



# **THEORY OF ARMoured GUNNERY**

## **PART II**

# **LEOPARD C2 APPLICATION OF FIRE**

**(ENGLISH)**

**(Supersedes B-GL-305-009/PT-002, dated 1995-03-15.)**

### **WARNING**

ALTHOUGH NOT CLASSIFIED, THIS PUBLICATION, OR ANY PART OF IT, MAY BE EXEMPT FROM DISCLOSURE TO THE PUBLIC UNDER THE ACCESS TO INFORMATION ACT. ALL ELEMENTS OF INFORMATION CONTAINED HEREIN MUST BE CLOSELY SCRUTINIZED TO ASCERTAIN WHETHER OR NOT THE PUBLICATION OR ANY PART OF IT MAY BE RELEASED.

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





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

**OPI: Armour School, CTC Gagetown**

**2004-03-09**



## FOREWORD

1. B-GL-393-009/FP-001, *Armour, Theory of Armoured Gunnery, Part 2, Leopard C2 Application of Fire*, is issued on the authority of the Chief of Land Staff.
2. B-GL-393-009/FP-001 is effective on receipt and supersedes all previous editions.
3. Suggestions for changes to this publication shall be forwarded through the normal channels to the Armour School, Attention IG Standards Cell.
4. Unless otherwise noted, masculine pronouns apply to both men and women.

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## **CHAPTER 1 PRINCIPLES OF OPERATION**

### **SECTION 1 GENERAL**

#### **INTRODUCTION**

1. Shooting techniques provide drills to assist crews in the application of fire from their AFVs. These techniques take into account the various factors affecting the weapon system, including the conditions particular to the engagement. Whenever possible, shooting techniques are standardized and follow a set pattern. However, the more complex and diversified the AFV, the more techniques required to cover all likely engagements. This manual attempts to minimize the number of shooting techniques used. For example, wherever possible, the same techniques are applied to shooting with both the IFCS day sight and with the IFCS thermal sight.
2. Continuous development, improvement and training methods tend to result in further techniques for crews to learn. However, if the basic principles are understood, crews should have little difficulty in operating the weapons efficiently. Frequent revision and practise on the Leopard Crew Gunnery Trainer (LCGT) and the open range helps in the development and the maintenance of a high standard of gunnery proficiency.

#### **AIM**

3. The aim of this publication is to describe the application of fire and the techniques of shooting with regard to the Leopard C2.

#### **SCOPE**

4. This publication deals with the application of fire using all the weapons and weapon systems available within the Leopard C2 platform.

## Leopard C2 Application of Fire

5. This publication should be read in conjunction with the following manuals:

- a. B-GL-305-009/PT-001 *Armour, Volume 9, Theory of Armoured Gunnery, Part 1, General*;
- b. Leopard C2 Turret Manual;
- c. B-GL-305-013/PT-001 *Armour, Volume 13, Armour Open Range Practices*; and
- d. B-GL-381-001/TS-000 *Operational Training, Training Safety*.

6. A list of definitions and a glossary of gunnery terms used are included within this publication.

## **CATEGORIES**

7. The application of fire from the Leopard C2 is grouped into six categories:

- a. the Integrated Fire Control System (IFCS);
- b. the Secondary Fire Control System (SFCS);
- c. the Commander's Fire Control System (CFCS);
- d. the Gun Laying Instruments (GLI);
- e. the cupola mounted machine-gun; and
- f. the multi-barrelled grenade dischargers(MBGD).

## SECTION 2 MODES OF OPERATION

### INTRODUCTION

8. The primary sight (IFCS), the fire control and the gun control systems installed within the Leopard C2 are designed to be used in conjunction with a laser range finder in the fully stabilized mode of operation. Although it can be used effectively in modes other than full stabilization, such modes are considered to be degraded modes of operation. Each degraded mode has certain limitations and should, therefore, only be used in operational emergencies. A detailed explanation of the modes of operation (see Figure 1-1) is summarized as follows:

- a. Mode A, "STABILIZATION" mode:
  - (1) A-1—IFCS fully operational;
  - (2) A-2—laser range finder not functioning;  
and
  - (3) A-3—IFCS not functioning, SFCS must  
be used.
  
- b. Mode B, "STAB READY" mode:
  - (1) B-1—IFCS fully operational;
  - (2) B-2—laser range finder not functioning;  
and
  - (3) B-3—IFCS not functioning, SFCS must  
be used.
  
- c. Mode C, "OBSERVATION" mode:
  - (1) C-1—IFCS fully operational;
  - (2) C-2—laser range finder not functioning;  
and

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(3) C-3—IFCS not functioning, SFCS must be used.

d. Mode D, “TURRET OFF” mode:

(1) D-1, and D-2—there are no functions available in these modes; and

(2) D-3—manual controls and the SFCS can be utilized.

MODES		(1) IFCS (Fully Operational)	(2) IFCS (Laser Unserviceable)	(3) IFCS (Not Available)
(A) STABILIZED	GNR	<p>Normal mode of operation for engaging static and moving targets while static or on the move and firing.</p> <p>After the laser is fired, the centre of the graticule remains on the target, and the gun moves to the correct firing position</p>	<p>A degraded mode of operation where the range to the target must be estimated. The range is inputted manually using the computer control unit (CCU). The centre of the graticule remains on the target, and the gun is moved into the correct firing position</p> <p>Engagement ranges, times and accuracy are limited.</p>	<p>A further degraded mode of operation where the secondary sight must be used.</p> <p>The estimated range is inputted manually on the range scale and the gunner uses the control handles to place the aiming mark onto the target. In doing so, the gun is moved to the correct firing position.</p> <p>Correct lead angles must be applied for moving targets or when on the move.</p>
	C/C	<p>Crew commander (C/C) can monitor gunner engagements and engage targets with the laser through the IFCS sight extension.</p> <p>Since there is no lead-lock available to the C/C, lead angles must be applied when engaging moving targets or when on the move.</p>	<p>C/C can only monitor the gunner engagements through the IFCS sight extension.</p>	<p>The C/C can use the TRP 5A as an observation device only.</p>

MODES		(1) IFCS (Fully Operational)	(2) IFCS (Laser Unserviceable)	(3) IFCS (Not Available)
(B) STAB READY	GNR	<p>A degraded mode of operation where the tank should not be fired on the move.</p> <p>Engagements of static and moving targets are slower because the sight graticule moves after the laser is fired. The gunner uses the control handles to place the centre of the graticule back onto the target. In doing so, the gun is moved to the correct firing position. The gunner must also manually apply lead angles when engaging moving targets.</p>	<p>A mode of operation where the gun should not be fired on the move and the range to all targets must be estimated.</p> <p>The range is inputted manually using the CCU. When the range is applied, the centre of the graticule moves off the target. The gunner uses the control handles to place the centre of the graticule back onto the target. In doing so, the gun is moved to the correct firing position.</p>	Same as MODE A-3 with one exception, targets are to be engaged from a static vehicle.
	C/C	C/C can monitor the gunner engagements and engage targets with the laser range finder through the IFCS sight extension. The graticule will move in the same manner as mentioned above.	C/C can monitor the gunner engagements through the IFCS sight extension.	The C/C can use the TRP 5A as an observation device only.

Figure 1-1a: Modes of Operation (Sheet 1 of 2)

Leopard C2 Application of Fire

MODES		(1) IFCS (Fully Operational)	(2) IFCS (LaserUnserviceable)	(3) IFCS (Not Available)
(C) OBSERVATION	GNR	<p>A degraded mode of operation where the gun is laid using manual controls and must be fired using the trigger on the manual elevation hand wheel.</p> <p>The laser is operated with the laser-firing button on the gunner's control handles. The gunner then places the centre of the graticule back onto the target. In doing so, the gun is moved to the correct firing position</p> <p>Engagements of static and moving targets are considerably slower than similar IFCS engagements.</p>	<p>A mode of operation where the gun is laid using manual controls and must be fired using the trigger on the manual elevation hand wheel.</p> <p>The range to the target must be estimated and applied to the CCU.</p> <p>Correct lead angles must be applied when engaging moving targets.</p>	<p>Same as MODE A-3 except that the gunner must lay the gun manually and must fire using the trigger on the manual elevation hand wheel.</p>
	C/C	<p>C/C can monitor gunner engagements through the IFCS sight extension but cannot engage targets with his power controller.</p> <p>The C/C can use the TRP 5A as an observation device only.</p>	<p>C/C can monitor gunner engagement through the IFCS sight extension.</p> <p>The C/C can use the TRP 5A as an observation device only.</p>	<p>The C/C can use the TRP 5A as an observation device only.</p>



MODES		(1) IFCS (Fully Operational)	(2) IFCS (LaserUnserviceable)	(3) IFCS (Not Available)
(D) TURRET OFF	GNR	NO FUNCTION	NO FUNCTION	The minimum mode of operation from a static tank.  When engaging static and moving targets, the range must be estimated, the correct lead angles must be applied to the SFCS, and the gunner must fire using the emergency firing circuit.  Engagement ranges, timing and accuracy will be notably affected.
	C/C	The C/C can use the TRP 5A as an observation device only.	The C/C can use the TRP 5A as an observation device only.	The C/C can use the TRP 5A as an observation device only.

Figure 1-1b: Modes of Operation (Sheet 2 of 2)

### SECTION 3 FIRE CONTROL SYSTEMS

#### IFCS

9. The accuracy and speed of the IFCS is such that it is the primary system used to apply fire from the Leopard C2. The IFCS permits the firing of armour piercing fin stabilized discarding sabot (APFSDS) commonly referred to as SABOT, high explosive squashed head (HESH), high explosive anti tank (HEAT), white phosphorus (WP), and 7.62 mm machine gun ammunition (COAX). There are six basic techniques that may be employed using the IFCS with these types of ammunition. The engagement techniques and range bands are covered in detail in the chapters that follow. The engagement range bands are summarized in Figure 1-2.

10. With the use of a commander's IFCS sight extension, the crew commander has the ability to use the IFCS to engage targets

## Leopard C2 Application of Fire

with the main armament. There is one technique that may be employed and it is covered in detail in the chapters that follow.

### **SFCS**

11. The SFCS is used:

- a. to measure an angle of sight (gunner's method);  
and
- b. when the IFCS is unserviceable.

12. The SFCS has no range determination system incorporated and is, consequently, more time consuming than the IFCS. In addition, it is less accurate than the IFCS as the techniques used are usually based on estimated ranges.

13. The SFCS permits the firing of SABOT, HESH, HEAT, WP and COAX ammunitions. There are five techniques that may be employed when using the SFCS with these ammunitions. The engagement techniques and range bands are covered in detail in the following chapters. The engagement range bands are summarized in Figure 1-2.

### **CFCS**

14. The CFCS consists of the IFCS sight extension. It allows the commander to engage targets using the lasing technique from a stationary tank or while on the move.

### **GLI**

15. The GLI permits the firing of HESH and WP beyond their direct fire range limitations inherent to the IFCS and SFCS sights using the semi-indirect technique.

16. Due to the inherent inaccuracy and limited effect of tank fire when used in either a semi-indirect or indirect role, using the Leopard C2 in such roles is strongly discouraged. In extreme

emergencies, the use of semi-indirect and indirect fire at targets beyond direct fire range may be employed.

17. The theory and techniques required to employ such fire will be maintained at the Armour Gunnery Specialist (AGS) level in order to retain the basic skill level within the Armoured Corp.

### **CUPOLA MOUNTED MACHINE-GUN**

18. The cupola mounted machine-gun (MG) may engage both ground and aerial targets.

### **MULTIPLE BARREL GRENADE DISCHARGERS (MBGD)**

19. The MBGD are mounted in two banks of four, one bank on each side of the turret. They fire the following grenades:

- a. Hexachlorophene (HCE) grenade that provides a smoke screen;
- b. high explosive (HE) grenade that provides a protective screen; or
- c. grenade that will, potentially, provide a protective screen that defeats thermal observation devices.

20. To fire, the C/C uses his controller to traverse the turret to the desired direction to produce the screen, selects the ammunition or bank on the MBGD control box and pushes the appropriate firing button.

