unit 4 Exercise Solutions	Reference
1. Defilade, dispersion, resupply, stable firing platform, mask and overhead clearance.	4101
2. To provide cover and concealment from enemy observation and direct fire.	4101a
3. To deny the enemy information and to deceive him as to our intentions.	4102
4. Natural vegetation, camouflage net.	4103
5. G	4202(3)(l)
6. A	4202(1)
7. D	42C2(3)(h)
8. C	4202(3)
9. B	4202(2)
10. F	4202(3)(k)
11. E	4202(3)(i)
12. D	4201a
13. C	4201b
14. B	4201c
15. A	4201d
16. "On line, to your direct front, action"!	4202
17. E	4203e
18. C	4203c
19. G	4203g
20. A	4203a
21. F	4203f
22. B	4203b
23. D	4203d
24. D	4204(4)
25. J	4204(10)
26. A	4204(1)
27. C	4204(3)
28. H	4204(8)
29. B	4204(2)
30. F	4204(6)
31. K	4204(11)
32. I	4204(9)
33. E	4204(5)
34. G	4204(7)
35. D	4205(4)
36. F	4205(6)
37. A	4205(1)
38. C	4205(3)
39. B	4205(2)
40. E	4205(5)
41. Compass method, map method	4301
42. Compass azimuth method, aiming circle method, M64A1 sight method	4302
43. 50 meters	4304a
44. 25 meters	4304b

Study Unit 4 Exercise Solutions	Reference
45. To place a deflection on the sight without disturbing the lay of the mortar.	4304
46. D	4302a(4)
47. B	4302a(2)
48. C	4302a(3)
49. A	4302a(1)
50. B	4302b
51. C	4302b
52. C	4302c(3)
53. A	4302c(1)
54. D	4302c(4)
55. B	4302c(2)
56. Whenever you can see the target through your sight; when enemy troops attack the mortar position.	4303
57.	4305
a. Move post to the left.	
b. Move post to the right.	
c. Minor movement to the left.	
d. Minor movement to the right.	
e. Drive in post.	
f. Tilt post to the left.	
g. Tilt post to the right.	
h. Post correct.	
58. C	4401c
59. F	4401f
60. A	4401a
61. D	4401d
62. G	4401g
63. E	4401e
64. H	4401h
65. B	4401b
66. C	4402c
67. F	4402c(3)
68. H	4402c(5)
69. A	4402a
70. G	4402c(4)
71. E	4402c(2)
72. B	4402b
73. D	4402c(1)
74. To relay your mortar if the baseplate shifts while firing; to converge or extend the coverage on a target after registration.	5101
75. E	4404e
76. B	4404b
77. F	4404f
78. C	4404c
79. A	4404a
80. D	4404d

Study Unit 4 Exercise Solutions	Reference
81. A	4403a
82. B	4403b
83. A.	5101
84. To distribute fire laterally across a target in width.	6101
85. C	6101(3)
86. F	6101(6)
87. D	6101(4)
88. A	6101
89. B	6101(2)
90. E	6101(5)
91. To distribute fire over a target in depth.	6102
92. E	6102b(2)
93. C	6102b
94. A	6102a
95. D	6102b(1)
96. B	6102b

STUDY UNIT 5

CONDUCT OF FIRE

Introduction. Conduct of fire includes all operations in placing effective fire on a target, such as the observer's ability to open fire when he desires, to adjust fire, to determine the distribution of fire upon the target, to shift fire from one target to another, and to regulate the type and amount of ammunition expended. It involves the action and teamwork of all the platoon members.

Lesson 1. FIRE COMMANDS FOR MORTARS

LEARNING OBJECTIVES

1. List the two types of fire commands.
2. List the elements of an initial fire command in proper sequence.
3. Name the element which is always announced in a subsequent fire command.

5101. Types of fire commands.

Fire commands are the technical instructions that enable mortar crews to engage a target. These commands will normally originate from the FDC. Fire commands should be brief and clear. They will include all the elements necessary to accomplish the fire mission. They may be given orally, by telephone, radio, or messenger. There are two types of fire commands: initial fire commands, which are used to start a fire mission; and subsequent fire commands, which are used to change firing data and to check firing. The elements of both types of commands follow the same sequence. However, subsequent commands include only such elements that are changed, except that the elevation element is always announced. To minimize errors in transmissions, the whole mortar platoon will repeat all elements of all fire commands in unison.

5102. Initial fire commands.

Initial fire commands are used to start a fire mission. They contain all the necessary information to lay your mortar and fire the first round. Elements not necessary for a particular mission are omitted. Each initial fire command should contain the following elements in the following sequence.

a. Mortars to follow. This element serves two purposes, it alerts the firing unit and it designates those guns that will follow the fire command.

b. Type of projectile and fuze. This element tells the mortar(s) what type of ammunition they will be firing and the type of fuze for each round.

c. Mortar to fire. This element designates the mortar or mortars which will fire the initial round. This element may be omitted if it is the same as "Mortars to follow".

d. Method of fire. Mortars that are firing are notified as to how many rounds are needed for the fire for effect, and any special instructions concerning the type of manipulation to be used. Any special instructions concerning the control of the firing will also be given at this time.

e. Deflection. The FDC announces the deflection to be placed on the sight.

f. Charge. The FDC announces the charge to be placed on the rounds.

g. Time setting. The FDC announces the time of flight setting necessary to cause the round to function at the desired height over the target (RP and Illume only).

h. Elevation. The FDC announces the elevation to be placed on the sight.

Once the elevation has been given and the gun is up, the squad leader will have the assistant gunner fire the designated rounds if a control element was not announced during the method of fire.

An initial fire command for a platoon using the base mortar for adjustment would go like this:

Sequence	Example
Mortars to follow	Platoon
Shell and fuze	Illume
Mortar(s) to fire	Gun number 4
Method of fire	One round
Deflection	Deflection 2800
Charge	Charge 2
Time setting	Time 30.5
Elevation	Elevation 1090

Note: All fire commands follow this sequence. Elements not needed for your particular mission are omitted.

Unfortunately, not all rounds hit the target on the initial command, so you must adjust your rounds onto the target using subsequent fire commands.

5103. Subsequent fire commands.

Subsequent fire commands include only the elements that are changed (except that the elevation is always announced). Corrections in deflection are given by the FDC announcing the new deflection to be placed on the sight. This element is omitted if the deflection was correct. Corrections in the elevation are given by the FDC announcing the new elevation to be placed on the sight. Even if the elevation is correct, it is repeated. To interrupt firing, CEASE FIRE or CHECK FIRE is announced.

a. Cease fire, indicates to the platoon the completion of a fire mission, but not necessarily the end of the alert. Firing is renewed by issuing a new initial fire command.

b. Check fire, indicates a temporary cessation of firing and allows firing to be resumed with the same data by the command RESUME FIRING or by a subsequent fire command.

So that the mortar crews may relax between fire missions, the end of the alert is announced by the command, END OF MISSION. All gunners then lay their mortars as directed by the FDC. Upon completion of a fire mission, all mortars normally lay on final protective fire (FPF) data unless otherwise directed. It is the responsibility of the platoon sergeant to ensure that the mortars are laid on final protective fire data and that the prescribed amount of ammunition for the FPF is prepared and in the position.

Lesson 2. SAFETY CHECKS

LEARNING OBJECTIVES

1. Given a list of the safety checks before firing, match each safety check with the crewman responsible for making the check.

2. Given a list of the safety checks during firing, match each safety check with the crewman responsible for making the check.

3. List the three safety precautions taken during firing.

4. Given a list of the crew duties during loading and firing, match each duty with the crewman assigned that duty.

5. List the safety checks for the LAV-M.

5201. Safety checks before firing.

A mortar in the hands of a well-trained Marine is an awesome weapon. However, if not handled properly, disaster could result. As with any weapon, a mortar must be employed with the utmost regard for safety. When utilized in this manner the risk to the employing unit is next to none, while at the same time it is hazardous to the enemy's health. Each member of the mortar crew is responsible for performing certain safety checks prior to firing the 81-MM mortar.

a. The gunner is responsible for performing the following safety checks before firing:

(1) There is mask and overhead clearance.

(a) Since the mortar is normally mounted in defilade, there may be a mask such as a hill, a tree, a building or just a rise in the ground.

(b) Overhead interference may be caused by overhanging branches of trees or roofs of buildings. In either case, the gunner must ensure that the round will not strike an obstacle.

(2) The barrel is locked to the baseplate and the open end of the socket is pointing in the direction of fire.

(3) The firing pin recess is facing upwards.

(4) The leg-locking handwheel is tight.

(5) The bipod locking latch is locked, securing the barrel clamps.

(6) The sight is secure.

b. The assistant gunner is responsible for seeing that the bore is clean and dry. A dirty bore or a bore with excessive oil in it can cause a misfire.

c. The ammunition men are responsible for ensuring that each round is clean, the safety pin is present, increments are properly placed and the ignition cartridge is in good condition.

5202. Safety checks during firing.

Safety before firing is important but you must also maintain safety during firing.

a. The gunner will conduct the same safety check during firing as he did before firing with these additional checks:

(1) Check the breech plug for possible gas leaks.

(2) Check the barrel clamp assembly to ensure it remains in its proper place near the cooling fins.

b. The assistant gunner will swab the bore after every ten rounds or after each fire for effect.

