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**B-GL-385-017/PT-001**

WEAPONS

# **81 mm MORTAR (ENGLISH)**

**(Supersedes B-GL-317-009/PT-001 dated 1980-05-15)**

## **WARNING**

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**Issued on the Authority of the Chief of Land Staff**

**Canada**





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## FOREWORD

1. B-GL-385-017/PT-001 *Weapons 81 mm Mortar* is issued on the authority of the Chief of the Land Staff.
2. This publication is effective on receipt and supersedes B-GL-317-009/PT-001 dated 80-05-15.
3. Suggestions for amendments should be forwarded through the usual channels to The Infantry School, Attention: C Stds O.
4. Unless otherwise noted, masculine pronouns contained herein apply to both genders.
5. This publication is available electronically on both the Defence Information Network (DIN) and the World Wide Web in the Army Electronic Library. Keyword—Army Electronic Library.

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## **CHAPTER 1 ROLE, CHARACTERISTICS AND ORGANIZATION**

### **SECTION 1 INTRODUCTION**

#### **AIM**

1. The aim of this publication is to provide direction to personnel operating and training on the 81 mm mortar.

#### **SCOPE**

2. This publication is one in a series of four volumes on mortars, which are divided into subject matter and levels of user requirements. The associated publications are:

- a. B-GL-392-006/FP-001, *Mortars in Battle*;
- b. B-GL-385-017/PT-001, *Weapons, 81 mm Mortar*;
- c. B-GL-385-015/PT-001, *Instruments for Calculating Mortar Fire Data*; and
- d. B-GL-385-016/PT-001, *Weapons, 60 mm Mortar M19 CDN*.

3. This publication contains detailed information on the technical handling, the maintenance and the ammunition of the 81 mm mortar. It also deals in general terms with mortar battle procedures at the detachment/section and group level.

#### **FORMAT**

4. The information contained in this publication is presented in the form of lesson plans to assist in the conduct of training and to ensure a common standard of mortar procedures. Therefore, units shall not modify any procedures detailed in this publication.

## **SAFETY PRECAUTIONS**

5. Mortar equipment and ammunition by its nature, and the material used in its manufacture, could be hazardous. All hazard warnings and safety precautions must be adhered to. Where the hazard warning or safety precaution applies it is indicated in the text of lessons and must be emphasised by the instructor.

6. Before and after each period of instruction or training, the instructor shall inspect all mortars, projectiles, projectile containers and ammunition boxes, to ensure that everything is in order. He must ensure that:

- a. no “live” projectiles are present during dry training;
- b. the mortar tube is clear of any obstructions or rounds; and
- c. no dummy projectiles are present during live practices.

**SECTION 2  
LESSON PLANS**

**LESSON 1  
ROLE AND CHARACTERISTICS**

**INSTRUCTOR'S NOTES**

1. **Aim.** To teach the following points:
  - a. the role of the 81 mm mortar platoon; and
  - b. the characteristics of the mortar.
2. **Time Required.** One 40-minute period.
3. **Method.** A basic instructional period.
4. **Stores.** The following stores are required:
  - a. a chalkboard;
  - b. an overhead projector; and
  - c. a computer with PowerPoint® software.
5. **Preparation.** Prior to the start of the period ensure the classroom is prepared.

**CONDUCT OF THE LESSON**

6. **Review.** Nil.
7. **Introduction.** A thorough knowledge of the role and characteristics of the 81 mm mortar will assist commanders at all level to better employ mortars during all types of operations.
8. **Role.** The role of the mortar platoon is “to provide and guarantee intimate indirect fire support to the battle group in all

81 mm Mortar

phases of war”. In all operations, the mortar platoon commander will work in conjunction with the affiliated Battery Commander in the Fire Support Co-ordination Centre (FSCC). This relationship ensures the maximum use of all indirect fire resources.

9. **Characteristics.** The tactical employment and deployment of the 81 mm mortar depends on its characteristics. These characteristics are divided into two main categories:

- a. those that affect the fire power; and
- b. those that affect the tactical deployment.

10. **Firepower Characteristics:**

- a. **Intensity of Fire.** A mortar is capable of firing up to 20 rounds a minute for short periods of time, and 15 rounds per minute during sustained fire. As a result of the small beaten zone of the weapon and the limited amount of ammunition usually available, high rates of fire are not normally used.

slow rate of fire	4 rounds per minute
normal rate of fire	8 rounds per minute
rapid rate of fire	12 rounds per minute

- b. **Flexibility.** The mortar can engage targets through an arc of 6400 mils. Depending upon the ammunition in use, targets can be engaged from 200 metres to 4782 metres (C 70 A1).
- c. **Visibility.** Provided preliminary arrangements are made, the mortar can produce effective fire when visibility is obscured by darkness, fog, rain, snow, or smoke.
- d. **Fire Potential.** The three main types of service ammunition used with the mortar are:



- (1) **High Explosive (HE).** The HE round produces fragmentation and blast effects, which can be expected to cause casualties within a radius of 190 metres. It has a killing radius of approximately 40 metres against troops in the open. The effectiveness against specific targets is a function of type of ammunition and fuzing.
- (2) **Smoke (SMK).** A white or red phosphorus round is available which can produce an effective smoke screen. It can also be used for signalling, incendiary effect (WP only), marking and has a casualty producing capability (WP only).
- (3) **Illuminating (ILLUM).** An illuminating round is provided for illumination of the battlefield and signalling.

e. **Time of Flight.** Depending on the charge and angle of elevation, the round will be in flight from 10 to 52 seconds.

f. **Limitations:**

- (1) **Beaten Zone.** The beaten zone of the mortar is long and narrow. This fact dictates that safety allowances must be made for our own troops when close-in targets are to be engaged. The best use of the beaten zone occurs when the long axis is parallel to the line of friendly troops.
- (2) **Accuracy.** The mortar is an indirect fire weapon therefore, accurate effective fire cannot be guaranteed until adjustment has been carried out.

11. Confirm by questions.

12. **Tactical Deployment Characteristics:**

- a. **High Trajectory.** Barrel angles of elevation vary from 800 to approximately 1511 mils depending on the range to the target. The mortar can therefore:
  - (1) be sited behind high cover, and fire over friendly troops;
  - (2) engage targets behind high cover; and
  - (3) produce a lethal effect on the ground in an area that is oval in shape around the point of impact (See Figure 1-1).
  
- b. **Mobility.** The mortar, its crew and ammunition are carried in one vehicle and can be brought into and taken out of action quickly. A mortar crew can man-pack a weapon and a limited amount of ammunition over short distances; however, with the use of vehicles it allows the mortar and its crew to be placed close to the mortar position. This will minimise manhandling and ensure a constant and reliable means of ammunition resupply.

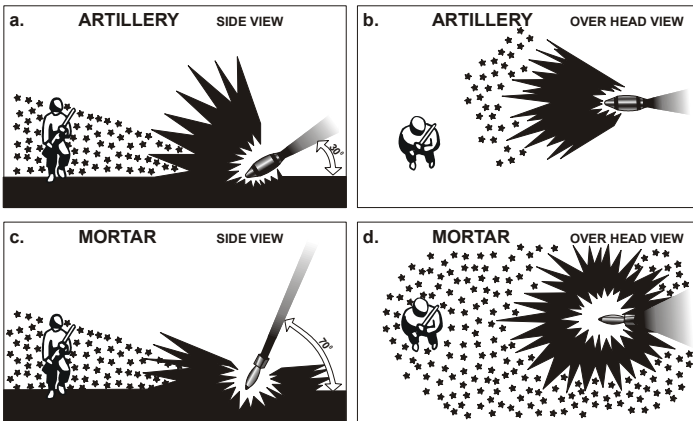


Figure 1-1: Artillery and Mortar Fall of Shot

- c. **Vulnerability.** A large and vulnerable target can be presented if mortars, crews and vehicles are concentrated. This fact, combined with the distinctive weapon signature, makes the use of carefully sited positions and alternative positions important in avoiding enemy detection and subsequent counter-mortar fire. To assist in overcoming this limitation, dispersed mortar positions could be used.
13. Confirm by questions.
  14. **Conclusion:**
    - a. questions to and from the class; and
    - b. test on the lesson.
  15. **Summary:**
    - a. Restate the aim.
    - b. **Final Statement.** The long range, high rate of fire, flexibility and mobility of the 81 mm mortar makes it a formidable weapon. If it is to be used successfully, and to its full potential, weapon handling must be of a high standard.
    - c. Your next lesson will be ...

## LESSON 2 ORGANIZATION

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points on the organization of the mortar platoon:
  - a. personnel and weapons;
  - b. vehicles and communications; and
  - c. duties of platoon personnel.
2. **Time Required.** Two 40-minute periods.
3. **Method.** A basic instructional period.
4. **Stores.** The following stores are required:
  - a. a chalkboard;
  - b. an overhead projector; and
  - c. a computer with PowerPoint® software.
5. **Preparation.** Set up the classroom with the overhead projector and slides.

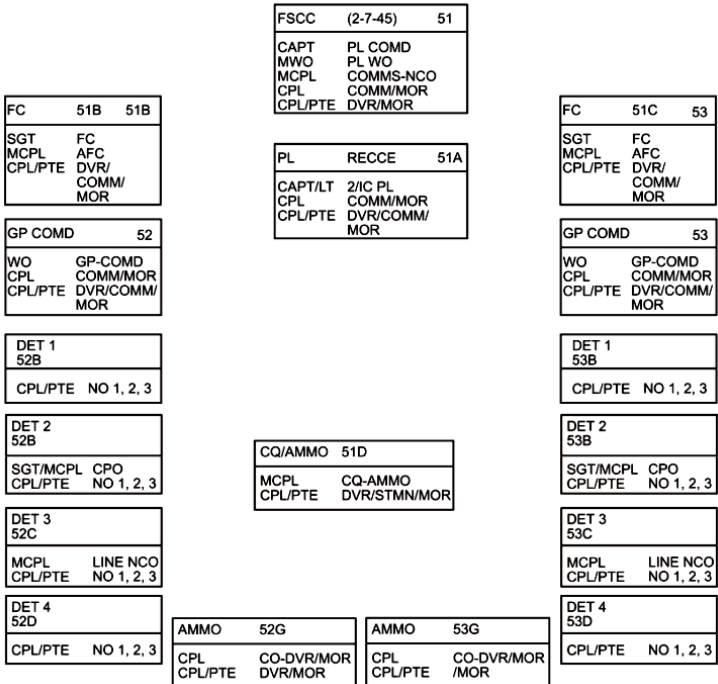
### CONDUCT OF THE LESSON

6. **Review.** Review the role and characteristics of the 81 mm mortar.
7. **Introduction.** The mortar platoon is one of the main support elements available to the battalion commander. The platoon must have a full complement of well trained personnel capable of carrying out tasks in any phase of war. The organization of the Battalion Mortar Platoon is based on the criteria of maximum weight

of fire support, simplicity of control at all levels and economy of personnel and equipment.

8. It will be normal for the platoon to be tactically deployed as a two group organization. Within the group the smallest fire unit will be a section of two mortars. This provides the supported commander the flexibility of having a fire unit available to fire at all times and the capability of detaching two mortars to a separate task. The organization of an 81 mm mortar platoon is shown in Figure 1-2. The 52/53 Echo and Foxtrot sub-call/signs are used for guides and sentry. The radio net for an 81 mm mortar platoon is shown in Figure 1-3. The tactical organization of an 81 mm mortar platoon is shown in Figure 1-4. (Vehicles will differ depending on the role and vehicle availability of the unit.)

**81 MM MORTAR PL ORGANISATION**



**Figure 1-2: 81 mm Mortar Platoon Organization**

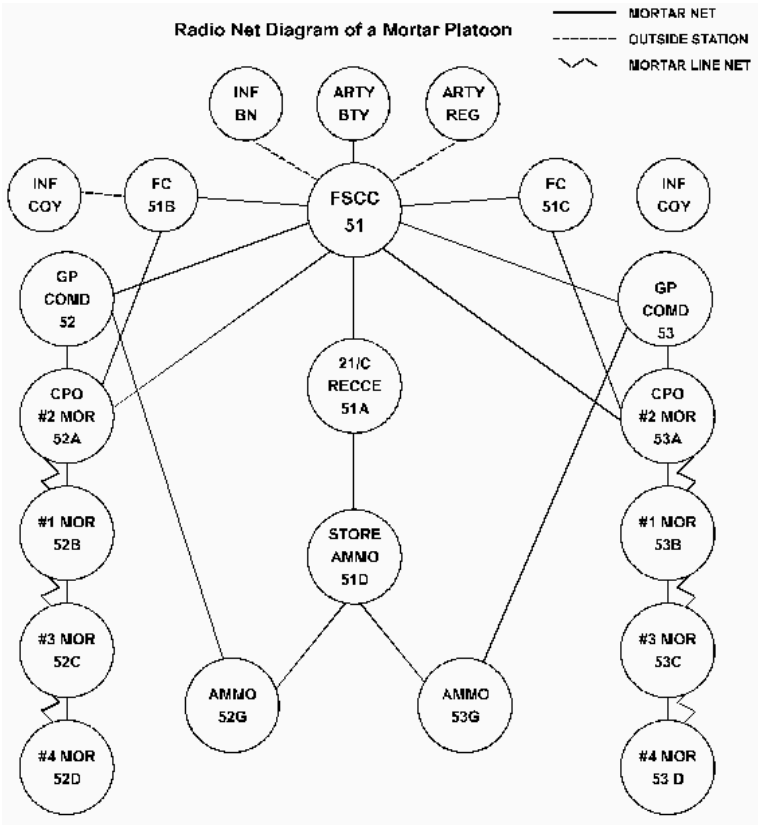


Figure 1-3: Radio Net Diagram of a Mortar Platoon

SER	SUB-UNIT	POSITION	C/S	PERSONNEL			VEHICLE (Note 1)	RADIO		WPNS		AMMUNITION	
1	PL CP	FSCC	51	CAPT MWO MCPL CPL CPL/PTE	PL COMD PL WO S-NCO/COMM COMM/MOR DVR/MOR		M577/ BISON CP/ LSVW CP	1	AZ A	1 2	PISTOL C7 C9	1 3 1	PERSONAL WPNS FIRST LINE
2	PL CP	PL RECCE	51A	CAPT/LT CPL CPL/PTE	PL 2/IC COMM/MOR DVR/COMM/ MOR		APC/LAV/ ILTIS	1	AZ A B Dismtd	1 1 1	PISTOL C7	1 2	
3	PL CP	FC AFC	51B 51C	SGT MCPL CPL/PTE	FC AFC DVR/COMM/ MOR	2 2 2	APC/LAV/ ILTIS	2	A B B Dismtd	2 2 2	C7	6	
4	MOR GP	GP COMD	52 53	WO CPL CPL/PTE	GP COMD COMM/MOR DVR/COMM/ MOR	2 2 2	APC/BISON/ LSVW	2	A B B Dismtd	2 2 2	C7	6	
5	MOR GP	CPO DET #2  DET #1  DET #3  LINE NCO DET #4	52A 53A  52B 53B  52C 53C  52D 53D	SGT/MCPL CPL/PTE  CPL/PTE  CPL/PTE  MCPL CPL/PTE	CPO NO 1,2,3  NO 1,2,3  NO 1,2,3  LINE NCO NO 1,2,3	2 6  6  6  2 6	APC/BISON/ LSVW MOR  APC/BISON/ LSVW MOR  APC/BISON/ LSVW MOR  APC/BISON/ LSVW MOR	2  2  2  2	A B      	4 8      8	C7 C9 C6 SRAAW(M)  MORTAR	20 8 8 2  8	PERSONAL WPNS FIRST LINE  FIRST LINE FOR 81 mm IS  a. 75% HE b. 20% SMK c. 5% ILL d. 30% PROX  PROXIMITY FUZE QUANTITY IS 30 % OF BASIC LOAD FOR HE.
6	MOR GP	AMMO	52G 53G	CPL CPL/PTE	DVR A/MOR DVR /MOR	2	M548/LSVW/ CARGO BISON	2	A	2	C7 C6	4 2	
7	PL CP	GROUP CQ AND AMMO	51D	MCPL CPL/PTE	CQ/AMMO DVR/MAG/ MOR	1 1	LSVW/ BISON CARGO	1	AZ	1	C7		
				FIRST LINE AMMUNITION FOR 81 mm IN AN <b>M113</b> IS :			FIRST LINE AMMUNITION FOR 81 mm IN A <b>MORTAR BISON</b> IS :						
				a. 87 HE b. 24 SMK c. 6 ILLUM d. 26 PROX  TOTAL : 116			a. 84 HE b. 21 SMK c. 6 ILLUM d. 25 PROX  TOTAL : 111						

Figure 1-4: Mortar Platoon Tactical Organization

**NOTE**  
Vehicles will differ depending on the role and vehicle availability of the unit.





9. **Duties.** The duties of platoon personnel are confined to the different levels of command only. The specific duties for the various personnel are detailed below:

- a. **The Platoon Commander.** The platoon commander is primarily responsible for the efficient operation of the mortar platoon as directed by the supported commander. His basic duties and responsibilities are:
- (1) the command, control and operational training of his mortar platoon;
  - (2) the planning and co-ordination for the movement of the mortar groups;
  - (3) the direction of fire and co-ordination of the requests of other fire support resources available;
  - (4) the co-ordination and allocation of ammunition and fire units under his control to his fire controllers (FCs);
  - (5) reporting to the supported commander on:
    - (a) the tactical information; and
    - (b) hostile mortar fire, artillery shelling and nuclear strikes; and
  - (6) in conjunction with the direct support battery commander (BC):
    - (a) establish and command the Fire Support Co-ordination Centre (FSCC) at battle group HQ;
    - (b) advise the supported commander on the detailed use and co-ordination of mortar and other fire resources available;

- (c) develop and produce the battle group indirect fire plan; and
- (d) co-ordinate the air defence deployed within the battalion area.

b. **The Platoon Second-in-Command.** The platoon 2IC is primarily responsible to the mortar platoon commander for the administration of the platoon. During operations his basic duties and responsibilities are:

- (1) the reconnaissance and survey of mortar positions, including liaison with the artillery survey party;
- (2) the control of mortar fire and unit movement in response to the platoon commander's orders;
- (3) the maintenance of communications with the FSCC and mortar platoon sub-units;
- (4) the conduct of; battle group fire missions from an anchor observation post (OP) and forward air control missions as required;
- (5) the conduct and co-ordination of mortar platoon resupply; and
- (6) the assumption of the responsibilities and duties of the mortar platoon commander in his absence.

c. **The Platoon Warrant Officer.** The platoon warrant officer is primarily responsible to assist the mortar platoon commander in the efficient functioning of the FSCC. His basic duties and responsibilities are:

## Role, Characteristics and Organization

- (1) assisting the platoon 2IC in the administration of the mortar platoon;
- (2) assuming control of the FSCC in the absence of the platoon commander; and
- (3) any other duties or responsibilities as detailed by the platoon commander.

d. **The Fire Controller.** The FC is primarily responsible for engaging targets. His basic duties and responsibilities are:

- (1) establishing an OP;
- (2) the co-ordination and production of his supported commander's fire plans;
- (3) acting as an indirect fire support advisor and co-ordinator to the supported arm commander;
- (4) reporting tactical information to the FSCC, the supported arm commander and both Control Post Operators (CPO);
- (5) the co-ordination and application of other indirect fire support available; and
- (6) the safety of own troops during target engagements.

e. **The Group Commander.** The group commander is primarily responsible for the efficient functioning of his group as directed by the mortar platoon commander. His basic duties and responsibilities are:

- (1) ensuring targets are engaged as required;

81 mm Mortar

- (2) the maintenance of communications within the mortar group to the FCs and FSCC;
- (3) ensuring that information is continually passed over the platoon net;
- (4) the detailed reconnaissance and initial occupation of the group/section mortar positions;
- (5) the co-ordination and control of all fire and movement within the group, as required;
- (6) the detailing of duties within the group; and
- (7) being prepared to act as a fire controller as required.

f. **The Control Post Operator.** The CPO is primarily responsible for the production of all fire data within the group. His basic duties and responsibilities are:

- (1) the passage of fire orders to the mortar line;
- (2) the maintenance of communications with the FCs and the FSCC;
- (3) the passage of applicable information to the FCs and the FSCC;
- (4) controlling the movement of the group (as required);
- (5) the administration and maintenance of the group; and

- (6) being prepared to assume the duties and responsibilities of the group commander.

g. **The Line NCO.** The Line NCO is primarily responsible for the physical control of the mortar line as directed by his group commander. The Line NCO is also the CPO for the junior section when it is detached out for other fire tasks. His basic duties and responsibilities are:

- (1) ensuring that the fire orders issued by the CPO are properly applied on the mortar line;
- (2) supervising the group in the occupation of firing positions;
- (3) the resupply of ammunition on the mortar line;
- (4) the serviceability and maintenance of the group weapons and equipment;
- (5) assisting the group commander and CPO with their duties as required; and
- (6) being prepared to assume the responsibilities of the CPO in his absence.

h. **The Assistant Fire Controller.** The AFC is primarily responsible to aid the FC in the engagement of targets and the production and execution of fire plans. His basic duties and responsibilities are:

- (1) assisting the FC in:
  - (a) establishing an OP and observing the area of responsibility;
  - (b) engaging targets;

- (c) reporting tactical information; and
    - (d) ensuring the safety of own troops when engaging targets;
  - (2) ensuring the equipment and stores of the FCs party are properly maintained;
  - (3) maintaining communications with the mortar group, the FSCC and the supported arms commander;
  - (4) being prepared to establish and assume duties of an anchor OP; and
  - (5) being prepared to assume the duties of the FC.
- i. **The Ammunition/Storeman NCO.** The ammunition NCO is primarily responsible for the resupply of ammunition to the mortar groups. His basic duties and responsibilities are:
  - (1) arranging for the maintenance, repair and replacement of all weapons and stores within the mortar platoon;
  - (2) the accounting and delivery of ammunition and rations during operations; and
  - (3) fulfilling of all other logistical requirements within the platoon during operations.
- j. **The Platoon Communication NCO.** The platoon comm NCO is primarily responsible for maintaining good communication within the platoon. His basic duties and responsibilities are:

Role, Characteristics and Organization

- (1) ensuring the serviceability of all communication equipment in the platoon;
  - (2) assisting in the efficient functioning of the FSCC; and
  - (3) monitoring and correcting the voice procedure and communication discipline within the platoon.
10. Confirm by questions.
11. **Conclusion:**
- a. questions to and from the class; and
  - b. test on the lesson.
12. **Summary:**
- a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...





## CHAPTER 2 DESCRIPTION AND MAINTENANCE

### LESSON 1 WEAPON DESCRIPTION

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach a description of the weapon to include:
  - a. the component parts;
  - b. their functions; and
  - c. ancillary equipment.
2. **Time Required.** Two 40-minute periods.
3. **Method.** A basic instructional period.
4. **Stores.** The following stores and equipment are required:
  - a. four mortars complete; and
  - b. a chalkboard.
5. **Preparation.** Prior to the first period ensure:
  - a. the mortars and equipment are displayed in the sequence to be taught;
  - b. the classroom and chalkboard are prepared; and
  - c. the instructor has carried out all safety precautions.

#### CONDUCT OF THE LESSON

6. **Review.** Review the organization of a mortar platoon.

81 mm Mortar

7. **Introduction.** In order to properly maintain and operate the 81 mm mortar it is necessary to have a detailed knowledge of the component parts of the weapon and their functions.

8. **The Baseplate CDN MK 1.** The baseplate (Figure 2-1) is circular in shape and is made of forged aluminium. In the centre of the upper surface, it has a rebound socket which provides a seat for the breech plug of the barrel. The baseplate is strengthened by four braces, which are spiked to prevent slippage of the baseplate when the mortar is fired. It has four grooves on the upper surface and four triangular shaped openings, which can be used as an aid in aligning the baseplate. The baseplate weighs 11.3 kg and has two purposes:

- a. to provide a platform for the mortar; and
- b. to transmit the shock of recoil to the ground on firing.



**Figure 2-1: Baseplate CDN MK1**

9. Confirm by questions.

10. **Barrel ML 81 mm L16A1/A2.** The barrel (Figures 2-2 and 2-3) is a smooth bore steel tube of forged monoblock construction weighing 12.2 kg. It consists of the following five main parts:

- a. **Muzzle Cover.** The muzzle cover is a rubberised canvas bag which fits over the outside of the muzzle preventing water, snow and other foreign material from entering the barrel when the mortar is not being fired.
- b. **Blast Attenuation Device (BAD).** The BAD is a device designed to provide a reduction of blast and overpressure. It consists of the following components: a cone, three collets, a ring and the locking nut, see Figure 2-4.
- c. **Barrel.** The muzzle has a collar and internally has a short taper, which provides a lead-in for rounds during loading. Below the collar are two unpainted surfaces (as shown at Figure 2-2), which provide seating for the sight testing attachment. The lower half of the barrel is finned to assist in cooling. On the plain portion of the barrel are two shoulders, one approximately 18 cm from the muzzle, the other just above the finning. These shoulders define the area within which the barrel clamp must be positioned. At the breech end it is reduced in diameter, and screw-threaded internally, for the breech plug. At the extreme lower end of the barrel are two flats, which are provided for the large wrench, used to remove or replace the breech plug.
- d. **Breech Plug.** The breech plug is ball shaped. Forward of the ball, the plug is screw-threaded for assembly into the lower end of the barrel, which is fitted with a copper sealing washer for proper seating, and is tapered to permit the use of 3 inch mortar rounds. The ball has two flat surfaces, which are provided for the use of the small wrench to remove or replace the breech plug, and to lock the barrel into the rebound socket of the baseplate. A hole drilled at an incline to the axis of the plug tapers at the front end and is threaded at the rear to house the firing pin.

81 mm Mortar

- e. **Firing Pin.** The firing pin is threaded for assembly into the breech plug. At the front it is tapered to a radius point. Just back of the screw thread is a collar. Around the circumference of the collar are a number of semi-circular slots on which the peg of the firing pin wrench locks during insertion or removal of the firing pin (Figure 2-2).

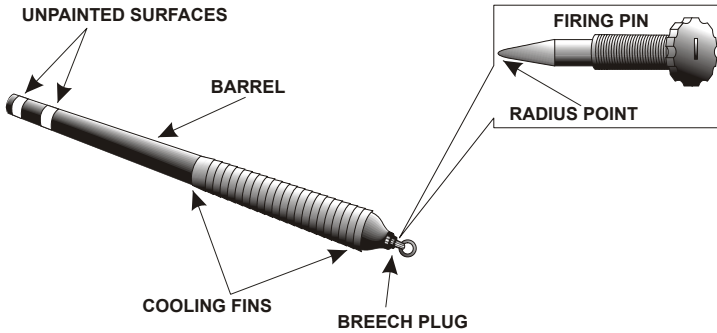
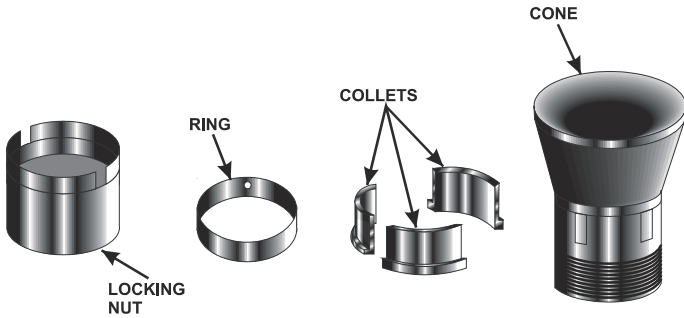


Figure 2-2: Barrel 81 mm L16A1



Figure 2-3: Barrel 81 mm L16A2



**Figure 2-4: Blast Attenuation Device (BAD)**

11. Confirm by questions.

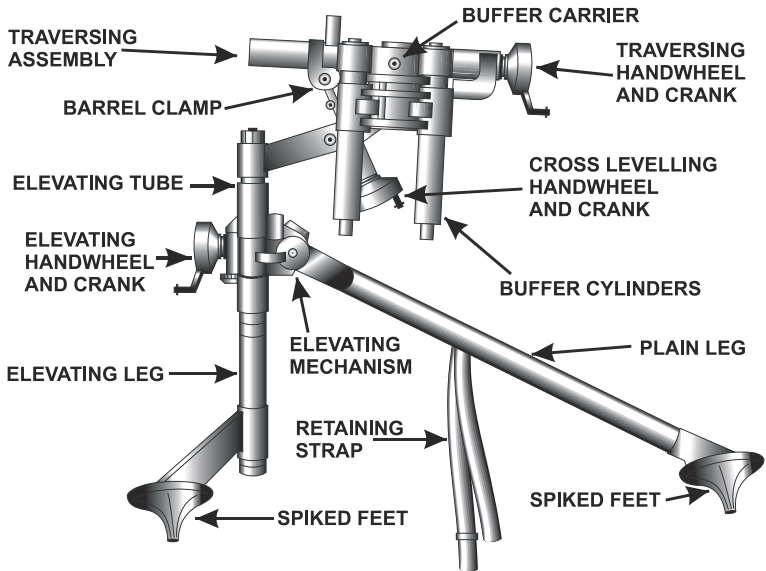
12. **Bipod.** The bipod (Figure 2-5) provides a front support for the barrel and carries the gears necessary to lay the mortar. The bipod assembly consists of three major components with a total weight of 11.8 kg. These components are:

- a. **Traversing Assembly.** The traversing assembly consists of the following:
  - (1) **Barrel Clamp.** This secures the barrel to the bipod and consists of an upper and lower clamp. Attached to the upper clamp is a curved handle, a spring-loaded locking rod and ball. The lower clamp is shaped to cradle the barrel, and is bored on each side to house the buffer cylinders. On its right side it is recessed to house the ball end of the locking rod. Above the recess is a safety latch which, when closed, locks the rod into the recess. On the left side of the upper clamp is a safety lock. This ensures both upper and lower clamps lock together.
  - (2) **Buffer Carrier.** This is shaped on the top to fit under the barrel and on each side it is bored to hold the buffer cylinders. It is also bored transversely and attached to the outer tube of the traversing

mechanism. On the left side is a sight bracket which has a dovetailed recess that provides a mounting for the sight unit.