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AMMO	TECHNIQUE		IFCS (m)	SFCS (m)	CFCS (m)
SABOT	Lasing	Static Target	190—4000	—	190—4000
		Moving Target	190—3000	—	190—3000
		On The Move	190—3000	—	—
	Estimated	Static Target	0—4000	0—2400	—
		Moving Target	0—3000	0—2400	—
		On The Move	0—1700	—	—
HESH / WP	Lasing	Static Target	190—4000	—	190—4000
		Moving Target	190—1500	—	190—1500
		On The Move	190—1500	—	—
	Estimated	Static Target	0—4000	0—3500	—
		Moving Target	0—1500	0—1500	—
		On The Move	—	—	—
COAX	Lasing	Static Target	190—1500	—	—
		Moving Target	190—1500	—	—
		On The Move	190—1500	—	—
	Estimated	Static Target	0—1500	0—1500	—
		Moving Target	0—1500	0—1500	—
		On The Move	0—1500	—	—

**Figure 1-2: Engagement Range Bands**

## **SECTION 4 START MODES**

### **INTRODUCTION**

21. The start mode is an established drill conducted by all crew members to ensure that the tank and all of its weapons and fire control systems are ready for use. Prior to the initial engagement, the systems are checked during the opening-up and action drills. In addition, the start mode drill is completed immediately following all engagements.

22. The commander's complete start mode is as follows:  
Ensures the IFCS override button on the commander's thermal control unit is ON (illuminated).

23. The gunner's complete start mode is given as follows:

- a. "AUTOMATIC" (on the CCU);
- b. "1500" (on the CCU);
- c. "1000" (on the SFCS sight);
- d. "APDS" (on the SFCS sight);
- e. "MAIN" (on the CCU); and
- f. start mode.

24. The loader's complete start mode is given as follows:

- a. SABOT loaded; and
- b. gun safe.

### NOTE

Due to the many mode variations and associated gunnery techniques, only the equipment used during an engagement is verified. In addition, the start mode used during a turret off mode of degraded operations is significantly different, as noted further in the text.

## LASING TECHNIQUE

25. The start mode used for lasing engagements in the “STABILIZED”, “STAB READY” and “OBSERVATION” modes is as follows:

- a. **Crew Commander.** The crew commander has no actions to perform and supervises the crew.
- b. **Gunner.** The gunner does the following:
  - (1) set the “MAIN/COAX” switch to “MAIN” and reports **MAIN**; and
  - (2) reports **START MODE** when ready to begin the next engagement.
- c. **Loader.** The loader does the following:
  - (1) after a main armament engagement, loads a **SABOT** round and reports **SABOT LOADED**, and presses the “GUN SAFE” button on the loader’s control box and reports **GUN SAFE**; and
  - (2) after a coax engagement, makes the COAX safe and reports **COAX SAFE**.

**ESTIMATED TECHNIQUE**

26. The start mode used for estimated engagements in the “STABILIZED”, “STAB READY” and “OBSERVATION” modes is as follows:

- a. **Crew Commander.** The crew commander has no actions to perform and supervises the crew.
- b. **Gunner:**
  - (1) When using the IFCS (range on CCU):
    - (a) sets the AUTOMATIC/MANUAL switch on the CCU to “MANUAL” and reports **MANUAL**;
    - (b) sets “1500” m on the range scale on the CCU and reports **1500**;
    - (c) sets the MAIN/COAX switch to “MAIN” and reports **MAIN**; and
    - (d) reports **START MODE** when ready to begin the next engagement.
  - (2) When using the IFCS (E00 used):
    - (a) sets the Main/COAX switch to “MAIN” and reports **MAIN**; and
    - (b) reports **START MODE** when ready to begin the next engagement.
  - (3) When using the SFCS:

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- (a) sets the SFCS range scale to “APDS, 1000”, and reports **APDS, 1000**;
  - (b) ensures the MAIN/COAX switch is set to “MAIN” and reports **MAIN**; and
  - (c) reports **START MODE** when ready to begin the next engagement.
- c. **Loader.** The loader does the following:
- (1) after a main armament engagement, loads a SABOT round and reports **SABOT LOADED** and presses the Gun Safe button on the loader’s control box and reports **GUN SAFE**; and
  - (2) after a coaxial engagement, makes the COAX safe and reports **COAX SAFE**.

## TURRET OFF MODE

27. The start mode used for engagements in the turret off mode is as follows:

- a. **Crew Commander.** The crew commander has no actions to perform and supervises the crew.
- b. **Gunner.** The gunner does the following:
  - (1) sets the SFCS range scale to “APDS, 1000”, and reports **APDS, 1000**;
  - (2) ensures the Main/Emergency switch to “EMERGENCY” and reports **EMERGENCY**; and



- (3) reports **START MODE** when ready to begin the next engagement.
- c. **Loader.** The loader does the following:
- (1) after a main armament engagement, loads a SABOT round and reports **SABOT LOADED** and presses the Gun Safe button on the loader's control box and reports **GUN SAFE**; and
  - (2) after a coaxial engagement, makes the COAX safe and reports **COAX SAFE**.



## **CHAPTER 2 ENGAGEMENT TECHNIQUES**

### **SECTION 1 GENERAL**

#### **INTRODUCTION**

1. Standardized procedures within the turret are essential for successful engagements. Such procedures in the form of drills ensure that each member of the crew is fully prepared for target engagements. Although there are minor variations between engagements conducted with the IFCS, SFCS, and CFCS, the sequences discussed in this chapter are the basis for all engagements.

#### **ENGAGEMENT TYPES**

2. Target engagements are categorized by the method used to determine the range to the target. The two techniques are as follows:

- a. lasing technique; and
- b. estimated technique.

3. To reduce the engagement times, the above techniques have been further divided into the following two categories:

- a. commander initiated engagements; or
- b. gunner initiated engagements.

## SECTION 2 LASING TECHNIQUES

### LASER AIMING RULES

4. Laser aiming rules have been established to ensure that a correct range is achieved quickly. The laser aiming rules are as follows:

- a. **Rule No. 1**—aim at the centre of the target if the laser circle is smaller than, or covers the target (see Figure 2-1);
- b. **Rule No. 2**—aim at the base of the target if:
  - (1) the laser circle is larger than the target (see Figure 2-2);
  - (2) the gunner recognizes that the laser return is incorrect (see Figure 2-3); or
  - (3) after relasing results in a double return; or a return of zeros;
- c. **Rule No. 3**—at partly covered targets, aim at the centre of the target (through the obstruction). This ensures that the return is not of the background area (see Figure 2-4).

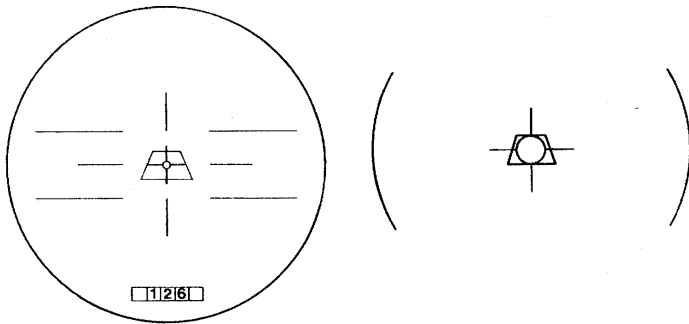


Figure 2-1: Laser Aiming Rule No. 1

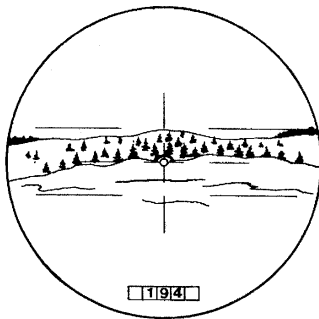


Figure 2-2: Laser Aiming Rule No. 2

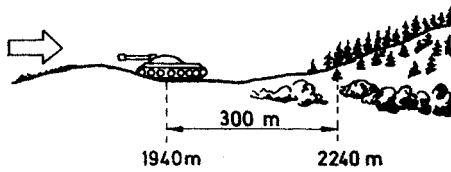


Figure 2-3: Laser Aiming Rule No. 2

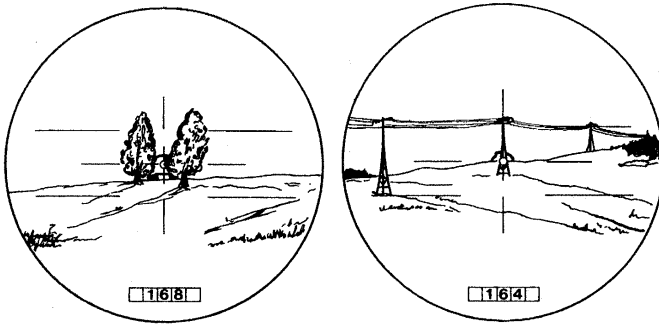


Figure 2-4: Laser Aiming Rule No. 3

## LASER RETURNS

5. **Laser Returns.** After the laser has been fired, one of the following returns will be displayed in the gunner's sight:

- a. a single return;
- b. a double return;
- c. a long range return;
- d. a return of "000"; or
- e. a return of "999".

6. **Single Return.** A single return indicates that the system received one laser return between 190 m and 4000 m. In this situation the following will occur:

- a. **Gunner.** The gunner will react as follows:
  - (1) report the range, **1800 (ONE EIGHT HUNDRED)**, or round up or down to the nearest hundred of metres, **1450—ONE FOUR HUNDRED FIFTY**;
  - (2) relay the graticule onto the centre of the target (in "FULLY STABILIZE", the

graticule stays at the original point of aim); and

(3) await the commander's order to fire.

b. **Commander.** The commander will verify the range in the IFCS sight extension and, when ready, order the gunner to fire.

7. **Double Return.** A blinking range in the IFCS sight indicates that the system received two laser returns. Only the longest range is displayed and input to the computer. In this situation the following will occur:

a. **Gunner.** The gunner will react as follows:

(1) report the range **DOUBLE 1800**;

(2) relay the graticule onto the centre of the target (in "FULLY STABILIZED", the graticule stays at the original point of aim); and

(3) await the commander's order to fire.

b. **Commander.** The commander will consider the range and issue one of the following orders:

(1) **FIRE**;

(2) **RELEASE** if time permits; or

(3) **AN ESTIMATED RANGE** followed by **FIRE** (if the commander believes that the lased range is wrong).

c. **Gunner.** The gunner will react to the commander's orders with the appropriate actions.

8. **Long Range Return.** A long range return indicates that the system received a return between 4010 m and 9990 m and the

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target is beyond direct fire range. The computer will apply a range of 4000 m. In this situation the following will occur:

- a. **Gunner.** The gunner will do the following:
  - (1) relay onto the target using the laser rules;
  - (2) relase;
  - (3) if the range displayed is below 4000 m, report the range and carry on IAW a single or double return; or
  - (4) if a long range appears again, report the range **5000**, relay the graticule onto the centre of the target, and wait for the commander's order.
  
- b. **Commander.** The commander will consider the range and do one of the following:
  - (1) order the gunner to **RELEASE** if time permits;
  - (2) engage the target with a different ammunition using the IFCS or SFCS estimated technique; or
  - (3) cease the engagement.

9. **Return of 000.** Three zeros displayed in the IFCS sight indicates one of the following:

- a. the laser was fired at a target below 190 m;
- b. the laser was fired at a target beyond 9990 m; or
- c. there was no laser emission.

10. When three zeros are displayed, the computer will automatically apply the (default) range of 1000 m to the computer. In this situation the following will occur:



- a. **Gunner.** The gunner will do the following:
  - (1) relay onto the target using the laser rules;
  - (2) release;
  - (3) note the range;
  - (4) if the range is between 190 m and 4000 m report the range and carry on IAW a single or double return; or
  - (5) if zeros are displayed a second time, the gunner will report **ZEROS**, relay the graticule onto the centre of the target and await the commander's order.
  
- b. **Commander.** The commander will consider the range to the target and do one of the following:
  - (1) if the commander believes that the target is at close range, order the gunner to fire;
  - (2) if the commander believes that the target is within direct fire range and the laser has missed the target, carry on with an estimated technique;
  - (3) order the gunner to **RELEASE** if time permits; or
  - (4) cease the engagement.

11. **Return of 999.** Three nines displayed in the gunner's sight indicates one of the following:

- a. The laser is switched off.
  