5203. Safety precautions during firing.

The following safety precautions should be adhered to whenever you are firing the 81-MM mortar:

a. All personnel in the firing position must wear helmets, body armor and hearing protection (ear plugs).

b. The assistant gunner will not handle more than one round at a time.

c. During fire for effect missions, the assistant gunner must take care not to load a new round before the previous round leaves the barrel.

5204. Crew duties during loading and firing.

Due to the size of the mortar round and the closeness of the muzzle, improper loading and firing can prove to be very damaging. During loading and firing, the crew does the following:

a. Upon receiving a fire command, the gunner repeats each element.

b. The gunner places the firing data on the sight and lays the mortar.

c. The ammunition man prepares the round with the proper charge. (If a fuze setting is announced, the ammunition man will also place it on the fuze).

d. The ammunition man completes his preparation of the round to include safety checks.

e. The assistant gunner removes the muzzle cover.

f. The assistant gunner will receive a round from the ammunition man and half load it by guiding it into the cannon with both hands.

g. Once the round is lowered into the cannon, it is considered half loaded. The A-gunner's left hand will return to its natural position near his side.

h. The squad leader on command of the FDC will command "Fire".

i. On command "Fire", the assistant gunner releases the round, letting the round slide down the cannon to strike the firing pin.

j. The assistant gunner, after releasing the round will bend over as in doing a wind mill exercise and touch his right hand to his left boot keeping his hand under the traversing handwheel (he will remain in this position until the round is fired or a misfire is announced).

k. If a misfire is announced, the crew will follow the misfire procedures (You will be taught misfire procedures in lesson 3).

Warning: Do not look into the cannon, and do not try to force a round down the cannon. Do not fire without a blast attenuator device.

Two additional safety precautions, not considered formal safety checks, of which you should be aware are:

a. Firing ammunition in a heavily lubricated bore, which can result in hang fire or failure to fire.

b. Dented barrels, which are unsafe for firing.

5205. Safety checks for the LAV-M.

When assigned to an LAI Battalion as a crewman for a LAV-M, there are certain safety checks you will have to perform in order to fire the mortar. You have already been taught the safety checks for the ground mounted mortar. Now let's go over the safety checks for mortar when mounted in the LAV-M.

The following are the safety checks for the LAV-M:

a. Check for mask and overhead clearance.

b. Ensure the barrel is locked in the socket with the firing pin exposed and firmly seated.

c. Check to ensure the barrel clamp is locked with the barrel clamp latch in place.

d. Ensure the blast attenuator device is properly mounted and secure.

e. Check to ensure the bipod assembly is locked in the bipod support.

f. Ensure the turntable locking lever is properly secured.

g. Ensure the hatch covers are open and secured.

h. Ensure the vehicle commander's hatch is closed.

i. Check to ensure the antenna is tied down. It may cause interference when firing over the rear or right side of the vehicle.

Lesson 3. FIRING MALFUNCTIONS

LEARNING OBJECTIVES

1. State the meaning of misfire, hangfire, and cookoff.

2. List the five causes of misfires.

3. When given a list of the steps to clear a misfire from a ground mounted mortar, arrange them in the proper sequence.

4. When given a list of the steps to clear a misfire from a LAV-M mounted mortar, arrange them in the proper sequence.

5301. Malfunctions during firing.

a. Misfire. A misfire is a complete failure to fire. In order to return the mortar to action with maximum safety and minimum delay, you must be thoroughly familiar with the steps for removing a misfire. You will be taught this procedure later in this lesson. A misfire is not necessarily dangerous, but since it cannot be immediately distinguished from a delay in proper functioning (hangfire), it must be handled with care. Misfires may be caused by a faulty firing pin, rounds lodging in the barrel (because of burrs, excess paint, oversize rounds, or dirt in the tube), misplaced obturating ring, defective ignition cartridge, or excess oil or water in the bore.

b. Hangfire. A hangfire is a delay in the functioning of a propelling charge explosive train at the time of firing. In more simpler terms, a hangfire is a delay in the firing of a round. The unpredictable delay may range from a split second to several minutes. Thus, a hangfire cannot immediately be distinguished from a misfire.

c. Cookoff. A cookoff is the functioning of one or more of the explosive components of a round chambered in a very hot weapon, initiated by the heat of the barrel. Simply stated, a cookoff is the firing of a round due to a hot weapon.

5302. Clearing misfires from a ground mounted mortar.

Anytime you drop a round down the tube and it fails to fire, you have a misfire. The following steps are for clearing a misfire.

a. When the misfire occurs, any member of the crew immediately announces, "MISFIRE". All personnel except the gunner move 50 meters or further to the rear of the mortar. The gunner then kicks the barrel several times with his heel in an attempt to dislodge the round. If the round fires, the mortar is re-laid, and firing is continued.

b. If the round does not fire, the gunner joins the crew and waits at least 1 minute to avoid a possible accident resulting from a hangfire. After 1 minute the gunner returns to the mortar and tests the barrel for heat. If the barrel is cool enough to handle, the crew returns to the mortar and removes the round as described below. If the barrel is hot, the gunner should cool the barrel utilizing whatever resources available (water, snow, ice).

c. After the barrel is cool, the gunner removes the sight and removes the firing pin. This ensures that the mortar does not fire should the round slip down the barrel while performing the misfire procedures. The gunner may depress the barrel, if necessary, to provide easier access to the firing pin. The gunner unlocks the barrel clamp (fig 5-1), the A-gunner rotates the barrel 90 degrees to unlock it from the baseplate and the gunner relocks the clamp assembly.

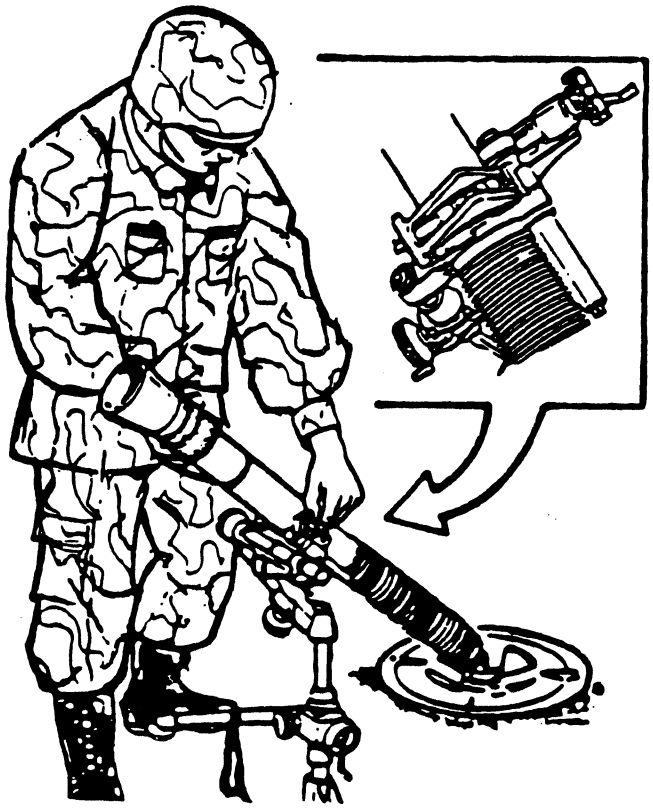


Fig 5-1. Gunner unlocking barrel clamp.

Note:	The gunner is shown on the wrong side of the barrel to allow you to view the misfire procedure.

d. The gunner grasps both ends of the traversing gear assembly to support the mortar throughout the rest of the procedure. The A-gunner places his right hand, palm up, under the blast attenuator device and his left hand, palm down, on top of the blast attenuator device. He places his thumbs alongside the forefingers, being careful to keep every part of both hands away from the muzzle. The ammo man puts both hands on the cooling fins under the barrel and slowly lifts it until it is horizontal. The ammo man must not stand directly behind the mortar (fig 5-2).

Fig 5-2. Positions of A-gunner, Gunner and Ammo man.

e. When the barrel reaches the horizontal position, and not before, the A-gunner moves the thumb of each hand over the muzzle (fig 5-3). When the fuze of the misfired round reaches the blast attenuator device, the A-gunner stops the round with his thumbs, without touching the fuze, and carefully removes it from the barrel (fig 5-4). The ammo man shakes the barrel to dislodge any remnants from the last round fired, and he relocks it into the socket of the baseplate.

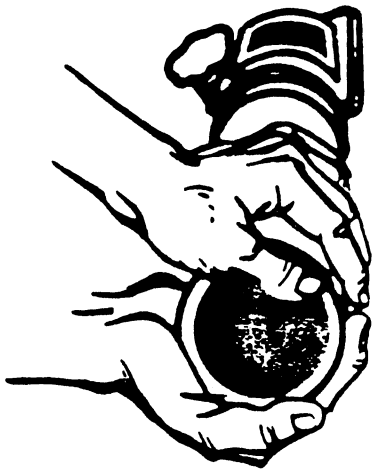


Fig 5-3. A-gunner's thumbs over the muzzle.

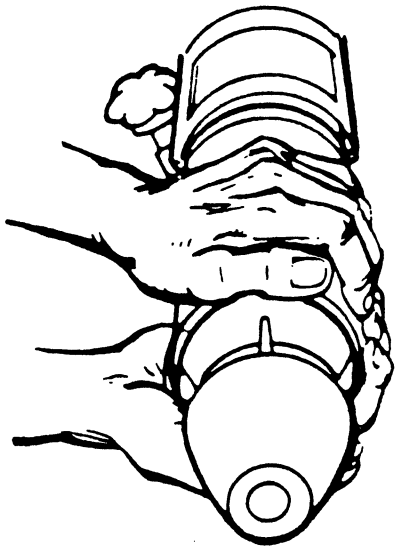


Fig 5-4. A-gunner removing the round.

f. The A-gunner passes the round to the ammo man who inspects it for the cause of the misfire. If the primer of the ignition cartridge is dented, he replaces the safety wire and places the round in a marked, safe location for disposal by ordnance personnel. If the primer is not dented, the round may be used again.

g. The firing pin must be replaced and the bore swabbed.

h. If the above procedure fails to remove the misfire, the barrel must be kept horizontal. It is removed from the bipod and laid horizontally on the ground until it can be turned over to ordnance for disposal.