- (3) **Traversing Mechanism.** This is of the telescopic type, consisting of an internal screw operating within a nut and tube. On the right is a traversing hand wheel and crank which moves the assembly and traverses the mortar 100 mils from one extremity to the other. One complete turn of the hand wheel and crank equals 10 mils.
- b. **Cross-levelling Assembly.** The cross-levelling assembly consists of the yoke, the cross-levelling arm, and the cross-levelling mechanism. The yoke is bored at each end for attachment to the traversing screw assembly and is bored at its centre for an axis pin to which one end of the cross-levelling arm is attached. The other end of the cross-levelling arm is attached to the elevating screw. The axis pin is fitted with a lubricator. A boss on the left side of the yoke is screw threaded internally, for the ball socket of the cross-levelling mechanism. The cross-levelling mechanism is positioned vertically between two lugs on the cross-levelling arm, and can be elevated or depressed by means of the cross-levelling hand wheel and crank.
- c. **Leg Assembly.** The leg assembly consists of two tubular metal legs terminating in spiked feet. The upper end of the plain leg has a serrated facing which locks to the serrated facing on the lug of the elevation leg. On the other side is a recess into which the hand wheel is fitted to hold the leg in other positions. A retaining strap attached to the plain leg is used to secure the barrel to the bipod. The elevating leg houses the elevating mechanism, which consists of the elevating screw, the elevating hand wheel and crank. The elevating

mechanism will provide for angles of elevation from 800 mils to 1511 mils, subject to suitable positioning of the bipod. On the inside of the elevating housing, adjacent to the plain leg, is a spring-loaded locating catch. When depressed it releases the catch from the recess of the plain leg.



**Figure 2-5: Bipod L5A5**

13. Confirm by questions.

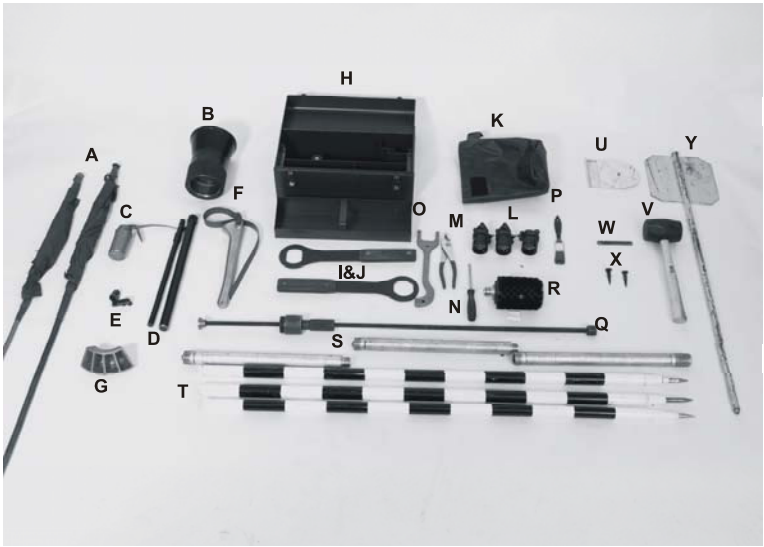
14. **Ancillary Equipment.** Ancillary equipment supplied with the mortar is important to its operation (Figure 2-6). The names and uses are:

- a. the sight unit C2A1 is provided to lay the mortar by indirect means;
- b. the boresight M45 is provided to test and adjust the sight unit C2A1;
- c. the Blast Attenuation Device;
- d. three aiming posts;

81 mm Mortar

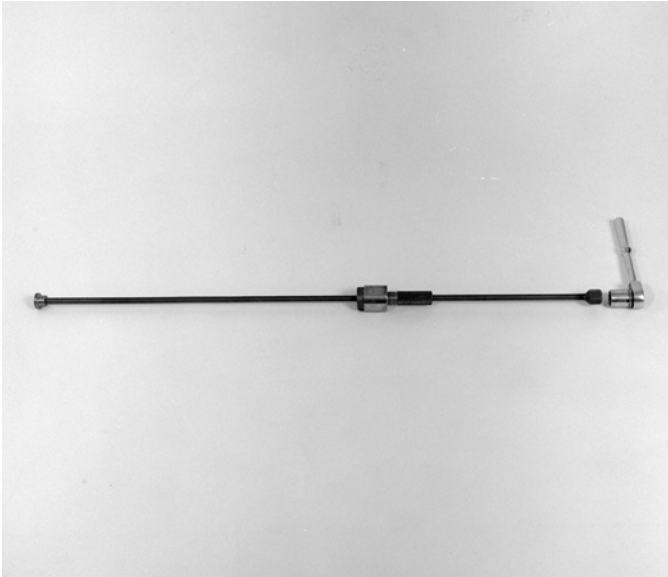
- e. a cleaning rod;
- f. arc marking flags (red/green)
- g. baseplate flags;
- h. a tool, removing jammed round; and
- i. the accessory spare parts chest containing the following items:
  - (1) three Trilux lights (one orange, two green);
  - (2) oil can (gun type);
  - (3) firing pins;
  - (4) muzzle cover;
  - (5) cleaning brush;
  - (6) wrench firing pin #382;
  - (7) wrench breech mechanism #383;
  - (8) wrench breech mechanism #384;
  - (9) tools releasing baseplate MK 1;
  - (10) periscope extension C2A1 sight unit;
  - (11) periscope;
  - (12) pliers;
  - (13) screwdriver;
  - (14) strap wrench (BAD);
  - (15) fuze wrench (PPD);
  - (16) high density plastic hammer;
  - (17) tool box;
  - (18) small brush, and
  - (19) target record card.





**Figure 2-6: Part of Ancillary Equipment**

A	Arc Markers (red/green)	N	Screwdriver (flat tip)
B	Blast Attenuation Device (BAD)	O	Fuze Wrench (PPD)
C	Oil Can	P	Small Brush
D	Periscope (with Case)	Q	Tool Removing Jammed Round
E	Periscope Extension	R	Cleaning Rod Brush
F	Strap Wrench (BAD)	S	Cleaning Rod (3 piece)
G	Tool Releasing Baseplate MK #1	T	Aiming Post (3)
H	Tool Box	U	Target Record Card
I	Wrench Breach #383	V	High Density Plastic Hammer
J	Wrench Breach #384	W	Wrench Firing Pin #382
K	Muzzle Cover	X	Firing Pins (2)
L	Trilux lights (1 x orange, 2 x green), with Styrofoam tray	Y	Baseplate Flag
M	Pliers		



**Figure 2-7: Tool, Removing Jammed Round**

15. Confirm by questions.
16. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. conduct the safety precautions.
17. **Summary:**
  - a. Restate the Aim.
  - b. **Final Statement.** To properly maintain and operate the 81 mm mortar it is essential to have a detailed knowledge of the component parts and their functions.
  - c. Your next lesson will be ...

## LESSON 2 C2A1 SIGHT UNIT

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the details of the C2A1 sight unit to include:
  - a. technical specification;
  - b. sight unit description and setting;
  - c. safety; and
  - d. case and periscope extension.
2. **Time Required.** Three 40-minute periods.
3. **Method.** A basic instructional period.
4. **Stores.** The following stores and equipment are required:
  - a. one sight unit per detachment;
  - b. one periscope extension per detachment; and
  - c. an overhead projector with a computer using PowerPoint software.
5. **Preparation.** Prior to the start of the first period set out the sight units (all units zeroed and facing the same way).

### CONDUCT OF THE LESSON

6. **Review.** Review the description of the 81 mm mortar.
7. **Introduction.** The C2A1 sight unit is the standard sighting device used with the 81 mm mortar. It is used primarily with the mortar firing in the indirect role, however, it can be used during

direct fire should the need arise. This sight unit is also used with the GPMG (C6) and the 60 mm mortar.

8. **Sight Unit Description.** The C2A1 sight unit was developed as a sight instrument for indirect fire weapons. It is designed to withstand rough treatment under field conditions and operate efficiently at climatic extremes. All scales and bubbles use illuminated radioactive material. It is relatively light (1.3 kg) and is issued in a case. It can be tested and adjusted by the mortar crew and can operate as a modified compass for recording aiming points.

### **WARNING**

The light sources which are used to provide illumination for the level vials, reticle, bearing and elevation scales and micrometer drums, together with their indices, contain radioactive tritium gas which is sealed in glass capsules. There is no significant external radiation hazard. The only hazard present is when the capsules are broken. Tritium is a gaseous substance, which emits low energy beta radiation. When released into the body through contact with the skin, inhalation or ingestion it rapidly oxidises or combines with water. If such absorption occurs, the tritium will rapidly be distributed throughout the body fluids and deliver a significant dose of harmful radiation to the body. The C2A1 sight unit contains a total of 2972 millicuries in its various components. The need for careful handling is obvious. If breakage of one of the capsules occurs in a confined or poorly ventilated space, the following action shall be taken: ALL PERSONNEL WILL EVACUATE THE ROOM, VEHICLE OR IMMEDIATE VICINITY FOR 30 MINUTES LEAVING DOORS, ACCESSES AND WINDOWS OPEN WHERE APPLICABLE.



**Figure 2-8: Sight Unit C2A1 and Case**

9. The C2A1 sight unit consists of four main components:
  - a. the telescope;
  - b. the bearing mechanism and scales;
  - c. the elevation mechanism and scales; and
  - d. the sight unit mount.

10. **The Telescope.** The sight unit consists of a fixed focus, ninety degree elbow telescope fitted with a rubber eyepiece. It incorporates a fixed reticule consisting of both a horizontal and vertical cross-hairs, allowing a field of view of 180 mils at a magnification of 1.8. The horizontal cross-hair is split by four graduations of 5 mils each, left and right of centre, to facilitate the alignment on the aiming point. The telescope is mounted to the top of the sight unit by a trunnion and clamp and can be adjusted vertically to assist in locating the aiming point. A housing is located on the top right of the telescope to receive the periscope assembly. The eyepiece can be rotated through an arc of 3200 mils to facilitate:

81 mm Mortar

- a. the use of the open sight which is part of the telescope housing; and
- b. alignment on the aiming points.

11. Confirm by questions.

12. **Bearing Mechanism and Scales.** Explain and demonstrate the following parts and components:

- a. **Bearing Coarse Scale Ring.** The bearing coarse scale ring is a rotatable ring graduated from 0 to 6400 mils marked each 100 mils but numbered every 200 mils. The zeroes designating hundreds have been omitted, thus the scale runs from 0 to 64 in increments of 2. A coarse scale clamp is provided to lock the coarse scale ring in any desired position. The coarse scale ring may be read against three separate indices, which are as follows:
  - (1) the bearing coarse scale index is located below the coarse scale ring against which all bearings in hundreds of mils will be read;
  - (2) the coarse scale record index is located above the coarse scale ring against which all records in hundreds of mils will be read; and
  - (3) the back bearing index located 3200 mils in back of the coarse scale ring.
- b. **Bearing Fine Scale Ring.** This is a rotatable ring located on the bearing knob. It is graduated from 0 to 100 mils, marked each mil and numbered every 10 mils and is used to supplement the bearing coarse scale ring. A butterfly nut is provided which allows the fine scale ring to be locked in any desired position. Two indices are provided against which these scales are read:

- (1) The bearing fine scale index is located to the right of the fine scale ring next to the body of the sight unit from which all bearings in units of mils will be read.
- (2) The fine scale record index is located on the left side of the fine scale ring against which all records in units of mils will be read. This record index can be adjusted during sight unit adjustment.

c. **Bearing Mechanism.** It consists of the following:

- (1) **Quick Release Gear.** This is provided to allow rapid horizontal rotation of the telescope. By turning the bearing locking device counter-clockwise and moving the bearing knob forward, the gear is disengaged and allows the upper part of the sight unit to be rotated freely until the desired arc has been covered. The bearing locking device must be reapplied to prevent changes in bearing during firing.
- (2) **Cross-levelling Bubble.** Located directly below the bearing coarse scale ring. When this bubble is centralised, and the reticule of the sight unit is laid on the point of aim, it ensures that the barrel is laid on the bearing indicated on the bearing scales.

13. Confirm by questions.

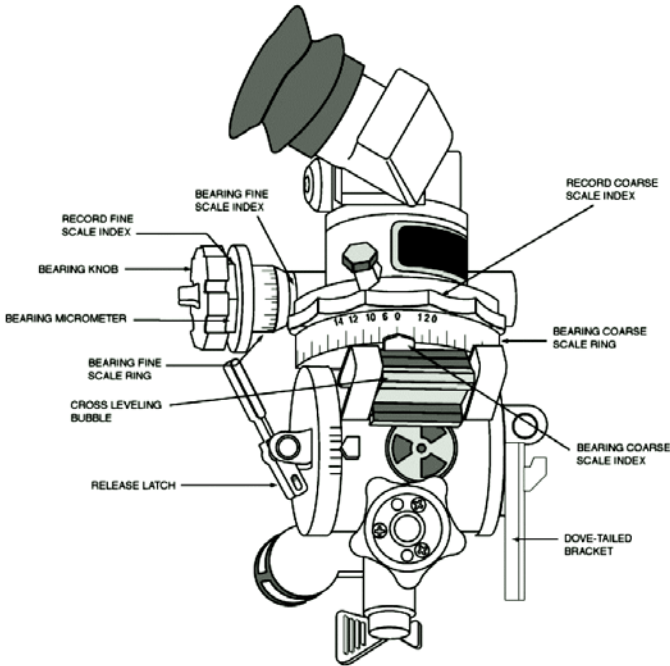


Figure 2-9: Sight Unit C2A1—Rear View

14. **Elevation Mechanism and Scales.** Explain and demonstrate the following:

- a. **Elevation Coarse Scale.** Though the sight unit has two elevation coarse scales on the elevation drum only the forward one is used with mortars, the one in the rear is designed for use with other weapons. The elevation coarse scale for mortars is graduated from 600 to 1600 mils, marked each 100 mils and numbered every 200 mils. The zeroes designating hundreds have been omitted. An elevation coarse scale index is provided in front of the drum against which all elevation in hundreds of mils will be read.
- b. **Elevation Fine Scale Ring.** This is located on the elevation knob and is provided to supplement the elevation coarse scale. It is graduated from 0 to 100 mils, marked each mil and numbered every



10 mils. An elevation fine scale index is located next to the body of the sight unit against which all elevation in units of mils will be read. The elevation fine scale ring can be adjusted during sight unit testing.

- c. **Elevation Bubble.** This is located below the elevation drum. When this bubble is centred, it indicates that the angle of elevation read on the sight unit has been applied to the barrel.
- d. **Elevation Locking Device.** This is provided to prevent changes in elevation setting during firing. A wing nut located under and in front of the elevation knob must be turned and relocked after the elevation has been set on the sight unit.

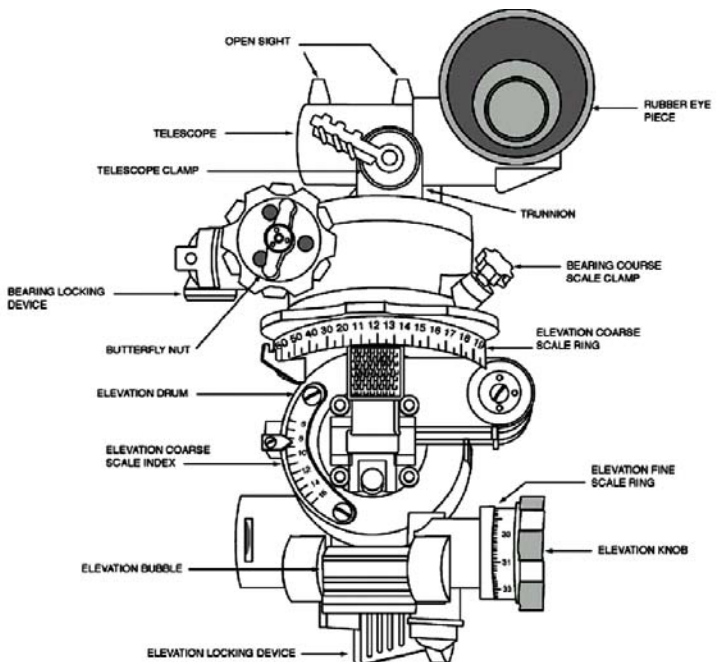


Figure 2-10: Sight Unit C2A1—Side View

- e. **Sight Unit Mount.** This is provided to lock the sight unit securely into the sight slot on the mortar and consists of a dovetailed bracket and latch. The

latch must be depressed when placing the dovetailed bracket into the sight slot to prevent binding and facilitate removal when required.

15. Confirm by questions.

16. **Setting the Record on the Sight Unit.** The No. 1 will set the record on the sight unit for the desired aiming point by the procedure listed below:

- a. Unlock the butterfly nut and rotate the bearing fine scale ring until the last two figures of the record are read against the bearing scale index, and lock the butterfly nut.
- b. Rotate the bearing fine scale back to zero.
- c. Unlock the bearing coarse scale clamp, rotate the bearing coarse scale ring until the even hundreds are read against the bearing index, lock the coarse scale clamp and rotate the bearing fine scale knob back to line up the record index with the bearing fine scale index.
- d. The record is now set on the sight unit and is left in this position while laying the mortar using the particular aiming point.
- e. If it becomes necessary to use one of the other aiming points the same procedure is followed when setting the record on the sight unit.
- f. Records can be set on the sight unit by the No. 1 when the sight unit is on the mortar or before placing it on the mortar.

#### **NOTE**

To avoid errors, the bearing scales should be zeroed before placing a record on the sight unit, and have the detachment commander verify the scales readings.

17. **Sight Unit Setting for Bearing.** The procedures for setting the bearings are:

- a. **Small Bearing.** If the ordered bearing does not exceed plus or minus 100 mils from the original, the following actions are carried out:
  - (1) unlock the bearing locking device;
  - (2) turn the bearing knob until the desired bearing in hundreds of mils is read against the bearing coarse scale index;
  - (3) continue to turn the bearing knob until the desired bearing in units of mils is read against the bearing fine scale index; and
  - (4) check the reading opposite both indices and if correct, relock the bearing locking device.
  
- b. **Large Bearings.** Should the ordered bearing exceed plus or minus 100 mils from the original, the following actions are carried out:
  - (1) unlock the bearing locking device;
  - (2) with the forefinger on the front of the quick release gear housing and the thumb on the bearing knob, force the knob forward and disengage the quick release gear;
  - (3) rotate the upper portion of the sight unit until the desired bearing in hundreds of mils is read against the bearing coarse scale index, then release the pressure and allow the quick release gear to re-engage;
  - (4) turn the bearing knob until the desired bearing in units of mils is read against the bearing fine scale index; and

- (5) check the reading against both and if correct, relock the bearing locking device. Ensure that the quick release gear is fully engaged or errors in bearing will result.

18. **Sight Unit Setting for Elevation.** To set an elevation on the sight unit, the following actions are carried out:

- a. unlock the elevation locking device;
- b. turn the elevation knob until the desired elevation in hundreds of mils is read against the elevation coarse scale index;
- c. continue to turn the elevation knob until the desired elevation in units of mils is read against the elevation fine scale index; and
- d. check the reading opposite both indices and if correct, relock the elevation locking device.

**NOTE**

When setting the sight unit for either bearing and/or elevation, care must be taken to ensure an error of 100 mils is not made. Double-check all settings.

19. **Zeroing the Sight Unit.** Before the sight unit is placed in the case, the bearing and record scales must read zero. The elevation scales must read "0800" mils. To zero the sight unit:

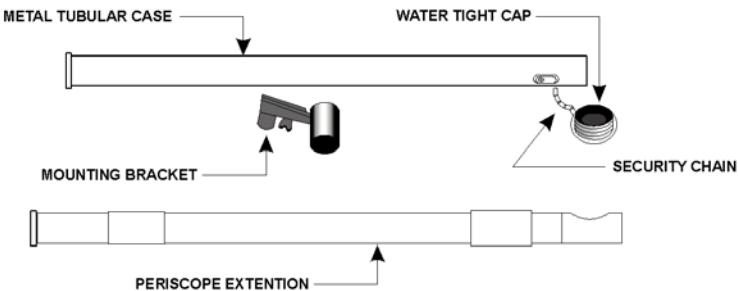
- a. Ensure that the zero graduation of both the coarse and fine scale rings is locked against their respective record indices.
- b. Unlock the bearing locking device and by disengaging the quick release gear, rotate the upper portion of the sight unit until the zero graduation of the coarse scale ring is read against the bearing coarse scale ring index. Notice that the coarse scale record index is in alignment with the coarse scale bearing index.

- c. Turn the bearing knob until the zero graduation of the fine scale ring is opposite the bearing fine scale index. Notice that the fine scale record index is now directly opposite the bearing fine scale index.
  - d. Turn the elevation knob until "0800" is read against the coarse scale index and zero is read against the fine scale index. Zeroing is now complete.
20. Confirm by questions and practice.
21. **Case Sight Unit C2A1 and Carriage:**
- a. The sight unit is provided with a metal protective immersion proof carrying case (Figure 2-8). The case includes secure storage for accessories.
  - b. **Carriage.** In order to fit the sight unit into the case:
    - (1) align the indices;
    - (2) place the sight unit in the dovetail bracket on the base of the case; and
    - (3) place the top over the sight and ensure the fasteners are closed.
22. **Periscopic Extension C2A1 Sight Unit.** Explain and demonstrate the use of the periscope extension:
- a. The periscope extension is used to overcome a barrel obstruction when the field of view of the sight unit telescope is obscured by the barrel. It consists of the following parts:
    - (1) the periscopic extension;
    - (2) the mounting bracket assembly; and
    - (3) the metal tubular case.

b. **Description:**

- (1) The periscope is contained in a metal tubular case which has a threaded cap on one end secured by a chain. It serves to protect the periscope when not in use. The periscope is 40 cm long with prisms at each end. The lower portion consists of a collar with two metal projections used for positioning and locking the periscope into position.
- (2) The mounting bracket assembly will be carried with the periscope in the accessory spare parts chest. It is used to position the periscope for use with the sight unit. It consists of a bracket, a ring and a securing screw.

c. **Installation.** The mounting bracket assembly slides over the lamp housing on the telescope. Ensure that the ring is positioned in front of the telescope. Tighten the securing screw. The periscope with the end containing the collar is inserted into the ring ensuring that the window is in line with the telescope and that the projections on the collar are engaged in the slots of the ring.



**Figure 2-11: Periscope**

23. Confirm by questions.

24. **Conclusion:**

- a. questions to and from the class; and
  - b. test on the lesson.
25. **Summary:**
- a. Restate the aim.
  - b. **Final Statement.** The C2A1 sight unit is the standard sighting device primarily used with the 81 mm mortar in the indirect role, it can also be used in the direct fire role should the need arise. Therefore, it is crucial to master its use.
  - c. Your next lesson will be ...

### LESSON 3 MAINTENANCE

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points with regards to maintenance:
  - a. normal care and cleaning;
  - b. cleaning before and after firing;
  - c. maintenance during firing;
  - d. the 81 mm mortar checklist; and
  - e. the barrel record history book.
2. **Time Required.** Two 40-minute periods.
3. **Method.** An explanation and practical demonstration.
4. **Stores.** The following stores and equipment are required:
  - a. four mortars complete;
  - b. cleaning rods and brushes, oil and cotton rags; and
  - c. a chalkboard.
5. **Preparation.** Prior to the first period ensure:
  - a. the stores are laid out in order of cleaning;
  - b. the chalkboard and classroom are set up; and
  - c. all safety precautions have been carried out.



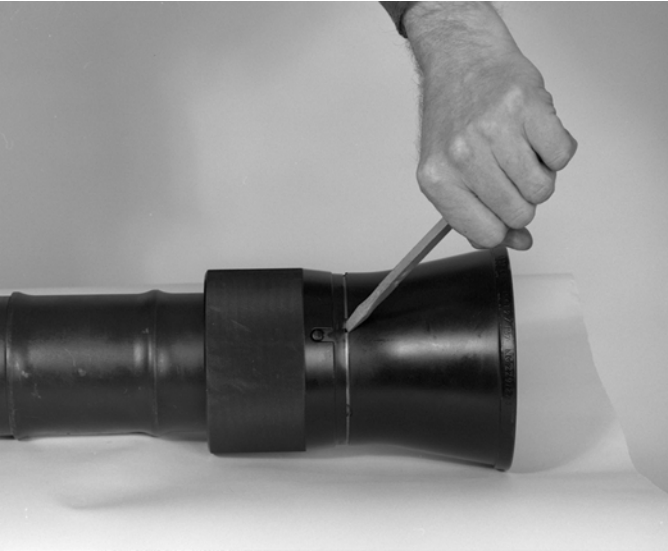
## CONDUCT OF THE LESSON

6. **Review.** Review the component parts of the mortar.

7. **Introduction.** The efficiency of the mortar depends on its mechanical condition, therefore, it is essential that all parts are kept in a serviceable condition by regular inspection and maintenance. This minimises delay and malfunctions when the mortar is brought into action.

8. **Blast Attenuation Device Removal (BAD).** In order to clean the BAD properly it must first be removed from the barrel. This will be done as follows:

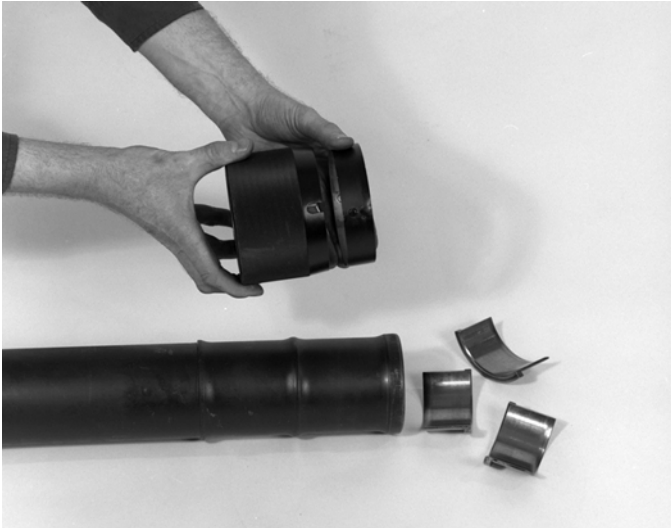
- a. gently pry up on edge of the locking ring in the recess ( Figure 2-12);
- b. this will only be required if the locking ring had to be secured as shown in Figure 2-18;
- c. unscrew the self-locking nut and slide the cone off (Figure 2-13);
- d. remove the collet segments and the self locking nut; and
- e. remove the locking ring from the self-locking nut (Figure 2-14).



**Figure 2-12: The Locking Ring**



**Figure 2-13: Self-locking Nut**

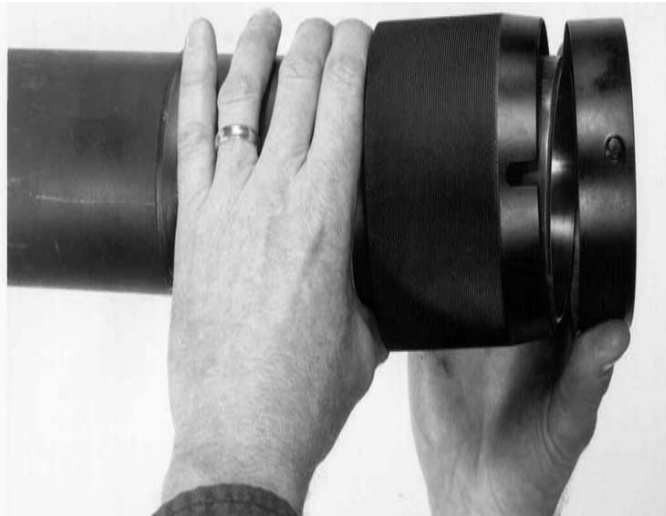


**Figure 2-14: Removal of Locking Ring**

9. **Blast Attenuation Device Set Up.** The following actions will be carried out to place the BAD on the barrel:
- a. Slide the locking ring into the self-locking nut aligning tabs with the slots. The locking ring must be installed so that the tabs contact the bottom of the self-locking nut (Figure 2-15).
  - b. Slide the self-locking nut over the muzzle (Figure 2-15).
  - c. Position the cone on the muzzle (Figure 2-16).
  - d. Position the collet segments between the muzzle and the base of the cone (Figure 2-16).
  - e. Hold the collet segments into position and slide the self-locking nut onto the barrel until it holds the collet segments (Figure 2-17).
  - f. Screw the self-locking nut until hand tight then tighten slightly with a strap wrench (Figure 2-17).