- b. The manual range is selected. This display is replaced with "E00" or a range if the gunner or commander engages the laser trigger.

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- c. The commander has selected the TRP 5A mode and the commander's palm switch is depressed. In this mode, the computer uses the range that is set on the TRP 5A range scale.

### **USING THE LASER RANGE FINDER (LRF)**

12. The following points apply to the use of the laser range finder:

- a. If no range is ordered, the gunner is not specifically ordered to fire the laser, and the EMCON state allows laser emission, the gunner must fire the laser range finder immediately upon target identification IAW the laser aiming rules. The commander will be aware that the gunner has fired the laser when the gunner reports the return. Regardless of the return reported, the gunner will re-lay centrally onto the target and wait for the commander's order.
- b. The commander will not give the executive order to fire until the gunner has reported the range.
- c. If at any time during an engagement, if the commander wants to confirm the range, **RELEASE** will be ordered. Upon hearing the order **RELEASE** the gunner will:
  - (1) repeat **RELEASE**;
  - (2) aim at the target IAW the laser aiming rules;
  - (3) fire the laser and report the return displayed; and
  - (4) re-lay onto the target and wait for the commander's order.

- d. The commander may order **RELEASE** for any of the following reasons:
  - (1) a SABOT round misses during a lasing engagement and the gunner reports **NOT OBSERVED**;
  - (2) the gunner reports anything except a single return;
  - (3) the target moves; or
  - (4) when the range to the target is in doubt.

### **COMMANDER INITIATED ENGAGEMENTS**

13. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) initiate a fire order by designating the weapon/ ammunition, ordering **LASE** and giving the target description;
  - (2) align the gun/ sight onto the target using the commander's controller or by ordering the gunner to traverse left or right;
  - (3) when laid onto the target, report **ON**;
  - (4) wait for the gunner's laser response;
  - (5) verify laser return and ammunition in IFCS sight extension; and
  - (6) issue the order to fire when ready.
- b. The gunner will:

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- (1) look through the sight, identify the target and report **ON**;
  - (2) lay the centre of the graticule onto the target IAW the laser aiming rules;
  - (3) fire the laser;
  - (4) follow the procedures based on the laser return;
  - (5) report the range displayed;
  - (6) check the ammunition indicator display to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. The loader will:
- (1) load the ammunition ordered;
  - (2) ensure that the correct ammunition is selected on the loader's control box;
  - (3) press the "LOADED" button on the loader's control box;
  - (4) report the ammunition type followed by ready e.g. **SABOT READY**; and
  - (5) continue loading the same ammunition until told to **STOP** or until a change in ammunition is ordered.

**NOTE**

If the gunner or commander identify that the loader has pushed the wrong ammunition button on the loader's control box, **STOP... WRONG AMMO**, will be reported. Once the correct ammunition is selected, the commander will order **GO ON** or **FIRE**.

- d. when the commander orders **TARGET STOP** ceasing the engagement, the crew will conduct the start mode drill as detailed in Chapter 1.
14. If the gunner does not identify the target, the gunner will report, **NOT OBSERVED**. Upon hearing the gunner's response, the commander will do one of the following:
- a. report **MY SIDE** indicating that the commander is assuming control of the engagement by employing the IFCS sight extension; or
  - b. attempt to talk the gunner onto the target using a more detailed target description and a reference point from which the gunner can make a line switch if time permits.

**GUNNER INITIATED ENGAGEMENTS**

15. When the gunner identifies a target, the engagement will be initiated as follows:
- a. the gunner will:
    - (1) look through his sight, identify the target and report **CONTACT** and target description (**TANK, APC, MEN**, etc.) or just **CONTACT** if he does not recognize the target;

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- (2) using the laser aiming rules, lay the graticule onto the target;
  - (3) fire the laser;
  - (4) follow the procedures based on the laser return;
  - (5) report the range;
  - (6) check the ammunition indicator display to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. the commander will:
- (1) listen for the gunner's laser response;
  - (2) verify the target and range;
  - (3) order the ammunition; and
  - (4) issue the order to fire when ready.
- c. the loader will follow the same sequence that is detailed for commander initiated engagements; and
- d. when the commander orders **TARGET STOP** ceasing the engagement, the crew will conduct the start mode drill as detailed in Chapter 1.

### SECTION 3 ESTIMATED TECHNIQUES

#### GENERAL

16. When the laser is not functioning, or if the tactical situation does not permit the use of lasers, the commander has a number of different methods to which he can utilize to estimate the range to the target. The most accurate of these is the lased range from another tank. The method by which the estimated range is applied depends on the fire control system and the ammunition being used. In an attempt to maintain a balance between engagement speeds and accuracy, when applying an estimated range into the CCU, the gunner will input the range to an accuracy of plus/minus 20 m. As an example, for an ordered range of 1700 m, a set range of 1680 m to 1720 m is acceptable. The different methods available are as follows:

a. **IFCS:**

- (1) For SABOT below ranges of 1300 m, the gunner will push the E00 switch, automatically entering a range of “1000 m” into the computer.
- (2) For SABOT at ranges between 1300 m to 1700 m: “1500 m” will be set on the CCU and the gunner will select the “MANUAL RANGE”.
- (3) For SABOT at ranges above 1700 m: the estimated range will be set on the CCU and the gunner will select the “MANUAL RANGE”.
- (4) For HESH: the estimated range will be set on the CCU for all engagements and the gunner will select “MANUAL RANGE”.

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- (5) For HESH at 1000 m: the gunner will select "E00", automatically entering a range of "1000 m" into the computer.
  - (6) For COAX: the estimated range will be set on the CCU for all engagements and the gunner will select "MANUAL RANGE".
  - (7) For COAX at 1000 m: the gunner will select "E00", automatically entering a range of "1000 m" into the computer.
- b. **SFCS:**
- (1) For SABOT below 1300 m: "1000" m will be set on the range scale.
  - (2) For SABOT above 1300 m: the estimated range will be set on the range scale.
  - (3) For HESH: the estimated range will be set on the range scale for all engagements.
  - (4) For COAX: the estimated range will be set on the range scale for all engagements.

## COMMANDER INITIATED ENGAGEMENTS

17. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition, giving the range in



hundreds of metres and providing a target description;

- (3) align the gun/sight onto the target using the commander's controller; or by ordering the gunner to traverse left or right;
- (4) when laid onto the target, report **ON**;
- (5) wait for the gunner to report **ON**;
- (6) verify laser return and ammunition in IFCS sight extension; and
- (7) issue the order to fire when he is ready.

b. The gunner will:

- (1) repeat the **RANGE**;
- (2) look through the sight, identify the target then report **ON**;
- (3) apply the range to the CCU or SFCS;
- (4) switch the "RANGE AUTO/ MANUAL" switch to "MANUAL" or toggle the "E00" switch as necessary;
- (5) lay the aiming mark on the centre of the target;
- (6) check the ammunition indicator display to ensure that the correct ammunition is selected;
- (7) on order from the commander, report **FIRING NOW** and fire; and

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- (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
  - c. The loader will follow the same sequence that is detailed for lasing engagements.
  - d. When the commander orders **TARGET STOP** ceasing the engagement, the crew will conduct the start mode drill as detailed in Chapter 1.
18. If the gunner does not identify the target, the gunner will report, **NOT OBSERVED**. Upon hearing the gunner's response, the commander will do one of the following:
- a. report **MY SIDE** and carry on with the engagement using the IFCS sight extension; or
  - b. attempt to talk the gunner onto the target using a more detailed target description and a reference point from which the gunner can make a line switch, if time permits.

## GUNNER INITIATED ENGAGEMENTS

19. When the gunner identifies the target, the engagement will be initiated as follows:
- a. The gunner will:
    - (1) look into the sight, identify the target and report **CONTACT** and target description (**TANK, APC, MEN**, etc.) or just **CONTACT** if the gunner does not recognize the target;
    - (2) report the general range to the target as follows: **NEAR** (below 1000 m), **MIDDLE** (1000—2000 m) or **FAR** (above 2000 m);

- (3) lay the centre of the graticule onto the target and wait for the commander to issue a fire order;
- (4) apply the range to the CCU or SFCS;
- (5) switch the “RANGE AUTO/ MANUAL” switch to “MANUAL” or toggle the “E00” switch as necessary;
- (6) lay the aiming mark on the centre of the target;
- (7) check the ammunition indicator display to ensure that the correct ammunition is selected;
- (8) on order from the commander, report **FIRING NOW** and fire; and
- (9) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.

b. The commander will:

- (1) verify the target and estimate the range of the target to be within the direct fire range band;
- (2) initiate a fire order by designating the weapon/ammunition and the range in hundreds of metres;
- (3) verify laser return and ammunition in IFCS sight extension; and
- (4) issue the order to fire when ready.

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- c. The loader will follow the same sequence that is detailed for lasing engagements.
- d. When the commander orders **TARGET STOP**, ceasing the engagement, the crew will conduct the start mode drill as detailed in Chapter 1.

### **SECTION 4 MULTIPLE TARGET ENGAGEMENTS**

#### **GENERAL**

20. Multiple target engagements deal with engaging one target immediately after another without a break in the engagement. Multiple target engagements are grouped into two categories:

- a. targets that are at similar ranges; and
- b. targets that are at various ranges.

#### **TARGETS AT SIMILAR RANGES**

21. When there are multiple targets at similar ranges, the commander will order the gunner to engage other targets by indicating the location of the next target in relation to the previous and by giving a target description as **STOP...NEXT TARGET LEFT, TANK ON**. This target description will signal to the loader and the gunner that there is no change in the nature of ammunition being used.

22. During lasing engagements, the laser will be used to confirm the range to the second target.

23. The sequence for lasing engagements will be as follows:

- a. After identifying the second target, the gunner will report **ON**, immediately lay onto the target using the laser aiming rules, lase, report the range and do one of the following:

- (1) fire, if the commander orders **GO ON**; or
    - (2) wait for the commander's order to fire.
  - b. The commander will then order **GO ON** or **FIRE** after the gunner reports **ON** and the **RANGE**.
  - c. The engagement will continue IAW the lasing techniques.
24. The sequence for all estimated engagements will be as follows:
- a. After identifying the second target, the gunner will report **ON**, immediately lay onto the target with the same point of aim that was used to hit the previous target. The gunner will also do one of the following:
    - (1) fire, if the commander ordered **GO ON**;  
or
    - (2) wait for the commander's order to fire.
  - b. The commander will then order **GO ON** or **FIRE** after the gunner reports **ON**.
  - c. The engagement will continue IAW the estimated techniques.

## TARGETS AT VARIOUS RANGES

25. When the multiple targets are at various ranges, the commander will order the gunner to engage other targets by indicating their location in relation to the previous target. This is done by giving a target description as **STOP...NEXT TARGET LEFT** or **RIGHT, TANK/ APC**, followed by a range in multiples of one hundred metres as **1400** for estimated techniques.

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26. The sequence for a lasing engagement involving subsequent targets will be as follows:

- a. After identifying the second target, the gunner will report **ON**, immediately lay onto the target using the laser aiming rules, lase, report the range and do one of the following:
  - (1) fire, if the commander ordered **GO ON**;  
or
  - (2) wait for the commander's order to fire.
- b. The commander will then order **GO ON** or **FIRE** after the gunner reports **ON** and the new range.
- c. The engagement will continue IAW the lasing techniques.

27. The sequence for an estimated engagement involving subsequent targets will be as follows:

- a. After identifying the second target, the gunner will report **ON**, repeat the range, immediately lay onto the target, apply the new range and do one of the following:
  - (1) fire, if the commander orders **GO ON**; or
  - (2) wait for the commander's order to fire.
- b. the commander will then orders **GO ON** or **FIRE** after the gunner reports **ON**; and
- c. the engagement will continue IAW the estimated techniques.

## **CHAPTER 3 SABOT SHOOTING AT STATIONARY TARGETS**

### **SECTION 1 GENERAL**

#### **INTRODUCTION**

1. This chapter deals with shooting APFSDS ammunition, normally referred to as SABOT, at stationary targets using all fire control systems under various conditions. The APFSDS round is the current operational kinetic energy (KE) round used by the Armoured Corps. There are a number of principal advantages to using APFSDS ammunition:

- a. its accuracy;
- b. its penetration; and
- c. its minimal dispersion.