5303. Misfire procedures for the LAV-M.

Listed below are the steps you will follow should you have a misfire when firing the mortar from the LAV-M.

a. Move to the rear of the mortar and kick the barrel several times to dislodge the round if it should be hanging in the barrel somewhere between the muzzle and the firing pin.

b. If the round fires, re-lay on the target and continue with the fire mission.

c. If the round does not fire and the barrel is hot, cool the barrel and continue the misfire procedure. If the barrel is cool, continue the misfire procedure.

d. Remove the sight and the sight extension. Using the firing pin wrench, retract the firing pin.

e. Depress the barrel to its lowest elevation and then elevate the mortar 15 turns of the elevation crank.

f. With the aid of the A-gunner, rotate the turntable until the mortar is pointed to the right of the vehicle.

g. The A-gunner will move to the right of the mortar and place his hands on the blast attenuator device near the muzzle, (the left hand on top and the right hand underneath).

h. Standing to the left of the mortar, the gunner will reach down and unlock the barrel clamp leaving the barrel clamp latch in place. The gunner will unlock the barrel from the socket by giving it a 1/4 turn.

i. The gunner will slowly and smoothly raise the barrel to a horizontal position. The A-gunner will place his thumbs at the top of the muzzle and the gunner will continue to raise the barrel until the round slides out and is caught by the A-gunner

j. The A-gunner will hand the round to the ammo man so he can inspect it to determine the cause of the misfire.

k. The gunner will raise the barrel as high as possible and shake it to remove any trash or foreign objects from the bore He then removes the firing pin and inspects it for faults and either replaces it or exchanges it ensuring that it is tightened The gunner lowers the barrel, secures the socket, turns the barrel making sure the firing pin is exposed and then locks the barrel clamp making sure the barrel clamp latch is secure.

l. The A-gunner swabs the bore.

m. The gunner replaces the sight and sight extension and re-lays the mortar.

- -

Unit Exercise: Answer the following questions and check your responses against those listed at the end of this study unit.

1. What are the two types of fire commands?

_____

2. In the spaces provided list, in sequence, the elements of an initial fire command.

_____

_____

_____

3. What element is always announced in a subsequent fire command?

_____

Matching: For items 4 through 11, match the before firing safety check in column 1 with the crewman responsible for making the check in column 2. Place your responses in the spaces provided.

Column 1		Column 2
Safety check		Crewman
___	4. Check for mask and overhead clearance.	a. Squad Leader
___	5. The sight is secure.	b. Gunner
___	6. The bore is clean and dry.	c. A-gunner
___	7. The firing pin recess is facing upwards.	d. Ammunition man
___	8. The bipod locking latch is locked.	
___	9. The round is clean, the safety pin is present, increments are properly placed and the ignition cartridge is in good condition.	
___	10. The barrel is locked to the baseplate and the open end of the socket is pointing in the direction of fire.	
___	11. The leg-locking handwheel is tight.	

Matching: For items 12 through 14, match the safety check during firing in column 1 with the crewman responsible for making the check in column 2. Place your responses in the spaces provided.

Column 1		Column 2
Safety check		Crewman
___	12. Swab the bore after every ten rounds.	a. Gunner
___	13. Check the breech plug for possible gas leaks.	b. A-gunner
___	14. Check the barrel clamp assembly to ensure it remains in its proper place near the cooling fins.	c. Ammunition man

15. List the three safety precautions taken during firing.

_____

_____

_____

Matching: For items 16 through 25, match the duties during loading and firing in column 1 with the crewman who performs the duties in column 2. Place your responses in the spaces provided.

Column 1	Column 2
Duties	Crewman
___ 16. Repeats the fire command.	a. Squad Leader
___ 17. Places the firing data on the sight and lays the mortar.	b. Gunner
___ 18. Prepares the round with the proper charge.	c. A-gunner
___ 19. Completes the preparation of the round to include safety checks.	d. Ammunition man
___ 20. Removes the muzzle cover.	
___ 21. Receives a round and half loads it.	
___ 22. After half loading the round, returns his left hand to its natural position near his side.	
___ 23. Commands "Fire".	
___ 24. Releases the round, letting it slide down the cannon.	
___ 25. After releasing the round, will bend over as in doing a wind mill exercise and touch his right hand to his left boot keeping his hand under the traversing handwheel.	

26. What is a misfire?

_____

27. What is a hangfire?

_____

28. What is a cookoff?

_____

29. What are the five causes of misfires?

_____

_____

30. Arrange the scrambled list of steps for clearing a misfire from a ground mounted mortar in the proper sequence.

(1) The A-gunner passes the round to the ammo man who inspects it to determine the cause of the misfire.
(2) The gunner removes the sight and the firing pin.
(3) A crewman announces "Misfire".
(4) The gunner unlocks the barrel clamp and the A-gunner unlocks the barrel from the baseplate.
(5) The gunner kicks the barrel.
(6) The crew waits behind the mortar for at least 1 minute.
(7) The firing pin is replaced and the bore is swabbed.
(8) The ammo man raises the barrel until it is horizontal.
(9) The gunner cools the barrel if it is hot.
(10) The A-gunner places his hands at the top of the muzzle.
(11) The A-gunner carefully removes the round from the barrel.
(12) The ammo man shakes the barrel to dislodge any remnants from the last round fired.
(13) If the misfire cannot be removed, the barrel is laid horizontally on the ground until it can be turned over to ordnance for disposal.

a. 3,5,6,9,2,10,4,7,8,1,13,11,12

b. 3,6,5,2,4,9,13,11,8,1,10,7,12

c. 3,5,6,9,2,4,10,8,11,12,1,7,13

d. 3,6,5,2,4,9,10,7,1,11,8,12,13

31. Arrange the scrambled list of steps for clearing a misfire from a LAV-M mounted mortar in the proper sequence.

(1) Remove the sight and the sight extension. Using the firing pin wrench, retract the firing pin.
(2) The A-gunner swabs the bore.
(3) Move to the rear of the mortar and kick the barrel several times.
(4) Cool the barrel if it is hot.
(5) Rotate the turntable until the mortar is pointed to the right of the vehicle.
(6) The gunner replaces the sight and the sight extension and re-lays the mortar.
(7) The gunner raises the barrel as high as possible and shakes it to remove any trash or foreign objects from the bore.
(8) Depress the barrel to its lowest elevation and then elevate the mortar 15 turns of the elevation crank.
(9) The gunner will unlock the barrel from the socket by giving it a 1/4 turn.
(10) The A-gunner places his hands on the blast attenuator device near the muzzle.
(11) The A-gunner will hand the round to the ammo man so he can inspect it to determine the cause of the misfire.
(12) The A-gunner will place his thumbs at the top of the muzzle and the gunner will continue to raise the barrel until the round slides out and is caught by the A-gunner.
(13) The gunner lowers the barrel, secures the socket, turns the barrel making sure the firing pin is exposed and then locks the barrel clamp making sure the barrel clamp latch is secure.
(14) The gunner will slowly and smoothly raise the barrel to a horizontal position.

a. 3,4,1,8,5,10,9,14,12,11,7,13,2,6

b. 3,4,5,1,8,9,10,14,12,11,13,6,7,2

c. 5,3,1,4,8,9,10,6,13,7,14,12,2,11

d. 5,3,1,4,14,11,8,12,9,6,2,7,10,13

SUMMARY

Within this study unit, you have been taught initial and subsequent fire commands, safety checks performed before firing and during firing, safety precautions and crew duties during loading and firing. You have also been taught the procedures for clearing misfires.

In the next study unit you will be taught the procedures for maintaining the mortar and inspecting the mortar.

Study Unit 5 Exercise Solutions	Reference
1. Initial, subsequent	5101
2. Mortars to follow Type of projectile and fuze Mortar to fire Method of fire Deflection Charge Time setting Elevation	5102
3. Elevation	5103
4. B	5201a(1)
5. B	5201a(6)
6. C	5201b
7. B	5201a(3)
8. B	5201a(5)
9. D	5201c
10. B	5201a(2)
11. B	5201a(4)
12. B	5202b
13. A	5202a(1)
14. A	5202a(2)
15. All personnel in the firing position must wear helmets, body armor and hearing protection (ear plugs). The A-gunner will not handle more than one round at a time. During fire for effects, the A-gunner must take care not to load a new round before the previous round leaves the barrel.	5203
16. B	5204a
17. B	5204b
18. D	5204c
19. D	5204d
20. C	5204e
21. C	5204f
22. C	5204g
23. A	5204h
24. C	5204i
25. C	5204j
26. A complete failure to fire.	5301a
27. A delay in the firing of a round.	5301b
28. The firing of a round due to a hot weapon.	5301c
29. Faulty firing pin, rounds lodging in the barrel, misplaced obturating ring, defective ignition cartridge, excess oil or water in the bore.	5301a
30. C	5302
31. A	5303

STUDY UNIT 6

MAINTENANCE AND INSPECTION

Introduction. As a crew member, you are responsible for the care and cleaning of the mortar and its accessories. Experience has shown that this weapon becomes unserviceable through lack of care much faster than from firing. The 81-MM mortar is a devastating weapon, capable of destroying the enemy before visual contact is made. But the weapon will not function effectively without proper care and cleaning. A dirty mortar could result in a round falling short of its target or simply failing to fire. It could be the difference between victory and defeat.