81 mm Mortar

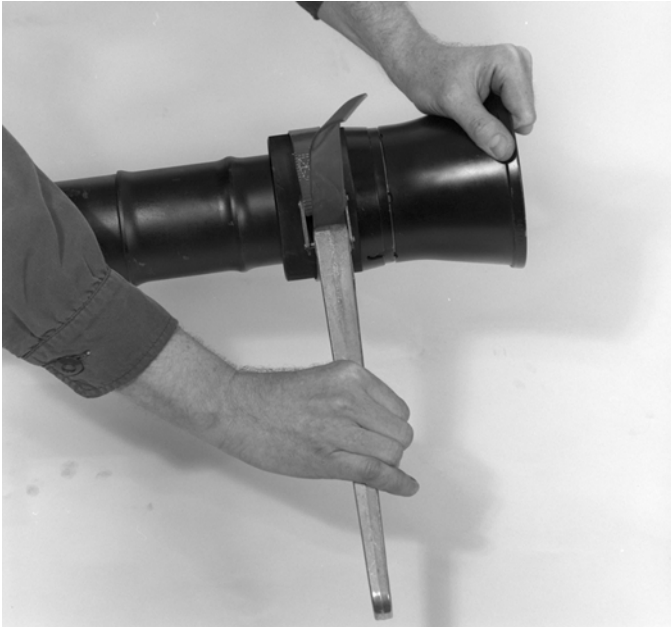
- g. If necessary, drive the locking ring into one recess on the cone, as shown in Figure 2-18. (Do not punch recesses more than 6 times.)



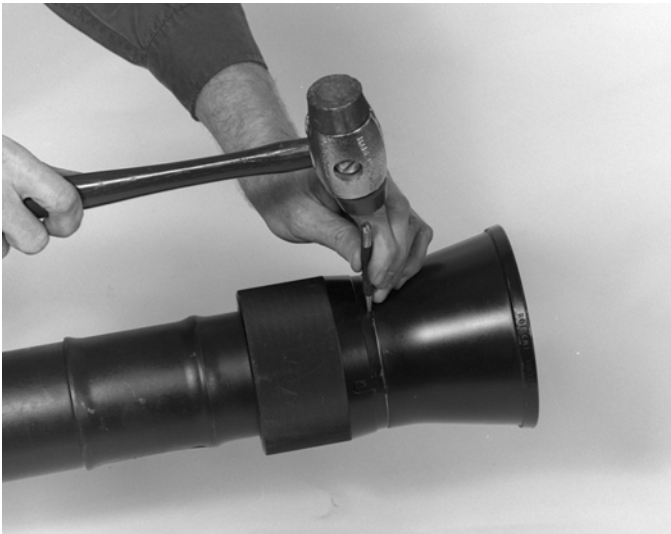
**Figure 2-15: Slide the Locking Ring into Self-locking Nut**



**Figure 2-16: Position the Cone on the Muzzle**



**Figure 2-17: Screw the Self-locking Nut**



**Figure 2-18: Drive the Locking Ring**

10. **Normal Care and Cleaning.** The care and cleaning of the mortar, its stores and equipment is a vital duty which is the

responsibility of the detachment. Weapons become unserviceable more through lack of maintenance than through prolonged use. Stores will be cleaned as follows:

- a. **Barrel.** Remove the firing pin and breech plug and clean. Attach some cotton rags to the cleaning rod head and insert the head into the bore. Work the rod up and down the barrel length several times then push the rod down until it touches the bottom of the barrel. Turn the rod several times in the same direction. This removes any accumulated dust, dirt and thickened oil. When the bore is clean, dry out with a clean cotton rag, then apply a thin coat of oil on the inside surface. Clean the outside surface of the barrel so that it is free of dirt and apply a light film of oil.
- b. **Blast Attenuation Device.** All parts will be cleaned and inspected for dirt and damage to the fine threads. A light coat of oil will be applied to all parts.
- c. **Bipod.** Remove all dirt, oil, dust and foreign matter, using a small stiff brush. Moving parts and polished surfaces are then coated with a thin film of oil, and inspected for faults in accordance with the checklist.
- d. **Baseplate.** Ensure that all dust, dirt and foreign matter are removed from the baseplate. The rebound socket must be clean and free to rotate in its housing. Inspect for faults in accordance with the checklist. Apply talcum powder to the stepped hole, neoprene washers and pad.
- e. **Sight Unit.** Remove all dust, dirt and foreign matter from the sight unit, periscope extension and case, using a soft cloth and a small brush. Wipe off all dials, levels and lenses with a soft tissue or cloth. Should dials or drums become stiff, the sight unit must be taken to the unit FCS Technician for lubrication.

- f. **Sight Unit Case.** Ensure the sight unit case is free of dirt and dust. Keep the inner compartment free from moisture and the sight unit bracket lightly oiled.
  - g. **Communications Equipment.** All radio sets and telephones must be kept clean and dusted off periodically. They must be stored correctly to prevent damage. Batteries must be removed from the sets.
11. Confirm by questions.
12. **Cleaning Before Firing.** Before loading the vehicle, the detachment will clean and inspect all stores. The line NCO will check each item as follows:
- a. **Barrel.** Using the cleaning rod and a clean rag, the bore will be thoroughly dried and inspected. Both the bore and the area of the firing pin protrusion will be clean and free from dirt and oil.
  - b. **Blast Attenuation Device.** Before installing the BAD on the barrel it will be thoroughly dried and inspected.
  - c. **Baseplate.** The rebound socket and underside of the plate will be examined for any distortion or cracks. The breech plug of the barrel will be placed in the rebound socket to ensure proper fitting and locking.
  - d. **Bipod.** All working parts will be cleaned and inspected to ensure proper functioning, then lubricated.
  - e. **Sight Unit.** The sight unit and extension will be inspected for damage. All glass surfaces will be cleaned with a tissue or soft cloth.

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- f. **Sight Unit Case.** The sight unit case will be checked to ensure the sight locks on its bracket and the case closes tightly.
- g. **Communications Equipment.** Both radio sets and telephones will be thoroughly examined to ensure they are in perfect working order. Batteries will be checked for remaining life, or renewed. Telephone cables will be checked for breakage or fraying.
- h. **Ammunition.** All ammunition will be examined to ensure that it is the correct type and quantity required with the correct number of increments for each round.

13. Confirm by questions.

14. **Maintenance During Firing.** After every fire mission the No. 1 will depress the barrel and the No. 2 will swab out any fouling or dirt. The mortar pit area will be kept tidy at all times, with particular attention being paid to excess increments. When possible, the barrel must be swabbed following every 10 rounds fired.

15. **Maintenance After Firing.** Great care must be exercised in cleaning the mortar after firing. It is cleaned in the following manner:

- a. **Barrel.** If time permits, the barrel, while still warm and before the mortar is dismantled, will be cleaned and oiled using Break Free or oil. Break Free will be used **only in the barrel**. At the earliest opportunity it will be cleaned as follows:
  - (1) if hot water is available, wash out the barrel;
  - (2) if it cannot be washed, then a wet sandbag wrapped around the head of the cleaning rod will be used to scour the bore;



- (3) when cleaned, the barrel and attachments will be oiled and inspected in accordance with the mortar cleaning checklist and stored with the muzzle cover off; and
  - (4) the barrel will be cleaned and re-oiled for a minimum of three successive days after firing to remove fouling caused by sweating.
- b. **Blast Attenuation Device.** If time permits, the cone and external parts of the BAD, while still warm and before the mortar is dismounted, will be cleaned and oiled. At the earliest opportunity, it will be cleaned as follows:
- (1) Strip the BAD from the barrel. If hot water is available, wash all parts.
  - (2) If it cannot be washed, then a wet sandbag will be used to scour the inside of the cone and all internal parts.
  - (3) When cleaned, the BAD will be oiled and inspected in accordance with the master cleaning checklist.
  - (4) The BAD will be cleaned and re-oiled for a minimum of three successive days after firing to remove fouling caused by sweating. The BAD should not be placed back on the barrel until this point.
- c. **Baseplate.** Remove heavy dirt and clean the rebound socket for free operation. At the earliest opportunity the baseplate should be cleaned, examined, oiled and stored.
- d. **Bipod.** Normal cleaning including checklist points.

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- e. **Sight Unit.** Normal cleaning including checklist points. If the sight was used during lower temperatures, it will be stored with the case cover off, to reduce sweating.
- f. **Sight Unit Case.** The sight unit case will be cleaned, inspected and stored in accordance with the checklist.

16. Confirm by questions.

17. **Maintenance Inspection.** It is essential that all parts of the 81 mm mortar be kept in a serviceable condition by regular inspection and maintenance. All the checklists are designed to enable a commander to efficiently inspect equipment and determine its combat readiness therefore, detailed inspections should be carried out in the sequence used in checklists. If there is not sufficient time for a detailed inspection, a spot check should be done from the checklist. Where a spot check turns up serious deficiencies, a complete inspection should follow. If there is any doubt about the state of equipment consult a Weapons Technician.

18. **Barrel Checklist:**

a. **Bore:**

- (1) no fouling or rust, lightly oiled;
- (2) it should be a light colour with no dark spots; and
- (3) longitudinal marks from tail fins in barrel are acceptable.

b. **Breech Plug:**

- (1) clean no fouling, lightly oiled,
- (2) firing pin housing clean, threads not cracked or distorted, and

- (3) no cracks or distortions to the plug or screw threads.

c. **Firing Pin:**

- (1) clean, no fouling, lightly oiled;
- (2) tip not cracked or distorted;
- (3) threads not cracked or damaged; and
- (4) base free of damage or distortion.

d. **Breech Plug Housing:**

- (1) threads clean, lightly oiled;
- (2) threads, no damage or distortion;
- (3) bevelled edges not distorted;
- (4) brass gasket or copper sealing ring, seated properly not damaged or distorted; and
- (5) brass gasket, grey lines indicate a fault, replace gasket.

e. **Barrel Exterior:**

- (1) no cracks, dents or bulges;
- (2) muzzle smooth, no distortions;
- (3) cooling fins not cracked; and
- (4) clean and lightly oiled.

19. **Blast Attenuation Device Checklist.** Remove the BAD from the barrel and proceed as follows:

- a. clean, no fouling, lightly oiled;

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- b. check for cracks, vents or bulges;
- c. the machined collets are a matched set and must be replaced as a set;
- d. do not peen locking ring until necessary and only then will it be done six times and then replaced;
- e. replace all parts that have become damaged or defective due to wear or damaged through installation or removal; and
- f. if the cone is damaged or worn out the entire BAD assembly must be replaced.

20. **Baseplate Checklist:**

- a. ensure it is clean and dry;
- b. check to ensure there are no cracks or warping;
- c. ensure the rebound socket rotates freely and is locked into place;
- d. ensure the locking shoulders are not broken;
- e. dry the rebound socket and apply talcum powder; and
- f. ensure the gaskets are clean, dry and serviceable.

21. **Bipod Checklist:**

- a. **Traversing Mechanism:**
  - (1) check the hand wheel and crank for serviceability; and
  - (2) the action must be smooth with no binding, with an 1/8<sup>th</sup> of a turn of backlash only.

b. **Cross Levelling Mechanism:**

- (1) ensure it is clean, lightly oiled;
- (2) check the hand wheel and crank for serviceability; and
- (3) the action must be smooth with no binding, with an  $1/8^{\text{th}}$  of a of turn backlash only.

c. **Elevating Mechanism:**

- (1) clean, lightly oiled;
- (2) check hand wheel and crank for serviceability;
- (3) the action must be smooth with no binding;
- (4) an  $1/8^{\text{th}}$  turn of backlash only, with the chromed leg free of distortion with no bulges or dents; and
- (5) grease the mechanism with 3 TP 606 grease every six months or as required by service conditions.

d. **Plain Leg:**

- (1) clean, lightly oiled;
- (2) the rivets tight on the serrated plate;
- (3) the locating catch locks the leg firmly into place;
- (4) the foot is not cracked or distorted; and
- (5) the web strap is clean and serviceable.

e. **Buffer Cylinders:**

- (1) clean, lightly oiled;
- (2) firmly attached, with spring casings properly positioned;
- (3) smooth but firm action; and
- (4) travels full length and returns to pre-fire position.

f. **Barrel Clamp:**

- (1) clean, lightly oiled;
- (2) with no cracks, bulges or dents;
- (3) the hinges operate smoothly and locks onto the barrel tightly;
- (4) clamp pressure is approximately 15.4 kg;
- (5) the locking rod seats in housing correctly; and
- (6) the safety latch engages firmly.

g. **Sight Bracket:**

- (1) clean and dry;
- (2) free of dents or distractions;
- (3) the sight engages and disengages smoothly; and
- (4) a Weapons Technician performs gauge check if necessary.

h. **Exterior Appearance:**

- (1) painted surfaces:
  - (a) free of chips and scratches;
  - (b) lightly oiled; and
  - (c) only authorised heat-resistant paints used.
- (2) parkerized metal is dark and lightly oiled; and
- (3) bright metal is clean, free of rust and lightly oiled.

22. **Sight Unit C2A1, Case and Periscope Checklist:**

a. **Sight Unit C2A1:**

- (1) clean and dry;
- (2) mounts and locks securely into place;
- (3) telescope lens clear, with the rubber eyepiece serviceable;
- (4) periscope mount not damaged;
- (5) telescope locks into place;
- (6) bearing drum rotates freely and locks securely into place;
- (7) bearing and elevation fine scale knob butterfly nut clamped into place;
- (8) bearing and elevation coarse and fine scales and indices clear and easily read;
- (9) illumination Trilux lights not deteriorated;

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- (10) elevation drum rotates freely and locks into place; and
- (11) all bubble housing are clear and bubbles of the correct dimension.

b. **Periscope:**

- (1) periscope and tubular case is clean, dry and free of distortion;
- (2) periscope prisms are clear and serviceable; and
- (3) periscope mounts correctly to sight unit.

c. **Case:**

- (1) sight unit case is clean and dry;
- (2) sight locks to bracket correctly;
- (3) cover is clean, dry and free of damage; and
- (4) cover locks to base correctly and carrying strap is serviceable.

23. **Spare Parts and Tools Checklist:**

- a. the tool box is clean and lightly oiled, and the cover locks securely;
- b. the oil can is filled and serviceable;
- c. the firing pin wrench is serviceable; and
- d. all other tools are clean, lightly oiled and not worn.



**CAUTION**

Break Free is to be used to clean the barrel only. It will damage lenses, scales, neoprene washers and plastic bushings. It will also break down the greases used in the elevating mechanism.

24. **Target Record Card Checklist:**
- a. they are clean, dry and serviceable; and
  - b. the marking have not deteriorated.
25. **Barrel History Record Book Checklist:**
- a. to be maintained by the control post officer (CPO);
  - b. completed daily during firing recording data as required;
  - c. barrel to be inspected by Weapons Technician every 1000 rounds and once every year; and
  - d. prefire check to be done by Weapons Technician prior to any live firing.

**NOTE**

The detachment commander will ensure that an accurate count of the number and type of rounds fired by each mortar is kept during the day and this information is given to the CPO on completion of the day's firing.

26. **Conclusion:**
- a. questions to and from the class;
  - b. test on the lesson; and

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- c. conduct all safety precautions.

27. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...

## CHAPTER 3

### LESSON 1 AMMUNITION AND FUZES 81 mm MORTAR AMMUNITION AND FUZES

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach the details of 81 mm mortar ammunition and fuzes to include:
  - a. types of ammunition and fuzes;
  - b. recognition; and
  - c. preparation.
2. **Time Required.** Five 40-minute periods.
3. **Method.** A basic instructional period.
4. **Stores.** The following stores and equipment are required:
  - a. an overhead projector and a computer with PowerPoint;
  - b. display rounds (HE, WP (white phosphorus), RP (red phosphorus), Illuminating and Dynamite Nobel Mortar Training System, 25 mm); and
  - c. display proximity fuze PPD 323 (proximity, point detonating) with fuze wrench.
5. **Preparation.** Prior to the start of the first period:
  - a. ensure the chalkboard and classroom are set up; and
  - b. carry out all safety precautions on the display ammunition.

## CONDUCT OF THE LESSON

6. **Review.** Nil.

7. **Introduction.** In a previous lesson on the roles and characteristics of the 81 mm mortar, we have seen that a number of different rounds can be employed with mortars. Therefore, every member of a mortar detachment **must** be thoroughly familiar with the different types of rounds, their recognition and the preparation required to fire them.

8. **Characteristics.** Ammunition for the 81 mm mortar is issued as semi-fixed complete rounds. The term "semi-fixed" signifies that, although the round is loaded and fired as one unit, the propellant charge can be adjusted to coincide with that required for any given range:

- a. A complete round contains all the necessary components required to fire the weapon once. These components are:
  - (1) the projectile, containing the various fillers;
  - (2) a fuze, which detonates and causes the round to function;
  - (3) a propelling charge, which propels the round the required distance;
  - (4) a primary cartridge, which ignites the propellant charge;
  - (5) a primer, which fires and ignites the primary cartridge; and
  - (6) a tail fin assembly, which stabilizes the round during flight.
- b. The 81 mm mortar ammunition is classified as being either:

- (1) service ammunition; or
- (2) training ammunition.

9. Confirm by questions.

10. **Service Ammunition.** There are three types of service ammunition: high explosive (HE), smoke (WP and RP) and illuminating (Illum). The following paragraphs discuss in detail each of them.

11. **High Explosive.** HE rounds are designed to produce a fragmentation blast effect. Most HE rounds used with 81 mm mortar have a killing radius of approximately 40 metres from point of burst and a casualty producing radius of approximately 190 metres. They can be fired with a number of fuze options, including Super Quick (SQ), Delay (D) and Proximity (Prox) which make them a very versatile round for area neutralisation. The current HE round used is the C70A1, which is described below.

12. **HE C70A1.** This is a Canadian version of the British L15 series of mortar rounds. The data and component information is described below:

a. **General Data:**

- (1) **Purpose.** Fragmentation, blast effect, and penetration against light fortifications.
- (2) **Weight.** Approximately 4.5 kg.
- (3) **Propellant Charge.** Primary cartridge plus six increments.
- (4) **Range.** Approximately 4,780 metres (Charge 6—UK MK 2, charge system).

b. **Component Parts.** The round consists of the following components:

- (1) **Body.** Iron casting, machine threaded internally and externally to receive the fuze and tail fin assembly.
  - (2) **Tail Unit.** It has six stabilising fins, and 42 perforations for the transmission of flash from the primary cartridge to the increments.
  - (3) **Obturing Ring.** The obturator is a split ring made of polycarbonate HMS 3113 produce by machining or moulding. Rings are heat treated to remove internal stresses. Ideally obturating rings allow proper cantering, provide obturation, create proper resistance to initial projectile movement and also provide a minimum drag effect on the projectile once motion has started. The obturator is assembled to the body as a split ring, loose coil.
  - (4) **Filler.** Composition B (60/40 RDX—TNT) explosive.
- c. **C87 Primer Cartridge.**
- d. **Increment.** Charge system used with the C70A1 rounds is known in the UK as the MK2 System. These cartridges which clip to the tail unit are removable as required. The cartridges consist of a horseshoe shaped container with propellant filling.
- e. **Fuze DM111A3/DM111A4.** Is an impact fuze with a selectable SQ or delay action.
- f. **Fuze PPD 323.** Is a dual-role fuze with an optional proximity/SQ function. It is issued separate from the round and will be installed by the crew in the field. To replace the DM 111A3/A4 fuze when required, see paragraph 36 for the fuze change procedure.

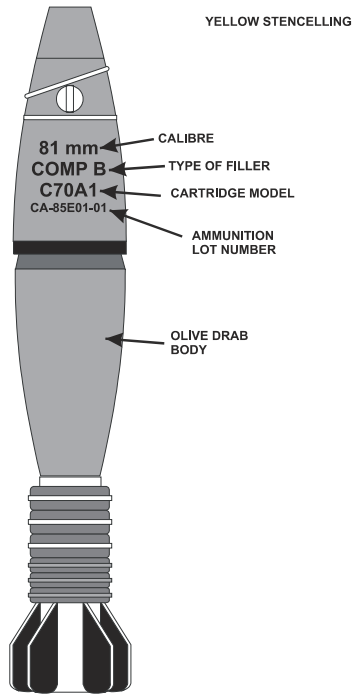
- g. **Recognition.** The body colour is olive drab, with a yellow band and yellow markings.
- h. **Preparation for Firing.** Leave fitted to the tail unit, only the number of augmenting charges required to achieve the desired range, adjust the selector on the fuze to the desired action (D or SQ) and remove the safety pin when ready to fire.

**NOTE**

On all charge systems augmenting charges will be removed from the top down.

- i. **Packaging.** Each round is packed, fitted with a two piece polystyrene augmenting charge protector. The protector is designed to fit snugly over the charges and is held in place by an elastic band. There are three rounds packed in each airtight C119A1 container and filled containers are built into palletized unit loads. The load consists of eight tiers with eight containers per tier (192 rounds).

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**Figure 3-1: HE Round C70A1 with Fuze DM 111A3/A4**

13. **Smoke.** Smoke rounds are designed to produce an effective, but limited smoke screen. They are also effective for signalling, marking targets for other fire units and aircraft, starting fires and they have a casualty producing capability. Currently, only the smoke round RP C106, described below, is used.

14. **Smoke C106.** The RP smoke was designed as a screening smoke cartridge by Austria and type-classified for unlimited use by the Canadian Forces. Improvements over 81 mm WP cartridges include a common body, tail and propelling system as with the Illuminating C105 and greater safety in storage, transportation and handling. The data and component information is discussed below:

a. **General Data:**

- (1) **Purpose.** Screening, blinding, and target marking.
- (2) **Weight.** Approximately 3.6 kg.



- (3) **Propellant Charge.** The round is issued with six equal sized TLS 85 increments.
- (4) **Range.** Approximately 5426 metres (charge 6).
- (5) **Burning Time.** 90 seconds.

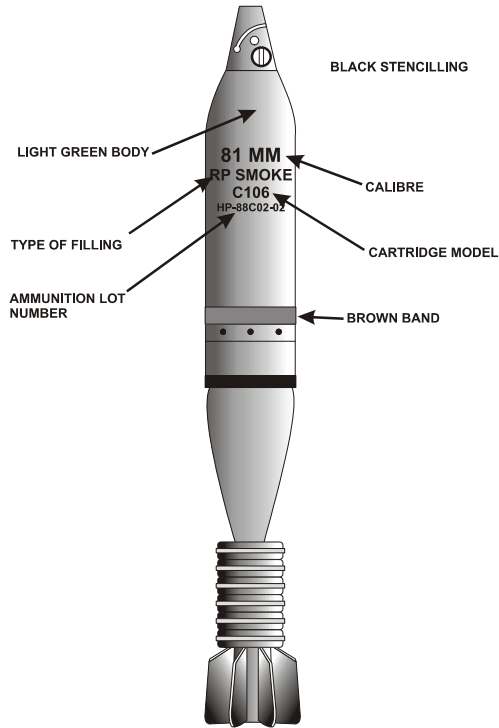
b. **Component Parts:**

- (1) **Body.** It is made of aluminium alloy and consists of a front and rear section. The front section houses the RP smoke assembly and a steel fuze adapter. The rear section has an external groove to accept an obturating ring. Both body sections are connected using six shear pins.
- (2) **Tail Unit.** This unit has six stabilizing fins and 42 perforations (flash holes) for passing the flash from the primary cartridge to the propelling charges.
- (3) **Obturating Ring.** The cartridge is issued with a plastic obturating ring fitted in the groove of the rear section.
- (4) **Filler.** The RP smoke assembly consists of a canister filled with three cylindrical RP pellets. The forward end of the canister contains a 0.1 second delay element followed by the buster charge, which is centrally located in the canister.

- c. **Primary Cartridge, TP 85.** The various components of this primary cartridge are made of aluminium alloys. The primary charge, which is M8 powder encased in a thin-walled aluminium tube, is initiated by a priming charge of black powder which in turn, is initiated by an anvil-type percussion primer.

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- d. **Fuze DM 111A4-C1.** This is a point-detonating fuze with a setting screw to allow functioning at the OV (Super quick) or MV (Delay .05 second) mode following impact. The safety wire must be removed before firing, and bore safety is provided by a delayed-arming feature that ensures the fuze cannot be armed during the first 40 metres (minimum) of flight.
  
- e. **Recognition.** The basic body colour is light green, with a brown hazard band placed forward of the obturating ring, and information stencilled in black.
  
- f. **Preparation for Firing.** The following actions are required to prepare the RP smoke, C106 cartridge for firing:
  - (1) Leave fitted to the tail unit only those increments required to make up the charge ordered.
  
  - (2) Ensure the setting sleeve is at OV for super quick action. **DO NOT USE THE MV (Delay) ACTION FOR THIS ROUND IN PEACE TIME TRAINING** as duds or "lost" rounds may occur.
  
  - (3) Remove the fuze safety wire.
  
- g. **Packaging.** For protection, each C106 cartridge has a white styrofoam protector installed around the propellant increments. There are three rounds packed in each triple polyethylene C122 container. There are 54 packed containers built into a palletised unit load and the load consists of six tiers of nine containers, totalling 162 rounds.



**Figure 3-2: Smoke Round C106 (RP)**

- h. **Functioning.** The expelling charge is ignited by the fuze on impact. Pressure generated by the expelling charge drives the RP smoke canister to the rear, cutting the shear pins and separating the rear body section from the front body section. Simultaneously with separation, the delay element is ignited by the expelling charge. Following the 0.1 second burn-through of the delay, the buster tube charge is initiated, which in turn ignites the three RP pellets, bursts the canister walls and expels burning RP granules to produce screening smoke.

15. **Illumination.** Illuminating rounds are used to illuminate a battlefield for direct or indirect fire. One illuminating round will light up an area of 800 - 1000 metres in diameter and will last approximately 35 to 45 seconds. It is also used for signalling. The

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current illuminating round in use is the C105, which is described below.

16. **Illuminating C105.** The C105 cartridge was designed by Austria and type-classified in 1988 for unlimited use by the Canadian Forces. Improvements over older 81 mm illuminating include longer range performance and a common body, tail and propelling system as with the RP smoke, C106. The data and component information is described below:

a. **General Data:**

- (1) **Purpose.** Illumination of an area and target marking.
- (2) **Weight.** Approximately 3.75 kg.
- (3) **Propellant Charge.** Six equal sized TLS 85 increments.
- (4) **Range.** Approximately 5367 metres (charge 6).
- (5) **Burning Time.** 35.5 seconds.
- (6) **Luminosity.** 900 000 candlepower.

b. **Component Parts:**

- (1) **Body.** The body is made of aluminium alloy and consists of a front and rear section. The front section houses the illuminating canister assembly and a steel adapter threaded to accept a fuze. The conical rear section has an external groove to accept the obturating ring. This rear body section also houses the parachute assembly. Both sections are connected using a rubber sealing ring and six shear pins.

- (2) **Tail Unit.** This tail has six stabilizing fins and 42 perforations (flash holes) for passing the flash from the primary cartridge to the propelling charges.
- (3) **Obturing Ring.** The cartridge is issued with a plastic obturating ring fitted in the groove of the rear body section.
- (4) **Filler.** The illuminating assembly consists of a flare canister, filled with 900 grams of magnesium/halogen composition, with a priming charge at the forward end. The parachute assembly consists of the bell-shaped spring guide, the spring, a parachute housing and a white nylon parachute with ten steel shroud lines.

17. **Primary Cartridge, TP 85.** The various components of this primary cartridge are made of aluminium alloys. The primary charge consists of M8 powder encased in a thin walled aluminium tube, and is initiated by a priming charge of black powder, which is initiated by an anvil-type percussion primer.

18. **Increment TLS 85.** The complete round is issued with a full service charge of six equal sized TLS 85 increments. Each increment contains approximately 22 grams of SB powder housed in a horseshoe-shaped celluloid container.