2. The tank commander can engage targets with SABOT ammunition using the following fire control systems:

- a. the IFCS;
- b. the SFCS; and
- c. the CFCS.

3. With earlier tanks, such as the Leopard C1, SABOT engagements were known as commander shoots. This meant that the commander ordered each round fired and each correction. With the improved optics built into the C2 turret, there is a significantly better chance that the gunner will be able to observe the fall of shot. Therefore, SABOT engagements are gunners' shoots unless **NOT OBSERVED** is reported. In such cases, the engagement will then revert back to being a commander's shoot.

## **RULES OF SABOT SHOOTING**

4. The following rules will be obeyed when utilizing SABOT ammunition:

a. Target hit:

- (1) if the target is hit and destroyed with the first round, cease the engagement; or
- (2) if the target is hit but not destroyed, fire additional rounds as necessary to destroy it.

### **NOTE**

Remembering that to remain exposed for longer periods of time increases the risk of being engaged by enemy weapon systems.

b. Target missed:

- (1) lasing technique—relase; or
- (2) estimated technique—apply the appropriate correction based on the crew's ability to observe the fall of shot:
  - (a) if the fall of shot is observed by the gunner or commander, either can employ their specific corrections to strike the target with the next round; or
  - (b) if the fall of shot is not observed by neither the gunner nor commander, the commander will initiate the corrections for SABOT estimated technique.



## **MAXIMUM EFFECTIVE RANGE**

5. The ballistic computer will set the IFCS graticule to the correct azimuth and elevation to fire SABOT at targets within 4000 m. Due to the following limitations, SABOT should be used to engage main battle tanks up to 2000 m and lightly armoured vehicles up to 4000 m:

- a. the hit probabilities are greatly reduced at ranges beyond 2000 m; and
- b. the penetration of frontal armour of MBTs beyond 2000 m is considered unlikely.

6. When using the SFCS, engagements are limited to 2400 m because the range scale being employed is not marked beyond that range. Although this sight allows for engagements beyond 2000 m, the associated limitations mentioned with respect to the IFCS still apply.

## **SECTION 2 CORRECTIONS**

### **GENERAL**

7. Due to the short time of flight, combined with the severe consequences of firing SABOT ammunition, it is difficult to observe a SABOT projectile that does not strike a hard target. This limitation is compounded if the thermal sight is not used. However, if the range to the target is known and the system is functioning correctly and is properly adjusted, it is likely that the target will be struck. A miss can result from one of the following:

- a. an incorrect range being applied to the sighting system either through incorrect lasing or a wrong range estimation by the commander;
- b. a fault in the system where either a component malfunctions or there is a loss of a correct relationship between one or more components;

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- c. an incorrect lay by the gunner during lasing or during the firing of the main armament; or
- d. a fault in the gun-sight relationship, which is corrected using the muzzle reference system.

## **RULES FOR LASING ENGAGEMENTS**

8. The laser provides accurate ranges, which improves engagement accuracy. A standard procedure will be used for both line and an elevation correction as follows:

- a. Target hit:
  - (1) if the target is destroyed, cease the engagement; or
  - (2) if the target is not destroyed, fire additional rounds as follows:
    - (a) when engaging a static target from a static position, the same point of aim will be used; or
    - (b) when engaging a moving targets or while on the move, the laser will be fired before each round is fired.
- b. Target missed:
  - (1) relase using the laser aiming rules; and
  - (2) fire a second round at the target.
- c. If the second round does not strike the target, the commander can switch to an estimated technique or switch to HESH and re-engage the target. If time permits the following will occur:

- (1) when in “FULLY STABILIZED” mode, the MRS will be checked; and
- (2) if there is a fault with the IFCS, the target can be re-engaged using the SFCS, employing the previous lased range or an estimated range.

## **RULES FOR ESTIMATED ENGAGEMENTS**

9. Engaging targets with an estimated technique is considered to be firing in a degraded mode of operation and will be conducted only in emergency situations when all or parts of the IFCS are not functioning. There are factors that limit the speed and accuracy of these engagements:

- a. the location of the CCU makes it difficult and time consuming to apply or change ranges; and
- b. the SFCS graticule is not ballistically matched to the current ammunition but can be converged at a pre-set range.

10. The range bands for SABOT engagements are detailed in Chapter 2 and are summarized as follows:

- a. **IFCS:**
  - (1) ranges below 1300 m—the “E00” switch is initiated;
  - (2) ranges between 1300 and 1700 m—“1500 m” is set on the CCU; and
  - (3) ranges above 1700 m—the estimated range is set on the CCU to the nearest one hundred metres.
- b. **SFCS:**

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- (1) ranges below 1300 m—"1000 m" is set on the range scale; and
- (2) ranges above 1300 m—the estimated range is set on the range scale.

## **RULES FOR ESTIMATED ENGAGEMENTS**

11. If the first round strikes the target, one of the following will occur:
  - a. if the target is destroyed, cease the engagement; or
  - b. if the target is not destroyed, fire additional rounds as follows:
    - (1) when engaging a static target from a static position, the same point of aim will be used; or
    - (2) when engaging a moving target or when on the move, a new aim-off will be applied before each round is fired.
  
12. If the first round does not strike the target, one of the following will occur:
  - a. if the gunner observes the fall of shot and can assess a Burst On Target (BOT) correction, the gunner will report and apply the BOT correction; or
  - b. if the fall of shot is not observed, the gunner will report **NOT OBSERVED** and the commander will assume control of the engagement and employ the corrections for SABOT estimated technique.

## **CORRECTIONS FOR SABOT ESTIMATED TECHNIQUE**

13. **Fall of first shot not observed.** If the fall of the first shot is not observed, the following drill will be applied:
- a. Using the target as a reference point, the commander will order a fixed amount of change in elevation by ordering the gunner to place the appropriate aiming mark onto the bottom of the target using the command **BOTTOM EDGE**. The gunner will repeat the order, re-aim and fire on order.
  - b. If the second round does not strike the target, the commander will order **TOP EDGE**. The gunner will again repeat the order, aim for the top of the target and fire on order.
  - c. If the target is not struck after the third round, cease the engagement and the following will occur:
    - (1) if the IFCS is being used, the MRS will be checked;
    - (2) if the SFCS is being used, the sight convergence will be checked; and
    - (3) the commander may move to another fire position and re-engage the target.
  - d. While conducting this drill, if either the commander or gunner observes the fall of shot, they can employ their applicable corrections.
14. **First Round Strikes Minus of the Target.** If the strike of the first round is not observed by the gunner but is reported minus of the target by the commander or another observer, the following drill will be applied:

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- a. Using the target as a reference point, the commander will order a fixed amount of change in elevation by ordering the gunner to place the appropriate aiming mark onto the top of the target using the command **TOP EDGE**. The gunner will repeat the order, re-aim and fire on order.
- b. If the second round does not achieve a hit, the engagement will be terminated and the following will occur:
  - (1) if the IFCS is being used, the MRS will be checked;
  - (2) if the SFCS is being used, the sight convergence will be checked; and
  - (3) the commander may move to another fire position and re-engage the target.

15. **First Round Strikes Plus of the Target.** If the strike of the first round is not observed by the gunner but is reported plus of the target by the commander or another observer, the following drill will be applied:

- a. Using the target as a reference point, the commander will order a fixed amount of change in elevation by ordering the gunner to place the appropriate aiming mark onto the bottom of the target using the command **BOTTOM EDGE**. The gunner will repeat the order, re-aim and fire on order.
- b. If the first correction does not achieve a hit, the engagement will be terminated and the following will occur:
  - (1) if the IFCS is being used, the MRS will be checked;
  - (2) if the SFCS is being used, the sight convergence will be checked; and

- (3) the commander may move to another fire position and re-engage the target.

16. **First Round Strikes Left or Right of the Target.** If the commander observes the strike of the round to be to the left or right of the target he will order one of the following line corrections:

- a. a mil correction in the direction of the target  
**LEFT ONE**; or
- b. a target size correction in the direction of the target  
**LEFT ONE TARGET.**

17. Upon hearing the commander's line correction, the gunner will do the following:

- a. repeat the ordered line correction;
- b. apply the correction to the sight; and
- c. wait for the order to fire.

### **COMMANDER'S COMBINED CORRECTION**

18. The commander, having observed the fall of shot to miss in both line and elevation, may order the gunner to apply a line and an elevation correction. For example, the commander could order **RIGHT ONE, TOP EDGE**. The gunner will repeat the order, re-aim and fire on order. Line is always reported and corrected before elevation.

## **SECTION 3 IFCS—LASING TECHNIQUES**

### **GENERAL**

19. When a commander wishes to engage a target with SABOT, he must consider the range to the target. MBTs must be at less than 2000 m and all other targets must be less than 4000 m. The

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IFCS is to be operated in one of the following modes as detailed in Chapter 1:

- a. A-1, IFCS used in the “FULLY STABILIZED” mode;
- b. B-1, IFCS used in the “STAB READY” mode; or
- c. C-1, IFCS used in the “OBSERVATION” mode.

### COMMANDER INITIATED ENGAGEMENTS

20. When a commander identifies a target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) initiate a fire order by designating the weapon/ammunition, the range by ordering **LASE** and the target description;
  - (2) align the gun/sight onto the target using the commander's controller or by ordering the gunner to traverse left/right;
  - (3) when laid onto the target, report **ON**;
  - (4) wait for the gunner to report **ON** and a laser response; and
  - (5) issue the order to fire when he is ready.
- b. When the gunner hears the commander's fire order, the gunner will:
  - (1) look through his sight, identify the target and report **ON**;
  - (2) IAW the laser aiming rules, lay the graticule onto the target;



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- (3) fire the laser;
  - (4) follow the procedures based on the laser return;
  - (5) report the range displayed at the 12 o'clock position in the sight to the nearest hundreds;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. When the loader hears the commander's fire order, the loader will :
- (1) load the ammunition ordered;
  - (2) ensure that the correct ammunition is selected on the loader's control box;
  - (3) press the "LOADED" button on the loader's control box;
  - (4) report the ammunition type followed by ready, **SABOT READY**; and
  - (5) continue loading the same ammunition until told to **STOP** or a change in ammunition is ordered.

- d. When the commander orders **TARGET ... STOP**, terminating the engagement, the crew will conduct the start mode drill as detailed in Chapter 1.

## **GUNNER INITIATED ENGAGEMENTS**

21. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into his sight, identify the target and report **CONTACT** and a target description (**TANK, APC, MEN**, etc.) or just **CONTACT** if he does not recognize the target;
  - (2) IAW the laser aiming rules, lay the graticule onto the target;
  - (3) fire the laser;
  - (4) follow the procedures based on the laser return;
  - (5) report the range displayed at the 12 o'clock position in the sight;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.

- b. When the commander hears the gunner report, **CONTACT** the commander will:
  - (1) listen for the gunner's laser response;
  - (2) verify the target and range as required;
  - (3) order the ammunition to be used; and
  - (4) issue the order to fire when he is ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for commander initiated engagements.

#### **SECTION 4** **IFCS—ESTIMATED TECHNIQUES**

##### **GENERAL**

22. When a commander wishes to engage a target with SABOT but the laser range finder is not functioning, he must estimate the range to the target. In order to effectively neutralize targets, MBTs must be at less than 2000 m and all other targets must be less than 4000 m. The IFCS is to be operated in one of the following modes as detailed in Chapter 1:

- a. A-2, IFCS is used in the "FULLY STABILIZED" mode without the laser;
- b. B-2, IFCS is used in the "STAB READY" mode without the laser; or
- c. C-2, IFCS is used in the "OBSERVATION" mode without the laser.

23. When operating in this degraded state, the commander should, where possible, employ a range that has been obtained from another tank laser.