Lesson 1. MAINTAINING THE 81-MM MORTAR

LEARNING OBJECTIVES

1. List the special tools and equipment used for maintaining the mortar.
2. Name the only part of the mortar authorized to be painted.
3. List the authorized cleaning materials for the mortar.

6101. Special tools and equipment.

Tools and equipment are issued to the using organization for maintenance. They should not be used for purposes other than those prescribed and should be properly stored when not in use. Use only tools that are provided and fit properly. Tools that do not fit may damage parts.

a. Muzzle cover. The muzzle cover (see fig 1-6) is used to cover the muzzle of the mortar when not in use.

b. Striker protrusion gauge. The striker protrusion gauge (see fig 1-15) is used to measure the firing pin.

c. Breech wrench (CM8982). The breech wrench (CM8982) (fig 6-1) is used to hold the cannon when removing the breech plug.

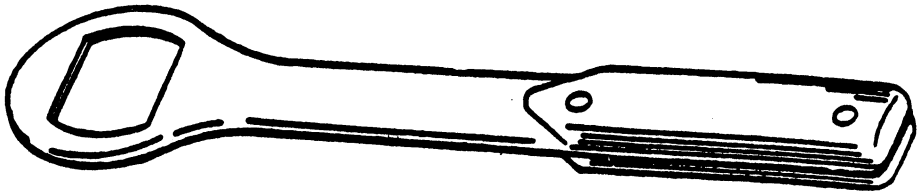


Fig 6-1. Breech wrench (CM8982).

d. Breech wrench (CM8983). The breech wrench (CM8983) (fig 6-2) is used to remove the breech plug.

Fig 6-2. Breech wrench (CM8983).

e. Firing pin wrench. The firing pin wrench (see fig 1-8) is used to remove the firing pin.

f. Cleaning staff. The cleaning staff (see fig 1-10) has two attachable sections and a cleaning brush, used to brush the bore.

g. M8 cleaning staff. The M8 cleaning staff is a long pole with four prongs on one end. The prongs are used to hold rags or other cleaning material for cleaning the bore.

6102. Painting.

Only the baseplate will be painted. The cannon and bipod will not be painted. When painting the baseplate, do not paint over the nameplate, serial number, inner ring socket caps, mortar seat inner ring or working surfaces that are lubricated. Complete painting of sighting and fire control equipment by the using organization is not permitted. Scratched or chipped surfaces should be retouched to prevent corrosion.

6103. Authorized cleaning materials.

When in use, the mortar should be cleaned daily. When not being used, it should be cleaned at least once a week. When cleaning, take particular care to keep all bearing surfaces and exposed, unpainted parts clean and properly lubricated. Rust, dirt, grit, gummed oil and water cause rapid deterioration of all parts of the weapon.

The following is the list of authorized cleaning materials for the mortar:

(1) Rags or wiping cloths

(2) Rifle bore cleaner

(3) Dry cleaning solvent

(4) Paint brushes

(5) Lubricants (special or medium oil)

Lesson 2. CLEANING THE 81-MM MORTAR

LEARNING OBJECTIVES

1. List the steps for cleaning the mortar before firing.

2. List the steps for cleaning the mortar during firing.

3. List the steps for cleaning the mortar after firing.

4. List the steps for care and cleaning of the optical parts.

6201. Cleaning before firing.

Before firing, the mortar crew should complete the following actions:

a. Inspect the three components of the mortar for cleanliness.

b. Clean the bore and firing pin with clean, dry rags.

c. Clean thoroughly and oil lightly all metal moving parts.

d. Do not leave any waste on the firing pin or in the barrel.

6202. Cleaning during firing.

During firing the bore should be swabbed after every 10 rounds, or after each fire for effect, to remove any foreign material.

The socket should be kept clean at all times so that the firing pin can be retracted if necessary, and the positions of the socket and the breech plug in the socket can be seen. If the breech plug is rotating (unscrewing), the barrel should be unlocked from the socket and the breech plug tightened using the proper wrenches. The position of the red painted firing pin recess will give an indication of the breech plug rotation.

6203. Cleaning after firing.

Clean the bore and all the moving parts of the mortar immediately after completion of firing.

a. Clean the bore with rifle bore cleaner immediately after completion of firing and for two consecutive days thereafter; a minimum of three cleanings. The barrel should be cool enough to touch with the bare hand before you use rifle bore cleaner in it.

b. Do not leave any waste on the firing pin or in the barrel.

c. If the cleaning cannot be accomplished immediately, apply oil to prevent corrosion and at the first opportunity, clean, oil, and inspect all of the parts.

6204. Care and cleaning of optical parts.

The proper care and cleaning of the optical parts of the mortar is accomplished as follows:

a. The exposed surfaces of lenses and other optical parts should be kept clean, dry, and free from oil and grease to prevent corrosion and scratching of the surface of the glass.

b. Never use polishing liquids, pastes, or abrasives to polish lenses and optical windows.

c. Use only lens paper especially intended for cleaning optical glass.

d. Cleaning.

(1) Keep oil and grease away from optical parts.

(2) Do not touch lenses or windows with bare fingers.

(3) Apply alcohol on the lens and wipe gently with clean lens paper to remove oil or grease from optical surfaces.

(4) If alcohol is not available and the temperature is above freezing, breathe heavily on the glass and wipe it off with clean lens paper. Repeat this operation until clean.

e. Cold weather cleaning.

(1) Clean optical surfaces with lens paper moistened with alcohol.

(2) If alcohol is not available, use dry lens paper.

(3) Wipe gently to avoid scratching or removing coated surface of optics.

Lesson 3. INSPECTING THE 81-MM MORTAR

LEARNING OBJECTIVE

List the steps for inspecting each component of the mortar.

6301. Inspection of the mortar.

Care, cleaning, and inspection go hand-in-hand. What you are looking for is cleanliness and serviceability. Inspection of the mortar should include, but is not limited to, inspection of the following:

a. Cannon. Check the general appearance and cleanliness of the bore, threaded exterior and the blast attenuator.

(1) Make sure that the cannon is not dented, bulged or cracked.

(2) Check the blast attenuator device for cleanliness, cracks, dents and rust. Ensure it is in the proper position and is secure.

b. Firing pin. Examine the firing pin for fouling, corrosion, foreign material, or a broken or burred point.

(1) Examine the breech plug for fouling, corrosion or foreign material.

c. Bipod. Check the general appearance and cleanliness of the bipod and see if all moving parts are properly lubricated.

(1) Turn the traversing handwheel all the way left and right to check for binding or inoperative parts.

(2) Turn the elevation handwheel all the way up and down to check for binding or inoperative parts.

(3) Turn the cross-leveling handwheel and check for binding or inoperative parts.

(4) Check the traversing handwheel, elevation handwheel and cross-leveling handwheel for backlash or play that exceeds 1/8 of a turn.

(5) Check for binding or damaged mortar mounting buffers (shock absorbers) by pulling down on both buffers at the same time. When released, they should return to the original position.

d. Baseplate. Check the general appearance and cleanliness of the baseplate.

(1) Check for dirt or foreign matter in the baseplate socket.

(2) Rotate the socket to see that it functions without binding and is free of cracks.

(3) Check the socket and the three non-metallic washers for cracks and cleanliness.

(4) The entire baseplate should have a light coat of oil.

e. Sight unit. Check the sight unit for foreign matter and cleanliness.

(1) Check the sight unit dovetail and sight unit adapter for burrs.

(2) Check for a broken or bent sight unit dovetail.

(3) Check for a broken or bent sight unit adapter.

(4) Check to see if the locking knobs are in working order.

(5) Check the lenses for cracks or breaks.

(a) Check the visibility of the lens.

- -

Unit Exercise: Answer the following questions and check your responses against those listed at the end of this study unit.

1. What are the special tools and equipment used for maintaining the mortar?

_____

_____

2. What is the only part of the mortar authorized to be painted?

_____

3. What are the authorized cleaning materials for the mortar?

_____

_____

4. What are the steps for cleaning the mortar before firing?

_____

_____

_____

_____

5. What are the procedures for cleaning the mortar during firing?

6. What are the steps for cleaning the mortar after firing?

7. What are the procedures for caring for the optical parts?

8. What are the procedures for cleaning the optical parts?

9. What are the procedures for cleaning the optical parts in cold weather?

10. What are the steps for inspecting the cannon?

11. What are the steps for inspecting the firing pin?

12. What are the steps for inspecting the bipod?

13. What are the steps for inspecting the baseplate?

14. What are the steps for inspecting the sight unit?

SUMMARY

In this study unit, you have learned the procedures for maintaining the mortar, care and cleaning before, during and after firing and inspection of the mortar. Remember whether you are in a combat situation, field training or in garrison, if you want this weapon to take care of you, you must first take care of this weapon.