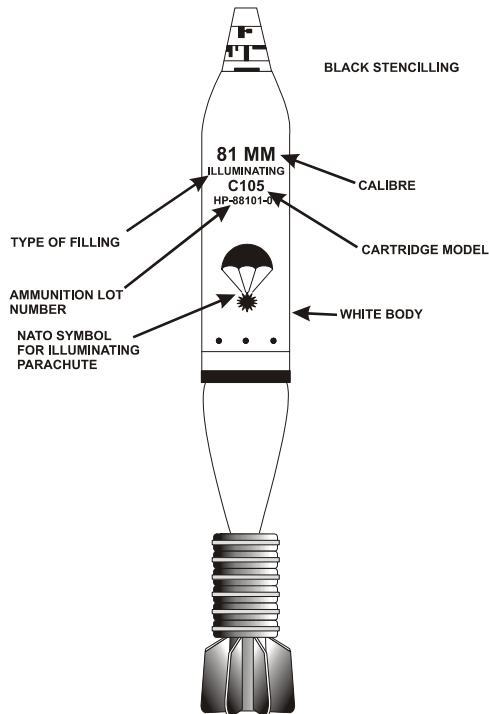
- a. **Fuze, MTSQ, DM 93-2.** This is a miniature clockwork-type mechanical time and super quick fuze. Settings from 6 to 54 seconds in the mechanical time (MT) mode can be set by hand or with a setting wrench.
- b. **Recognition.** The body colour is white and the information is stencilled in black.
- c. **Preparation for Firing.** Leave fitted to the tail unit only those increments required to make up the charge ordered. Then remove the fuze safety wire

for MT action, and align the setting mark (arrow) over the time setting ordered.

**NOTE**

If fuzes have been prepared, but not fired, they must be reset to “S” and have the safety wire replaced before the ammunition is transported.

- d. **Functioning.** The expelling charge is ignited at the time set on the fuze. Pressure generated by the expelling charge drives the flare canister rearward, cutting the shear pins and separating the rear body section (and flare canister) from the front body section. Simultaneously with separation, the delay elements are ignited by the expelling charge. A compressed spring in the rear body section reasserts itself, and assists in deployment of the parachute and illuminating payload. Following the burn-through of at least one delay pellet, the priming charge is ignited for flare initiation at the optimum height of 350 metres.
  
- e. **Packaging.** For protection during transport and handling, each C105 cartridge has a white styrofoam protector installed around the propellant increments. Three complete rounds are packed in triple polyethylene containers. The palletised unit load consists of six tiers of nine containers, totalling 162 rounds.



**Figure 3-3: Illumination Round C105**

19. **Cartridge, 81 mm, Bedding, C120.** The 81 mm C120 bedding cartridge is a development of SNC Industrial Technologies to meet a Canadian Forces requirement for an operationally effective means of bedding-in, or setting, the base plate of a standard (dismounted) 81 mm C3 mortar. Two bedding cartridges are usually required as a minimum for medium or average soil conditions. The C120 bedding cartridge is weight adjusted to closely simulate the full charge recoil impulse of a service HE cartridge such as the C70A1 without the need to unnecessarily expend the more valuable operational rounds. The C120 fibre projectile body is designed to break up and completely disperse an inert metal powder payload immediately upon leaving the muzzle of the weapon, thus producing a minimum trajectory. This characteristic ensures that the firing signature and exact location of the weapon will be difficult to detect by enemy surveillance systems and counter-battery radar. The complete cartridge, consists of the following main components:

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- a. **Projectile Body.** The projectile body consists of a spirally wrapped waterproofed fibre cylinder which is loosely filled with approximately 3.6 kg of "Atomet 69" (a free flowing, low-toxicity, finely granulated iron powder). A moulded polycarbonate plastic tail adapter is press fitted into the rear of the body and secured in place by adhesive bonding. The nose of the projectile is sealed by a flat metal end cap, which is secured in place by a circumferential roll crimp.
- b. **Obturator Ring.** A standard 81 mm polycarbonate split ring obturator is fitted in the groove in the plastic (base to tail) adapter.
- c. **Tail Unit, TV180.** A standard 81 mm, TV180 tail unit is attached to the moulded rear body assembly.
- d. **Cartridge, Primary, L39A1.** A standard L39A1 primary cartridge is used.
- e. **Charge, Propellant, Increment.** A maximum of five L40A1 standard horseshoe increments are used.
- f. **Performance.** The bedding cartridge is normally fired at a relatively high barrel elevation (usually between 1100 and 1500 mils), and at the special (5 increment) maximum charge to produce the most direct and uniform impulse at the mortar base plate. Firing at the above charge also ensures that gas pressures and setback forces are sufficient to completely disrupt the projectile body and disperse all filler material and tail section fragments away from the immediate area of the firing point. Particles will dissipate within a relatively small fan-shaped safety area (200 by 100 metres) to the front of the firing point due to gravitational and aerodynamic drag forces.



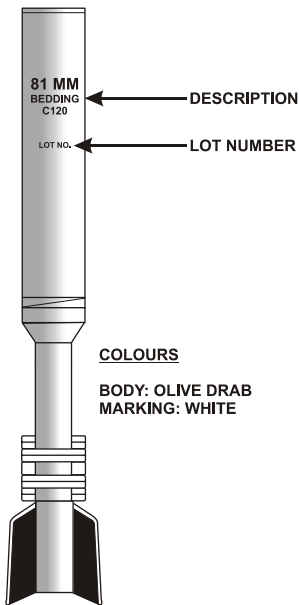
- g. **Preparation for Firing.** Other than normal prefiring checks for serviceability and correct assembly of propellant increments, no special preparations are required.
- h. **Identification and Marking.** The bedding cartridge is identified and marked in accordance with current NATO criteria for inert filled break-up type projectiles, that is, olive drab (OD) body colour with all stenciled markings in white (see Figure 3-4). Additional special markings may be added on the closing cap using adhesive labels.
- i. **Packaging.** The 81 mm C120 cartridge is packed three per plastic container C119A1. A redesigned polyethylene foam/neoprene rubber cushion is included in the bottom of the container to both protect the nose of the cartridge and secure the contents for handling and transportation.
- j. **Shipping, Storage and Transportation.** Complete shipping and transport detail may be found in C-74-300-D01/TA-000 *Ammunition Logistical Data* under NSN 1315-21-913-5021 AIC 0676 (Ammunition Interchangeability Code).
- k. **Tabulated Data.** The following data applies to the C120 bedding cartridge:
  - (1) complete weight (nominal) 4.31 kg;
  - (2) inert filler weight (nominal) 3.6 kg;
  - (3) overall length (approximate) 483 mm;
  - (4) net explosive quantity (nominal) 0.118 kg;
  - (5) operating and storage temperature—  
-46°C to +63°C;

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- (6) shipping name—Cartridges for Weapons, Inert Projectile;
- (7) HCC (Hazardous Compatibility Classification) 1.2C;
- (8) UN number 0328.

**NOTE**

Inspections shall be carried out in accordance with CFTO C-74-300-B02/NJ-000 *Inspection of Ammunition*. Cartridges with loose closing caps or tail adapters, or showing evidence of leaking iron powder filler, shall be reported via normal CF410 channels to NDHQ / DAPM 3.



**Figure 3-4: Bedding C120**

20. Confirm by questions.

21. **Identifying 81 mm Mortar Ammunition.** All members of the mortar platoon **must** be capable of identifying ammunition by type instinctively to avoid making errors during both day and night engagements. There are several methods of identifying rounds both by day and at night. Here are some examples:

a. **By Day:**

- (1) **Colour.** As mentioned previously in this lesson.
- (2) **Stencilling.** All rounds have the following information stencilled on them:
  - (a) calibre of the mortar;
  - (b) type of filler;
  - (c) model of shell; and
  - (d) ammunition lot number.

b. **By Night:**

- (1) **Weight.** HE rounds are lighter than smoke and illuminating,
- (2) **Fuze.** The mechanical time fuze used with the illuminating round has an external time graduation that can easily be identified by touch, thereby quickly distinguishing it from smoke or HE.
- (3) Each type and nature of round has its own distinctive shape, size and number of increments.

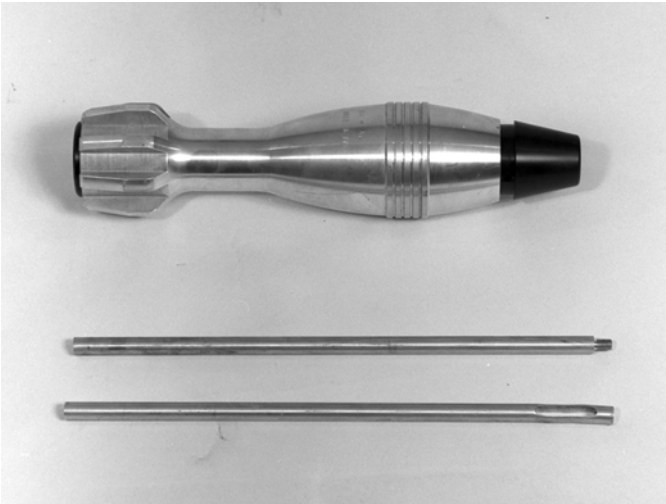
**CAUTION**

Rounds may fall short when firing 81 mm ammunition in wet weather. Every effort must be made to keep the mortar barrel and ammunition dry.

22. Confirm by questions.

23. **Training Ammunition.** The Mortar Training Device (MTD) consists of two main parts: the sabot and the 25 mm cartridge. The sabot is made of aluminium alloy and in shape and weight resembles the live 81 mm mortar round. A 25 mm sub-calibre barrel runs longitudinally through the sabot. The cartridge, containing a small projectile, is available in four charges (0-3) and allows firing at ranges from 70 to 480 metres.

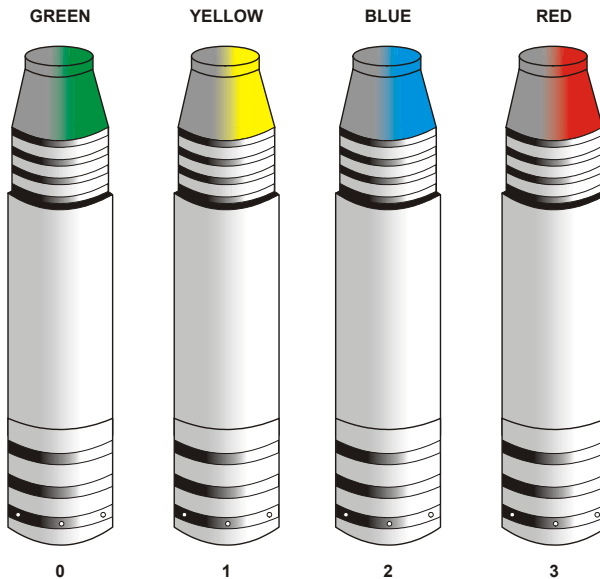
24. The MTD including cartridge weighs 3.8 kg. The sabot has the shape of a mortar round including tail fins and is 34.5 cm long. This is approximately 15 cm shorter than service rounds.



**Figure 3-5: MTD Sabot**

25. **Training Cartridge.** Muzzle velocities, ranges available and markings for the cartridges according to their charges are as follows:

CHARGE	COLOUR OF PROJECTILE HEAD	CARTRIDGE CASE GROOVES	RANGES (metres)
0	Green	None	70-240
1	Yellow	One	150-320
2	Blue	Two	200-410
3	Red	Three	250-480



**Figure 3-6: Training Cartridges (Charges 0-3)**

26. **Preparation.** After initial introduction to the MTD and its capabilities, the time required for trained mortar personnel to set up the system is no more than that required to set up for a normal shoot. The shorter ammunition preparation time allows the No. 3 of the mortar detachment to lay out canvas for the sabot landing area.

27. **Operation.** A cartridge of the required charge is placed in the barrel of the sabot and turned clockwise to lock it in position. The sabot is dropped into the barrel of the 81 mm mortar. When the sabot is fired the projectile is propelled to the target and the sabot is propelled out of the mortar barrel to land approximately 10 metres in

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front of the mortar. The projectile emits a greyish-white smoke puff on impact to allow fall-of-shot adjustment. The sabots are recovered and cleaned for re-use with new cartridges. Removal of the spent cartridge to allow re-use of the sabot is accomplished by simply rotating it one-quarter turn counter-clockwise. If the sabot landed on its base the cartridge may require the use of pliers or rapping on the cartridge base to facilitate removal by hand.

28. **Accuracy.** The manufacturer's conversion tables are based on a reduced scale of 1:10 and range is calculated on a reduced scale of 1:10 in 100 metre increments. This has been recalculated at 25 metre increments to provide similarity with the service firing tables.

29. **Misfires.** The following misfire drills may be require when firing with the MTD 25 mm:

- a. **Cartridge Fails to be Struck.** Shake the barrel as for normal misfire drill. If the cartridge remains hung up then unload, clean barrel and sabot and continue with firing drills.
- b. **Cartridge Struck/Projectile Fired.** The No. 1 determines if the projectile has fired. If the projectile has been fired then normal misfire drills are carried out.
- c. **Cartridge Struck/Projectile not Fired.** Normal misfire drill will be carried out to the point where the No. 2 removes the sabot. At this time the sabot must be kept pointed downrange and the area to the rear of the sabot must be clear. The base of the cartridge is examined by the No. 2. Using a gloved hand, the No. 2 will turn and remove the cartridge with an under hand grasp. If not struck carry on with firing, if struck then remove the sabot a safe distance where the No. 2 will remove the cartridge and place it aside to be destroyed as a dud.

30. Confirm by questions.

31. **Interchangeability Label for NATO Armies** (Figure 3-7). This label of technical mortar information has been produced to provide the basic data required to allow safe emergency/wartime firing of NATO 81 mm mortar ammunition. The details provided allow determination of safe interchangeability and are enclosed in each ammunition container during packaging. The detailed description of the label is as follows:

### WARNING

When removing the cartridge the sabot must be pointed downrange with the area to the rear cleared.

- a. **National Title of Cartridge.** The title at the top of the label should be similar to that stencilled on each projectile body, thus ensuring the use of the correct label for the cartridge model being fired.
- b. **Range Coverage and Angles of Elevation.** Mortar tube elevation angles in degrees and mils provide suitable range coverage overlays between charge zones. This selection of elevation angles and range overlaps is done for each projectile having a separate firing table. It is expected that this range/charge/elevation arrangement will provide fall of shot within 400 metres of a predicted target regardless of the mortar used.
- c. **Fuze-action, Model, Preparation.** The title indicates the action (PD, MT, MTSQ, Prox) and the model number. Block spaces 1 to 3 provide the setting method, action at each setting and any additional preparations required.
- d. **Charge Zones and Charge Make-up.** The charge (zone) numbers are shown between the applicable range coverage in metres and the arrangement of increments to make up that charge zone. The charge arrangement pictorials also provide a clear graphic presentation of the quantity

and different types of increments used in the arrangements.

- e. **Design Pressure Requirement (DPR).** The DPR is shown beside the pictorial description of each charge zone. Only those charges with a DPR lower than the design pressure for the L16A1 and/or L16A2 mortars barrel (115.8 MPa) are to be used.

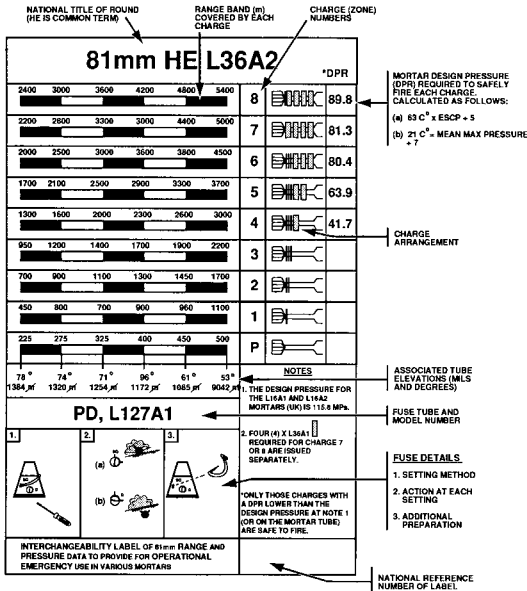


Figure 3-7: Example of an Interchangeability Label for NATO Armies

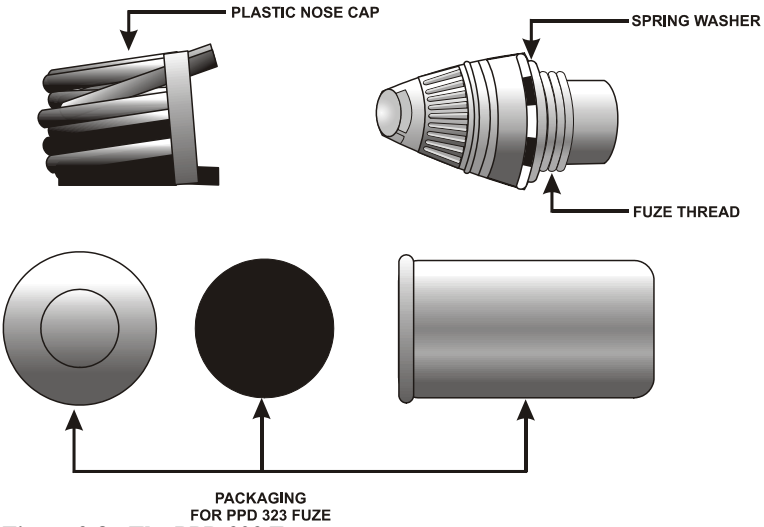
32. Confirm by questions.

33. **Fuze Change Procedure for the Fuze PPD 323.** The PPD 323 Fuze will be issued separately when required to user units. Since the C70A1 ammunition is already issued with the Fuze DM 111A3/A4 attached, the following procedures will be followed by mortar detachments when they remove the DM 111A3/A4 and install the PPD 323 proximity fuze in the field. The procedure requires two persons, which is the responsibility of the No. 3 assisted by the No. 2 as follows:



- a. The No. 2 will hold the complete HE round across his lap with the fuze projecting past his leg (Figure 3-9). Simultaneously, the No. 3 should place the hand wrench C1 on the DM 111A3/A4 fuze and attempt to remove the fuze.
- b. If the fuze cannot be removed, strike the wrench handle with a high density plastic hammer until it loosens. Remove fuze PD DM 111A3/A4 using the wrench (Figure 3-10).
- c. The No. 3 visually inspects the PPD 323 fuze for the following :
  - (1) the plastic nose cap is undamaged;
  - (2) the fuze threads are undamaged; and
  - (3) the spring washer is undamaged and located at the top of the threads.
- d. The No. 3 inserts the fuze PPD 323 clockwise by hand (Figure 3-11).
- e. Using the fuze wrench, the No. 3 tightens the PPD 323 fuze as much as possible to ensure the circuit continuity between the mortar round body and the fuze (Figure 3-12).
- f. A tap on the wrench handle may be required to obtain the desired torque.

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**Figure 3-8: The PPD 323 Fuze**



**Figure 3-9: Position of Both Mortarmen**



**Figure 3-10: Remove Fuze PD DM 111A3/A4**



**Figure 3-11: Insert Fuze PPD 323 Clockwise by Hand**



**Figure 3-12: Tighten the PPD 323 Fuze**

34. Confirm by practice.
35. **Conclusion:**
  - a. questions to and from the class; and
  - b. test on the lesson.
36. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Detail what the next lesson will be ...

## CHAPTER 4 MORTAR HANDLING DRILLS

### LESSON 1 PRELIMINARY HANDLING

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following mortar crew drills:
  - a. elementary drill;
  - b. rounds action; and
  - c. cease firing.
2. **Time Required.** Two 40-minute periods.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** The following equipment and training personnel are required:
  - a. one mortar, a sight unit and baseplate flag per detachment; and
  - b. one demonstration detachment.
5. **Preparation.** Prior to the start of the first period:
  - a. select a suitable area for four detachments; and
  - b. have the instructor carry out all safety precautions.

#### CONDUCT OF THE LESSON

6. **Review.** Review the component parts of the 81 mm mortar.

7. **Introduction.** Explain that before specific mortar drills can be taught, the mortar detachment must be capable of mounting and dismounting the mortar with the maximum of speed and efficiency. To fulfil the requirement, each member has certain actions he must carry out instinctively to enable his detachment to operate efficiently.

8. **Elementary Drill.** Have the demonstration detachment explain and demonstrate the elementary drill. Drills are used to ensure that order is maintained during mortar operations. All detachment members must be able to carry out the actions of each detachment number. The actions required are detailed below when the following commands are given:

- a. **Positions.** On the command **POSITIONS**, the No. 1 acknowledges the command and the entire detachment moves to the location of the stores and positions themselves in the following manner:
  - (1) The No. 1 positions himself to the rear of the baseplate.
  - (2) The No. 2 positions himself to the rear of the barrel and bipod assembly in line with the No. 1.
  - (3) The No. 3 positions himself one pace to the right of and in line with the No. 2. When all are in position they will number themselves. All will remain at the position of attention (see Figure 4-1).
- b. **Rest.** On the command **REST**, the No. 1 acknowledges and all numbers stand at ease and relax.
- c. **Change Round.** On the command **CHANGE ROUND**, the No. 1 acknowledges, moves in rear of the detachment and takes the position of the No. 3 who in turn has taken the position of the No. 2. The No. 2 has moved into the position vacated by No. 1. When all are in position they will re-number themselves.

- d. **Stand Clear.** On the command **STAND CLEAR**, the No. 1 acknowledges and the detachment moves clear of the stores.

9. These commands also apply when the mortar is mounted and will be dealt with later.



**Figure 4-1: Position of the Detachment with Mortar Dismounted**

10. Confirm by questions and practice.
11. **Rounds Action.** Have the demonstration detachment explain and demonstrate this command. Having ordered **POSITIONS**, the actions of the detachment numbers on the command **(number of) ROUNDS ACTION** are as follows:
  - a. The No. 1 acknowledges the order, slings the sight unit over his right shoulder, picks up the baseplate with the spikes facing out. He moves to the baseplate flag and places the baseplate on the ground, slightly right and to the rear of the flag and then jumps on it to stabilize it. He must ensure that the open end of the rebound socket is facing the intended direction of fire. Then, with the sight unit, he moves one pace to the left of the baseplate.

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- b. The No. 3 positions himself on the right of the barrel and grasps the muzzle end with the left hand. In the right hand he will carry the spare parts box and aiming stakes.
- c. At the same time the No. 2 moves to the rear, places himself on the right of the barrel and grasps the breech plug with his left hand.
- d. The No's 2 and 3 move forward to the baseplate and position the barrel/bipod assembly on the ground approximately 25 cm from the forward edge of the baseplate.
- e. The No. 2 undoes the retaining strap, unlocks the barrel locking clamp and grasps the barrel above the breech plug with both hands.
- f. The No. 3 grasps the barrel at the muzzle end and, with the No. 2, lifts the barrel. The No. 2 inserts the breech plug into the rebound socket and turns the barrel a quarter turn ensuring the firing pin is uppermost. The No. 2 locks the barrel locking clamp ensuring that the clamp is approximately 2 ½ cm above the lower shoulder. He then grasps the upper barrel and steadies it while the No. 3 adjusts the bipod.
- g. The No. 3 corrects the position of the bipod by placing the feet perpendicular to the barrel and about 25 cm from the forward edge of the baseplate.
- h. The No. 2 opens the traversing handle and centralizes the buffer carrier. He then opens the cross-levelling handle and elevates the mechanism until the traversing gear is horizontal. The No. 2 then moves to a position on the right of the mortar kneeling on his left knee facing the front. At the same time the No. 3 opens the elevating handle and elevates the elevating screw approximately 15 cm. He then moves to the vehicle and off-loads the ordered number of HE rounds plus three rounds of smoke. The No. 3 prepares and checks the rounds to



ensure that they are complete and undamaged. He then moves to a position on the right of the No. 2 and kneels on his left knee facing the front.



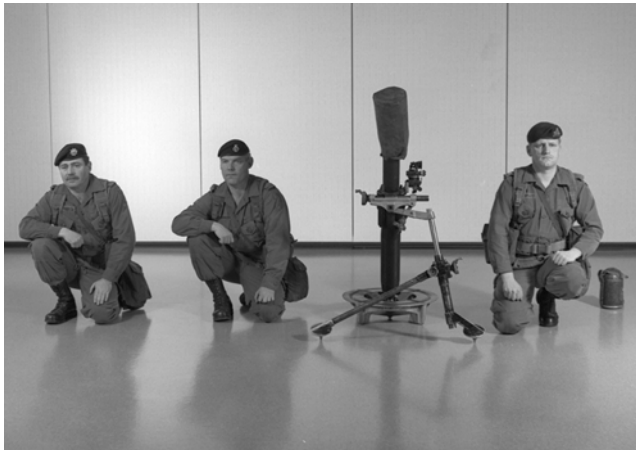
**Figure 4-2: Position of the Detachment with Mortar Mounted**

- i. Once the No. 1 sees that the mortar is mounted, he locks the sight unit onto the sight unit bracket ensuring the sight unit is as close as possible over top of the baseplate marker. He then ensures that the bearing scale is set at zero, sets an elevation of 1100 mils on the sight unit and levels the elevation and cross-levelling bubbles. He then takes up his position on the left of the mortar, kneeling on his right knee facing the front, and reports **NUMBER ... READY**. While reporting he places his left hand above the barrel.
12. Confirm by questions and practice.
13. **Cease Firing.** Have the demonstration detachment explain and demonstrate the cease fire drill. The actions of the detachment members on the order **CEASE FIRING** are as follows:
  - a. The No. 1 acknowledges the order, removes the sight unit from the sight bracket, moves one pace to the left,

places all indices at zero, places the elevation setting at 0800 mils and then places it in its case.

- b. The No. 2 grasps the traversing handle and traverses the buffer carrier to the extreme right. He then closes the traversing handle, grasps the cross-levelling handle, depresses the cross-levelling rod completely and closes the handle.
- c. At the same time the No. 3 grasps the elevating handle, depresses the elevating screw to approximately 10 cm, closes the handle, then with both hands grasps the barrel at the muzzle end.
- d. The No. 2 unlocks the barrel locking clamp, turns the barrel a quarter turn and re-locks the barrel locking handle, then with both hands grasps the lower barrel and removes the breech plug from the rebound socket.
- e. The No's 2 and 3 together lower the barrel and bipod assembly to the ground.
- f. The No. 2 secures the barrel to the plain leg by means of the retaining straps.
- g. The No. 3 moves to the right of the muzzle, faces to the rear and grasps the muzzle end in the right hand. In his left hand he will carry the spare parts box and aiming stakes. At the same time the No. 2 turns and faces the rear and grasps the breech plug in his right hand. Together, they lift the barrel/bipod assembly and move it to the rear. The mortar is then placed to the right of the baseplate, facing the direction of fire and he takes his place for the command **POSITIONS**.
- h. The No. 1 picks up the sight unit case, slings it over the right shoulder, picks up the baseplate and then moves to the rear or to the designated area. He places the baseplate down with the sight unit case on top. He then faces the direction of fire and he also takes his place for **POSITIONS**.

- i. When the No's 2 and 3 have the mortar clear, the No. 1 will after physically inspecting the area where the mortar was, report **NUMBER ... MORTAR AREA CLEAR**.
  - j. All ammunition will be reconditioned as follows:
    - (1) replace the safety pin in the fuse;
    - (2) clean and dry the ammunition;
    - (3) replace the increments on the tail fin assembly;
    - (4) replace all original packaging material; and
    - (5) place ammunition in its correct inner and outer packs.
  - k. All detachment members take up their position as previously taught. On hearing the command **STAND CLEAR**, the crew knows that the drill has been completed.
14. Confirm by questions and practice.



**Figure 4-3: Position of the Detachment on the Command REST**

15. **Conclusion:**
- a. questions to and from the class;

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- b. test on the lesson; and
- c. the instructor will carry out all safety precautions.

16. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Explain what the next lesson will be ...

## LESSON 2 AIMING AND AIMING POINTS

### INSTRUCTOR'S NOTES

1.     **Aim.** To teach the points described below:
  - a.     aiming points;
  - b.     auxiliary aiming points; and
  - c.     aiming.
  
2.     **Time Required.** Two 40-minutes periods.
  
3.     **Method.** Explanation and demonstration.
  
4.     **Stores.** The following stores and equipment are required:
  - a.     one mortar, a sight unit and baseplate flag per detachment;
  - b.     an overhead projector with a PowerPoint® equipped computer; and
  - c.     a chalkboard.
  
5.     **Preparation.** Prior to the start of the first period:
  - a.     prepare the PowerPoint® presentation and chalkboard for the first period which will include theory, selection of aiming points and method of laying and aiming;
  - b.     for the outdoor period, the mortars should be mounted and aiming points established; and
  - c.     the instructor will carry out safety precautions.

## CONDUCT OF THE LESSON

6. **Review.** Name the parts of the sight unit C2A1.
7. **Introduction.** The mortar is an indirect fire weapon; therefore, the target is not normally seen from the mortar position. Accurate fire can only be brought to bear through the use of an aiming point and through the ability of the No. 1 to lay a correct aim on that aiming point.
8. **Aiming Points.** Explain and demonstrate, the following three types of aiming points:
  - a. **Distant Aiming Point (DAP).** When speed is essential a DAP should be used. Light conditions permitting, it should be a clearly defined, easily recognised object at a minimum distance of 1000 metres from the mortar position, for example, a corner of a building, a tree, a telephone pole, a clearly defined hilltop, etc. It should be at a right angle to the line of fire and to the left of the mortar line to reduce errors in parallelism between mortars, and to minimise the chance of a barrel obstruction. By night a distant aiming point may be selected if light conditions are good or if a distant light is visible.