## COMMANDER INITIATED ENGAGEMENTS

24. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition; the range (**BATTLE** for targets below 1300 m, **1500** for targets between 1300 m and 1700 m or the range in hundreds of metres for targets over 1700 m) and the target description;
  - (3) align the gun/sight onto the target using the commander's controller; or by ordering the gunner to traverse left/right;
  - (4) when laid onto the target, report **ON**;
  - (5) wait for the gunners to report **ON**; and
  - (6) issue the order to fire when he is ready.
- b. When the gunner hears the commander's fire order, the gunner will:
  - (1) repeat **BATTLE** or the **RANGE**;
  - (2) look through the sight, identify the target then report **ON**;
  - (3) apply the range as follows: for targets below 1300 m, toggle the laser trigger toward the inside ("E00" will be displayed in the sight); for targets between 1300 m and 1700 m, ensure "1500" is set in the CCU ("999"

displayed in the sight), or for targets above 1700 m, enter the range into the CCU;

- (4) toggle the “RANGE AUTO/ MANUAL” switch to “MANUAL”;
- (5) lay the aiming mark on the centre of the target;
- (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
- (7) on order from the commander, report **FIRING NOW** and fire; and
- (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.

- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

## **GUNNER INITIATED ENGAGEMENTS**

25. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into the sight, identify the target and report **CONTACT** and target description (**TANK, APC, MEN**, etc.) or **CONTACT** if he does not recognize the target;

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- (2) report the general range to the target as follows: **NEAR, MIDDLE** or **FAR**;
  - (3) lay the centre of the graticule onto the target and wait for the commander to issue the range;
  - (4) apply the range as ordered and switch the “RANGE AUTO/MANUAL” switch to “MANUAL” or toggle the “E00” switch;
  - (5) lay the aiming mark on the centre of the target;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner report, **CONTACT** the commander will:
- (1) verify the target and estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition and the range as detailed in the commander initiated engagements; and
  - (3) issue the order to fire when ready.

- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

## **SECTION 5**

### **SFCS—ESTIMATED TECHNIQUES**

#### **GENERAL**

26. When a commander wishes to engage a target and the IFCS is not functioning, he must utilize the SFCS. First, he must estimate the range to the target, less than 2000 m for MBTs and less than 2400 m for other armoured vehicles. The SFCS is to be operated in one of the following modes as detailed in Chapter 1:

- a. A-3, SFCS used in the "FULLY STABILIZED" mode;
- b. B-3, SFCS used in the "STAB READY" mode;
- c. C-3, SFCS used in the "OBSERVATION" mode;  
or
- d. D-3, SFCS used in the "TURRET OFF" mode.

#### **COMMANDER INITIATED ENGAGEMENTS**

27. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will follow the same procedure as with the IFCS, except he will issue the range as follows:
  - (1) **BATTLE** for targets below 1300 m; or
  - (2) the range in hundreds of metres for targets over 1300 m.

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- b. When the gunner hears the commander's fire order, the gunner will:
  - (1) repeat **BATTLE** or the **RANGE**;
  - (2) look through the sight, identify the target and then report **ON**;
  - (3) apply the range IAW the appropriate range bands;
  - (4) lay the aiming mark on the centre of the target;
  - (5) on order from the commander, report **FIRING NOW** and fire; and
  - (6) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
  
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the IFCS engagements.

## GUNNER INITIATED ENGAGEMENTS

28. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into the sight, identify the target and report **CONTACT** and target description (**TANK, APC, MEN**, etc.) or **CONTACT** if he does not recognize the target;
  - (2) report the general range to the target as follows: **NEAR, MIDDLE** or **FAR**;



- (3) lay the centre of the graticule onto the target and wait for the commander to issue a fire order;
  - (4) apply the range IAW the appropriate range bands;
  - (5) lay the aiming mark on the centre of the target;
  - (6) on order from the commander, report **FIRING NOW** and fire; and
  - (7) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner report, **CONTACT** the commander will:
- (1) verify the target and estimate the range of the target to be within the direct fire range band; and
  - (2) initiate and issue the fire order.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the IFCS engagements.

## **SECTION 6**

### **CFCS—COMMANDER ENGAGEMENTS—LASING TECHNIQUE**

#### **GENERAL**

29. The IFCS sight extension combined with the laser firing button allows the commander to engage targets using either the day or the thermal sight with both speed and precision. The

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commander's controller is not equipped with the "LEAD LOCK" button. This limits his ability to engage moving targets. Therefore, he must apply an appropriate aim-off when engaging moving targets or when on the move engaging static targets:

- a. SABOT—5 mils; and
- b. HESH/WP/COAX—7.5 mils.

30. The success of engaging movers while on the move is greatly diminished and should only be attempted in emergency circumstances.

## OPERATING MODES

31. The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-1, IFCS used in the "FULLY STABILIZED" mode;
- b. B-1, IFCS used in the "STAB READY" mode; or
- c. C-1, IFCS used in the "OBSERVATION" mode.

## IFCS SIGHT EXTENSION ENGAGEMENTS

32. When the commander identifies the target and chooses to engage it with the commander's IFCS sight extension, the engagement will be initiated as follows:

- a. The commander will:
  - (1) inform the crew that he will be engaging the target himself by saying, **MY SIDE**;
  - (2) ensure that the override button on the commander's thermal control unit is engaged (illuminated);

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- (3) initiate a fire order by ordering the loader to ready the desired ammunition, **READY SABOT**;
  - (4) align the sight onto the target by using the commander's controller;
  - (5) look through the commander's IFCS sight extension and, using the Laser Aiming Rules, lay the graticule onto the target;
  - (6) fire the laser;
  - (7) note the range displayed at the 6 o'clock position in the sight and follow the procedures based on the laser return;
  - (8) check the ammunition indicator display at the 6 o'clock position in the sight to ensure that the correct ammunition is selected; and
  - (9) re-lay centrally and, when ready, report **FIRING NOW** and fire.
- b. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for all other IFCS and SFCS engagements.



**ANNEX A  
SAMPLE FIRE ORDERS**

**IFCS—LASING TECHNIQUES**

1. **Commander Initiated Engagements.** There is a **SOLID** return with a range that is less than 2000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE, TANK ... ON</b>		
	<b>ON</b>	
	<b>1400</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET, STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

2. There is a **DOUBLE** return with a range that is less than 2000 m. The commander selects the reported range. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE, TANK ... ON</b>		
	<b>ON</b>	
	<b>DOUBLE 1500</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET, STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

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3. There is a long range return with a range that is greater than 4000 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE, APC ... ON</b>		
	<b>ON</b>	
		<b>SABOT ... READY</b>
	<b>5100</b>	
<b>STOP ... 3000</b>		
	<b>3000</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

The gunner immediately relased and received “5120” on his second attempt. The commander decided to employ an estimated technique. The gunner applied the range to the CCU.

4. There is a return of 000 with a target that is on a crest that is approximately 1100 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE TANK ... ON</b>		
	<b>ON</b>	
		<b>SABOT ... READY</b>
	<b>ZEROs</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

The gunner immediately re-lased and received “000” on his second attempt. The commander decided to fire as the computer automatically applied the default “1000 m” to the sight.

5. There is a single return with a range that is less than 2000 m. First round misses the target.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE TANK ... ON</b>		
	<b>ON</b>	
		<b>SABOT ... READY</b>
	<b>1600</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>NOT OBSERVED</b>	
<b>STOP ... RELEASE</b>		
	<b>RELEASE</b>	
		<b>SABOT ... READY</b>
	<b>1400</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

The only correction available to the commander is to release.

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6. There is a SINGLE return with a range that is less than 2000 m. The gunner does not observe the target.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE TANK ... ON</b>		
	<b>NOT OBSERVED</b>	
		<b>SABOT ... READY</b>
<b>MY SIDE</b>		
<b>FIRING NOW</b>		
<b>TARGET</b>		
		<b>SABOT ... READY</b>
<b>FIRING NOW</b>		
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

The commander continued with the engagement using the IFCS sight extension when the gunner reported **NOT OBSERVED**.

7. **Gunner Initiated Engagements.** There is a SINGLE return with a range that is less than 2000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT ... TANK</b>	
	<b>1600</b>	
<b>SABOT</b>		
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>



8. There is a DOUBLE return with a range that is greater than 2000 m. First round misses the target.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT ... APC</b>	
	<b>DOUBLE 2500</b>	
<b>SABOT</b>		
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>NOT OBSERVED</b>	
<b>STOP...RELEASE</b>		
	<b>RELEASE</b>	<b>SABOT ... READY</b>
	<b>2300</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

9. **Multiple Target Engagements.** The commander initiates a multiple lasing engagement at two targets of equal range. There is a SINGLE return with a range that is less than 2000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, LASE, TWO TANKS ... HEAD-ON TANK ... ON</b>		
	<b>ON</b>	
	<b>1600</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	

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<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>STOP ... NEXT TARGET LEFT ... BROADSIDE TANK ... ON</b>		
	<b>ON ... 1600</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

10. The gunner initiates a multiple lasing engagement at two targets of different ranges. There is a SINGLE return with a range that is less than 2000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT TANK AND APC 1800</b>	
<b>SABOT</b>		
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>STOP ... NEXT TARGET LEFT ... APC ... ON</b>		
	<b>ON ... 2000</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

As the commander must verify every target the gunner wants to engage, the commander can easily redirect his gunner onto the target with the higher priority.

**IFCS—ESTIMATED TECHNIQUES**

11. **Commander Initiated Engagements.** The commander estimates the target to be at a range below 1300 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, BATTLE TANK ... ON</b>		
	<b>BATTLE ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

The gunner toggles the laser trigger inwards and selects "E00". The gunner placed the centre of the graticule on the centre of the target.

12. The commander estimates the target to be at a range of 1600 m. First round miss.

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<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, 1500 TANK ... ON</b>		
	<b>1500 ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>ADD</b>	
		<b>SABOT ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

“1500” is set on the CCU. The gunner placed the centre of the graticule on the centre of the target for the first round and applies the BOT correction for the second round.

13. The commander estimates the target to be at a range of 2000 m. The first round misses the target and the fall of shot is not observed.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT, 2000 TANK ... ON</b>		
	<b>2000 ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>NOT OBSERVED</b>	
<b>STOP, BOTTOM EDGE</b>		
	<b>BOTTOM EDGE</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

“2000” is set on the CCU. The gunner placed the centre of the graticule on the centre of the target.

14. **Gunner Initiated Engagements.** The gunner identifies the target. The commander estimates the target to be at a range of 1900 m. The first round misses the target and the gunner does not observe the fall of shot.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT TANK ... FAR</b>	
<b>SABOT ... 2000</b>		
	<b>2000</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW NOT OBSERVED</b>	
<b>STOP, BOTTOM EDGE</b>		
	<b>BOTTOM EDGE</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW NOT OBSERVED</b>	
<b>STOP, TOP EDGE</b>		
	<b>TOP EDGE</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW TARGET</b>	
<b>TARGET STOP</b>	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

“2000” is set on the CCU. The gunner placed the centre of the graticule on the centre of the target.

**SECONDARY FIRE CONTROL SYSTEM ENGAGEMENTS**

15. **Commander Initiated Engagements.** The commander estimates the target to be at a range below 1300 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT BATTLE TANK ... ON</b>		
	<b>BATTLE ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>1000, APDS, MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

“1000” is set on the range scale. The gunner placed the centre of the graticule on the centre of the target.

16. The commander estimates the target to be at a range of 1500 m. First round miss.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT 1500 TANK ... ON</b>		
	<b>1500 ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>DROP</b>	
		<b>SABOT ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>1000, APDS, MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

### NOTE

“1500” is set on the range scale. The gunner placed the centre of the graticule on the centre of the target for the first round and applies the BOT correction for the second round.

17. **Gunner Initiated Engagements.** The gunner identifies the target. The commander estimates the target to be at a range of 1800 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT TANK; MIDDLE</b>	
<b>SABOT ... 1800</b>		
	<b>1800 ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>1000, APDS, MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**NOTE**

“1800” is set on the range scale. The gunner placed the centre of the graticule on the centre of the target.

18. **Multiple Target Engagements.** The commander initiates a multiple estimated engagement at two targets of different ranges. The first target is below 1300 m and the second is between 1300m and 1800 m. First round hits.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT BATTLE TWO TANKS, RIGHT TANK ... ON</b>		
	<b>BATTLE ... ON</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>STOP ... NEXT TARGET LEFT ... TANK ... ON</b>		
	<b>ON</b>	<b>SABOT ... READY</b>
<b>1500</b>		
	<b>1500</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>1000, APDS, MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>

**CFCS—LASING TECHNIQUE**

19. **Commander Initiates an Engagement.** First round hit.