Study Unit 6 Exercise Solutions	Reference
1. Muzzle cover, striker protrusion gauge, breech wrench (CM8982), breech wrench (CM8983), firing pin wrench, cleaning staff, M8 cleaning staff.	6101
2. Baseplate.	6102
3. Rags or wiping cloths, rifle bore cleaner, dry cleaning solvent, paint brushes, lubricants.	6103
4. Inspect the components for cleanliness. Clean the bore and firing pin with clean, dry rags. Clean and lightly oil all metal moving parts. Do not leave any waste on the firing pin or in the barrel.	6201
5. Swab the bore after every 10 rounds or after each fire for effect. Keep the socket clean.	6202
6. Clean the bore and all moving parts immediately after completion of firing. Clean the bore with rifle bore cleaner immediately after firing and for two consecutive days thereafter. Do not leave any waste on the firing pin or in the barrel. If cleaning cannot be accomplished immediately, apply oil to prevent corrosion and at first opportunity, clean, oil and inspect all of the parts.	6203
7. Keep exposed surfaces of lenses and other parts clean and dry. Never use polishing liquids, pastes, or abrasives to polish lenses and optical windows. Use only lens paper especially intended for cleaning optical glass.	6204
8. Keep oil and grease away from optical parts. Do not touch lenses or windows with bare fingers. Apply alcohol on the lens and wipe gently with clean lens paper. If alcohol is not available and the temperature is above freezing, breathe heavily on the glass and wipe it off with clean lens paper.	6204d

9. Clean optical surfaces with lens paper moistened with alcohol.
If alcohol is not available, use dry lens paper.
Wipe gently to avoid scratching or removing coated surface of optics. 6204e

10. Check the general appearance and cleanliness of the bore, threaded exterior and the blast attenuator.
Ensure the cannon is not dented, bulged, or cracked.
Check the BAD for cleanliness, cracks, dents and rust.
Ensure the BAD is in the proper position and is secure. 6301a

11. Examine the firing pin for fouling, corrosion, foreign material, or a broken or burred point.
Examine the breech plug for fouling, corrosion or foreign material. 6301b

12. Check the general appearance and cleanliness and see if all moving parts are properly lubricated.
Check the traversing handwheel for binding or inoperative parts.
Check the elevation handwheel for binding or inoperative parts.
Check the cross-leveling handwheel for binding or inoperative parts.
Check the traversing handwheel, elevation handwheel, and cross-leveling handwheel for backlash or play that exceeds 1/8 of a turn.
Check for binding or damaged mortar mounting buffers. 6301c

13. Check the general appearance and cleanliness.
Check for dirt or foreign matter in the baseplate socket.
Rotate the socket to see that it functions without binding and is free of cracks.
Check the socket and the three non-metallic washers for cracks and cleanliness.
The entire baseplate should have a light coat of oil. 6301d

14. Check the sight unit for foreign matter and cleanliness.
Check the sight unit dovetail and sight unit adapter for burrs.
Check for a broken or bent sight unit dovetail.
Check for a broken or bent sight unit adapter.
Check to see if the locking knobs are in working order.
Check the lenses for crack or breaks.
Check the visibility of the lens. 6301e

THE M252, 81-MM MORTAR CREWMAN

REVIEW LESSON

INSTRUCTIONS: The purpose of the review lesson examination is to prepare you for your final examination. We recommend that you try to complete your review lesson examination without referring to the text, but for those items (questions) you are unsure of, restudy the text. When you finish your review lesson and are satisfied with your responses, check your responses against the answers provided at the end of this review lesson examination.

Select the ONE answer that BEST completes the statement or that answers the item. For multiple choice items, circle your response. For matching items, place the letter of your response in the space provided.

1. What is the mission of the 81-MM mortar platoon?

   a. Adjust fire onto targets
   b. Provide continuous close fire support
   c. Repel the enemy's assault
   d. Close with and destroy the enemy

2. Where in the infantry battalion is the 81-MM mortar platoon located?

   a. Weapons platoon
   b. Weapons company
   c. H&S company
   d. Headquarters company

3. How many enlisted Marines are in the 81-MM mortar platoon?

   a. 68
   b. 75
   c. 80
   d. 90

4. How many officers are in the 81-MM mortar platoon?

   a. 1
   b. 2
   c. 4
   d. 5

5. The 81-MM mortar platoon headquarters consists of _____ officer(s) and _____ enlisted Marines.

   a. 1, 2
   b. 1, 4
   c. 4, 10
   d. 4, 12

6. How many Marines are in the 81-MM mortar section?

a. 10
b. 14
c. 24
d. 32

7. How many Marines are in the 81-MM mortar squad?

a. 6
b. 10
c. 14
d. 16

Matching: For items 8 through 12, match the platoon member in column 1 with the duties they perform in column 2.

Column 1	Column 2
Platoon member	Duties
8. Platoon Commander	a. Operation and maintenance of assigned vehicle.
9. Platoon Sergeant	b. Gets ammunition for platoon.
10. Ammunition Technician	c. Responsible for operation of the platoon.
11. Ammunition Man	d. Responsible for operation of the FDC.
12. Ammunition Man/Driver	e. Provides local security for the FDC.

Matching: For items 13 through 17, match the platoon member in column 1 with the duties they perform in column 2.

Column 1	Column 2
Platoon member	Duties
13. Section Leader	a. Calls for fire and adjusts fire onto targets.
14. Ammunition NCO	b. Responsible for training and employment of the section.
15. Forward Observer	c. Gets ammunition and supplies for the section.
16. Squad Leader	d. Places the firing data on the sight, and lays the mortar for deflection and elevation.
17. Gunner	e. Supervises the emplacement, laying and firing of the mortar.

8. What are the three identifying characteristics of the 81-MM mortar?

a. Breech loaded, rifled bore, high angle of fire.
b. Smooth bore, muzzle loaded, high angle of fire.
c. Breech loaded, smooth bore, high angle of fire.
d. Smooth bore, muzzle loaded, low angle of fire.

19. What are the three main components of the 81-MM mortar?

a. Cannon, mount and baseplate.
b. Muzzle, Blast attenuator device, and sight.
c. Sight, bipod and baseplate.
d. Mortar, ammunition and fuzes.

20. What is the weight of the barrel with blast attenuator device?

a. 20 lbs.
b. 25 lbs.
c. 35 lbs.
d. 48 lbs.

21. What is the weight of the mount?

a. 17 lbs.
b. 19 lbs.
c. 24 lbs.
d. 27 lbs.

22. What is the weight of the baseplate?

a. 18.5 lbs.
b. 25.8 lbs.
c. 28.5 lbs.
d. 32.5 lbs.

23. The elevation of the M252 81-MM mortar ranges from _____ to _____ mils.

a. 0600 - 1600
b. 0800 - 1800
c. 0900 - 1900
d. 1000 - 6400

24. Each turn of the elevation drum is approximately how many mils?

a. 4
b. 6
c. 10
d. 12

25. The elevation crank has how many total cranks of elevation?

a. 10
b. 26 1/8
c. 40 1/4
d. 50 1/2

26. The number of mils deflection left or right from center is

a. 100.
b. 400.
c. 1000.
d. 6400.

27. What is the total deflection with movement of the mortar mount?

a. 1600 mils
b. 3200 mils
c. 4800 mils
d. 6400 mils

28. How many total turns do you make traversing from left to right or right to left?

a. 20
b. 26 1/2
c. 28 1/2
d. 32 1/4

29. How many total turns is the minor adjustment crank?

a. 10
b. 15
c. 25
d. 30

30. What is the maximum range of the M252 81-MM mortar?

a. 4737 meters
b. 5733 meters
c. 6400 meters
d. 7352 meters

31. What is the minimum range of the M252 81-MM mortar?

a. 70 meters
b. 75 meters
c. 100 meters
d. 125 meters

32. What is the sustained rate of fire for the M252 81-MM mortar?

a. 15 rpm
b. 20 rpm
c. 30 rpm
d. 40 rpm

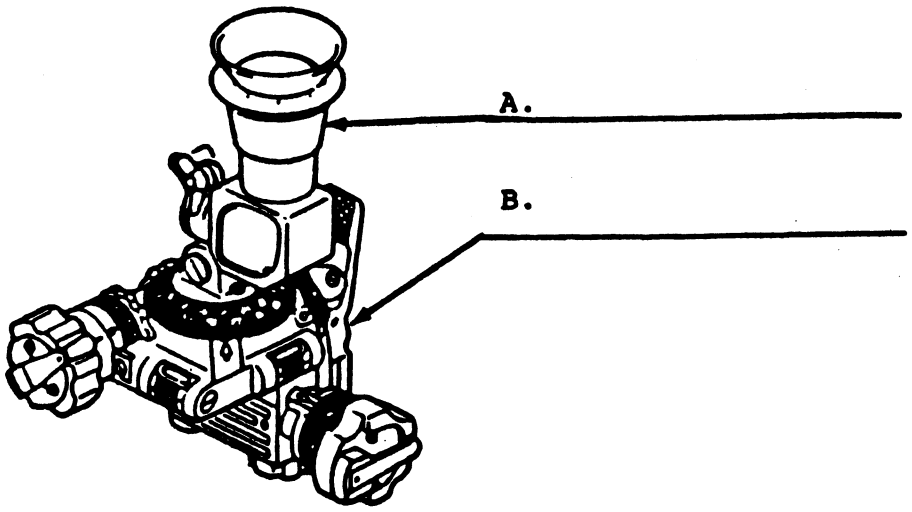
33. What is the maximum rate of fire for the M252 81-MM mortar?

a. 15 rpm
b. 20 rpm
c. 30 rpm
d. 40 rpm

34. What is the spare part normally carried by the mortar squad?

a. Aiming post
b. Firing pin
c. M64A1 sight
d. Blast attenuator device

Questions 35 and 36 pertain to the figure below.