### NOTE

In order to obtain the record, the Group Commander will stand in the centre of the mortar line and with his prismatic compass shoot a bearing through the DAP. Once he has applied the magnetic variation to that bearing he will give it to all mortars as a record. If the situation permits, all No. 1 crew members will go to the centre of the mortar line to receive their record and obtain a good identification of the DAP.

- b. **Close Aiming Point (CAP).** A CAP can be established by either a prismatic compass or an aiming circle. Two stakes planted in line are

required, with the near stake at a minimum of 25 metres and the far stake at a minimum of 50 metres (minimum of 25 metres from each mortar) from the mortar position, depending upon prevailing conditions. They should be to the left front of the mortar line to reduce the chance of a barrel obstruction.

- c. **Auxiliary Aiming Point (AAP).** When a CAP or a DAP is in use, they must be supplemented by an auxiliary aiming point (AAP) that can be used should a barrel obstruction or poor visibility obscure the field of view between the telescope and the aiming point in use. An AAP is represented by two stakes to the left rear of the mortar and not less than 800 mils from the aiming point in use.

9. Confirm by questions.

10. **Aiming.** Because of the various types of objects that may be used as aiming points, a very distinctive point of aim must be selected to avoid errors in laying the mortar. Points of aim will normally be either a vertical edge or an apex. When laying the mortar on a point of aim, the following rules will apply:

- a. **Vertical Edges.** The vertical lines of the reticule will be placed on the vertical edge (Figure 4-4).
- b. **Apex.** The vertical lines of the reticule will be placed on top of the apex (Figure 4-5).

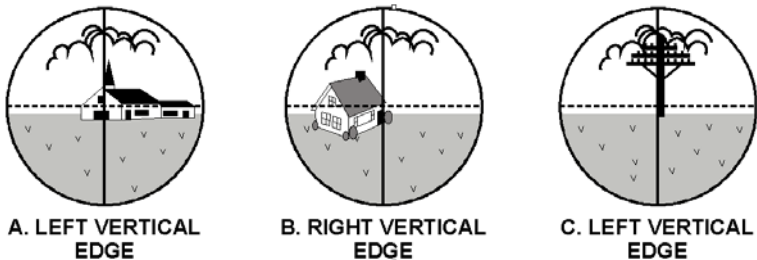
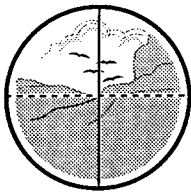
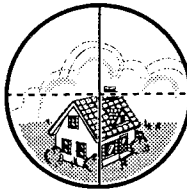


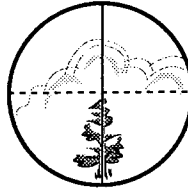
Figure 4-4: Use of Vertical Edges as Aiming Points



**A. SADDLES OR PEAKS OF HILLS**



**B. HOUSES**

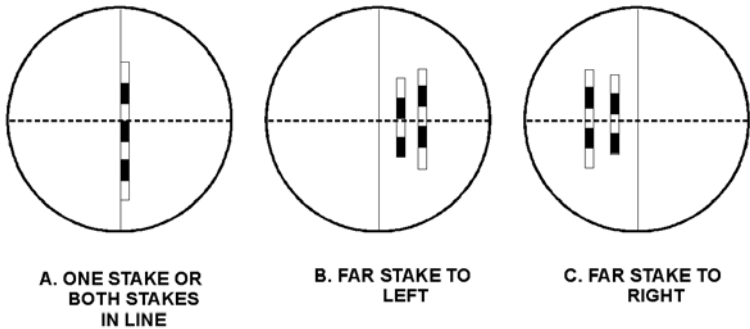


**C. TREES**

**Figure 4-5: Use of Apexes as Aiming Points**

11. **Stakes.** Explain and demonstrate:
  - a. When using one stake, the vertical line of the reticule will be laid on the lower left edge.
  - b. When two stakes are used and they appear as one, the reticule will be laid on the lower left edge (Figure 4-6A).
  - c. When two stakes are used and both appear in the sight picture, a compensated point of aim must be established. To establish a compensated point of aim, the following sequence is followed:
    - (1) lay the vertical line of the reticule on the left edge of the far stake;
    - (2) note the point on the horizontal line that touches the left edge of the near stake;
    - (3) place this point on the left edge of the far stake; and
    - (4) the distance between the vertical line of the reticule and the left edge of the far stake is equal to the far stake and the left edge of the near stake, therefore, the error in sight unit displacement has been compensated for (Figure 4-6, B-C).





**Figure 4-6: Use of Aiming Stakes as Aiming Points**

12. Confirm by questions.

13. **Aiming.** This is the process of applying a direction to the barrel through the use of the sight unit and a point of aim. To carry out this process, a set of rules for aiming must be followed. These rules are:

- a. The rules of aiming:
  - (1) place either eye onto the eyepiece and look through the telescope;
  - (2) adjust the telescope vertically to bring the aiming point into the field of view required;
  - (3) lay the vertical line of the reticule correctly on the selected point of aim; and
  - (4) when using the open sight, aim as with the rifle.
- b. To lay a correct aim:
  - (1) look through the telescope bearing in mind the rules of aiming; and
  - (2) turn the traversing hand wheel and crank until the vertical line of the reticle in the telescope is correctly aligned on the selected point of aim.

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14. Confirm by questions.
15. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor to carry out safety precautions.
16. **Summary:**
  - a. Restate the aim.
  - b. **Final Statement.** “Remember, without proper aiming, mortar fire will not be accurate.”
  - c. Your next lesson will be ...

### LESSON 3 REACTING TO FIRE ORDERS

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points on fire orders:
  - a. the sequence of fire orders; and
  - b. how to react to fire orders.
2. **Time Required.** Five 40-minute periods.
3. **Method.** Lecture/demonstration and practice.
4. **Stores.** The following stores and equipment are required:
  - a. an overhead projector and PowerPoint® slides of initial/subsequent fire orders;
  - b. one mortar, a sight unit and baseplate flag per detachment; and
  - c. a chalkboard.
5. **Preparation.** Before the start of the first period:
  - a. prepare the overhead projector, the PowerPoint® presentation and chalkboard;
  - b. for the outdoor period, mortars should be mounted and aiming points established; and
  - c. the instructor will carry out safety precautions.

#### CONDUCT OF THE LESSON

6. **Review.** Review aiming and aiming points covered in the previous lesson.

7. **Introduction.** To obtain effective mortar fire in the shortest possible time, clear and concise fire orders are vital. Fire orders are normally transmitted over a communications system, therefore, it is essential that they be given clearly, quickly and in a definite sequence. All fire orders involve the following personnel:

- a. The fire controller (FC) prepares the necessary fire order to engage a target. This information is sent to the control post operator (CPO).
- b. The CPO records the information, then acknowledges the message exactly as sent, processes the data and prepares fire orders for the line which is passed to the line NCO.
- c. The line NCO in turn relays the information to the line.
- d. The mortar numbers apply the information to the sight unit, prepare the ammunition and acknowledge the orders by reading from the sight unit, then lay the mortar for firing.

8. **Fire Orders.** There are two types of fire orders:

- a. **Initial Fire Orders.** These orders contain all the necessary fire data to bring a round or rounds on or near the target.
- b. **Subsequent Fire Orders.** These orders contain the necessary corrections to the fire data to effectively engage the target.

9. **Initial Fire Orders.** This information is given by the line NCO to all the No.1's who acknowledge the order and apply the information to the mortar for firing. Fire orders are always given in a particular sequence, and are acknowledged **exactly** as sent. This is done to ensure that orders are easily understood and that nothing is omitted.

<b>SEQUENCE</b>	<b>EXPLANATION</b>
WARNING ORDER	This identifies the size of the fire unit, for example: fire mission left section, fire mission four mortars, fire mission platoon. As soon as the No. 1 hears <b>FIRE MISSION ... MORTARS</b> he will remove the muzzle cover and place it on the ground (except in extremely inclement weather).
AMMUNITION AND FUZE	<p>This indicates the type of ammunition and may include the volume required. If a type of ammunition is not specified it is understood that HE fuzed super quick is required. The ammunition required in adjustment and in fire for effect is specified by the shell or fuze:</p> <ul style="list-style-type: none"> <li>a. Shell: "HE", "Illuminating" or "Smoke".</li> <li>b. Fuze: "Super Quick", "Prox" "Time" or "Delay". If the type of ammunition required for "In Adjustment" and for "Fire for Effect" is different, then <b>IN ADJUST</b> or <b>IN EFFECT</b> will be used: <ul style="list-style-type: none"> <li>(1) <b>DELAY FIVE ROUNDS.</b> HE delay is fired during Adjustment and in Fire for Effect.</li> <li>(2) <b>PROX IN EFFECT FIVE ROUNDS.</b> Here "In Effect" denotes two types of fuzes, HE fuzed super quick In Adjust and five rounds with proximity fuze in Fire for Effect.</li> <li>(3) <b>SMK IN ADJUST FIVE ROUNDS.</b> Smoke is used In Adjust and HE fuzed super quick in Fire for Effect.</li> </ul> </li> </ul>
CHARGE	<p>The charge is always given in the initial order. It denotes the number of increments, which are to remain on the round. The charge given in the initial order is for the first round that is to be fired, that is:</p> <ul style="list-style-type: none"> <li>a. <b>FIRE MISSION—FOUR MORTARS, FIVE ROUNDS, CHARGE FOUR.</b> Charge four will be applied to HE fuzed super quick,</li> </ul>

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SEQUENCE	EXPLANATION
	b. <b>FIRE MISSION—TWO MORTARS, SMK IN ADJUST, PROX IN EFFECT, 10 ROUNDS, CHARGE FIVE.</b> Charge five will be applied to the smoke rounds. If the charge does not change for the In Effect ammunition it will not be restated. If, however, the charge changes for the In Effect ammunition it will be stated in a subsequent fire order.
'PAUSE	To allow time for all the No. 1s to acknowledge and avoid repetitions by the Line NCO.
BEARING	The bearing will be determined by the CPO and this is the bearing to be placed on the sight unit, for example: <b>BEARING 0075, BEARING 1550.</b>
ELEVATION	The elevation will be determined by the CPO and this is the elevation to be placed on the sight unit, for example: <b>ELEVATION 1135.</b>
COMMAND TO FIRE	Determined by the ordered number of rounds and method of fire, for example:  a. <b>FIRE FOR EFFECT.</b>  b. <b>3 ROUNDS FIRE FOR EFFECT.</b>  c. <b>ADJUST FIRE.</b> If a mortar is not designated by the FC, the CPO could designate one.  d. <b>AT MY COMMAND.</b> It is normally initiated by the FC, however, the CPO may use <b>AT MY COMMAND</b> if he feels it is necessary for example for safety. Example: <b>AT MY COMMAND THREE ROUNDS FIRE FOR EFFECT.</b>  e. <b>TWO ROUNDS BEDDING-IN FIRE.</b>

10. The following are some common abbreviations used and their meaning.

10 R	10 rounds
ADJ	adjust
AF	adjust fire
AMC	at my command
B	bearing
CHG	charge
E	elevation
FFE	fire for effect
FM	FIRE MISSION
FZ	fuze
IE	in effect
ILL	illuminating rounds
MOR	mortar
PROX	proximity fuze
R	rate
REC	record
RFFE	rapid fire for effect

11. The following are four examples of fire orders written with abbreviations:

FM 2 MOR	FM 4 MOR
10 R	SMK IE 5 R
CHG 2	CHG 3
PAUSE	PAUSE
B 3250	B 1145

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E 1145	E 0995
RFFE	4 AF
FM PL	FM 4 MOR
ILL 5 R	SMK IN ADJ
FZ 21.5	PROX IE 5 R
CHG 3	CHG 6
PAUSE	PAUSE
B 1540	B 6130
E 1075	E 0925
1 AF	2 AF

12. Confirm by questions and practice.

13. **Subsequent Fire Orders.** Subsequent Fire Orders originate with the FC and are converted by the CPO. Only those parts of the order that have changed from the initial order are given, normally only bearing, elevation, and the command to fire. However, other changes may be necessary, for example fuze setting, or the charge and the changes would be given in the normal sequence. By convention, any portion that is not mentioned remains as in the initial order. The No. 1 will acknowledge in the usual manner.

14. **Reports.** The following reports are used:

- a. **NUMBER .. ON.** This report is given by the No. 1 after he has received a fire order from the CPO. This report signifies to the No's 2 and 3 also to the line NCO that his mortar is laid as ordered and ready to fire. The sequence is:



- (1) The No. 1 will acknowledge the fire order as previously taught.
- (2) The No. 1 will then lay the mortar.
- (3) The No. 3 who has prepared the ordered number of rounds will pass a round to the No. 2 who will quickly check the preparation of the round paying particular attention to see if the charge is correct, the safety pin has been removed and the fuze setting is correct.

15. **Bedding In.** On firing the first rounds, when the No. 1 reports **ON**, the following precautions will apply:

- a. The No. 1 will remove the sight unit, turn to the rear, look away to the right side, place his left foot on the baseplate and his left hand on the barrel cooling fins.
- b. The No. 2 will place his right foot on the baseplate and insert the tail of the round into the muzzle.
- c. On the order to fire from the line NCO, the No. 2 will drop the round, and on the follow through his hand will move under the barrel. He will place his right hand on the cooling fins just above the No. 1's hand, and he will look away to ensure debris kicked up from the ground does not impair his vision.
- d. The same procedure will be carried out until the baseplate is firmly seated in the ground. This normally takes two rounds, but may take more depending on the type of terrain.

**NOTE**

The removal of the sight unit is mandatory to ensure that it does not become damaged. Once the baseplate is firmly bedded-in, this drill is no longer required.

16. **One Round Fire for Effect.** In the event that the FC wishes to ensure that the belt(s) of fire effectively covers the target area, after adjusting, he may order **ONE ROUND FIRE FOR EFFECT**. To do this all mortars should be fired in SALVO employing the following procedure:

- a. the No. 1 will acknowledge;
- b. the mortars will be laid;
- c. the No. 1 will report **ON**, to the Line NCO; and
- d. when the Line NCO sees that all detachments are ready he will order **STANDBY, FIRE**.

17. **Fire for Effect.** This is the method of fire most commonly used by the FC as it ensures a good volume of well aimed effective fire on the target. The line NCO will give the command to fire as **FIRE FOR EFFECT**. Remember, the number of rounds has already been given in the initial order. The procedure shall be as follows:

- a. the No. 1 will acknowledge as previously taught;
- b. the No. 1 will check the lay of the mortar, laying it if necessary;
- c. if more than three rounds are required, the No. 3 will report **AMMUNITION READY** when they are prepared;
- d. the No. 1 will acknowledge **AMMUNITION READY**;
- e. the No. 1 will report **ON**;

- f. the No. 2 will count each round;
- g. the lay of the mortar will be checked between each round;
- h. mortars will not fire in rotation but will fire individually as soon as they are ready; and
- i. on completion of all rounds being fired, the No. 1 will report to the Line NCO his detachment number and **ROUNDS COMPLETE**.

18. **Rounds Rapid Fire for Effect.** This method of fire is ordered by the FC when a heavy volume of fire is required on a target under emergency conditions. This method is usually of short duration due to the limitations of available ammunition. The CPO will give the command to fire as **NUMBER ... ROUNDS RAPID, FIRE FOR EFFECT**; the procedure shall be as follows:

- a. The No. 1 will acknowledge as previously taught.
- b. The No. 1 will check the lay of the mortar, laying it if necessary.
- c. The No. 3 will report **AMMUNITION READY**, once the required number of rounds is prepared.
- d. The No. 1 reports **ON**.
- e. The No. 2 will place the rounds in the barrel as quickly as possible shouting out the number of each round fired.
- f. The No. 1 will relay after every five rounds. He will check the elevation bubble as the rounds are being fired and will adjust the elevation crank as necessary.
- g. When all rounds have been fired, the No. 1 will report to the Line NCO **NUMBER ... ROUNDS COMPLETE**.

19. Confirm by questions and practice.

20. **Fire Orders Misunderstood.** If during the passage of fire orders, the No. 1 is in doubt, he will ask for clarification by using one of the following terms:

- a. **CHECK.** If he has missed part of the fire order, he can ask for example:
  - (1) **CHECK CHARGE;**
  - (2) **CHECK BEARING;**
  - (3) **CHECK ELEVATION;** or
  - (4) **CHECK NUMBER OF ROUNDS.**
  
- b. **AGAIN.** Used if he has missed the order completely. This tells the originator that he must send the complete order again.
  
- c. **WRONG.** The order **WRONG**, is used by the originator of an order when that order has been incorrectly acknowledged. Since **WRONG** is an order in itself, it must be acknowledged before the correction is given, for example:
  - (1) Line NCO to the No. 1: **FM 2 MOR 2 Rds CHG 3.**
  - (2) The No. 1 to Line NCO: **FM 2 MOR 2 Rds CHG 2.**
  - (3) Line NCO to No. 1: **WRONG/CHG 3.**
  - (4) The No. 1 To Line NCO: **WRONG/CHG 3.**

21. **Action by Mortar Numbers.** The speedy application of all fire orders by the mortar numbers is a vital part of all fire discipline, therefore, all mortar numbers must:

- a. think of what is required;

- b. acknowledge the order in the correct sequence; and
- c. orders must be carried out accurately and quickly.

22. **Miscellaneous Orders and Reports.** Explain each order below:

- a. **REPEAT.** This order is used by the FC to the CPO and is an order to fire the previous fire mission again. Fire data and the method of fire will remain the same. The CPO **will not** use the word **REPEAT** to the mortar line, but will order instead the last method of fire and the mortar numbers will carry on in the usual manner.
- b. **IN ADJUST.** This order is used in the preparation of the type and amount of ammunition and fuze to be used in adjustment.
- c. **ADJUST.** This order is used to correct fire onto a target. The CPO will fire one or more rounds at the designated bearing and range. It is given to the mortar line as fire data.
- d. **CHECK FIRING.** This means to stop firing immediately. All actions on the mortars with the exception of firing shall continue in accordance with orders received. Check firing is cancelled by the report **CANCEL CHECK FIRING** given by the originator.
- e. **CANCEL.** The order CANCEL prefixing any order cancels that order, for example, **CANCEL CONVERGE, CANCEL LEFT 100, CANCEL AT MY COMMAND.**
- f. **AT MY COMMAND.** Is an order given by an observer who requires to control the execution of fire from a fire unit while completing his activities for a **FIRE MISSION.** The fire unit must then report **READY** and wait for further orders from the observer.

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- g. **REST.** This means that the fire mission is temporarily suspended for the mortars or fire units in question and the mortar detachments may rest at their position in action.
- h. **STAND CLEAR.** This may be given by the FC or CPO at the completion of a fire mission, or when time permits, the mortar numbers will move away from their mortars, and is cancelled by the command **POSITIONS.**

23. Confirm by questions and practice.

24. **Conclusion:**

- a. questions to and from the class; and
- b. test on the lesson; and
- c. the instructor will carry out safety precautions.

25. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Detail what the next lesson will be ...

## LESSON 4 LAYING FOR BEARING AND ELEVATION

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points on laying the 81 mm mortar:
  - a. laying for bearing, small corrections;
  - b. laying for elevation, small corrections;
  - c. laying for bearing, large corrections;
  - d. laying for elevation, large corrections; and
  - e. establishing safety arcs.
2. **Time Required.** Six 40-minute periods.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** One mortar, a sight unit and baseplate flag per detachment are required.
5. **Preparation.** During the periods the students will acknowledge all orders. Prior to the start of the first period:
  - a. the mortars should be mounted and aiming points selected; and
  - b. the instructor will carry out the required safety precautions.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedure for laying the mortar.

7. **Introduction.** It is essential that every member of a detachment be able to set a bearing and elevation properly on a sight unit and lay on a point of aim to produce effective fire.

8. **Laying for Bearing, Small Corrections.** Bearings are indicated on the bearing coarse and fine scale rings and read against the bearing coarse and fine scale indices. The traversing mechanism on the bipod allows lateral movement of the mortar, approximately 50 mils either side of its central position. During the laying of the mortar the cross-levelling bubble must be maintained in a central position. With the sight unit on the mortar, order a new bearing not to exceed 50 mils (small correction for bearing) from the previous bearing, then explain and demonstrate the actions of the No. 1, who will:

- a. place the ordered bearing on the sight unit;
- b. acknowledge the order (reading from the sight unit);
- c. centralize the cross-levelling bubble using the cross-levelling mechanism;
- d. look through the telescope and note the position of the aiming point in the field of view;
- e. if the aiming point is in the field of view, rapidly turn the traversing hand wheel and crank until the vertical line of the reticle is halfway to the selected point of aim;
- f. centralize the cross-levelling bubble; and
- g. carry out the procedure of traversing and adjusting the cross-levelling bubble until the vertical line of the reticle is on the selected point of aim and the cross-levelling bubble is central.



**NOTE**

Any movement of the cross-levelling bubble will necessitate a check on the point of aim and vice versa until both are correct and no further movement is required.

9. Confirm by questions and practice.

10. **Laying for Elevation, Small Corrections.** Elevations are indicated on the elevation coarse scale and fine scale ring, and read against the elevation coarse and fine scale indices. The elevating mechanism on the bipod allows vertical movement of the mortar. In order for mortar fire to hit the target the elevation applied to the barrel must coincide with that placed on the sight unit. During the laying of the mortar the elevation bubble must be maintained in a central position. With the sight unit on the mortar, order a new elevation not to exceed 200 mils (small correction for elevation) from the previous elevation, then explain and demonstrate the actions of the No. 1, who will:

- a. place the ordered elevation on the sight unit;
- b. acknowledge the order (reading from the sight unit); and
- c. glancing at the elevation bubble, rapidly turn the elevating crank until the bubble is centralized.

11. Confirm by questions and practice.

12. **Laying for Bearing, Large Corrections.** Frequently, corrections for bearing will be ordered that will require movement of the bipod, which is necessary because of the limited traverse permitted in the traversing mechanism. With the sight unit on the mortar, order a new bearing to exceed 50 mils (large correction for bearing) from the previous bearing, then explain and demonstrate the following actions to be taken:

- a. Place the ordered bearing on the sight unit.
- b. Acknowledge the order (reading from the sight unit).

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- c. Centralize the cross-levelling bubble using the cross-levelling mechanism.
- d. Look through the telescope and note the position of the aiming point in the field of view.
- e. If the aiming point is not in the field of view, the No. 1 must carry out the following additional procedures:
  - (1) Centralize the carrier and expose approximately 18 cm of the elevating screw.
  - (2) Order **BIPOD 2**.
  - (3) The No.'s 1 and 2 grasp the bipod legs and either the No. 1, or No. 2, if necessary, looking through the open sight on the telescope, directs the lateral movement of the bipod by ordering **TO ME, TO YOU** as the case may be.
  - (4) Together, they move the bipod until the No. 1 observes that he is almost on the selected aiming point. He then orders **STEADY**.
  - (5) On this command, the movement of the bipod ceases and the No. 1 will move the left leg of the bipod in or out until the cross-levelling bubble changes position. He then orders **STAMP IN**, on this command, both numbers stamp in the feet of the bipod with their outside foot.
  - (6) The No. 1 now lays the mortar for bearing as taught previously.

13. Confirm by questions and practice.

14. **Laying for Elevation, Large Corrections.** It will happen that corrections ordered for elevation will require movement of the

bipod. With the sight unit on the mortar, order a new elevation that cannot be obtained with the bipod in its present position (large correction for elevation), then explain and demonstrate the actions of the No. 1, who will:

- a. Place the ordered elevation on the sight unit.
- b. Acknowledge the order (ready from the sight unit).
- c. Centralize the carrier and expose approximately 18 cm of the elevating screw.
- d. Order **BIPOD 2**.
- e. With the No. 2, grasp the barrel with one hand and the bipod legs with the other.
- f. Order **IN** or **OUT** whichever is applicable, until he observes that the elevation bubble starts to move and the telescope is pointing near the selected point of aim.
- g. Then order **STAMP IN**. On this command both numbers stamp in the feet of the bipod with their outside foot.
- h. Then lay the mortar for elevation as taught previously.

15. Confirm by questions and practice.

16. **Establishing Safety Arcs.** Each detachment will at times, have to establish safety arcs. Safety arcs are set out to ensure that rounds do not fall outside of a given safety zone. During live fire practices arcs will be established because of range restrictions. In wartime situation they may be established to ensure that all mortar fire will be conducted only in battalion or company allotted areas. There are two safety flags per detachment; one red and one green. To eliminate confusion with other detachment flags, when looking through the telescope the red safety flag will be planted **RIGHT** front and the green safety flag **LEFT** front. It is the responsibility of the Group Commander to designate the safety arcs for each detachment.

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Each detachment will establish their safety flags using the sight unit as follows:

- a. the No. 1 will place one of the arc bearings on his sight unit and lay the mortar;
- b. once the mortar has been laid he will then, without disturbing the lay, align all bearing indices on the sight unit;
- c. the safety flag will be planted by the No. 3 as taught, approximately 3 metres to the front; and
- d. after this side of the safety arc is established the same procedure will be carried out for the other side.

17. Confirm by questions and practice.

18. **Conclusion:**

- a. questions to and from the class;
- b. test on the lesson; and
- c. the instructor will carry out safety precautions.

19. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...

## **LESSON 5 LAYING THE MORTAR**

### **INSTRUCTOR'S NOTES**

1. **Aim.** To teach the laying of the mortar and the command **BIPOD 2**.
2. **Time Required.** Six 40-minute periods.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** The following stores and training support is required:
  - a. one mortar, a sight unit and baseplate flag per detachment; and
  - b. one demonstration detachment.
5. **Preparation.** A suggested method for teaching is to demonstrate, talk through and practice as much as possible. Prior to the start of the first period:
  - a. the mortars should be mounted and aiming points selected;
  - b. the instructor will carry out the required safety precautions.

### **CONDUCT OF THE LESSON**

6. **Review.** Review the establishing and recording of aiming points.
7. **Introduction.** At any time during operations the mortar numbers may be called upon to lay the mortar. The laying is done by the No. 1 occasionally assisted by the No. 2. The procedure for laying must become instinctive to all and speed coupled with accuracy is essential, or the resulting fire will not be effective.

8. **Laying the Mortar.** In laying the mortar the procedure is to elevate, roughly align, traverse, and cross-level until all bubbles are level and the sight picture is on the selected point of aim. Having issued an order, explain and demonstrate the actions of No. 1, who will:

- a. place the ordered bearing and elevation on the sight unit;
- b. acknowledge the order (reading from the sight unit);
- c. if movement of the bipod is required, carry out the actions previously taught—move for bearing, then for elevation and finally roughly adjust the cross-levelling bubble using the left leg of the bipod;
- d. centralize the elevating bubble using the elevating crank;
- e. centralize the cross-levelling bubble using the cross-levelling mechanism;
- f. traverse until the vertical line of the telescope is half-way to the selected point of aim;
- g. adjust the cross-levelling bubble;
- h. carry out the procedure in subparagraphs f. and g. until the vertical line of the telescope is on the selected point of aim and the cross-levelling bubble is central;
- i. check the elevation bubble and correct if necessary; and
- j. finally, check and ensure that all bubbles are central and the aim is correct.

9. Confirm by questions and practice.

10. **Command BIPOD 2.** With the sight unit on the mortar, order a new bearing to exceed 50 mils (large correction for bearing)

from the previous bearing, then explain and demonstrate the following action to be taken by the No. 1:

- a. Place the ordered bearing on the sight unit.
- b. Acknowledge the order (reading from the sight unit).
- c. Centralize the cross-levelling bubble using the cross-levelling mechanism.
- d. Look through the telescope and note the position of the aiming point in the field of view.
- e. If the aiming point is not in the field of view, carry out the following additional procedures:
  - (1) Centralize the carrier and expose approximately 18 cm of the elevating screw.
  - (2) Order **BIPOD 2**.
  - (3) The No.'s 1 and 2 grasp the bipod legs and either the No. 1, or No. 2, if necessary, looking through the open sight on the telescope, directs the lateral movement of the bipod by ordering **TO ME, TO YOU** as the case may be.
  - (4) Together, they move the bipod until the No. 1 observes that he is almost on the selected point of aim. He then orders **STEADY**.
  - (5) On this command, the movement of the bipod ceases and the No. 1 will move the left leg of the bipod in or out until the cross-levelling bubble changes position. He then orders **STAMP IN**, on this command, both numbers stamp in the feet of the bipod with their outside foot.
  - (6) The No. 1 now lays the mortar for bearing as taught previously.

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11. Confirm by questions and practice.
12. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor to carry out safety precautions.
13. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...



## LESSON 6 ESTABLISHING AND RECORDING AIMING POINTS

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following on aiming points:
  - a. establishing aiming points; and
  - b. recording aiming points.
2. **Time Required.** Four 40-minute periods.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** The following stores and equipment are required:
  - a. one mortar, a sight unit and baseplate flag per detachment;
  - b. an aiming circle; and
  - c. a prismatic compass.
5. **Preparation.** Prior to the start of the first period:
  - a. the mortars should be mounted and aiming points selected; and
  - b. the instructor will carry out the required safety precautions.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedures for bringing mortars in and out of action.
7. **Introduction.** The mortar is an indirect fire weapon, which means it must establish an artificial or natural aiming point, which is

not the target. A prismatic compass or aiming circle is used to orient the mortar so that bearings placed on the sight unit will be the grid bearing of the mortar barrel, once properly laid on the aiming point.