<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>MY SIDE, READY SABOT</b>		
		<b>SABOT ... READY</b>
<b>FIRING NOW</b>		
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED, GUN SAFE</b>



## **CHAPTER 4**

### **HESH SHOOTING AT STATIONARY TARGETS**

#### **SECTION 1**

#### **GENERAL**

#### **INTRODUCTION**

1. This chapter deals with shooting HESH CE ammunition at stationary targets during both day and night conditions, employing the IFCS, the SFCS, or the CFCS. The principle limitations of using HESH ammunition are:

- a. its inaccuracy at long range;
- b. its lack of penetration against composite armours;  
and
- c. its long time of flight.

2. The tank commander can engage targets with HESH using the following fire control systems:

- a. the IFCS ;
- b. the SFCS ; and
- c. the CFCS.

3. With the improved optics found within the C2 turret, there is a very good chance that the gunner will be able to observe the fall of shot. Therefore, as with SABOT engagements, HESH will be treated as a gunner's shoot. If he reports **NOT OBSERVED** the engagement will become a commander's shoot. The commander, as always, will retain overall responsibility and must be prepared to step in and correct his gunner when the situation dictates.

## **RULES OF HESH SHOOTING**

4. The following rules will be observed when employing HESH:

- a. Target hit:
  - (1) if the target is hit and destroyed with the first round, stop the engagement; or
  - (2) if the target is hit but not destroyed, fire additional rounds as necessary to destroy it.
- b. Target missed: the gunner will apply the HESH corrections.

## **MAXIMUM EFFECTIVE RANGE**

5. The ballistic computer will set the IFCS graticule to the correct azimuth and elevation to fire HESH at targets up to 4000 m. With the introduction of complex armours, HESH has little chance of defeating the latest generation of tanks or APCs. Due to the limitations of the chemical energy round, HESH should only be used to engage the following:

- a. old generation tanks as a last resort (T54/55, T64);
- b. lightly armoured vehicles;
- c. men in open beyond the range of the COAX; and
- d. man made fortifications such as:
  - (1) buildings;
  - (2) trenches;
  - (3) bunkers;

- (4) road blocks; and
  - (5) checkpoints.
6. While it is possible to engage targets up to 4000 m with the IFCS, round dispersion affects hit probability:
- a. the first round hit probabilities are greatly reduced at ranges beyond 1000 m; and
  - b. the likelihood of hitting a target smaller than a tank beyond 3000 m is remote at best.
7. When using the SFCS, engagements are limited to 3500 m as the range scale is limited to that range. That being said, direct fire engagements should remain at 3000 m and below in order to maximize hit probability.

## **SECTION 2 CORRECTIONS**

### **GENERAL**

8. All direct HESH shooting employs the principles of observation and correction of fire. Generally, the gunner is able to observe and correct his own fire. The commander, however, remains ultimately responsible for all engagements.

### **CORRECTIONS AVAILABLE TO THE GUNNER**

9. There are three corrections available to the gunner:
- a. **BOT Correction:**
    - (1) line is always reported and corrected first and it is used at all ranges;
    - (2) under 2000 m, it is the usual correction for elevation; and

## Leopard C2 Application of Fire

- (3) over 2000 m, it is not the initial correction for elevation unless the laser range finder was used to measure the range;
- b. **Standard Elevation Correction, (add/drop 200 m or 400 m):**
- (1) may be used at any range;
  - (2) over 2000 m, it must be the initial elevation correction unless the laser range finder was used to measure the range;
  - (3) over 2000 m, once applied, a straddle must be achieved. If not, reapply the standard correction until a straddle is achieved;
  - (4) once the target is straddled, halve the correction in the direction of the target;
  - (5) over 2000 m, once a 100 m correction has been made, the gunner can then apply the BOT correction; and
  - (6) under 2000 m, it is not necessary to straddle the target before applying the BOT correction.
- c. **Gunner's Combined Correction.** Any combination of the BOT correction for line and the Standard correction for elevation. All limitations apply.

## CORRECTIONS AVAILABLE TO THE COMMANDER

10. Although the correction of direct fire is usually the responsibility of the gunner, the commander must be prepared to correct fire when:

- a. the gunner fails to observe the fall of shot and reports **NOT OBSERVED**;
  - b. the commander disagrees with his gunner's reported correction; or
  - c. when the round falls outside the scope of the corrections available to the gunner.
11. The commander takes over the shoot by ordering **STOP**, followed by the correction he wishes applied. The commander will then order one of the following:
- a. **GO ON**, if he wants to hand control back to the gunner; or
  - b. **FIRE**, if he wants to retain control of the engagement and order subsequent corrections himself.

**NOTE**

If the commander agrees with the gunner's reported line correction but not the reported elevation correction, the commander may repeat the gunner's reported line correction followed by the desired elevation correction.

12. There are four corrections available to the commander:
- a. **The Commander's Line Correction:**
    - (1) measured in mils, using the commander's sight or binoculars, and is applied by the gunner as follows:
      - (a) up to 7.5 mils can be applied using the graticule pattern of his sight; and

- (b) corrections over 7.5 mils must be applied using the traverse indicator.
- b. **Commander's Elevation Correction:**
  - (1) 2 or 4 mils (lasing technique); or
  - (2) increments of 100 m (estimated technique).
- c. **Target Size Correction:**
  - (1) maximum of three target widths for line;
  - (2) maximum of one target height for elevation; and
  - (3) one-half target corrections only if the target has been struck.
- d. **Commander's Combined Correction.** Any combination of the commander's line, elevation, and target size corrections. All limitations apply.

### SECTION 3 IFCS—LASING TECHNIQUES

#### GENERAL

13. When a commander wishes to engage a target with HESH, a commander must confirm that the range to the target is less than 4000 m for APCs, bunkers, or soft targets. Once that is confirmed, the weapons and IFCS can be operated in one of the following modes as detailed in Chapter 1:

- a. A-1, IFCS used in the "FULLY STABILIZED" mode;
- b. B-1, IFCS used in the "STAB READY" mode; or



- c. C-1, IFCS used in the “OBSERVATION” mode.

## **COMMANDER INITIATED ENGAGEMENTS**

14. When a commander identifies the target, an engagement is initiated:

- a. the commander will follow the procedures IAW the SABOT lasing engagement (as detailed in Chapter 3);
- b. when the gunner hears the commander's fire order, the gunner will follow the appropriate procedures IAW the SABOT lasing engagement (as detailed in Chapter 3); and
- c. when the loader hears the commander's fire order, the loader will:
  - (1) load HESH ammunition;
  - (2) ensure that the correct ammunition is selected on the loader's control box;
  - (3) press the “LOADED” button on the loader's control box;
  - (4) report the ammunition type followed by ready, **HESH READY**; and
  - (5) continue loading the same ammunition until told to **STOP** or until a change in ammunition is ordered.

## **GUNNER INITIATED ENGAGEMENTS**

15. When the gunner identifies the target, the engagement will be initiated as follows:

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- a. the gunner will follow the procedures IAW the SABOT lasing engagement (as detailed in Chapter 3);
- b. when the gunner initiates the engagement, the commander will follow the procedures IAW the SABOT lasing engagement, changing only the ammunition type to be used from SABOT to HESH (as detailed in Chapter 3); and
- c. when the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the commander initiated engagements.

## **SECTION 4 IFCS—ESTIMATED TECHNIQUES**

### **GENERAL**

16. When a commander wishes to engage a target with HESH but the laser range finder is not functioning, he must confirm the range to the target is less than 4000 m for APCs, bunkers, or soft targets. The weapons and IFCS can be operated in one of the following modes as detailed in Chapter 1:

- a. A-2, IFCS used in the "FULLY STABILIZED" mode without the laser;
- b. B-2, IFCS used in the "STAB READY" mode without the laser; or
- c. C-2, IFCS used in the "OBSERVATION" mode without the laser.

17. When operating in this degraded mode the commander should, where possible, employ a range that has been obtained from another tank's laser.

18. HESH, unlike SABOT ammunition, has a sloping trajectory that is difficult to fit within manageable range bands. In order to

increase the chance of a first round hit, the estimated range of each target must be applied to the FCS being used:

- a. **IFCS.** The estimated range is inputted into the CCU:
  - (1) when the range to the target is anything but 1000 m, the gunner inputs the appropriate range and selects the manual range by toggling the “AUTOMATIC/MANUAL” switch to “MANUAL”; or
  - (2) when the range to the target is 1000 m, the laser switch is toggled inward “E00”.
- b. **SFCS.** The estimated range is applied to the sight using the range scale available.

## COMMANDER INITIATED ENGAGEMENTS

19. When a commander identifies a target, an engagement will be initiated:

- a. The commander will:
  - (1) estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition, the range in hundreds of metres between 0 and 4000 m and the target description;
  - (3) align the gun/sight onto the target using the commander’s controller or by ordering the gunner to traverse left/right;
  - (4) when laid onto the target, report **ON**;

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- (5) wait for the gunner to report **ON**; and
  - (6) issue the order to fire when he is ready;
- b. When the gunner hears the commander's fire order, the gunner will:
- (1) repeat the **RANGE**;
  - (2) look through the sight, identify the target then report **ON**;
  - (3) enter the range into the CCU, or select "E00" by toggling the laser switch inward;
  - (4) switch the "RANGE AUTO/MANUAL" switch to "MANUAL";
  - (5) lay the aiming mark onto the centre of the target;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire;
  - (8) re-lay centrally onto the target; and
  - (9) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

## **GUNNER INITIATED ENGAGEMENTS**

20. When a gunner identifies a target, an engagement will be initiated as follows:

- a. The gunner will:
  - (1) look through his sight, identify the target and report **CONTACT** and a target description (**TANK, APC, MEN**, etc.) or simply **CONTACT** if he does not recognize the target;
  - (2) report the general range to the target as follows: **NEAR, MIDDLE** or **FAR**;
  - (3) lay the centre of the graticule onto the target and wait for the commander to issue a fire order;
  - (4) enter the range into the CCU, or select “E00” by toggling the laser switch inward;
  - (5) switch the “**RANGE AUTO/MANUAL**” switch to “**MANUAL**”;
  - (6) lay the centre of the graticule onto the target;
  - (7) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (8) on order from the commander, report **FIRING NOW** and fire;
  - (9) re-lay centrally onto the target; and

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- (10) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the gunner initiates the engagement, the commander will:
- (1) verify the target and estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition and the range in hundreds of metres between 400 m and 4000 m; and
  - (3) issue the order to fire when he is ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

## **SECTION 5** **SFCS—ESTIMATED TECHNIQUES**

### **GENERAL**

21. When a commander wishes to engage a target with HESH and the IFCS is not functioning, he must first confirm that the range to the target is less than 3500 m for APCs, bunkers, or any other soft targets. Once this is determined, the SFCS can be employed as detailed in Chapter 1:

- a. A-3, SFCS used in the "FULLY STABILIZED" mode;
- b. B-3, SFCS used in the "STAB READY" mode;
- c. C-3, SFCS used in the "OBSERVATION" mode;  
or

- d. D-3, SFCS used in the “TURRET OFF” mode.

## COMMANDER INITIATED ENGAGEMENTS

22. When a commander identifies a target, an engagement will be initiated:
- a. The commander will follow the same procedure as was followed for IFCS engagements.
  - b. When the gunner hears the commander's fire order, the gunner will:
    - (1) repeat the **RANGE**;
    - (2) look through his sight, identify the target and then report **ON**;
    - (3) apply the range on the range scale;
    - (4) lay the centre of the graticule onto the target;
    - (5) on order from the commander, report **FIRING NOW** and fire;
    - (6) re-lay centrally onto the target; and
    - (7) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
  - c. When the loader hears the commander's fire order, the loader will follow the same sequence that is followed for IFCS engagements.