35. In the figure above, A is pointing to which major part of the M64A1 sight unit?

a. Telescope mount
b. Sight unit
c. Elbow telescope
d. Deflection scale

36. In the figure above, B is pointing to which major part of the M64A1 sight unit?

a. Telescope mount
b. Sight unit
c. Elbow telescope
d. Deflection scale

37. How many parts of the M64A1 sight are illuminated by tritium gas?

a. Four
b. Five
c. Eight
d. Nine

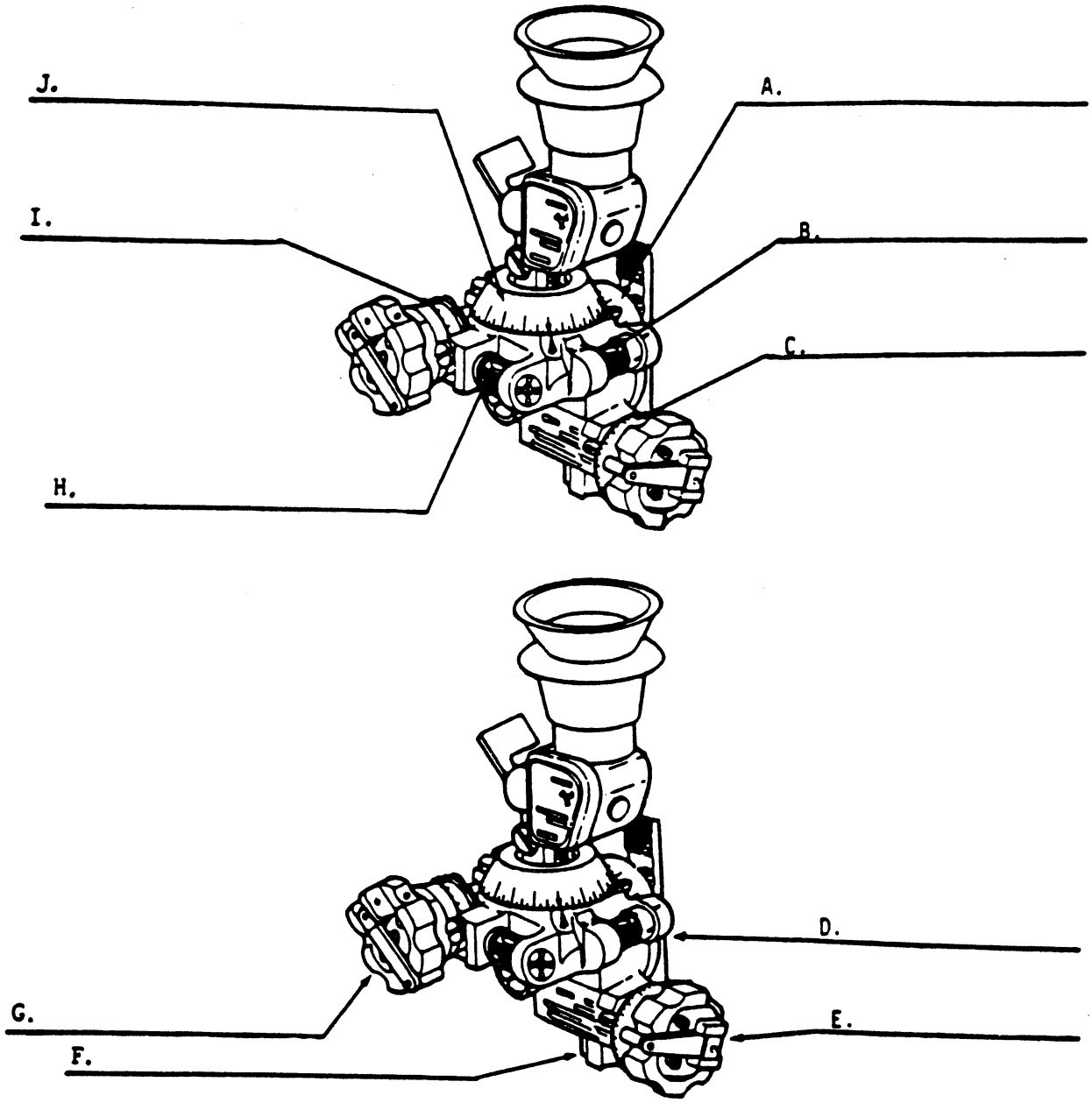
38. The sight is always mounted on the mortar with an initial deflection of _____ and an initial elevation of _____.

a. 3200, 1100
b. 3200, 1600
c. 6400, 1100
d. 6400, 1600

39. To mount the sight to the mortar, you simply depress the dovetail locking lever and insert the _____ into the dovetail slot of the bipod.

a. sight
b. locking lever
c. dovetail
d. switch

Questions 40 through 49 refer to the figure below.



40. In the figure above, A refers to what part of the sight?

a. Cross level vial
b. Elevation vial
c. Elevation knob
d. Coarse elevation scale

41. In the figure above, B refers to what part of the sight?

a. Elevation knob
b. Latching lever
c. Cross level vial
d. Fine Deflection scale

42. In the figure, C refers to what part of the sight?

a. Latching lever
b. Elevation vial
c. Coarse deflection scale
d. Fine elevation scale

43. In the figure, D refers to what part of the sight?

a. Latching lever
b. Elevation knob
c. Coarse elevation scale
d. Fine deflection scale

44. In the figure, E refers to what part of the sight?

a. Elevation knob
b. Deflection knob
c. Fine elevation scale
d. Fine deflection scale

45. In the figure, F refers to what part of the sight?

a. Elevation vial
b. Cross level vial
c. Elevation locking knob
d. Deflection locking knob

46. In the figure, G refers to what part of the sight?

a. Deflection knob
b. Elevation knob
c. Coarse deflection scale
d. Cross level vial

47. In the figure, H refers to what part of the sight?

a. Deflection knob
b. Elevation vial
c. Coarse deflection scale
d. Latching lever

48. In the figure, I refers to what part of the sight?

a. Deflection knob
b. Cross level vial
c. Fine deflection scale
d. Elevation vial

49. In the figure, J refers to what part of the sight?

a. Elevation knob
b. Deflection knob
c. Coarse elevation scale
d. Coarse deflection scale

50. Deflection settings are always placed on the sight _____

a. first.
b. in degrees.
c. last.

51. Deflections are always given in _____ digits.

a. two
b. three
c. four
d. five

52. Elevation settings are always placed on the sight _____

a. first.
b. in degrees.
c. last.

53. Elevations are always given in _____ digits.

a. two
b. three
c. four
d. five

54. The mortar is never fired with an elevation setting lower than _____ mils.

a. 0600
b. 0700
c. 0800
d. 0900

55. The mortar is never fired with an elevation setting higher than _____ mils.

a. 1300
b. 1400
c. 1500
d. 1600

Matching: For questions 56 through 60, match each step for dismounting and stowing the sight in column 1 with its applicable step number in column 2.

Column 1	Column 2
Steps for dismounting	Order done
56. Depress the dovetail locking lever and lift the sight up off the bipod.	a. Step 1 b. Step 2 c. Step 3 d. Step 4 e. Step 5
57. Close and lock the case.	
58. Place a deflection of 3200 mils and an elevation of 0800 mils on the sight.	
59. Place the sight into the indentations in the case.	
60. Loosen the wingnut and place the elbow telescope in the rest position.	

61. What is the purpose of boresighting the 81-MM mortar?

a. To align the sight with the target.
b. To align the barrel with the target.
c. To ensure the deflection and elevation on the sight is an accurate indication of what is on the gun.
d. To ensure the deflection and elevation are on line with the target.

Listed below in scrambled order are the steps for boresighting the sight for elevation.

(1) Recheck all level vials.
(2) Center the crosslevel vial by slightly rotating the boresight around the barrel.
(3) Attach the M45 boresight to the barrel below and touching the upper stop band.
(4) Rotate the elevation knob on the sight until the elevation bubble is centered.
(5) Elevate/depress the barrel until the elevation vial on the M45 boresight is centered.

62. Which of the sequences below of the steps for boresighting the sight for elevation is correct?

a. 3,5,4,2,1
b. 3,2,5,4,1
c. 3,5,2,4,1
d. 3,5,4,1,2

Listed below in scrambled order are the steps for boresighting the sight for deflection.

(1) Ensure the sight is set at a deflection of 0 mils.
(2) Ensure the vertical crossline of the sight is aligned with the distant aiming point.
(3) Attach the M45 boresight to the barrel below and touching the upper stop band.
(4) With the boresight aligned on the distant aiming point, level the sight by centering the crosslevel bubble.
(5) Align the vertical crossline of the boresight onto the distant aiming point.
(6) Select a distant aiming point that is as far from the mortar as possible and not less than 200 meters.

63. Which of the sequences below of the steps for boresighting the sight for deflection is correct?

a. 3,2,5,6,1,4
b. 3,2,4,5,6,1
c. 3,1,6,5,4,2
d. 3,1,2,5,4,6

Listed below in scrambled order are the steps for removing the M45 boresight from the barrel.

(1) Swing the elbow telescope until it is about parallel with the elevation bubble.
(2) Stow the clamp assembly and straps in the corner compartment and the boresight in the center compartment of the carrying case.
(3) Loosen the clamp screw, releasing the boresight from the barrel.
(4) Release the clamp assembly and straps by removing the ring from the hook and the strap shaft.