**8. Establishing and Recording Aiming Points:**

**a. Action of the Group Commander:**

- (1) when the group is ordered into action, it will be the Group Commander's responsibility to establish an aiming point and ensure each mortar is recorded for its respective aiming point;
- (2) when the No. 1's are ordered to record this aiming point, the order will contain the following information:
  - (a) type of aiming point;
  - (b) description of the aiming point including the selected point of aim; and
  - (c) the RECORD in mils (grid bearing).

**b. Action of the No. 1s.** On receipt of the Group Commander's indication of the aiming point, the No. 1s shall:

- (1) acknowledge the order and identify the aiming point;
- (2) write all pertinent information on the "Record of Aiming Points Card" (see Figure 4-7);
- (3) refer to this "Record of Aiming Points Card" when using a particular aiming point to set the record on his sight unit; and

- (4) erase all records when **CEASE FIRING** is ordered.

<b>RECORD OF AIMING POINTS</b>		
<b>Type</b>	<b>Description</b>	<b>Record</b>
DAP (Distant)	Left, brown house left edge	2175
CAP (Close)	Left, near and far stake, left edge	1600
AAP (Auxiliary)	Two black and white stakes	0600

**Figure 4-7: Record of Aiming Points Card**

#### **NOTE**

1. It will be necessary on occasion to change aiming points and therefore the record on the sight unit must be changed.
2. If for any reason the bearing coarse scale clamp or butterfly nut becomes loose and the scales slip; the record must be reset on the sight unit by the No. 1. He must then refer to his "Record of Aiming Points Card" and follow the procedure outlined above.

9. Confirm by questions and practice.
10. **Establishing and Recording a Close Aiming Point (CAP).**  
To establish and record the CAPs, the same basic procedures as outlined in paragraph 8 will apply. However, in addition, the following actions shall be carried out by the No. 1:
  - a. He shall ensure the record is correctly applied to the C2 sight unit.
  - b. Chose an area that offers a field of view clear of obstacles at a minimum distance of 50 metres.
  - c. Use the quick release gear, rotate the head of the telescope until the indicated aiming point can be viewed through the telescope and the vertical line in

the telescope is aimed at left edge of the aiming point.

- d. Order **STAKE 3**. The No. 3 with an intermediate stake moves half way to the aiming point and on the order **PLANT**, he positions the stake in such a manner so that left edge is in line with the vertical line of the telescope and left edge of the aiming point.
- e. Direct the No. 3 to advance 25 metres towards the mortar and plant the near stake in such a manner so that its left edge is in line with the vertical line of the telescope and the left edge of the far stake.
- f. Order **IN 3**, to direct the No. 3 to return to the mortar.
- g. Unlock and slip the bearing coarse and fine scale rings, until the noted bearing is read against both bearing indices, lock both scales (the reading now opposite the coarse and fine scale record indices is the record for the CAP).
- h. Report **CAP ESTABLISHED AND RECORDED AT....**

11. **Establishing and Recording an Auxiliary Aiming Point (AAP)**. On command **ESTABLISH AAP** or when time permits, the No. 1 shall:

- a. Select an area that provides an unobstructed field of view for a minimum distance of 50 metres, and at a minimum angle of approximately 800 mils from the aiming point being used.
- b. Check the lay of his mortar on the initial aiming point and write down his barrel bearing, for example 6300 mils.
- c. Use the quick release gear, rotate the telescope until the selected area can be viewed.

- d. Order **STAKE 3** and plant two stakes in the selected area, by carrying out the proper procedure for planting stakes (see paragraph 10).
- e. Checking his mortar to ensure that no movement has taken place, he will unlock and slip both the bearing coarse and fine scale rings (using the same procedure as for putting on a record) until the noted bearing (6300) is read against the bearing indices, then lock the scales.
- f. Realign the fine bearing index and note the reading now against both the coarse and fine scale record indices (this reading is the **RECORD** of the AAP).
- g. Record the AAP on the “Record of Aiming Point Card” as previously taught.
- h. Unlock and slip the coarse and fine scale rings until the record of the initial aiming point is read against the record indices, lock the scales.
- i. Rotate the telescope back to his initial aiming point (the reading opposite the bearing indices will be 6300 mils).
- j. Report **AAP RECORDED** to the Line NCO.

**NOTE**

If two stakes are not available, then one stake will be used with an object (tree, vehicle, etc.) to replace the far stake.

12. Confirm by questions and practice.
13. **Conclusion:**
  - a. questions to and from the class;

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- b. test students on the lesson; and
- c. the instructor will carry out safety precautions.

14. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...

## LESSON 7 MISFIRE DRILLS

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the remedy for misfires.
2. **Time Required.** Four 40-minute periods.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** The following equipment is required:
  - a. one mortar, a sight unit and baseplate flag per detachment; and
  - b. training rounds.
5. **Preparation.** A demonstration could be done by a demonstration detachment if one is available. Prior to the first period:
  - a. have a suitable area prepared; and
  - b. the instructor will carry out the required safety precautions.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedures for laying the mortars and selecting aiming points.
7. **Introduction.** A misfire occurs when a round is loaded into the barrel and fails to fire. In order to return the mortar to action with the minimum delay and maximum safety, the mortar detachment must be thoroughly familiar with the drill for remedying the misfire.
8. **Reason of a Misfire.** A misfire may occur for the following reasons:

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- a. faulty primer;
- b. fouling in the barrel; it will normally cause rounds to be hung in the barrel;
- c. faulty obturating ring; it will normally either cause rounds to hang or get stuck in the barrel;
- d. excessive oil and dirt in the barrel or on the round; it will normally cause rounds to hang and get stuck in the barrel; and
- e. broken firing pin.

9. **Misfire Drill.** If a round is dropped down the barrel, and fails to fire, the No. 1 shall immediately shout **NO. ... MISFIRE**, and carry out the applicable drill/procedures described in the following paragraphs.

10. **Round Hung in the Barrel.** Occasionally, for different reasons, a round will become hung in the barrel. The mortar detachment shall then take the following action:

- a. the No. 1 will shout, **NO. ... MORTAR, MISFIRE**, grasp the sight unit slot with his left hand and reach under the barrel and grasp the traversing hand wheel with his right hand (Figure 4-8);
- b. he will then shake the barrel sharply from front to rear;
- c. the No.'s 2 and 3 will carry out their normal duties; and
- d. should this action cause the round to fire the No. 1 shall:
  - (1) report **NO. ... MORTAR, ROUND FIRED OFF LINE**;
  - (2) relay the mortar;



- (3) fire another round to replace the one fired off line; and
- (4) carry out the remainder of the fire order.

11. **Faulty Primer.** If after carrying out the procedures as in the previous paragraph, the round fails to fire the following procedure is carried out:

- a. The No. 1 retains his hold on the bipod for **one minute** and shakes the barrel sharply again. It is necessary to wait **one minute** as the increments may ignite within that time if the barrel is hot.
- b. If this does not cause the round to fire he will shout **UNLOAD MISFIRE**. On the command the following actions occur:
  - (1) The No. 1 depresses the elevation completely. The No. 2 stands and faces the barrel, **ensuring that his body is kept well clear of the muzzle**. He then places his right leg just forward of the plain leg to steady the bipod. He places his right hand under the muzzle to support the barrel, and his left hand on the barrel locking clamp.
  - (2) The No. 3 will remove the firing pin and stand to the rear of the No. 1, left of the baseplate and face the barrel. When the No. 3 is in position, the No. 2 unlocks the barrel clamp. At the same time the No. 3 grasps the base of the barrel, left hand under, right hand over and gives the barrel a quarter turn either way, ensuring that the flat portions of the breech plug are aligned with those of the rebound socket. The No. 2 then re-locks the barrel clamp.
  - (3) The No. 3 seeing that the No. 2 has both hands grasping the barrel will raise the

breech end with one continuous motion until the barrel is horizontal.

- (4) Once the barrel has reached the horizontal position, the No. 2 will extend his hands over the muzzle to decrease the size of the barrel opening and catch the round as it slides out. The barrel is raised and gently shaken by the No. 3 until this occurs.
- (5) The No. 2 will look for fouling dropping out of the barrel. He will check the primer and if it has been struck he will report **FAULTY PRIMER** and place the round clear of the mortar position in a misfire pit for later return to the issuing ammunition facility. The No. 3 will shake the barrel to dislodge any further fouling that may remain.



**Figure 4-8: Position of Detachment on the Command UNLOAD MISFIRE**



**Figure 4-9: Position of the Hands of No. 1, No. 2 and No. 3**

- (6) The mortar is now reassembled, re-laid, and fired in accordance with the fire order. A round is fired to replace the one removed from the barrel.

**NOTE**

1. Rounds will **NOT** be unloaded from a HOT barrel. Water or snow can be used to cool the barrel prior to the 1 minute being started.
2. Under no circumstances will a round, that has had the primer struck, be reloaded.
3. Under no circumstances will a barrel that was raised to the horizontal position be lower down with the round still in it.

12. Confirm by questions and practice.

13. **Fouled barrel.** If upon checking the round after its removal from the barrel the No. 2 observes that the primer has not been struck and fouling has fallen clear of the barrel, he will report **PRIMER CORRECT, FOULING CLEAR**. The mortar is then reassembled, swabbed, relayed and the same round is fired in accordance with the fire order. However, if the No. 2 does not observe fouling falling clear of the barrel he will report **PRIMER CORRECT, FOULING IN THE BARREL**. The No. 3 will then shake the barrel to dislodge the fouling. If fouling does not drop clear, the No. 2 will clean the barrel. The mortar is then reassembled, re-laid, and the same round fire in accordance with the fire order.



**Figure 4-10: Position of the Detachment with the Barrel Raised**

14. **Faulty Obturating Ring.** If the primer has not been struck but the obturating ring is misplaced, the No. 2 will report **FAULTY OBTURATING RING**. The No. 2 will re-seat the ring in its proper place and fire that round providing the ring has not been damaged.

#### **NOTE**

If the ring has been damaged it will be removed. The round can then be fired, but with a loss in range (the No. 1 must inform the Line NCO of this before this action is taken).

15. **Round Stuck in the Barrel.** If the procedures above are carried out and the round does not slide clear of the barrel, the following procedures will apply:

- a. The No. 1 will report **ROUND STUCK IN THE BARREL**. Keep the barrel in the horizontal position. The No. 2 seeing that the No. 3 has both

hands grasping the barrel will place his right hand under the muzzle to support the barrel and his left hand on the barrel locking handle. The No. 1 will remove the sight unit and hold the bipod securely. The No. 2 unlocks the barrel clamp. The No. 1 supports the bipod, at the same time the No. 2 and 3 will remove the barrel, ensuring it remains horizontal and move it clear of the mortar position. They then gently lay the barrel horizontally on the ground with the muzzle, pointed in the direction of the target area. Once the barrel has been removed, the No. 1 will lay the bipod on the ground.

- b. After the procedure in sub-paragraph a. has been carried out, the following procedure will apply:
- (1) With the assistance of the No. 2 and 3, the breech plug is removed.
  - (2) The No. 1 will ensure the mortar tube is held in a secure horizontal position. At the same time the No. 3 will ensure the handle of the Tool, Removing, Jammed Round is screwed fully against the brass bearing and insert it into the tube at the base plug end. The No. 3 will screw the handle clockwise until fully home.
  - (3) Using a 1-inch socket and suitable speed wrench, T-handle, etc. the No. 3 will screw the threaded portion of the Tool, Removing, Jammed Round clockwise until the obturating ring of the mortar round appears at the muzzle end of the tube.
  - (4) The No. 2 will catch and remove the round from the barrel and will look for the following:
    - (a) Check the primer and if it has been struck will report **FAULTY**

**PRIMER** and place the round in the misfire pit.

- (b) If upon checking the round after its removal from the barrel the No. 2 observes that the primer has not been struck and the obturating ring is seated correctly he will report **PRIMER CORRECT, OBTURATING RING CORRECT** and place the round clear of the mortar position for later firing.
- (c) If the primer has not been struck but the obturator ring is misplaced, the No. 2 will report **FAULTY OBTURATING RING**. The No. 2 will re-seat the ring in its proper place and place that round clear of the mortar position for later firing providing the ring has not been damaged.
- (5) The No. 3 will remove the Tool, Removing, Jammed Round from the mortar barrel.
- (6) The No. 2 will visually inspect the barrel for any obvious dents, bulges, deformities, or fouling which may have caused the stuck round. If fouling of the tube is suspected, the No. 2 will clean the barrel. The mortar is then re-assembled, re-laid and the same round fired in accordance with the fire order.
- (7) Barrels failing the above inspection criteria will be returned to a Weapons Technician for further examination/or repair.

### NOTES

1. If after having followed the current misfire drill, a round of US origin remains stuck in the barrel, extreme care must be taken during unloading, as it has been positively established that a dislodged round, falling on the Breech Plug (even without the Firing Pin), will fire.

2. The breech type Tool, Removing, Jammed Round **can** be used safely with US ammunition.

3. The barrel should be tilted forward until the base is higher than the muzzle. An attempt to remove the stuck round by shaking should be made. If this attempt fails, the first part of the hung round procedure will be carried out.

4. The barrel should be unclamped from the mount and carried, muzzle low, to a safe position, and placed horizontally on the ground with the muzzle, pointed in the direction of the target area. Once the barrel has been moved the procedure for removing a stuck round will be followed as described previously.

16. Confirm by questions and practice.

17. **Conclusion:**

- a. questions to and from the class;
- b. test on the lesson; and
- c. the instructor will carry out safety precautions.

18. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...



## LESSON 8 ADJUSTING AN ERRING MORTAR

### INSTRUCTOR'S NOTES

1. **Aim.** To teach how to adjust an erring mortar.
2. **Time Required.** Two 40-minute period.
3. **Method.** A basic instructional period.
4. **Stores.** One mortar, a sight unit and baseplate flag per detachment are required.
5. **Preparation.** Prior to the first period:
  - a. have suitable area prepared; and
  - b. the instructor will carry out the required safety precautions.

### CONDUCT OF THE LESSON

6. **Review.** Review fire orders and laying the mortar.
7. **Introduction.** Occasionally, during firing, the lines of fire may become crossed or spread out, that is not parallel. The lines of fire for mortars must be parallel to produce effective fire. When the fire controller (FC) sees that the line of fire of a given mortar is not parallel he could give the erring mortar an individual correction to bring its fire into the proper position in the belt of fire. This would then mean that the erring mortar would have different sight readings than the correct mortars, which obviously is not desirable. If the error is for bearing then it can be adjusted so that all mortars will have the same reading and their line of fire will be parallel. This error is normally due to sight inaccuracies and can be corrected for line by expedient means. However, mortars erring for range must be reboresighted for elevation as soon as possible.

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8. **Adjusting an Erring Mortar.** When the FC wishes to adjust the line of fire of the erring mortar, having given that mortar an individual correction, he will give the order **ADJUST LINE OF FIRE**. On receiving this order the control post operator (CPO) will order **ADJUST LINE OF FIRE AT BEARING ...** (the bearing originally issued to the erred mortar). On this command the No. 1 shall proceed as follows:

- a. Check the lay of the mortar and make any corrections necessary.
- b. If his sight unit does not read the bearing ordered he will, without changing the lay of the mortar, unlock, slip the coarse and fine bearing scales to the initial/ordered bearing against the bearing indices, and lock the scales. This procedure will change the record, set on the sight unit, by an amount equal to the difference between the initial/ordered bearing and the previous bearing. For example if the previous bearing is less than the initial/ordered bearing the record will be correspondingly greater; and if the initial/ordered bearing is greater the record will be correspondingly less.

**EXAMPLE:**

Initial/ordered bearing 1600 mils	Previous bearing 1650 mils
Initial record 2100 mils	New record 2050 mils

- c. The No. 1 must now change the “Record of Aiming Points Card” to reflect this lesser or greater record for all aiming points. If the new record is **less** than the previous record, he will **subtract** the difference from all records for other aiming points. If the new record is **greater** than the previous record, he will **add** the difference to all records for aiming points.

- d. When this is completed the No. 1 will report **NO. ... MORTAR, LINE OF FIRE ADJUSTED AT BEARING ...** (the ordered bearing).
- e. The CPO will acknowledge the report and inform the FC accordingly, **LINE OF FIRE ADJUSTED.**

**NOTE**

Re-boresighting will be required at the earliest possible time.

- 9. Confirm by questions and practice.
- 10. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor will carry out safety precautions.
- 11. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 9 PARALLELING MORTARS

### INSTRUCTOR'S NOTES

1.     **Aim.** To teach the paralleling of mortars.
2.     **Time Required.** Three 40-minute periods.
3.     **Method.** Practical explanation and demonstration.
4.     **Stores.** One mortar, a sight unit and baseplate flag per detachment are required.
5.     **Preparation.** The period will be conducted by giving an explanation of the procedure, followed by practise. Before the first period, the instructor will carry out the required safety precautions.

### CONDUCT OF LESSON

6.     **Review.** Review aiming procedures and aiming points.
7.     **Introduction.** To achieve effective mortar fire it is necessary that the bearings of fire from individual mortars in a fire unit correspond to the same degree of accuracy. When this is so, the mortars in a group are said to be parallel. This is achieved by various means to ensure that the mortars of a group are oriented and recorded to the same degree of accuracy.
8.     Lines of fire are made parallel by using one of these three instruments:
  - a.     the aiming circle;
  - b.     the prismatic compass; or
  - c.     the C2A1 sight unit.

**NOTE**

The two first instruments are taught on the Advanced Mortar Course. Only the method of paralleling mortars using the C2A1 sight unit will be covered in this lesson.

9. **Paralleling Mortars by Sight Unit.** This method of paralleling mortars describes the establishing and recording of an aiming point, which will automatically parallel all mortars on the mortar line. This method is initiated by the Group Commander ordering **...ROUNDS ACTION, PARALLEL BY SIGHT UNIT.** When all mortars of the fire unit are mounted, leveled, and close aiming points (CAPs) are established, he places himself beyond the far stake of the number 1 mortar and, using a prismatic compass, shoots a bearing through the stake to the sight unit of the mortar. He then gives this bearing to the No. 1 as a record. The No. 1 of the number 1 mortar puts the record on, rotates his sight unit onto the far stake and he carries out the following procedure:

a. **No 1 Mortar:**

- (1) The No. 1 will check the lay of the mortar on the aiming point and note the barrel bearing, for example, **BARREL BEARING 1600.**
- (2) Without disturbing the mortar, the No. 1 rotates the telescope onto the sight unit of the number 2 mortar.
- (3) The No. 1 unlocks and slips the bearing coarse and fine scale rings until the noted barrel bearing is read against the bearing indices (this procedure is carried out in the same manner as applying a record), and locks the scales.

- (4) The No. 1 rotates the telescope until all indices are aligned and reads the bearing between the indices. He gives this bearing to the number 2 mortar as **RECORD**, for example **NUMBER 2 RECORD 4550**.

#### **NOTE**

The above procedure is repeated for all mortars of the fire unit. On completion, the group commander will give the number 1 mortar the TRUE RECORD. The No. 1 of the number 1 mortar will then place this record on his sight unit and rotate the telescope on the aiming point. In the event that the group commander is not around, the No. 1 of the number 1 mortar, after completing his procedure, will add or subtract 3200 mils on the initial record.

**b. No 2 Mortar:**

- (1) The No. 1 acknowledges the report **RECORD** and places the record on his sight unit as previously taught.
- (2) The No. 1 rotates the telescope onto the centre of the sight unit of the number 1 mortar, and notes the barrel bearing.
- (3) The No. 1 rotates the telescope on his CAP, unlocks and slips both the bearing coarse and fine scale rings until the barrel bearing is read against the bearing indices (this procedure is carried out in the same manner as applying a record), locks the scales and then realigns the four bearing indexes.
- (4) The No. 1 obtains the record for the CAP by reading the coarse and fine scale record indices, then he notes the record on the "Record of Aiming Points Card".

- (5) The No. 1 Reports **NUMBER ...  
MORTAR PARALLELED AND  
RECORDED AT \_\_\_\_.**

**NOTE**

All remaining mortars of the fire unit will carry out the above procedures as for the number 2 mortar. Once completed, the Line NCO will give a common bearing to lay all mortars on the centre of arc.

10. Confirm by questions and practice.
11. **Conclusion:**
- a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor to carry out safety precautions.
12. **Summary:**
- a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 10 BARREL OBSTRUCTION

### INSTRUCTOR'S NOTES

1.     **Aim.** To teach the remedy for barrel obstruction.
2.     **Time Required.** One 40-minute period.
3.     **Method.** Practical explanation and demonstration.
4.     **Stores.** One mortar, a sight unit and baseplate flag per detachment are required.
5.     **Preparation.** Prior to the start of the period:
  - a.       select aiming points and determine bearings that will be obstructed by the barrel; and
  - b.       the instructor will carry out the required safety precautions.

### CONDUCT OF LESSON

6.     **Review.** Review the procedures for recording aiming points.
7.     **Introduction.** Occasionally, the control post operator will order a bearing, which, when placed on the sight unit, and the telescope rotated, will cause the telescope to look straight at the barrel. Obviously when this occurs the mortar cannot be laid using either of the initial, distant or close aiming point, as it cannot be seen through the telescope. This barrel obstruction will occur at various bearings depending on the record set on the sight unit, and covers an arc of approximately 1000 mils from the front of the barrel to the rear of the barrel.
8.     **Remedy for Barrel Obstruction.** When a bearing is ordered, which, when set on the sight unit, and the telescope is rotated,



causes the telescope to look at the barrel, the No. 1 in order to lay his mortar will carry out the following procedure:

- a. report **NUMBER ... MORTAR BARREL OBSTRUCTION**;
- b. use his auxiliary aiming point (AAP) as his aiming point;
- c. refer to his "Record of Aiming Points Card" and determine the record to be set on the sight unit;
- d. set this record on the bearing coarse and fine scale rings against the record coarse and fine scale indices as previously taught;
- e. set the bearing ordered on the sight unit;
- f. using his AAP lay the mortar and carry out the fire order; and
- g. upon completion of that particular shoot, set the record on his sight unit for the aiming point and refer to it as his aiming point.

#### **NOTE**

This drill will not be required if the periscope extension is available.

9. Confirm by questions and practice.
10. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor will carry out safety precautions.

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11. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 11 LAYING BY NIGHT

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the procedures for laying the mortar in darkness.
2. **Time Required.** One 40-minute period.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** The following stores and equipment are required:
  - a. one mortar, a sight unit and baseplate flag per detachment; and
  - b. two Trilux aiming lamps with each mortar (one orange, one green).
5. **Preparation.** Prior to the lesson:
  - a. the mortars should be mounted and aiming points established; and
  - b. the instructor will carry out the required safety precautions.

### CONDUCT OF LESSON

6. **Review.** Review ammunition identification at night.
7. **Introduction.** One of the characteristics of the mortar is its ability to effectively engage registered targets in darkness, fog, rain or smoke. Harassing missions on unregistered targets can be conducted by predicted shooting. By using the night aiming equipment described in this lesson, the mortar can be laid during darkness with almost the same speed and accuracy as can be accomplished during daylight.

8. **Night Aiming Equipment.** To enable the mortar crew to lay the mortar in darkness, a special night lamp must be used, the aiming stake lamp (Trilux):

- a. **Description.** The aiming stake lamp consists of a metal case containing a Trilux light source. The rear of the case is equipped with a clamp designed to attach the lamp to the aiming stake.
- b. **Installation.** The aiming stake lamp is clamped in position on the stake so that it can be clearly seen by the No. 1. When two stakes are used for an aiming point the green light will be used on the near stake and the orange light on the far stake. When only one stake is used for an aiming point, the orange Trilux will be used.

9. **Aiming.** Aiming at night is essentially the same as during daylight except that in this case the points of aim will be the filtered light provided by the aiming stake lights. Therefore, aiming points will be as follows:

- a. **One Stake.** The centre of the orange filter of the aiming stake lamp.
- b. **Two Stakes:**
  - (1) when they appear in line, use the centre of the green filter; and
  - (2) when both lights are visible; aim off the orange light the measured distance between the green light and the orange light.

10. **Laying the Mortar at Night.** Explain and demonstrate the procedure. Once the aiming stake lamps have been illuminated and the required readings placed on the sight unit, the mortar is laid in the same manner as for daylight operation. However, due to a much greater chance for error, the work must be more deliberate and slower.

**NOTE**

During preparation for night firing, all unnecessary equipment will be stored in the detachment vehicle.

**WARNING**

The light sources, which are used to provide illumination, contain radioactive tritium gas which is sealed in glass capsules. There is no significant external radiation hazard. The only hazard present is when the capsules are broken. Tritium is a gaseous substance, which emits low energy beta radiation. When released into the air it rapidly oxidizes or combines with water and in such form is rapidly absorbed by the body through contact with the skin, inhalation or ingestion. If such absorption occurs, the tritium will rapidly be distributed throughout the body fluids and deliver a significant dose of harmful radiation to the body. The need for careful handling is obvious. If breakage of one of the capsules occurs in a confined or poorly ventilated space, the following action shall be taken: **ALL PERSONNEL EVACUATE THE ROOM, VEHICLE OR IMMEDIATE VICINITY FOR 30 MINUTES LEAVING DOORS, ACCESSES AND WINDOWS OPEN WHERE APPLICABLE.**

11. Confirm by questions and practice.
12. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor will carry out safety precautions.
13. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## **LESSON 12**

### **SIGHT UNIT TESTING**

#### **INSTRUCTOR'S NOTES**

1. **Aim.** To teach the following points on the boresighting of the sight unit:
  - a. description of the M45 Boresight;
  - b. test for boresight accuracy;
  - c. test for elevation; and
  - d. test for bearing.
2. **Time Required.** Four 40-minute periods.
3. **Method.** An explanation and practical period.
4. **Stores.** The following stores and equipment are required:
  - a. one mortar, a sight unit and baseplate flag per detachment; and
  - b. one boresight M45, per detachment.
5. **Preparation.** Prior to the start of the first period:
  - a. have a suitable area with a distant aiming point (DAP) set-up;
  - b. have the mortars mounted; and
  - c. the instructor will carry out the required safety precautions.

## CONDUCT OF THE LESSON

6. **Review.** Review the procedures for laying the mortar.
7. **Introduction.** The sight unit occasionally will be jarred out of adjustment for elevation and bearing due to firing or unnecessary rough handling. These errors can be determined and corrected by using the Boresight M45.
8. **General.** All sight units must be tested occasionally, particularly before firing. Precautions must be made to ensure that the sight unit being tested stays with the mortar it was tested on; also all sight units of a group must be tested with the same M45 Boresight.
9. **The Boresight M45:**
  - a. **Description.** The boresight has an elbow telescope with a rubber eyepiece at one end. The telescope has a fixed focus and a magnification of 3 power. It is attached to the body by a pivot shaft and clamp to allow the telescope to pivot either way. Included on the body are elevation and cross-level bubbles. Attached to the base of the body are two web straps designed to attach the boresight to the barrel of the mortar. After initial use these straps may be cut to the desired length without danger of fraying. The boresight has a field of view of 215 mils and weighs 1.3 kg. It is carried in a metal case with a strap and a metal handle for carrying. The case weighs 1.5 kg (Figure 4-11).



**Figure 4-11: Boresight M-45**

- b. **Maintenance.** The instrument will not be subjected to rough handling or abuse, or inaccuracy will result. The instrument will be kept clean and dry. It will be cleaned periodically by removing all foreign matter with a soft cloth or brush. The glass surfaces if oily or greasy should be cleaned with a tissue using a detergent sparingly. To prevent rust, a light film of instrument oil should be applied to all but the glass surfaces.

10. Confirm by questions.

11. **Test for Boresight Accuracy.** The Boresight M45 is adjusted at the manufacturing plant and it should not require readjustments as a result of normal field handling. The accuracy of the boresight will be verified by an advanced mortarman prior to the boresight being used. The following method will be used:

- a. Mount the mortar on level ground and sandbag it for stability if not bedded-in.
- b. Remove the blast attenuation device (BAD).



- c. Lay on a DAP ensuring that the mortar and sight unit are cross-levelled.
- d. Adjust the boresight on top of the mortar barrel with the telescope pointed to the front, leaving the straps loose enough to allow slight movement. Cross-level the boresight by rotating it on the barrel circumference and tighten the clamp assembly (Figure 4-12).
- e. Align the vertical line in the boresight telescope on the DAP by traversing the mortar and at the same time, keeping the boresight cross-level bubble central by slightly rotating the cross-levelling mechanism on the tripod. This ensures that all bubbles remain central.
- f. Note the point of aim on the DAP.



**Figure 4-12: Boresight Mounted on Top of the Barrel**

- g. Without moving the barrel of the mortar, remove the boresight and reinstall it beneath the mortar barrel

ensuring that the telescope is pointing to the front



and its cross-level bubble is central, (Figure 4-13).