## GUNNER INITIATED ENGAGEMENTS

23. When a gunner identifies a target, an engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into his sight, identify the target, report contact, a target description, and general range as detailed for IFCS estimated engagements;
  - (2) lay the centre of the graticule onto the target and wait for the commander to issue the fire order;
  - (3) apply the range on the range scale;
  - (4) lay the centre of the graticule onto the target;
  - (5) on order from the commander, report **FIRING NOW** and fire;
  - (6) re-lay centrally onto the target; and
  - (7) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner's report, the commander will:
  - (1) verify the target and estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition and the range in hundreds of metres; and



- (3) issue the order to fire when ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for IFCS engagements.

## **SECTION 6**

### **CFCS—COMMANDER ENGAGEMENTS—LASING TECHNIQUE**

#### **GENERAL**

24. The IFCS sight extension, combined with the laser range finder, allows the commander to engage targets with either the day or thermal sights with both speed and precision. The limitations associated are detailed in Section 6, Chapter 3.

#### **OPERATING MODES**

25. The operating modes are the same as for the IFCS lasing technique.

#### **IFCS SIGHT EXTENSION ENGAGEMENTS**

26. When a commander identifies a target and chooses to engage it with the commander's IFCS sight extension, the engagement will be initiated as follows:

- a. The commander will:
  - (1) report **MY SIDE**;
  - (2) ensure that the override button on the commander's thermal control unit is engaged (illuminated);
  - (3) initiate a fire order by ordering the loader to **READY HESH**;

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- (4) align the sight onto the target by using the commander's controller;
  - (5) look through the commander's IFCS sight extension and, using the Laser Aiming Rules, lay the graticule onto the target;
  - (6) fire the laser;
  - (7) note the range displayed at the 6 o'clock position in the sight and follow the procedures IAW the Laser Aiming Rules;
  - (8) check the ammunition indicator display at the 6 o'clock position in the sight to ensure that the correct ammunition is selected; and
  - (9) re-lay centrally and, when ready, report **FIRING NOW** and fire.
- b. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for all other IFCS and SFCS engagements.

**ANNEX A  
SAMPLE FIRE ORDERS**

**IFCS—LASING TECHNIQUES**

1. **Commander Initiated Engagements.** There is a SINGLE return at a range that is less than 2000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH LASE APC ... ON</b>		
	<b>ON</b>	
		<b>HESH ... READY</b>
	<b>800</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

2. There is a DOUBLE return with a range that is less than 2000 m. The commander selects the reported range.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH LASE TRANSPORT ... ON</b>		
	<b>ON</b>	
		<b>HESH ... READY</b>
	<b>DOUBLE 1500</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>RIGHT AND ADD</b>	
		<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

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3. There is a LONG RANGE return greater than 4000 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH LASE APC ... ON</b>		
	<b>ON</b>	
	<b>5100</b>	<b>HESH ... READY</b>
<b>STOP ... 3000</b>		
	<b>3000</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>ADD 200</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>DROP 100</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>ADD</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

The gunner immediately released and received “5120” on his second attempt IAW the laser aiming rules. The commander decided to employ an estimated technique.

4. **Gunner Initiated Engagements.** There is a SINGLE return with a range that is less than 2000 m. The gunner does not observe the fall of shot of the first round.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT ANT ...</b>	
	<b>1600</b>	
<b>HESH</b>		
		<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>NOT OBSERVED</b>	
<b>STOP ... DROP ONE TARGET</b>		
	<b>DROP ONE TARGET”</b>	<b>HESH ... READY</b>
<b>GO ON</b>		
	<b>FIRING NOW</b>	
	<b>ADD</b>	
		<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

#### **IFCS—ESTIMATED TECHNIQUES**

5. **Commander Initiated Engagements.** The commander estimates the target to be at a range below 1000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH 1000 BUNKER ... ON</b>		
	<b>1000 ... ON</b>	
		<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

“E00” (1000 m) is set by rocking in on the laser button.  
 The gunner placed the centre of the graticule on the centre of the target.

6. The commander estimates the target to be at a range between 1000 m and 2000 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH 1600 APC ... ON</b>		
	<b>1600 ... ON</b>	<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>ADD</b>	
		<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

“1500” is set on the CCU. The gunner placed the centre of the graticule on the centre of the target.

7. The commander estimates the target to be at a range of 2500 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH 2500 TRANSPORT ... ON</b>		
	<b>2500 ... ON</b>	<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>ADD 200</b>	
<b>STOP ... ADD ONE TARGET</b>		
	<b>ADD ONE TARGET</b>	<b>HESH ... READY</b>
<b>GO ON</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

### NOTE

“2500” is set on the CCU. The gunner applied the standard correction. The commander stepped in to apply a target size correction and gave the shoot back to the gunner.

8. **Gunner Initiated Engagements.** The gunner identifies the target. The commander estimates the target to be at a range of 600 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT APC ... NEAR</b>	
<b>HESH ... 600</b>		
	<b>600</b>	<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

“600” is set on the CCU. The gunner placed the centre of the graticule on the centre of the target.

9. **The gunner identifies the target.** The commander estimates the target to be at a range of 1900 m. The first round misses the target. The fall of shot is not identified.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT BUNKER ... FAR GROUND</b>	
<b>HESH ... 1900</b>		
	<b>1900</b>	<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>NOT OBSERVED</b>	
<b>DROP 200</b>		
	<b>DROP 200</b>	<b>HESH ... READY</b>
<b>GO ON</b>		
	<b>FIRING NOW</b>	
	<b>ADD</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>	<b>AUTOMATIC, 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>



**NOTE**

“1900” is set on the CCU.

**SFCS (TURRET OFF MODE) ENGAGEMENTS**

10. **Multiple Target Engagements.** The commander initiates a multiple lasing engagement at two targets of equal range. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH 800 APC AND TRANSPORT, APC ... ON</b>		
	<b>800 ... ON</b>	<b>HESH ... READY</b>
<b>FIRE</b>	<b>FIRING NOW</b>	
	<b>ADD</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>STOP ... NEXT TARGET LEFT ... TRANSPORT ... 1000, ON</b>		
	<b>1000 ... ON</b>	<b>HESH ... READY</b>
<b>GO ON</b>	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>	<b>1000, APDS, EMERGENCY, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**CFCS—LASING TECHNIQUE**

11. **Multiple Target Engagements.** The commander initiates a multiple lasing engagement at two targets of equal range. First round hit.

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<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH LASE APC AND TRANSPORT, APC ... ON</b>		
	<b>ON</b>	
	<b>900</b>	<b>HESH ... READY</b>
<b>FIRE</b>	<b>FIRING NOW</b>	
	<b>ADD</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>STOP ... NEXT TARGET LEFT ... TRANSPORT ... ON</b>		
	<b>ON</b>	<b>HESH ... READY</b>
	<b>1000</b>	
<b>GO ON</b>	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

12. The gunner initiates a multiple lasing engagement at two targets of different ranges. There is a SOLID return with a range that is less than 2000 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT BUNKER AND APC, APC 1600</b>	
<b>HESH</b>		<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>DROP</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>STOP ... NEXT TARGET LEFT ... BUNKER ... ON</b>		
	<b>ON</b>	
	<b>1800</b>	<b>HESH ... READY</b>
<b>GO ON</b>		

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>FIRING NOW</b>	
	<b>ADD</b>	<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

13. The commander initiates a multiple estimated engagement at two targets of different ranges. The first target is below 1000 m and the second is over 1000 m. First round hits.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH 800 TWO APCs, HEAD ON APC ... ON</b>		
	<b>800 ... ON</b>	
		<b>HESH ... READY</b>
<b>FIRE</b>	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>STOP ... NEXT TARGET LEFT ... BROADSIDE APC ... 1200 ... ON</b>		
	<b>1200 ... ON</b>	<b>HESH ... READY</b>
<b>GO ON</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**NOTE**

For both engagements, the gunner applied the range on the CCU or SFCS range scale.

**CFCS—COMMANDER ENGAGEMENTS—ESTIMATED TECHNIQUE**

14. **CFCS.** The commander initiates a lasing/estimated engagement. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>READY HESH</b>		
		<b>HESH ... READY</b>
<b>FIRING NOW</b>		
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**CHAPTER 5**  
**WHITE PHOSPHORUS SMOKE SHOOTING AT**  
**STATIONARY TARGETS**

**SECTION 1**  
**GENERAL**

**INTRODUCTION**

1. This chapter deals with shooting white phosphorus (WP) smoke ammunition at stationary targets during day or night conditions when using the IFCS, during day with the SFCS and CFCS or at night when using indirect illumination.
2. The tank commander can screen targets with WP smoke using the following fire control systems:
  - a. the IFCS;
  - b. the SFCS; and
  - c. the CFCS.
3. Ranging with WP smoke ammunition is wasteful and destroys the element of surprise. Commanders should therefore consider using the laser range finder or a HESH round to establish the correct range to the target. The HESH round has the advantage that it can be used up to the maximum range of smoke and its smoke also indicates wind conditions in the target area. This allows the commander to assess the best point of origin. When ranging is complete, the commander will continue the engagement by ordering an ammunition change. The ballistics of the WP smoke round and the HESH round are similar up to 8000 m.
4. All smoke shoots are considered commander's shoots. He will initiate the engagements and give the executive order to fire all smoke rounds. He is also responsible for any corrections.

## **POINT OF ORIGIN**

5. Under ideal conditions, the point of origin should be placed 30 m to 50 m upwind of the target area. However, if there is any doubt, it is best to place the rounds directly between the target and the area requiring cover and as close to the target as possible. This takes advantage of the neutralizing aspect of WP smoke.

## **MAXIMUM EFFECTIVE RANGE**

6. With HESH ammunition selected, the ballistic computer sets the IFCS graticule to the correct azimuth and elevation to fire WP smoke at targets up to 4000 m.

7. When using the SFCS, engagements are limited to 3500 m because the range scale is only marked to that range. When using the CFCS, engagements are limited to 3000 m because the range scale is only marked to that range. Although both sights allow for direct fire engagements beyond 3000 m, the limitations still apply.

## **CORRECTIONS**

8. Although the commander is responsible for all corrections, if HESH is used for ranging, normal HESH corrections are employed.

9. The corrections that are available to the commander and their limitations are as follows:

a. The commander's line correction:

- (1) when the correction is assessed, the commander uses his controller to traverse the turret the required amount; or
- (2) when measured, the correction is measured in mils with the commander's sight or binoculars and is applied by the gunner to the graticule pattern of his sight or traverse indicator.

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- b. The commander's elevation corrections are the same as for HESH shooting (as detailed in Chapter 4). The corrections are summarized as follows:
  - (1) 2 or 4 mils; or
  - (2) 100 m increments.
- c. **The commander's combined correction.** Any combination of the commander's line and elevation correction with all their limitations. Line is always ordered first.

## SECTION 2 IFCS—LASING TECHNIQUES

### GENERAL

10. The commander wishes to screen a target with WP smoke and considers that the range is less than 4000 m for all targets. The weapons and IFCS are being operated in one of the following modes as detailed in Chapter 1:

- a. A-1, IFCS used in the "FULLY STABILIZED" mode;
- b. B-1, IFCS used in the "STAB READY" mode; or
- c. C-1, IFCS used in the "OBSERVATION" mode.

### ENGAGEMENT TECHNIQUES

11. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) initiate a fire order by designating the weapon/ammunition, the range by

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- ordering **LASE** and the description of the target or point of origin;
  - (2) align the gun/sight onto the target using the commander's controller or by ordering the gunner to traverse left/ right;
  - (3) when laid onto the target, report **ON**;
  - (4) wait for the gunner's laser response; and
  - (5) issue the order to fire when ready.
- b. When the gunner hears the commander's fire order, the gunner will:
- (1) look through the sight, identify the target and report **ON**;
  - (2) using the laser aiming rules, lay the graticule onto the target;
  - (3) fire the laser;
  - (4) follow the procedures based on the laser return;
  - (5) report the range displayed at the 12 o'clock position in the sight;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected; and
  - (7) on order from the commander, report **FIRING NOW** and fire;
  - (8) re-lay centrally onto the target; and
  - (9) observe the fall of shot and carry out the applicable corrections until the target is



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neutralized or until the commander stops the engagement.

- c. When the loader hears the commander's fire order, the loader will:
  - (1) load the ammunition ordered;
  - (2) ensure that the "HESH" ammunition is selected on the loader's control box;
  - (3) press the "LOADED" button on the loader's control box;
  - (4) report the ammunition type followed by **READY, SMOKE READY**; and
  - (5) continue loading the same ammunition until told to **STOP** or until a change in ammunition is ordered.