64. Which of the sequences below of the steps for removing the M45 boresight from the barrel is correct?

a. 3,2,1,4
b. 3,1,4,2
c. 3,4,1,2
d. 3,2,4,1

65. Because the propellant charges can be detached and varied in number for firing and the safety wire must be removed before firing, 81-MM mortar ammunition is classified as _____.

a. inert
b. fixed
c. semifixed
d. explosive

66. What are the three main assemblies of a typical mortar round?

a. Body, fuze, and fin assembly
b. Body, head, and tail assembly
c. Primer, ignition cartridge, and body
d. Fuze, ignition cartridge, and increments

67. What is the assembly that is the main component of the round, and contains the material which produces the desired effect of the round?

a. Fuze
b. Body
c. Fin
d. Primer

68. What is the assembly that controls the method of exploding the shell?

a. Fuze
b. Body
c. Fin
d. Primer

69. What is the assembly that stabilizes the round in flight and causes it to strike with the fuze end first?

a. Fuze
b. Body
c. Fin
d. Primer

70. What are the six types of 81-MM mortar rounds?

a. Low explosive, white smoke, practice, training, high explosive, red smoke.
b. High explosive, white phosphorus, red phosphorus, illumination, training practice, training.
c. Training, illumination, smoke, explosive, practice, inert.
d. White phosphorus, illumination, smoke, low explosive, airburst, ground burst.

71. What are the markings that appear on each mortar shell?

a. Caliber, type of filler, type of cartridge, ammunition lot number.
b. Caliber, type of explosive, lot number, company name, date of manufacture.
c. Type of round, lot number, caliber, disposal instructions, firing instructions.
d. Caliber, type of round, temperature of round, lot number, date packed.

72. What type of 81-MM mortar round is white with black markings?

a. High explosive
b. White phosphorus
c. Illumination
d. Training

73. What type of 81-MM mortar round is black with white markings?

a. Red phosphorus
b. Training
c. High explosive
d. Training practice

74. What type of 81-MM mortar round is olive drab with yellow markings?

a. Illumination
b. High explosive
c. Red phosphorus
d. White phosphorus

75. What type of 81-MM mortar round is blue with white markings?

a. Training
b. Illumination
c. Training practice
d. Red phosphorus

76. What type of 81-MM mortar round is light green with black markings?

a. High explosive
b. Training
c. White phosphorus
d. Red phosphorus

77. What type of 81-MM mortar round is light green with red markings?

a. Illumination
b. Training
c. White phosphorus
d. Red phosphorus

78. What is the type of 81-MM mortar round that is used for battlefield illumination and signaling?

a. High explosive
b. Illumination
c. Smoke ammunition
d. Training

79. What is the type of 81-MM mortar round that is used to train mortar crews in loading and firing.

a. High explosive
b. Illumination
c. Smoke ammunition
d. Training

80. What is the type of 81-MM mortar round that is used for screening, casualty producing, incendiary action and signaling?

a. High explosive
b. Illumination
c. Smoke ammunition
d. Training

81. What is the type of 81-MM mortar round that is used to cause casualties to enemy personnel and destroy enemy vehicles and emplacements by blast and fragmentation.

a. High explosive
b. Illumination
c. Smoke ammunition
d. Training

82. What are the five types of fuzes used with 81-MM mortar ammunition?

a. Impact, explosive, dynamite, TNT, point detonating
b. Impact, powder-train time, mechanical time, multioption, radio doppler
c. Mechanical time, airburst, VT, proximity, delay
d. Impact, delay, quick, superquick, time

83. What are the three components of a propelling charge?

a. Fuze, body, fin assembly
b. Primer, fuze, explosive charge
c. Primer, ignition cartridge, increments
d. Primer, detonator, propelling charge

Questions 84 through 87 pertain to disposing of unused increments. Match each action in column 1 with its applicable step number in column 2.

	Column 1	Column 2
	Action	Order done
84.	Extend a starting train of single increments laid end to end. End this starting train with not less than 1 meter of inert material.	a. Step 1 b. Step 2 c. Step 3 d. Step 4
85.	Preburn all dead grass or brush within 30 meters around the burning place.	
86.	Ignite the inert material.	
87.	Select a place at least 100 meters from the mortar position, parked vehicles, and ammunition piles.	

88. What are the two types of ammunition storage used for 81-MM mortar ammunition?

a. Day storage and night storage.
b. Light storage and heavy storage.
c. Wet storage and dry storage.
d. Depot storage and field storage.

89. White phosphorus rounds are stored with the fuze end _____?

a. up
b. down
c. off
d. on

90. What are the five common characteristics used for selecting a mortar position?

a. Camouflage, cover, concealment, defilade, resupply
b. Camouflage, observation, access, resupply, natural cover
c. Defilade, dispersion, resupply, stable firing platform, mask and overhead clearance
d. Mask and overhead clearance, camouflage, observation, access, defilade

91. What is the reason for positioning the mortar in defilade?

a. To enable you to fire in every direction.
b. To provide cover and concealment from enemy observation and direct fire.
c. To seat the baseplate properly.
d. To limit access to the mortar position.

92. What is the purpose of camouflage?

a. To avoid enemy observation from overhead.
b. To protect you from direct fire weapons.
c. To deny the enemy information and to deceive him as to your intentions.
d. To provide you with cover and concealment.

93. What are the materials used for camouflaging the mortar position?

a. Dirt and sandbags
b. Camouflage paint and vehicles
c. Foxholes and bunkers
d. Natural vegetation and camouflage nets

Listed below in scrambled order are the steps for ground mounting the 81-MM mortar.

(1) The gunner will sight in on the direction stake.
(2) The baseplate man sets the baseplate on the ground.
(3) The A-gunner places the cannon in the gunner's right shoulder.
(4) The gunner prepares the bipod for mounting.
(5) The A-gunner inserts the barrel into the baseplate.
(6) The gunner places the sight on the mortar.
(7) The gunner attaches the barrel to the bipod.

94. Which of the sequences below for ground mounting the 81-MM mortar is correct?

a. 2,4,5,7,3,1,6
b. 2,5,4,3,7,6,1
c. 2,7,6,1,5,3,4
d. 2,6,4,5,7,3,1

95. Which piece of mortar equipment is carried by the squad leader?

a. Barrel
b. Baseplate
c. Bipod
d. Sight case

96. Which piece of mortar equipment is carried by the gunner?

a. Baseplate
b. Bipod
c. Barrel
d. Sight case

97. Which piece of mortar equipment is carried by the A-gunner?

a. Baseplate
b. Bipod
c. Barrel
d. Sight case

98. Which piece of mortar equipment is carried by the ammunition man?

a. Baseplate
b. Bipod
c. Barrel
d. Sight case

99. What is the command for mounting the mortar?

a. "Stand by to mount, mount".
b. "Mount the mortar".
c. "Prepare to mount, mount".
d. "On line, to your direct front, action"!

100. What are the two methods to determine initial direction of fire most commonly used by the mortar platoon?

a. Compass and map
b. M64A1 sight and M45 boresight
c. Aiming circle and azimuth
d. Map and protractor

101. What are the three methods used for parallel laying the mortars?

a. Reciprocal lay, direct lay and boresighting
b. Compass azimuth, aiming circle and M64A1 sight
c. Compass, map and protractor
d. Indirect lay, direct lay and parallel lay

102. When placing out your aiming posts, at what distance from the mortar should the far aiming post be?

a. 25 meters
b. 50 meters
c. 75 meters
d. 100 meters

103. When placing out your aiming posts, at what distance from the mortar should the near aiming post be?

a. 25 meters
b. 50 meters
c. 75 meters
d. 100 meters

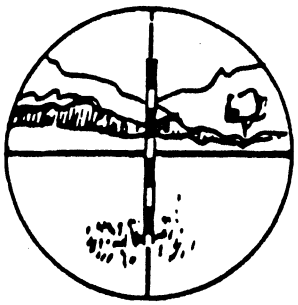
104. What is meant by referring the sight?

a. To place a deflection on the sight without disturbing the lay of the mortar.
b. To turn the sight in the direction of the target.
c. To align the sight with the aiming posts.
d. To place the referred deflection on the sight.

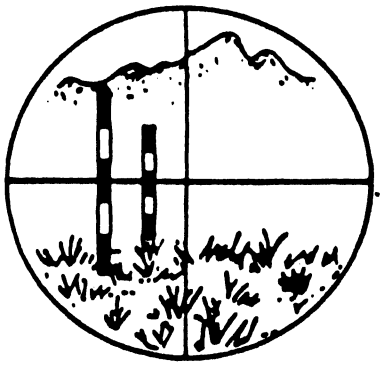
105. What are the two conditions under which you can use direct lay of the 81-MM mortar?

a. When you have no FO or FDC.
b. Whenever you can see the target through your sight and when enemy troops attack the mortar position.
c. Whenever you don't have a compass or an aiming circle for parallel laying.
d. When you have no communications equipment or your position has been overrun.

106. Which of the illustrations below shows an aligned sight picture?

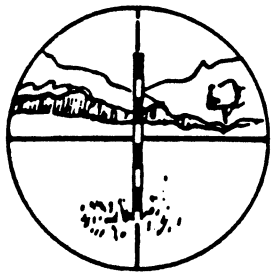


a.