**Figure 4-13: Boresight Mounted on Bottom of the Barrel**

- h. Recheck the cross-levelling and elevation bubble and ensure that the lay of the mortar has not been disturbed.
- i. Note the point of aim on the DAP.
- j. Misalignment of the points of aim, between sub-paragraph f. and i. indicates a bearing error in the boresight.
- k. If an error is revealed the boresight **will be** turned in for repair. (See note below).

**NOTE**

If absolutely required, the boresight can still be used for boresighting. The true bearing of the mortar tube then lies midway between the two lines of sight of the boresight when installed on top of and below the barrel of the mortar tube (Figures 4-12 and 4-13). Note the deviation, set the sight unit cross-hairs of each mortar on the midpoint, and zero the sight unit scales and indices in the manner indicated in paragraph 10. e. This deviation must then be added to (or subtracted from) all other sight units.

12. **Preparation for Sight Unit Testing.** All mortar sight units in the fire unit should be tested occasionally during lulls in firing. This testing will only be done on the order and under supervision of a qualified advanced mortarman. When testing the sight unit for bearing, ensure that:

- a. The mortar is mounted on level ground and sandbagged for stability if not bedded-in.
- b. The sight unit is tested on its proper mortar.
- c. The BAD must be installed.
- d. The mortar is laid on a rear DAP with the bearing scales reading 3200 against both bearing and record indices and 800 mils on the elevation scales.
- e. Cross-level the mortar and sight unit.
- f. Adjust the boresight on top of the mortar barrel with the telescope pointed to the rear, leaving the straps loose enough to allow slight movement. Cross-level the boresight by rotating it on the barrel circumference and tighten the clamp assembly (Figure 4-14)
- g. Ensure that the boresight accuracy test has been completed.

13. **Sight Unit Testing for Elevation.** When it is necessary to adjust the sight unit for elevation the procedure below is as follows:



**Figure 4-14: Boresight Mounted for Testing Elevation and Bearing**

- a. Elevate the mortar until the elevation bubble on the boresight is central. The barrel will now be at an angle of 800 mils.
- b. Cross-level the sight unit.
- c. Centre the sight unit elevation bubble by turning the elevation micrometer.
- d. Re-check all bubbles.
- e. The elevation scales should now read 800 mils. If not, adjust as follows:
  - (1) loosen the three screws in the end of the elevation micrometer with the small screwdriver provided with the sight unit;

- (2) hold the micrometer in place and slide the elevation fine scale ring until it reads zero mils opposite the elevation fine scale ring index; and
  - (3) tighten the three screws (be careful not to strip the head of the screws).
- f. Finally, re-check all bubbles on both instruments ensuring they are level and the sight unit elevation scales read exactly 800 mils. If not, repeat the above procedure.
14. Confirm by questions and practice.
15. **Sight Unit Testing for Bearing.** The sight unit occasionally will be jarred out of adjustment for bearing by firing or abuse. The resulting error can be determined and corrected by using the boresight. The mortar will be bore-sighted using the following procedure:

**NOTE**

The BAD must be on.

- a. Align the vertical line in the telescope on the DAP by traversing the mortar and at the same time, keeping the boresight cross-level bubble central by slightly rotating the cross-levelling mechanism on the bipod. This ensures all bubbles remain central.
- b. Note the point of aim for adjustment on the DAP.
- c. Look through the sight unit telescope and note the position of the vertical line of the reticle in relation to the point of aim for adjustment.
- d. If the vertical line is laid on the point of aim, the sight unit is in adjustment.

- e. If the vertical line is off the point of aim, the sight unit is in error and must be adjusted as follows:
- (1) Turn the bearing knob and align the vertical line of the reticle onto the point of aim. The resulting reading on the bearing fine scale index is the sight unit error.
  - (2) Loosen the butterfly nut and keeping the bearing knob from rotating, move the bearing fine scale ring until it reads zero mils opposite the bearing index.
  - (3) Rotate the butterfly nut until the holes in the flange are opposite the three small screws and loosen each screw with the small screwdriver provided with the sight unit.
  - (4) Ensuring that no movement of the bearing knob is allowed, rotate the record index until it is aligned with the zero graduation of the bearing fine scale ring and the bearing fine scale index.
  - (5) Tighten the three screws and the butterfly nut (be careful not to strip the head of the screws).
- f. Finally, re-check all bubbles and telescope vertical lines ensuring they are in alignment with the point of aim. If not, repeat the above procedures until all bubbles are central and all vertical lines are on the point of aim with zero on the bearing scales.

### NOTES

1. If the sight unit is out of adjustment in excess of 10 mils in bearing or elevation, it should be taken to the Weapons Technician for checking.
2. Ensure that the same boresight is used for testing all the sight units of the same fire unit.

16. Confirm by questions and practice.
17. **Conclusion:**
  - a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor will carry out safety precautions.
18. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 13 CRANK METHOD

### INSTRUCTOR'S NOTES

1. **Aim.** To teach crank corrections for laying and the required actions by the No. 1.
2. **Time Required.** One 40-minute period.
3. **Method.** Practical explanation and demonstration.
4. **Stores.** One mortar, a sight unit and baseplate flag per detachment are required.
5. **Preparation.** Prior to the start of the period:
  - a. have a suitable area prepared with a distant aiming point (DAP);
  - b. have the mortars mounted; and
  - c. the instructor will carry out all required safety precautions.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedures for laying the mortar.
7. **Introduction.** In some instances, crank corrections can be given on the line. This order is initiated by the fire controller (FC) and is given to the mortar line exactly as it was sent. These types of corrections are quick and very effective.
8. **Crank Corrections.** One crank is a complete turn of the traversing or the elevating hand wheel (one crank equal 10 mils). The corrections can be received one at a time or combined in pairs. The commands for crank corrections are:



- a. **RIGHT...CRANK(S);**
  - b. **LEFT...CRANK(S);**
  - c. **UP...CRANK(S);** and
  - d. **DOWN...CRANK(S).**
9. **Actions of the No. 1.**
- a. **Right or Left Correction.** With traversing corrections the actions are:
    - (1) turn the traversing hand wheel the specified amount of cranks in the direction ordered;
    - (2) level the cross-levelling bubble;
    - (3) turn the telescope on the point of aim; and
    - (4) resume firing if so ordered.
  - b. **Up or Down Correction.** With elevation corrections the actions are:
    - (1) turn the elevating hand wheel the specified amount of cranks to elevate or depress the mortar as ordered;
    - (2) using the elevating knob, level the elevating bubble; and
    - (3) resume firing, if so ordered.
  - c. **Double Correction.** This is used when both traversing and elevation corrections are required, the procedure is:
    - (1) turn the traversing hand wheel the specified amount of cranks in the direction ordered;

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- (2) turn the elevating hand wheel the specified amount of cranks to elevate or depress the mortar as ordered;
    - (3) using the elevating knob, level the elevating bubble;
    - (4) level the cross-levelling bubble;
    - (5) turn the telescope on the point of aim; and
    - (6) resume firing if so ordered.
  - d. When the crank corrections are used to adjust a target, the procedure is to:
    - (1) do the procedure previously taught;
    - (2) fire the adjusting round;
    - (3) pass to the other mortars the bearing and elevation by reading them directly from the sight unit; and
    - (4) relay the mortar.
  - e. On the command **FIRE FOR EFFECT**, all mortars will use the same data as the adjusting mortar.
  - f. Crank corrections may be given during a fire for effect to adjust the mean point of impact (MPI). All mortars will then apply the same procedure.
10. Confirm by questions and practice.
11. **Conclusion:**
- a. questions to and from the class;
  - b. test on the lesson; and
  - c. the instructor will carry out safety precautions.

12. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be .....

## **LESSON 14 DIRECT FIRE**

### **INSTRUCTOR'S NOTES**

1.     **Aim.** To teach the following points on direct fire:
  - a.     firing the first round; and
  - b.     the method of adjustment.
2.     **Time Required.** One 40-minute period.
3.     **Method.** Practical explanation and demonstration.
4.     **Stores.** One mortar, a sight unit and baseplate flag per detachment are required.
5.     **Preparation.** Prior to the start of the period:
  - a.     have a suitable area prepared with a distant aiming point (DAP);
  - b.     have the mortars mounted; and
  - c.     the instructor will carry out all required safety precautions.

### **CONDUCT OF THE LESSON**

6.     **Review.** Review the crank method for making corrections.
7.     **Introduction.** While not normally used to engage targets, the procedure for direct fire must be understood. An enemy coming in direct line of sight with the mortar line can be engaged with speed and accuracy using the direct fire method of engagement.
8.     **Firing the First Round.** When direct fire is to be used, the control post operator (CPO) or Line NCO will estimate the range to

target and using the proper firing table, choose the appropriate charge and elevation. This data will be passed to the line. The No. 1 will:

- a. align all bearing indices together;
- b. apply the elevation to the sight unit;
- c. looking through the telescope, lay the mortar on the target ensuring that the levels are on;
- d. fire the first round; and
- e. relay the mortar as fast as he can and wait for the fall of shot.

9. **Method of Adjustment.** When the round explodes in the target area, the No. 1 will:

- a. using the bearing knob, rotate the sight unit to have the reticle on the point of explosion;
- b. relay the mortar on the target (this will correct the round for line);
- c. depending if the first round was plus or minus of target, crank up the elevating hand wheel to decrease or crank down to increase the range of the next round, as many times as deemed necessary to hit the target or bracket it;
- d. level the elevating bubble using the elevating knob;
- e. check his lay in direction and the cross-levelling bubble;
- f. fire another round; and

**NOTE**

All other corrections should normally be only for range, until the target is hit.

- g. when the target has been hit, rotate the sight unit on the aiming point and pass this data to the other mortars, (if there was only one mortar in adjust).

**NOTE**

All mortars can use the same round to make their line correction and the elevation from the adjusting mortar for their fire for effect.

10. Confirm by questions and practice.

11. **Conclusion:**

- a. questions to and from the class;
- b. test on the lesson; and
- c. the instructor will carry out safety precautions.

12. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be...

## CHAPTER 5 EMPLOYMENT

### LESSON 1 BATTLE PROCEDURE AT GROUP LEVEL

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach battle procedure at the group level to include:
  - a. understanding and reacting to:
    - (1) warning orders; and
    - (2) movement orders.
  - b. states of readiness; and
  - c. types of mortar occupations and positions.
2. **Time Required.** Two 40-minute periods.
3. **Method.** A basic instructional period.
4. **Stores.** The following training equipment is required:
  - a. a chalkboard; and
  - b. an overhead projector with a PowerPoint® equipped computer.
5. **Preparation.** Prior to the start of the first period:
  - a. prepare the overhead projector and slides; and
  - b. prepare the classroom.

## CONDUCT OF THE LESSON

6. **Review.** Review the role and characteristics of the 81 mm mortar platoon.

7. **Introduction.** In all phases of war, speed and control are essential. Unless personnel at all levels know what they must do, confusion is unavoidable and speed is lost. Battle procedure therefore, is a sequence of events or drills carried out by all mortar personnel so that the right people arrive at the right place at the right time fully prepared to carry out their allotted task.

8. **Warning Orders.** Battle procedure starts with a warning order. It must be brief, clear and provide all levels of command sufficient time to prepare for the tasks ahead. To accomplish this the warning order must have four essential pieces of information, which are:

- a. a brief forecast of the situation, tasks or moves;
- b. the earliest time of move or degree of notice to move;
- c. the time and place of the rendezvous (RV) for the O group; and
- d. any special administrative instructions.

9. **Action by the Mortarmen.** When the mortarmen receive the warning order, they are responsible for:

- a. executing the orders;
- b. executing the preparations;
- c. checking the detachment stores;
- d. refuelling the detachment vehicles;
- e. completing an ammunition count;



- f. carrying out a vehicle inspection and any maintenance required;
  - g. completing a communications check;
  - h. completing the preparations to move; and
  - i. moving on order.
10. **Orders.** There are three types of orders used by the platoon, which are:
- a. **Detailed Orders.** These are used in normal situations when the platoon commander has time to go to a RV or to the platoon location. This will be the normal way to give orders.
  - b. **Radio Orders.** These are usually used when time does not permit the passage of detailed orders. They are also used during the initial deployment of the platoon or for changes in employment or deployment of the platoon during the different phases of an operation.
  - c. **Movement Orders.** For any moves in support of a particular phase of operation the Movement Order Proforma is used (see *Mortars in Battle*, B-GL-392-006/FP-001). It is broken down into four parts, which are:
    - (1) **Part I—Warning Order.** This part is normally sent to the platoon second-in-command (2IC) by the fire support co-ordination centre (FSCC).
    - (2) **Part II—Observation Post Party.** This part is normally sent to the fire controllers (FCs) by the FSCC and does not affect the groups.
    - (3) **Part III—Group Command.** This part is sent to the group commander by either the

FSCC or 2IC and contains information about the next position in order to receive and prepare it.

- (4) **Part IV—Mortar Groups.** This is the part, which directly affects the control post operators (CPOs) and groups. The platoon normally sends it to the 2IC or the group commander. Basically, it is the confirmation of the orders in Part III.

11. Confirm by questions.

12. **States of Readiness.** States of readiness are laid down, particularly in mechanised operations, so that soldiers are not kept at an unnecessarily high state of readiness for prolonged periods of time. Prolonged periods under high states of readiness, especially if they occur frequently, may affect essential maintenance, morale and combat effectiveness of soldiers. No firm direction is given on states of readiness. Obviously, differences will depend on the situation, however, as a general guide the states of readiness are associated with the mortar stages of occupation (see *Mortars in Battle*).

13. Confirm by questions.

14. **Types of Mortar Occupations.** There will normally be three types of occupations (see *Mortars in Battle*):

- a. the deliberate occupation;
- b. the silent occupation; and
- c. the crash action.

15. **Layout of a Mortar Group.** The layout of the mortars within the group will normally be affected by the ground, the need for control and for an effective pattern of fall of shot at the target. Therefore, the maximum distance between mortars should approximate the lethal diameter of the HE round. Types of layouts can be found in B-GL-392-006/FP-001 *Mortars in Battle*.

16. Confirm by questions.

17. **Conclusion:**
  - a. questions to and from the class; and
  - b. test on the lesson.
  
18. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 2 LOADING AND RESUPPLY

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points on loading and re-supply:
  - a. security;
  - b. tactical loading; and
  - c. re-supply.
2. **Time Required.** One 40-minute period.
3. **Method.** A basic instructional period.
4. **Stores.** A mortar vehicle complete is required.
5. **Preparation.** Prepare an area with the vehicle loaded.

### CONDUCT OF LESSON

6. **Review.** Review the degrees of reconnaissance, states of survey, types of occupation and stages of battle procedure occupation.
7. **Introduction.** In order for a mortar group to function properly it must be responsible for its own group security and for the serviceability and proper loading of all stores and equipment. Serious problems may occur if one or all of the above are neglected.
8. **Security.** When the mortar groups or platoon are going into or out of action they are particularly vulnerable. Therefore, some means of security must be established, whether it is provided by the groups, platoon or reconnaissance party in location. Also strict camouflage measures, traffic discipline and defensive plans must be enforced, not only for going into and out of action but throughout the entire occupation. Personnel at the baseplate position must be able to

protect themselves from air attack, ground attack (both armoured and dismounted soldiers), counter bombardment and Nuclear, Biological, and Chemical Warfare threat.

9. Confirm by questions.

10. **Accuracy of Instruments.** Mortar fire will only be as accurate as the instrument used in setting up the mortar line and the sight unit used on the mortars. It is the responsibility of the group commander to calibrate the group's aiming circles and compasses and the detachment commander's responsibility to ensure that his sight unit is tested and correct for bearing and elevation. Sight unit testing will be conducted before firing, during lulls in firing and whenever in doubt. Frequent shocks from firing, periods of maintenance and cleaning and unnecessary rough handling are some of the reasons that would cause a sight unit to be put out of adjustment.

11. **Tactical Loading.** The loading and organization of equipment, positioning of personnel and ammunition is the responsibility of the line NCO under the direction of the group commander and should be conducted as per unit loading tables. It is the responsibility of the detachment commanders and mortar numbers to ensure that their vehicle is loaded correctly and is complete. The vehicle and all its equipment must be serviceable and clean at all times. The vehicle must be loaded in such a way as to ensure prompt handling of the mortar equipment, ammunition and practical positioning of personnel. As a guide the amount of ammunition to be carried by each mortar vehicle will be 75% HE, 20 % Smoke and 5% Illuminating with 30% of the HE fuze proximity. These amounts will vary depending on the vehicle and the operation. The specific responsibilities of each detachment members are as follows: (for vehicles other than the Mortar Bison with the Royal Ordnance mount).

- a. The No. 1 is primarily responsible for all aiming equipment, which includes:
  - (1) the sight unit;
  - (2) aiming stakes;
  - (3) baseplate flags; and

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- (4) baseplate.
- b. The No. 2 will be responsible for:
  - (1) the barrel;
  - (2) the spare parts box; and
  - (3) any cleaning equipment.
- c. The No 3 will be responsible for:
  - (1) the bipod;
  - (2) the camouflage of all equipment;
  - (3) the ammunition (including small arms, 84 mm, M72 and .50 cal); and
  - (4) the vehicle.

12. Confirm by questions.

13. **Re-supply.** Within a detachment the procedure for re-supply of ammunition is based on the push system, that is, the ammunition is controlled by the fire support co-ordination centre and brought forward to the delivery point automatically. The procedure for ammunition utilisation and re-supply is as follows:

- a. the platoon second-in-command, with the group ammunition vehicles, picks up the ammunition at the delivery point and brings it forward to the group;
- b. the No. 3 ensures that his detachment is topped up, always taking ammunition from the group ammunition vehicle first, if possible;
- c. emergency re-supply is dealt with on a request basis, and this ammunition will be delivered directly at the group position;

- d. ammunition vehicles may be kept with the groups and extracted nightly for re-supply by the second-in-command; and
  - e. it is the responsibility of the No. 3 to keep the line NCO fully briefed on the ammunition status, who in turn will inform the control post operator of the actual status of the ammunition.
14. Confirm by questions.
15. **Conclusion:**
- a. questions to and from the class; and
  - b. test on the lesson.
16. **Summary:**
- a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...





**CHAPTER 6**  
**81 mm MORTAR (BISON)**

**LESSON 1**  
**DESCRIPTION**

**INSTRUCTOR'S NOTES**

1. **Aim.** To teach the following on the 81 mm mortar (Bison):
  - a. description of Royal Ordnance (RO) mount;
  - b. technical data; and
  - c. maintenance.
2. **Time required.** Two 40-minute lessons.
3. **Method.** Explanation, demonstration and practice.
4. **Stores.** The following stores and equipment are required:
  - a. a chalkboard;
  - b. an overhead projector with a PowerPoint equipped computer;
  - c. one 81 mm mortar (Bison) per six students; and
  - d. cleaning material.
5. **Preparation.** Set up the classroom and practice area for training.

**CONDUCT OF THE LESSON**

6. **Review.** Nil.

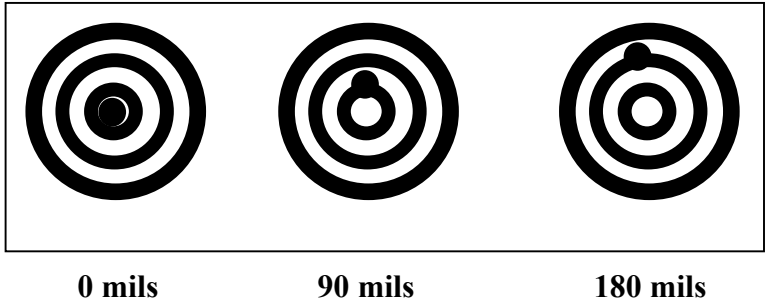
## 81 mm Mortar

7. **Introduction.** The commander and detachment members must be familiar with the RO mount and its servicing in order to properly employ and maintain the Bison Mortar weapon system.

8. **Description.** The 81 mm mortar (Bison) mount consists of the following components:

- a. A plate secured to the floor of the vehicle by twelve mounting packs, which act as shock absorbers.
- b. A turntable attached to the top of the plate. It is traversed by means of the turntable traversing handle located on the left of the mount. It is locked by the turntable locking lever located opposite the handle.
- c. A housing located on one end of the turntable. The housing contains a fixed socket into which the breech plug is placed.
- d. A monopod, which is used to support the barrel. The monopod is secured to the barrel by means of a clamp and buffer assembly. An additional buffer system is attached to the monopod to assist in shock absorption.
- e. An elevating hand wheel and crank and a large cross-levelling hand wheel and crank attached to the monopod. They are used in conjunction with the elevation and cross level bubbles of the C2 sight unit.
- f. A metal plate mounted on the central fixed portion of the mount.
- g. A vehicle tilt indicator located in the center of the plate. It consists of a bubble and two circles scribed on the bubble glass (The bubble and scribed circles are illuminated by Trilux). The vehicle tilt is indicated by the location of the bubble in relation to the two circles, for example:

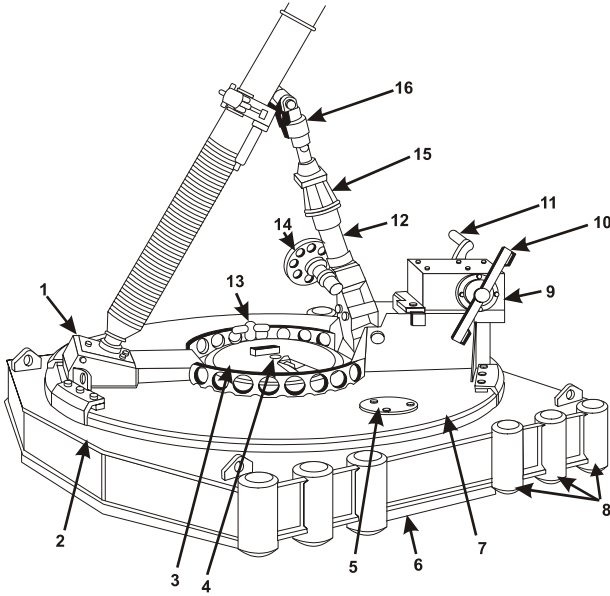
- (1) the vehicle tilt is 90 mils when the inner circle cuts the center of the leveling bubble; and
- (2) the vehicle tilt is 180 mils when the outer circle cuts the center of the leveling bubble (**cross-levelling capability may not be possible to obtain**).



**Figure 6-1: Vehicle Tilt Indicator**

- h. A bearing scale located on a ring surrounding the plate. The scale is graduated in tens from 0 to 6400 mils and numbered every hundred mils. It can be read to an accuracy of five mils. Two indices, each illuminated by Trilux, are positioned adjacent to the bearing scale; one index determines the mortar bearing while the other index determines the vehicle heading (These indices are similar to the lower and inner and the upper and outer indices on the C2 sight). The bearing scale is adjusted by unlocking the bearing scale locking handle. This will allow any reading to be set without traversing the mount.

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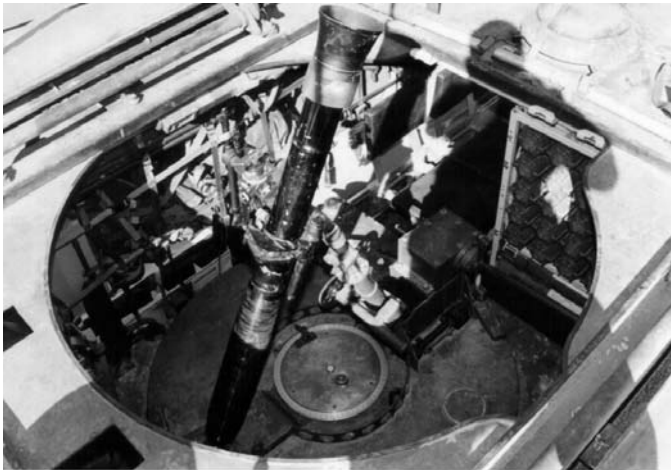


- |                                     |                                 |
|-------------------------------------|---------------------------------|
| 1. BREECH PLUG SOCKET HOUSING       | 9. TRAVERSE GEARBOX             |
| 2. PLATE                            | 10. TURNTABLE LOCKING LEVER     |
| 3. BEARING SCALE RING               | 11. TURNTABLE TRAVERSING HANDLE |
| 4. VEHICLE TILT INDICATOR           | 12. MONOPOD                     |
| 5. LUBRICATION PLATE COVER          | 13. BEARING SCALE LOCKING       |
| 6. SHOCK ABSORBER MATTRESS ASSEMBLY | 14. TRAVERSING HAND WHEEL       |
| 7. TURNTABLE                        | 15. ELEVATING HAND WHEEL        |
| 8. SHOCK ABSORBERS                  | 16. BUFFER SYSTEM               |

**Figure 6-2: Royal Ordnance Mount**



**Figure 6-3: British Royal Ordnance Mount**



**Figure 6-4: British Royal Ordnance Mount—Rear View**

9. Confirm by questions.
10. **Technical Data.**
  - a. Weight—565 kg.
  - b. Height—1430 mm (maximum vertical height with barrel fitted).

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- c. Width—1315 mm.
- d. Length—1320 mm.
- e. Azimuth scale—6400 mils graduated every 10 mils and numbered every 100 mils. Scale may be zero set at any angle.
- f. Azimuth reader—set adjacent to the azimuth scale are two lensatic readers for:
  - (1) bearing index; and
  - (2) vehicle heading index.
- g. Vehicle interface—12 absorbent shock mounts secured to the vehicle floor over top of a shock absorbent pad.
- h. Monopod—accommodates elevations between 0800 and 1422 mils.

11. Confirm by questions.

12. **Maintenance.** The following types of maintenance and the requirements for each need to be considered:

- a. **Daily Maintenance:**
  - (1) Clean and lightly oil the monopod using cleaner, lubricant and preservative fluid (CLP). Ensure that both the flat surface on the monopod and the locating eyes are clean from dust, dirt and/or ice. This is essential due to their limited tolerances.
  - (2) Clean all exposed glass surfaces of the sighting equipment. Wash with clean water and dry with a clean cotton rag. Do not touch any glass surface directly with your fingers.

- (3) Any burrs, flaws or cracks that become apparent during the inspection must be reported immediately to first line maintenance for examination. The equipment will not be fired until approved by the EME technician who conducted the examination.
- b. **Weekly Maintenance** (once each seven days during operational use):
- (1) Apply grease to both lubricators on the monopod pivot bolt.
  - (2) Clean and lightly oil the barrel clamp using CLP.
  - (3) Remove, clean and lightly oil the bearing plate and scale using the following procedure:
    - (a) Move the vehicle heading lens clear of the scale.
    - (b) Unscrew the six Allen screws securing the top plate and lift the plate clear.
    - (c) Remove the scale ring. Clean, lightly oil with CLP and replace.
    - (d) Replace the top plate and tighten the six Allen screws progressively in a clockwise sequence.
    - (e) Remove each of the mounting pack dust covers. Check the security of the bolts and tighten them if necessary. Ensure that the cover vent holes are clear and replace the covers.

- c. **Monthly Maintenance.** Conducted once every month in conjunction with weekly maintenance.
  - (1) Lubricate the turntable using the following procedure:
    - (a) Remove the access plate by undoing the three screws that secure it. Unscrew and remove the access plate to expose one of the two turntable lubricators (the other lubricator is located forward on the base).
    - (b) Grease the two lubricators. Traverse the turntable in 800 mil intervals and grease the lubricators with two or three strokes of the grease gun at each traversed point.
  - (2) Grease the monopod pivot bolt as per weekly maintenance.
- d. **Annual Maintenance.** Conducted once every twelve months in conjunction with regularly scheduled monthly servicing:
  - (1) Remove the access plate on the platform and lightly smear the traverse gear ring with grease.
  - (2) The elevating gearbox, traversing gearbox, cross-levelling mechanism and the buffers will be stripped and serviced only by EME personnel.

13. Confirm with questions.

14. **Conclusion:**

- a. questions to and from the class; and



- b. conduct a written test.

15. **Summary.**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...

## **LESSON 2 ROUNDS ACTION**

### **INSTRUCTOR'S NOTES**

1. **Aim.** To teach the following firing drills:
  - a. rounds action; and
  - b. cease firing.
2. **Time Required.** Two 40-minute lessons.
3. **Method.** Explanation and demonstration.
4. **Stores.** The following equipment and personnel are required:
  - a. one Bison Mortar LAV per detachment; and
  - b. one demonstration detachment.

### **CONDUCT OF THE LESSON**

5. **Review.** Review the component parts of the Royal Ordnance (RO) mount.
6. **Rounds Action.** Explain and demonstrate the actions required on the command **ROUNDS ACTION**. The sequence is:
  - a. Upon receipt of the command, **ROUNDS ACTION**, the number 1 mortar will conduct the following drills:
    - (1) The No. 3 (driver) will:
      - (a) dismount his vehicle and connect a 30 metre length of field telephone cable (WD 1 TT) from the terminal box of his vehicle to the

external terminal box of the Bison Mortar vehicle located immediately to his left; and

- (b) remount his vehicle and man the externally mounted C6 GPMG.
- (2) The No. 2 will:
- (a) prepare the ammunition; and
  - (b) aid the No. 1 as required (for example: preparation of the periscope extension and mounting bracket.
- (3) The No. 1 will:
- (a) Acknowledge the order.
  - (b) Place the C2 sight unit on the mortar and apply an elevation of 1100 mils to the sight.
  - (c) Slip the bearing coarse scale ring and apply a bearing of 3200 mils to the sight while ensuring that all indices remain aligned.
  - (d) Orient the turntable using the following procedure:
    - i) order **UNLOCK** to traverse the turntable to the center of the rear deck or the applicable quadrant;
    - ii) order **LOCK** to secure the turntable;

- iii) order **UNCLAMP** to move the barrel locking clamp to center; and
  - iv) order **CLAMP** to secure the locking clamp.
  - (e) Centralize the cross-levelling bubble of the C2 sight unit. Turn the cross-levelling hand wheel of the RO mount with the left hand.
  - (f) Centralize the elevation bubble of the C2 sight unit. Turn the elevation hand wheel and crank of the RO mount with the left hand.
  - (g) Attach the periscope and periscope bracket to the C2 sight unit.
  - (h) Verify the level of all RO mount and C2 sight bubbles.
  - (i) Turn the C2 sight unit down the center of the mortar line. (Ensure that all periscopes can be viewed).
  - (j) Report, **NUMBER 1 MORTAR READY TO PARALLEL.**
- b. The members of the remaining mortars within the fire unit will carry out the following actions:
- (1) The No. 3 (driver) will:
    - (a) dismount and connect a 30 metre length of field telephone cable (WD 1 TT) from the terminal box of his vehicle to the external terminal box of the Bison Mortar vehicle located immediately to his left; and

- (b) remount his vehicle and man the externally mounted C6 GPMG dependant on the quadrant of fire.
- (2) The No. 2 will:
- (a) prepare the ammunition; and
  - (b) aid the No. 1 as required (for example: preparation of the periscope extension and mounting bracket).
- (3) The No. 1 will:
- (a) Acknowledge the order.
  - (b) Place the C2 sight unit on the mortar and apply an elevation of 1100 mils to the sight.
  - (c) Slip the bearing coarse scale ring and apply a bearing of 6400 mils to the sight while ensuring that all indices remain aligned.
  - (d) Centralize the cross-leveling bubble of the C2 sight unit. Turn the cross-leveling hand wheel of the RO mount with the left hand.
  - (e) Centralize the elevation bubble of the C2 sight unit. Turn the elevation hand wheel and crank of the RO mount with the left hand.
  - (f) Attach the periscope and periscope bracket to the C2 sight unit.
  - (g) Verify the level of all RO mount and C2 sight bubbles.

- (h) Turn the C2 sight unit down onto the periscope of the number 1 mortar.
- (i) Report, **NUMBER ... MORTAR READY TO PARALLEL.**

7. **Ceasefiring.** Upon receipt of the command **CEASE FIRING**, the members of all of the mortar detachments within the fire unit will conduct the following drills:

- a. The No. 3 will:
  - (1) disconnect the field telephone cables (WD 1 TT) from his vehicle and from the vehicle located to his immediate right;
  - (2) reel and stow the cable; and
  - (3) mount his vehicle and await further instruction.
- b. The No. 2 will:
  - (1) Recondition the ammunition.
  - (2) Upon receipt of the order **UNLOCK** from the No. 1, the No. 2 will unlock the turntable locking lever. Kick the locking lever counterclockwise with the right foot until it moves freely (**too many rotations of the locking lever will cause the locking lever to unscrew from the mount**).
  - (3) Upon receipt of the order **LOCK** from the No. 1, the No. 2 will lock the turntable locking lever. Kick the locking lever clockwise with the right foot until it does not move (**care must be taken not to over tighten the locking lever**).
- c. The No. 1 will:

- (1) Acknowledge the order to **CEASEFIRE**.
- (2) Remove the C2 sight unit and periscope from its mount brackets. Align all sight unit bearing indices. Zero all bearing scales. Apply an elevation of 0800 mils to the sight unit and place it and the periscope into their respective cases.

#### **NOTE**

This is the open or travelling position. At times dependant upon the weather and/or the tactical situation the mortar firing hatch will be closed for traversing the mortar into its closed firing position.

- (3) Unlock the azimuth scale locking handles on the RO mount turntables. Zero the azimuth scale by rotating it until 6400 mils is read against the bearing index. Lock the azimuth scale locking handle.
  - (4) Report to the fire unit control post operator/commander, **NUMBER ... MORTAR READY TO MOVE**, as soon as all drills have been completed, the ammunition reconditioned and the mortar detachments are ready to move.
8. Confirm by questions and practice.
  9. **Conclusion:**
    - a. questions to and from the class; and
    - b. conduct a practical test.
  10. **Summary.**
    - a. Restate the aim.

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- b. Make a final statement.
- c. Your next lesson will be ...



### LESSON 3 LAYING FOR BEARING AND ELEVATION

#### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points on laying the mortar:
  - a. laying for bearing, small corrections;
  - b. laying for elevation, small corrections;
  - c. laying for bearing, large corrections; and
  - d. laying for elevation, large corrections.
2. **Time Required.** Two 40-minute lessons.
3. **Method.** Explanation, demonstration with practice.
4. **Stores.** The following equipment is required:
  - a. one Bison Mortar LAV per detachment; and
  - b. prepared fire orders.
5. **Preparation:**
  - a. prior to the start of the period the mortar will be in the open travelling position;
  - b. during the period the students will acknowledge all orders; and
  - c. initially the instructor will carry out supervised safety precautions.

#### CONDUCT OF THE LESSON

6. **Review.** Review the sight setting for bearing and elevation.

7. **Introduction.** In order to produce accurate fire from the Bison mortar, every member of the mortar detachment must be capable of setting both an elevation on the 81 mm mortar C2 sight unit and a bearing on the Royal Ordnance (RO) mount turntable.

8. **Explanation.** In order to lay the mortar as per small and large corrections, it is necessary to conduct the following procedures:

- a. **Small Correction in Bearing and Elevation.** The procedure is:
  - (1) The No. 2 will unlock the RO mount turntable locking lever by kicking it anti-clockwise to the unlocked position with his right foot (the No. 2 will lock and unlock the RO mount turntable without being ordered to do so by the No. 1).
  - (2) The No. 1 will grasp the turntable traversing handle and traverse the RO turntable until the ordered bearing is read against the bearing index of the turntable azimuth scale.
  - (3) The No. 1 will order, **LOCK**, to the No. 2.
  - (4) The No. 2 will lock the turntable locking lever by kicking it clockwise to the locked position with his right foot.
  - (5) The No. 1 will:
    - (a) Apply the ordered elevation to the C2 sight unit. If the required elevation cannot be obtained, the No. 1 must move the barrel clamp up or down the barrel using the following procedure:
      - i) unlock the barrel clamp and move it until the elevation bubble of the C2 sight unit is

approximately centralized  
(half of the elevating shaft  
must be exposed to move the  
clamp);

- ii) lock the barrel clamp;
  - iii) cross-level; and
  - iv) lay the mortar for elevation.
- (b) Acknowledge the order by reading back both the bearing from the RO mount azimuth scale and the elevation from the C2 sight unit.
- (c) Centralize the elevation bubble of the C2 sight unit by turning the elevation wheel of the RO mount monopod with his left hand.
- (d) Centralize the bearing bubble of the C2 sight unit by turning the cross-leveling wheel of the RO mount with his right hand.
- (e) Report, **NUMBER ... MORTAR ON**, when both bubbles are centralized.
- b. **Large Correction in Bearing and Elevation.** The No. 1 and the No. 2 will conduct the same drills as in laying the mortar for small corrections in bearing and elevation.

9. Confirm by questions and practice.

10. **Conclusion:**

- a. questions to and from the class; and
- b. conduct a practical test on lesson.

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11. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 4 PARALLEL AND RECORD

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the drills for parallel and record.
2. **Time Required.** Two 40-minute lessons.
3. **Method.** Demonstration, explanation and practice.
4. **Stores.** The following equipment is required:
  - a. one Bison Mortar LAV per detachment; and
  - b. prepared fire orders.
5. **Preparation.** Prior to the start of the first period:
  - a. one 81 mm mortar (Bison) will be designated as the number 1 mortar and a second 81 mm mortar (Bison) will be number 2;
  - b. prepared the records; and
  - c. the instructor will carry out supervised safety precautions.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedure for laying the mortar for bearing and elevation.
7. **Introduction.** In order to generate effective fire from the mortar fire unit, it is necessary that the bearings of fire from each mortar correspond to each other with the same degree of accuracy. When the mortars within the fire unit meet the above conditions, they are said to be “parallel”.

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8. **Parallel and Record.** This drill must be carried out by all of the mortars within the fire unit immediately upon occupation of all base plate positions. All communications between mortar detachments will be carried out by field telephone or the mortar line communications system (MLCS). The drill is as follows:

- a. All mortar No. 1s will report, **READY FOR PARALLEL.**
- b. The fire unit commander will order **PARALLEL AND RECORD.**
- c. All mortar No. 1s will acknowledge.
- d. The No. 1 of the number 1 mortar will turn his C2 sight unit periscope onto the periscope of the number 2 mortar and note the bearing (this procedure will be repeated for the number 2, 3 and 4 mortars).
- e. The No. 2 of the number 1 mortar will transmit the noted bearing to each respective mortar by means of the MLCS.
- f. The No. 1 of the number 2, 3 and 4 mortars will:
  - (1) apply the applicable bearing to their C2 sight unit and read back sequentially the noted bearing to the No. 2 of the number 1 mortar;
  - (2) lay their mortars back onto the periscope of the number 1 mortar ensuring all bubbles are level (due to the position of the RO mount turntable traversing handle, the No. 2s of the mortars may have to traverse their mortars with the aid of verbal commands from their No. 1s); and
  - (3) report, **NUMBER ... MORTAR CHECK** to the number 1 mortar by MLCS once their mortars are laid.

- g. The No. 1 of the number 1 mortar will:
  - (1) Turn his periscope onto the periscope of the mortar requesting to be checked, then:
    - (a) If the observed difference between the noted bearing and the checked bearing is two mils or less, the No. 1 of the number 1 mortar will order, **NUMBER ... MORTAR CORRECT**. The No. 1 of the checked mortar will acknowledge.
    - (b) If the difference between the noted and checked bearings is greater than two mils, the parallel procedure will be repeated until the two mil requirement is achieved.
- h. Once all of the mortars are correct, all No. 1s will remove their periscope extensions and await receipt of the record from the fire unit commander (in poor light conditions, the periscopes of the mortars can be silhouetted by use of the target record card or by a red filtered flashlight to improve their visibility).
- i. The No. 1 of the number 1 mortar will:
  - (1) Turn his telescope towards the left front of his barrel orienting it onto the group commander.
  - (2) Shoot a bearing with his sight unit through the prismatic compass of the group commander. He will manually indicate completion of this action to the group commander.
- j. The group commander will:

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- (1) Shoot a bearing with his prismatic compass through the C2 sight unit periscope of the number 1 mortar (he must remain in the same position as in paragraph 3.i.).
  - (2) Convert the bearing by applying the local magnetic variation and compass error.
  - (3) Add his bearing to the bearing obtained by the C2 sight unit of the number 1 mortar, then:
    - (a) If the total of the two bearings is  $\leq 6400$  mils, it will be considered as the true record. Subsequently, it will be applied to all of the mortars within the fire unit.
    - (b) If the total of the two bearings is  $> 6400$  mils, the group commander will subtract 6400 mils from the total to obtain the true record for the fire unit.
  - (4) Order all of the mortar No. 1s to **RECORD AT ... MILS** (the record will be the same for all mortars within the group).
- k. All of the mortar No. 1s will:
- (1) Acknowledge in sequence.
  - (2) Unlock the RO mount azimuth scale locking handle.
  - (3) Turn the scales until the ordered record is applied against the bearing index.
  - (4) Lock the RO mount azimuth scale.
  - (5) Note the bearing as indicated against the vehicle heading index of the RO mount



azimuth scale. Highlight the bearing with a marking pencil or pen. It will be used as a quick reference in the event their RO mount azimuth scales should slip during firing.

- (6) Enter the record onto the mortar record card.
  - (7) Report, **NUMBER \_\_ MORTAR RECORDED AT ... MILS** (Read from the RO mount bearing. Do not read from the mortar record card).
  - (8) physically mark the bearing scale ring with a marking pencil or pen with the safety arcs.
9. Confirm by questions and practice.
10. **Conclusion:**
- a. questions to and from the class; and
  - b. conduct a practical test.
11. **Summary:**
- a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## **LESSON 5 MISFIRE DRILLS**

### **INSTRUCTOR'S NOTES**

1.     **Aim.** To teach the remedy for misfires.
2.     **Time Required.** Two 40-minute lessons.
3.     **Method.** Explanation, demonstration and practice.
4.     **Stores.** The following stores and equipment are required:
  - a.       one 81 mm mortar (Bison) per detachment; and
  - b.       training rounds.
5.     **Preparation.** Prior to the start of the first period:
  - a.       prepare a suitable area with the 81 mm mortar (Bison);
  - b.       prepare the demonstration detachment; and
  - c.       supervised the carrying out of the safety precautions.

### **CONDUCT OF THE LESSON**

6.     **Review.** Review the procedure for laying the mortar.
7.     **Introduction.** A misfire occurs when a round, which has been loaded into the barrel, fails to fire. It may occur for the following reasons:
  - a.       faulty primer;
  - b.       fouling in the barrel, which will normally cause rounds to “hang in the barrel”

- c. faulty obturating ring, which will normally cause rounds to "hang" or get stuck in the barrel; and
  - d. excessive oil and dirt in the barrel or on the rounds, which will normally cause rounds to "stick" and "hang" in the barrel.
8. In order to return the mortar into action with minimum delay and maximum safety, the detachment must be thoroughly familiar with the following misfire drill:
- a. The No. 1 will:
    - (1) Shout, **MISFIRE**.
    - (2) Ensure that the No. 2's head is below the muzzle of the mortar.
    - (3) Ensure that the elevation is >0900 mils.
    - (4) Grasp the monopod buffers with the left hand and the sight unit with his right hand.
    - (5) Shake the monopod backwards and forwards (**Ensure that the barrel is clear of the hatch.** (Figure 6-5)).
    - (6) If the round fires:
      - (a) report, **NUMBER ... MORTAR, ROUND FIRED OFF LINE**;
      - (b) relay the mortar;
      - (c) fire a round to replace the one that was fired off line; and
      - (d) carry on with the rest of the issued fire order.
    - (7) If the round is not fired:

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- (a) Retain his grasp of the mortar.
- (b) Wait one minute.
- (c) Shake the mortar again.
- (d) If no round is fired, he will order **MISFIRE UNLOAD**:
  - i) The No. 1 will fully elevate the mortar.
  - ii) The No. 2 will unlock the barrel clamp with his left hand.
  - iii) The No. 1 will remove the firing pin. The firing pin recess will be facing down.
  - iv) The No. 1 then completely depresses the mortar. If necessary, he will traverse the mortar until it points to one of the rear corners of the upper deck hatch opening.
  - v) The No. 1 and No. 2 will stand on the RO mount and face the barrel.
  - vi) The No. 2 will unlock the barrel clamp with his left hand.
  - vii) The No. 1 will rotate the barrel one quarter turn.
  - viii) The No. 2 will re-lock the barrel clamp.

- ix) The No. 1 will grasp the barrel near the breech plug and raise it to a horizontal position. Concurrently, the No. 2 cups his hands around the muzzle of the barrel.
- x) The No. 1 will continue to raise and gently shake the barrel until the round slides out of the muzzle.
- xi) The No. 2 will catch the round as it slides out of the muzzle of the mortar.
- xii) The No. 1 and 2 then carry out the appropriate drills for faulty primer, primer correct—fouling clear, primer correct—fouling in the barrel, faulty obturating ring or round stuck in the barrel.

**NOTE**

1. The barrel must be clear of the vehicle before using the round removing tool.
2. The No. 1 must remove the sight unit from the mortar before removing the barrel from the barrel clamp.

- xiii) Once the misfire is identified, the No. 1 and No. 2 will reassemble the mortar.
- xiv) The No. 1 will relay the mortar using the last data given.

- xv) The No. 1 will fire a round to replace the one that was removed from the barrel.



**Figure 6-5: Misfire Drills—Position of the No.1's Hands**



**Figure 6-6: Misfire Drills—Gaining Access to the Firing Pin**



**Figure 6-7: Misfire Drills—Removing the Firing Pin**



**Figure 6-8: Misfire Drills—Tipping up the Mortar**

9. Confirm by questions and practice.

10. **Conclusion:**

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- a. questions to and from the class; and
- b. conduct a practical test.

11. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...



## **LESSON 6 ADJUST AN ERRING MORTAR**

### **INSTRUCTOR'S NOTES**

1. **Aim.** To teach how to adjust an erring mortar.
2. **Time Required.** One 40-minute lesson.
3. **Method.** Explanation, demonstration and practice.
4. **Stores.** One Bison Mortar LAV per detachment is required.
5. **Preparation.** Prior to the start of the period:
  - a. select a suitable area with the Bison Mortar LAV in location; and
  - b. safety precautions will be carried out by the instructor.

### **CONDUCT OF THE LESSON**

6. **Review.** Review fire orders and laying the mortar.
7. **Introduction.** The lines of fire for mortars must be parallel to produce effective fire. If they become crossed or spread out (that is, not parallel), the fire controller (FC) will give the erring mortar an individual correction to bring its fire into the proper position in the belt of fire. Consequently, the erring mortar will have a different sight-reading than the correct mortars.
8. **Erring.** If the error is for bearing, it can be adjusted so that all mortars will have the same reading. This “erring” is normally due to sight inaccuracies which can be corrected by expedient means. However, mortars erring for range must be re-boresighted for elevation as soon as possible.

9. **Adjusting an Erring Mortar.** In order to adjust an erring mortar, the mortar detachment must conduct the following drill:

- a. Having received the order from the control post officer, **ADJUST LINE OF FIRE AT BEARING ...**, the No. 1 will:
  - (1) check the lay of the mortar and make corrections if necessary;
  - (2) unlock the Royal Ordnance (RO) mount bearing scale locking handle and rotate the scale until the ordered bearing is read against the bearing indices (the record of the mortar will change); and
  - (3) report **NUMBER ... MORTAR LINES OF FIRE ADJUSTED AT BEARING ...** (read the RO mount bearing scale).
- b. The No. 2 will:
  - (1) mark the scale at the vehicle heading indices with a marking pen/pencil; and
  - (2) change the record on the target record card.

10. Confirm by questions and practice.

11. **Conclusion:**

- a. questions to and from the class; and
- b. conduct a practical test.

12. **Summary:**

- a. Restate the aim.
- b. Make a final statement.
- c. Your next lesson will be ...

## LESSON 7 SIGHT UNIT TESTING

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the following points for sight unit testing:
  - a. test for elevation; and
  - b. test for bearing.
2. **Time Required.** Two 40-minute lessons.
3. **Method.** Explanation, demonstration and practice.
4. **Stores.** The following equipment is required:
  - a. one Bison Mortar LAV per detachment; and
  - b. one M45 boresight per detachment.
5. **Preparation.** Prior to the first period:
  - a. select a suitable area with a distant aiming point (DAP);
  - b. mount the mortars in the 81 mm mortar (Bison) vehicles; and
  - c. safety precautions will be carried out.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedure for laying the mortar.
7. **Introduction.** The boresighting procedure for the Bison Mortar LAV is the same as the ground mounted mortar. The Bison Mortar parallel and record drill is conducted with the C2 sight unit.

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Consequently, the sight unit must be boresighted to the Royal Ordnance (RO) mount and its monopod.

8. **Boresight Verification.** Normal verification of boresight accuracy will be conducted in the same manner as for the ground mounted role.

9. **Testing for Elevation.** In order to adjust the sight unit for elevation, the following procedure must be conducted:

- a. Test the sight unit on its proper mortar.
- b. Park the Bison Mortar LAV on level ground.
- c. The blast attenuation device (BAD) must be on the mortar.
- d. Cross-level the mortar and its sight unit.
- e. Adjust the boresight on top of the mortar just below the BAD, with the telescope pointed to the rear. Leave the straps loose enough to allow slight movement.
- f. Cross-level the boresight. Rotate it on the barrel and tighten the clamp assembly.
- g. Elevate the mortar until the elevation bubble on the boresight is central (the barrel is now at an angle of 0800 mils).
- h. Cross-level the sight unit.
- i. Centre the sight unit elevation bubble and turn the elevation micrometer.
- j. Re-check all bubbles.
- k. Read the elevation scales. They should read 0800 mils, if not, adjust as follows:

- (1) loosen the three screws in the end of the elevation micrometer using the small screwdriver provided with the sight unit;
  - (2) lock the micrometer in place and slide the elevation fine scale ring until it reads zero opposite the elevation fine scale ring index; and
  - (3) tighten the three screws.
1. Re-check all bubbles on both instruments. Ensure that they are level and the sight unit elevation scales read exactly 0800 mils. If not, repeat the above procedure.

10. **Testing for Bearing.** The sight unit occasionally will be jarred out of adjustment for bearing by firing or abuse. Consequently, all mortar sight units in the fire unit should be tested occasionally during lulls in firing.

11. The boresight can both determine and correct an error in bearing. However, this testing must only be done on the order and supervision of a qualified Advanced Mortarman. Furthermore the same boresight must be used for testing all the sight units in the fire unit. The drill for testing for bearing is as follows:

#### **NOTE**

The BAD must be on.

- a. Park the Bison Mortar LAV on level ground.
- b. Ensure that the correct sight unit is mounted to the correct mortar.
- c. Lay the mortar on a DAP with the bearing scales reading 3200 mils against the bearing index and 0800 mils on the elevation scales.

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- d. Adjust the boresight on the top of the barrel just below the BAD, with the telescope pointing to the rear. Ensure its cross-level bubble is centralized.
- e. Align the vertical line in the telescope on the DAP. Traverse the mortar. Concurrently, keep the boresight cross-level bubble central by slightly rotating the cross-leveling mechanism on the monopod (this ensures all bubbles remain central).
- f. Note the point of aim on the DAP.

12. To test the sight unit, the No. 1 will look through the sight unit telescope noting the position of the vertical line of the reticle in relation to the point of aim for adjustment, then:

- a. If the vertical line is laid on the point of aim, the sight unit is in adjustment.
- b. If the vertical line is off the point of aim, the sight unit is in error and must be adjusted (If the sight unit is out of adjustment in excess of 10 mils in bearing or elevation, it should be taken to a Weapons Technician to be checked).

13. To adjust the sight unit the No. 1 will:

- a. Turn the bearing knob until the vertical line of the reticle is aligned with the point of aim (the resulting reading on the bearing fine scale index is the sight unit error).
- b. Loosen the butterfly nut.
- c. Move the bearing fine scale ring until the zero graduation is read opposite the bearing index (ensure that the bearing knob does not rotate).
- d. Rotate the butterfly nut until the holes in the flange are opposite the three small screws.

- e. Loosen each screw with the small screwdriver provided with the sight unit.
  - f. Rotate the record index until it is aligned with the zero graduation of the bearing fine scale ring and the bearing fine scale index (ensure that the bearing knob does not move).
  - g. Check all bubbles and telescope vertical lines. If they are not in alignment with the point of aim, repeat the above procedure.
14. Confirm by questions and practice.
15. **Conclusion:**
- a. questions to and from the class; and
  - b. conduct a practical test.
16. **Summary:**
- a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ...

## LESSON 8 PREPARING A POSITION FOR RE-OCCUPATION

### INSTRUCTOR'S NOTES

1. **Aim.** To teach the preparation of a mortar position for re-occupation.
2. **Time Required.** Four 40-minute lessons.
3. **Method.** Demonstration, explanation and practice.
4. **Stores.** One Bison Mortar LAV with EIS per detachment is required.
5. **Preparation.** Prior to the start of the first period:
  - a. stake one Bison Mortar LAV to act as a demonstration vehicle; and
  - b. safety precautions will be carried out for all Bison Mortar LAV.

### CONDUCT OF THE LESSON

6. **Review.** Review the procedures for parallel and record drills.
7. **Introduction.** A mortar or fire unit must be able to re-occupy a baseplate position. In order to re-occupy a baseplate position, the position must be prepared.
8. **Preparation for Re-occupation.** Upon receipt of the command, **PREPARE FOR RE-OCCUPATION**, the mortar detachment will conduct the following drill:
  - a. The No. 2 will ensure that the last fire data sent by the control post operator (CPO) has been recorded



on the mortar record card. This data must include the bearing and elevation.

- b. The No. 1 will order, **STAKES THREE**.
- c. The No. 3 (driver) will:
  - (1) Dismount and plant a red and white stadia rod 75 metres to the rear and slightly left of the vehicle (since there is no guarantee that the mortar will be in exactly the same position upon re-occupation of the baseplate position, an aiming post must be used in conjunction with all fire data. (Figure 6-9)).
  - (2) Plant a vehicle referencing stake on both the right front and rear tire. He will ensure that the referencing stakes are centered and touch their respective wheel hub (Figure 6-10).
- d. The No. 1 will quick release and fine scale the C2 sight unit onto the aiming post. Concurrently, he will ensure that all bubbles remain level without disturbing the lay of the mortar.
- e. The No. 2 will note and record the bearing on his mortar record card as a sight bearing.

9. **Re-occupation.** The mortar detachment will conduct the following drill to re-occupy a baseplate position:

- a. The No. 3, assisted by a ground guide, will occupy his mortar position following his previous vehicle tracks. The ground guide will align the vehicle with the vehicle referencing stakes.
- b. The No. 1 will:
  - (1) bring the mortar into action;

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- (2) apply the C2 sight unit bearing and elevation to the sight unit;
- (3) note the point of aim. If the sight unit is not laid onto the aiming post, the No. 1 will:
  - (a) order, **UNLOCK** to the No. 2;
  - (b) lay the mortar onto the aiming post using the turntable traversing hand wheel and cross-levelling hand wheel;
  - (c) check the reading on the azimuth scale; and
  - (d) unlock the azimuth scale and apply the bearing from the mortar record card against the bearing index.
- (4) the No. 2 will re-mark the vehicle heading index with a marking pen/pencil.



**Figure 6-9: Baseplate Re-occupation—Placement of Stadia Rod**



**Figure 6-10: Baseplate Re-occupation—Vehicle Referencing Stakes**

10. Confirm by questions and practice.
11. **Conclusion:**
  - a. questions to and from the class; and
  - b. conduct a practical test.
12. **Summary:**
  - a. Restate the aim.
  - b. Make a final statement.
  - c. Your next lesson will be ..



## **81 mm BISON MORTAR LAV TRAINING REQUIREMENTS DUTIES AND RESPONSIBILITIES**

1. **Group Commander.** The duties and responsibilities of a group commander within an 81mm Bison mortar platoon do not greatly differ from the present duties and responsibilities of a group commander within a mechanized 81mm mortar platoon. In addition to his normal duties and responsibilities, he must consider the following:
  - a. he can remain with the group (in most situations, the occupation of a baseplate position only requires enough space to park four Bison Mortar LAV );
  - b. he should consider hull down and/or dug in vehicle positions in defensive operations; and
  - c. he should mount the control post operator's (CPO) vehicle and man the crew commander's hatch during fire planning (this will enable him to have direct contact with the CPO by either voice or vehicle internal communication system).
  
2. **Control Post Operator (CPO).** The duties and responsibilities of a CPO in an 81 mm Bison mortar platoon do not differ from the present duties and responsibilities of a CPO in a mechanized 81 mm mortar platoon. However, he has the option of performing his duties from any Bison Mortar LAV in the group (every Bison Mortar LAV is configured with a CPO's station).
  
3. **Line NCO.** The duties and responsibilities of a Line NCO within an 81 mm Bison mortar platoon do not differ from the present duties and responsibilities of a Line NCO within a mechanized 81 mm mortar platoon. However, he now has three ways to communicate to the mortar line:
  - a. His primary means of communication to the group will be the mortar line communication system (MLCS) utilizing the in-service PRC 126 radio. When using this system, the procedure is:

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- (1) The CPO will pass fire data to both the Line NCO and No. 1's by MLCS.
  - (2) The Line NCO will read back the fire order to the CPO by means of MLCS. Concurrently, the detachment No. 1 will apply the fire data and lay their mortars (There is no requirement for the Line NCO to transmit the data to the detachments. They have already heard the fire data twice over the MLCS).
  - (3) The No. 1 will read back the fire data to the Line NCO by MLCS.
  - (4) The Line NCO will:
    - (a) correct any fire data which has been read back incorrectly; and
    - (b) communicate with the CPO as required by means of MLCS.
- b. His secondary means of communication will be provided by the TA 43-PT field telephone. Communication within the group will be conducted in the same manner as with the MLCS with the following exceptions:
- (1) The No. 2 will:
    - (a) monitor the field telephone;
    - (b) acknowledge fire orders; and
    - (c) verbally convey fire data to their detachment's No. 1 (it would not be practical for the No. 1 to apply fire data to the mortar while holding a field telephone).

- c. His final means of communication is voice.  
Communication within the group will be conducted  
in accordance with present doctrine.