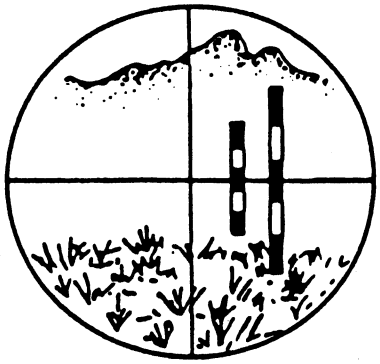


b.

107. Which of the illustrations below shows a compensated sight picture?



a.



b.

108. What is the purpose of traversing fire?

a. To distribute fire laterally across a target in width.
b. To distribute fire over a target in depth.
c. To distribute fire over a target in length.
d. To distribute fire over a target in height.

109. What is the purpose of searching fire?

a. To distribute fire laterally across a target in width.
b. To distribute fire over a target in depth.
c. To distribute fire over a target in length.
d. To distribute fire over a target in height.

110. What are the two types of fire commands?

a. Preparatory, command of execution
b. Primary, alternate
c. Initial, subsequent
d. Initial, partial

111. What element is always announced in a subsequent fire command?

a. Deflection
b. Time setting
c. Charge
d. Elevation

112. What is a misfire?

a. A delay in the firing of a round
b. A complete failure to fire
c. The firing of a round due to a hot weapon

113. What is a hangfire?

a. A complete failure to fire
b. The firing of a round due to a hot weapon
c. A delay in the firing of a round

114. What is a cookoff?

a. The firing of a round due to a hot weapon
b. A delay in the firing of a round
c. A complete failure to fire

115. What is the only part of the mortar authorized to be painted?

a. Sight unit
b. Baseplate
c. Bipod
d. Barrel

116. What are the authorized cleaning materials for the mortar?

a. Steel wool, gasoline, rags, paint brushes, CLP
b. Rags or wiping cloths, rifle bore cleaner, dry cleaning solvent, paint brushes, lubricants
c. Paint brushes, paint thinner, diesel, rags, break free
d. Alcohol, rags, steel wool, CLP, wire brush

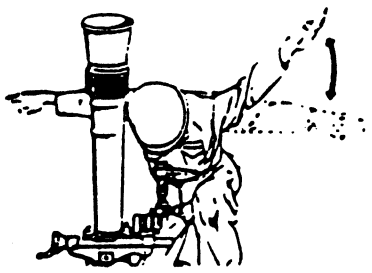
117. When do you swab the bore during firing of the mortar?

a. After every round and fire for effect
b. After every five rounds and every other fire for effect
c. After every ten rounds and every fire for effect
d. After every fire for effect with more than three rounds

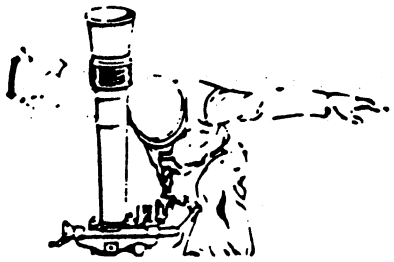
118. What is the procedure for cleaning the mortar after firing?

a. Clean the bore with rifle bore cleaner immediately after firing and for two consecutive days thereafter.
b. Clean the bore with CLP after firing.
c. Clean the entire mortar with dry cleaning solvent for three days after firing.
d. Clean only the moving parts with CLP and the dirty parts with rifle bore cleaner until they are clean.

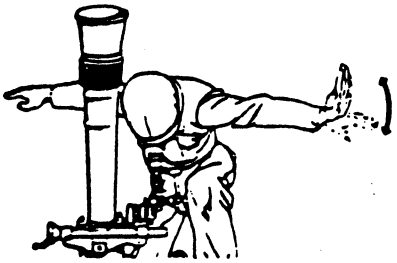
Questions 119 through 126 pertain to the figure below.



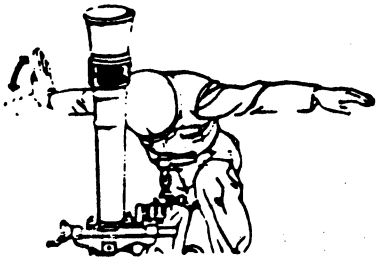
A.



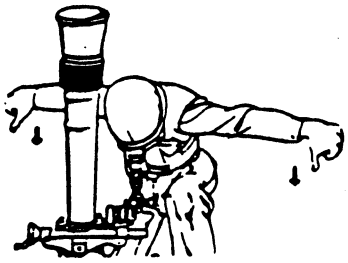
B.



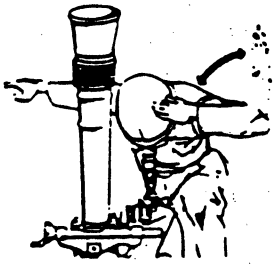
C.



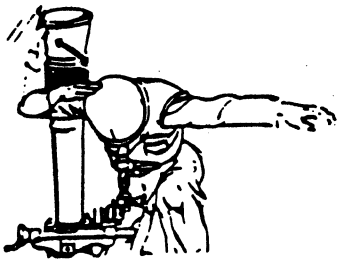
D.



E.



F.



G.

H.

119. In the figure, A represents the hand and arm signal meaning

a. minor movement of the post to the left.
b. move aiming post to the left.
c. move aiming post to the right.
d. minor movement of the post to the right.

120. In the figure, B represents the hand and arm signal meaning

a. move aiming post to the left.
b. move aiming post to the right.
c. tilt post to the left.
d. tilt post to the right.

121. In the figure, C represents the hand and arm signal meaning

a. minor movement of the post to the left.
b. minor movement of the post to the right.
c. drive in post.
d. post correct.

122. In the figure, D represents the hand and arm signal meaning

a. tilt post to the left.
b. tilt post to the right.
c. minor movement of the post to the left.
d. minor movement of the post to the right.

123. In the figure, E represents the hand and arm signal meaning

a. post correct.
b. drive in post.
c. tilt post to the right.
d. tilt post to the left.

124. In the figure, F represent the hand and arm signal meaning

a. tilt post to the left.
b. tilt post to the right.
c. minor movement of the post to the left.
d. minor movement of the post to the right.

125. In the figure, G represents the hand and arm signal meaning

a. move aiming post to the left.
b. move aiming post to the right.
c. tilt post to the right.
d. tilt post to the left.

126. In the figure, H represents the hand and arm signal meaning

a. drive in post.
b. post correct.
c. move aiming post to the right.
d. move aiming post to the left.

Review Lesson Solutions

		Reference
1.	b.	1101
2.	b.	1102
3.	a.	1102
4.	a.	1102
5.	b.	1102
6.	b.	1102
7.	a.	1102
8.	c.	1102
9.	d	1102
10.	b.	1102
11.	e.	1102
12.	a.	1102
13	b	1102
14.	c.	1102
15.	a.	1102
16	e.	1102
17	d	1102
18.	b.	1201
19.	a.	1202
20.	c.	1203
21.	d	1203
22.	c.	1203
23.	a.	1203
24.	c.	1203
25.	d.	1203
26.	a.	1203
27.	d.	1203
28.	c.	1203
29	c.	1203
30	b.	1203
31	c.	1203
32	a.	1203
33	c.	1203
34	b.	1301
35.	c.	2101
36.	a.	2101
37.	d.	2103
38.	a.	2104
39.	c.	2104
40.	d.	2102
41.	c.	2102
42.	d.	2102

		Reference
43.	a.	2102
44.	a.	2102
45.	c.	2102
46.	a.	2102
47.	b.	2102
48.	c.	2102
49.	d.	2102
50.	a.	2104
51.	c.	2104
52.	c.	2104
53.	c.	2104
54.	c.	2104
55.	c.	2104
56.	c.	2104
57.	e.	2104
58.	a	2104
59.	d.	2104
60.	b.	2104
61.	c.	2201
62.	b.	2202
63.	c.	2203
64.	b.	2204
65.	c.	3101
66.	a.	3102
67.	b.	3102
68.	a.	3102
69.	c.	3102
70.	b.	3201
71.	a.	3203
72.	c.	3202
73.	b.	3202
74.	b.	3202
75.	c.	3202
76.	d.	3202
77.	c.	3202
78.	b.	3204
79.	d.	3204
80.	c.	3204
81.	a.	3204
82.	b.	3301
83.	c.	3401

		Reference
84.	c.	3402
85.	b.	3402
86.	d.	3402
87.	a.	3402
88.	d.	3502
89.	a.	3502
90.	c.	4101
91.	b.	4101
92.	c.	4102
93.	d.	4103
94.	b.	4202
95.	d.	4201
96.	b.	4201
97.	c.	4201
98.	a.	4201
99.	d.	4202
100.	a.	4301
101.	b.	4302
102.	b.	4304
103.	a.	4304
104.	a.	4304
105.	b.	4303
106.	a.	4403
107.	b.	4403
108.	a.	4601
109.	b.	4602
110.	c.	5101
111.	d.	5103
112.	b.	5301
113.	c.	5301
114.	a.	5301
115.	b.	6102
116.	b.	6103
117.	c.	6202
118.	a.	6203
119.	b.	4305
120.	b.	4305
121.	a.	4305
122.	d.	4305
123.	b.	4305
124.	a.	4305

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		Reference
125.	c.	4305
126.	b	4305

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FC 23-93	81-MM Mortar, M252
TM 09922A-20&P/2	Technical Manual for 81-MM Mortar, M252
TM 09922A-10/1	Operator's Manual for: Mortar 81-MM, M252

MCI Related Courses

03.23h	The M224, 60-MM Mortar Crewman
03.31h	81-MM Mortar NCO

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