### **SECTION 3**

#### **IFCS—ESTIMATED TECHNIQUES**

#### **GENERAL**

12. The commander wishes to screen a target with WP smoke but the laser range finder is not functioning. The commander considers that the range is less than 4000 m. The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-2, IFCS used in the "FULLY STABILIZED" mode without the laser;
- b. B-2, IFCS used in the "STAB READY" mode without the laser; or
- c. C-2, IFCS used in the "OBSERVATION" mode without the laser.

13. When operating in this degraded mode, the commander should, where possible, employ a range that has been obtained from another tank laser.

## ENGAGEMENTS TECHNIQUES

14. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition, the range in hundreds of metres and the description of the target or point of origin;
  - (3) align the gun/sight onto the target using the commander's controller or by ordering the gunner to traverse left/right;
  - (4) when laid onto the target, report **ON**;
  - (5) wait for the gunners to report **ON**; and
  - (6) issue the order to fire when ready.
- b. when the gunner hears the commander's fire order, the gunner will:
  - (1) repeat the **RANGE**;
  - (2) look through the sight, identify the target then report **ON**;
  - (3) enter the range into the CCU;
  - (4) switch the "RANGE AUTO/MANUAL" switch to "MANUAL";

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- (5) lay the aiming mark onto the centre of the target;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire;
  - (8) re-lay centrally onto the target; and
  - (9) observe the fall of shot and carry out the applicable corrections until the target is neutralized or until the commander stops the engagement.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

### **SECTION 4** **SFCS—ESTIMATED TECHNIQUES**

#### **GENERAL**

15. The commander wishes to screen a target with WP smoke but the IFCS is not functioning. The commander considers that the range is less than 3500 m. The weapons and SFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-3, SFCS used in the "FULLY STABILIZED" mode;
- b. B-3, SFCS used in the "STAB READY" mode;
- c. C-3, SFCS used in the "OBSERVATION" mode;  
or
- d. D-3, SFCS used in the "TURRET OFF" mode.

## ENGAGEMENTS TECHNIQUES

16. When the commander identifies the target, the engagement will be initiated as follows:
- a. The commander will follow the same procedure as with the IFCS.
  - b. When the gunner hears the commander's fire order, the gunner will:
    - (1) repeat the **RANGE**;
    - (2) look through the sight, identify the target then report **ON**;
    - (3) apply the range to the range scale;
    - (4) lay the centre of the graticule onto the target;
    - (5) on order from the commander, report **FIRING NOW** and fire;
    - (6) re-lay centrally onto the target; and
    - (7) observe the fall of shot and carry out the applicable corrections until the target area is effectively screened by smoke or the commander stops the engagement.
  - c. When the loader hears the commander's fire order, the loader will follow the same sequence that is laid out for the IFCS engagements.

**SECTION 5**  
**CFCS—COMMANDER ENGAGEMENTS—LASING**  
**TECHNIQUE**

**GENERAL**

17. The IFCS sight extension combined with the laser firing button allows the commander to engage targets with either the day or thermal sights with both speed and precision. The limitations are detailed in Chapter 3.

**OPERATING MODES**

18. The operating modes are the same as for the IFCS lasing technique.

**IFCS-SIGHT EXTENSION ENGAGEMENTS**

19. When the commander identifies the target and chooses to engage it with the commander's IFCS sight extension, the engagement will be initiated as follows:

- a. The commander will:
  - (1) ensure that the button on the commander's thermal control unit is engaged (illuminated);
  - (2) initiate a fire order by ordering the loader to **READY SMOKE**;
  - (3) align the sight onto the target by using the commander's controller;
  - (4) look through the commander's IFCS sight extension and, using the laser aiming rules, lay the graticule onto the target;
  - (5) fire the laser;

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- (6) note the range displayed at the 6 o'clock position in the sight and follow the procedures based on the laser return;
  - (7) check the ammunition indicator display at the 6 o'clock position in the sight to ensure that the correct ammunition is selected; and
  - (8) re-lay centrally and, when ready, report **FIRING NOW** and fire.
- b. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the commander initiated engagements.

### **SECTION 6 CFCS—COMMANDER ENGAGEMENTS ESTIMATED TECHNIQUE**

#### **GENERAL**

20. The commander wishes to screen a target with WP smoke but the IFCS and SFCS are not functioning. The commander considers that the range is less than 3000 m. The weapons and CFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-1, CFCS used in the "FULLY STABILIZED" mode with the computer;
- b. A-3, CFCS used in the "FULLY STABILIZED" mode without the computer; or
- c. B-3, CFCS used in the "STAB READY" mode.

21. Due to the following limitations, the commander's ability to engage targets is severely limited and should only be attempted in an extreme emergency:

- a. the lack of the laser range finder;

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- b. the inaccuracy of the TRP 5A sight; and
- c. the fact that the sight is not ballistically matched to the ammunition.





## ANNEX A SAMPLE FIRE ORDERS

### IFCS—LASING TECHNIQUES

1. There is a SINGLE return with a range that is less than 2000 m. The wind is from the left. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SMOKE LASE BUNKER ... ON</b>		
	<b>ON</b>	
		<b>SMOKE ... READY</b>
	<b>800</b>	
<b>LEFT ONE ZERO</b>		
	<b>LEFT ONE ZERO</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

2. The commander estimates the target to be at a range below 1000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SMOKE 800 ANT ... ON</b>		
	<b>800 ... ON</b>	<b>SMOKE ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

### IFCS—ESTIMATED TECHNIQUES

3. The commander estimates the target to be at a range beyond 3000 m and uses HESH for ranging.

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<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH 3200 CORNER OF WOODS ... ON</b>		
	<b>3 200 ... ON</b>	<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
<b>LEFT TWO ZERO, DROP 200</b>		
	<b>LEFT TWO ZERO, DROP 200</b>	<b>HESH ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
<b>STOP, SMOKE</b>		<b>SMOKE ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
<b>TARGET STOP</b>		
	<b>MANUAL, 1500 MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**SFCS—ENGAGEMENTS**

4. The fire orders are the same as for SFCS estimated techniques.

**CFCS—LASING / ESTIMATED TECHNIQUE**

5. **CFCS Engagements.** The commander initiates a lasing/estimated engagement. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>READY SMOKE</b>		
		<b>SMOKE ... READY</b>
<b>FIRING NOW</b>		
		<b>SMOKE ... READY</b>
<b>FIRING NOW</b>		
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

## **CHAPTER 6**

### **MACHINE-GUN SHOOTING AT STATIONARY TARGETS**

#### **SECTION 1**

#### **GENERAL**

#### **INTRODUCTION**

1. This chapter deals with shooting the COAX and the cupola mounted machine-gun (MG) at stationary targets under day and night conditions using the IFCS, during day conditions with the SFCS and at night when using indirect illumination.
2. The tank commander can engage targets with the COAX using the following fire control systems:
  - a. the IFCS; and
  - b. the SFCS.
3. As with HESH shooting, the gunner is responsible for the observation and correction of COAX fire, with the commander prepared to step in and order corrections if necessary. The same rules also apply for using the order **GO ON** and **FIRE** after a correction by the commander.

#### **MAXIMUM EFFECTIVE RANGE**

4. The maximum effective range in general terms for all types of MG shooting is that at which tracer burn out (TBO) occurs. However, where conditions exist such that the fall of shot over TBO can be easily observed (i.e., dust or water), the maximum effective range will be greatly increased.

#### **LENGTH OF BURSTS**

5. The following will influence the length of bursts:

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- a. the need to observe fire during ranging and the desired effect on the target once the range is established;
  - b. the nature of the ground and the conditions of visibility; and
  - c. the need to conserve ammunition and reduce barrel wear.
6. While no rigid rule can be given, the following lengths of bursts are provided as a guide based on the standard belt comprising 4 ball/1 trace (4B/1T):
- a. Ranging bursts:
    - (1) Lasing technique. A short burst of two tracers.
    - (2) Estimated technique. Up to TBO—a short burst of two tracers; and beyond TBO—a long burst of four tracers.
  - b. killing bursts:
    - (1) Up to TBO. Small targets or personnel gone to the ground—a short burst of two tracers; and large targets or personnel in the open—a long burst of four tracers.
    - (2) Beyond TBO. All killing bursts should be long bursts of four trace.
    - (3) Speculative fire. A short burst of two tracers in irregular intervals.
7. The gunner reports **TARGET** whenever he considers the mean point of impact (MPI) of a burst to be on target.

## **CORRECTIONS AVAILABLE TO THE GUNNER**

8. BOT correction is the only correction available to the gunner.

## **CORRECTIONS AVAILABLE TO THE COMMANDER**

9. The corrections available to the commander, and their limitations, are as follows:
  - a. The commander's line corrections are the same as for HESH shooting (as detailed in Chapter 4);
  - b. The commander's elevation corrections are the same as for HESH shooting (as detailed in Chapter 4). The corrections are summarized as follows:
    - (1) 2 or 4 mils; or
    - (2) 100 m increments.
  - c. The target size corrections are the same as for HESH shooting (as detailed in Chapter 4). The corrections are summarized as follows:
    - (1) a maximum of three target widths for line;
    - (2) a maximum of one target height for elevation; and
    - (3) one-half target corrections only if the target has been struck on the top, bottom, or side.
  - d. The commander's combined correction. Any combination of the commander's line and elevation corrections with all their limitations. Line is always ordered first.

## SECTION 2 IFCS—LASING TECHNIQUE

### GENERAL

10. The commander wishes to engage a target with the COAX and considers that the range is within the range of the MG. The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-1, IFCS used in the “FULLY STABILIZED” mode;
- b. B-1, IFCS used in the “STAB READY” mode; or
- c. C-1, IFCS used in the “OBSERVATION” mode.

### COMMANDER INITIATED ENGAGEMENTS

11. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will initiate the engagement IAW the procedures for a HESH engagement (as detailed in Chapter 4).
- b. The gunner hears the commander's fire order, the gunner will:
  - (1) look through the sight, identify the target and report **ON**;
  - (2) change the weapon selector switch on the gunner's control panel from “MAIN” to “COAX”;
  - (3) lay the graticule onto the target IAW the laser aiming rules (as detailed in Chapter 2);

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- (4) fire the laser;
  - (5) follow the procedures based on the laser return;
  - (6) report the range displayed at the 12 o'clock position in the sight;
  - (7) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (8) on order from the commander, report **FIRING NOW** and fire;
  - (9) re-lay centrally onto the target; and
  - (10) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. When the loader hears the commander's fire order, the loader will:
- (1) ready the COAX by placing the safety catch at "FIRE";
  - (2) report the ammunition type followed by **READY, COAX READY**; and
  - (3) monitor the function of the COAX until told to **STOP** or a change in ammunition is ordered.

## **GUNNER INITIATED ENGAGEMENTS**

12. When the gunner identifies the target, the engagement will be initiated as follows:

## Leopard C2 Application of Fire

- a. The gunner will:
- (1) look into the sight, identify the target and report **CONTACT** and what the target is (**TANK, APC, MEN**, etc.) or **CONTACT** if he does not recognize the target;
  - (2) lay the graticule onto the target using the laser aiming rules;
  - (3) fire the laser;
  - (4) follow the procedures based on the laser return;
  - (5) report the range displayed at the 12 o'clock position in the sight;
  - (6) on order, change the weapon selector switch on the gunner's control panel from "MAIN" to "COAX";
  - (7) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (8) on order from the commander, report **FIRING NOW** and fire;
  - (9) re-lay centrally onto the target; and
  - (10) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement;
- b. When the commander hears the gunner report, **CONTACT** the commander will:
- (1) listen for the gunner's laser response;



- (2) verify the target and range as required;
  - (3) order the ammunition; and
  - (4) issue the order to fire when ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for commander initiated engagements.

### **SECTION 3**

#### **IFCS—ESTIMATED TECHNIQUES**

#### **GENERAL**

13. The commander wishes to engage a target with the COAX but the laser range finder is not functioning. The commander considers that the range is within the range of the MG. The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-2, IFCS used in the "FULLY STABILIZED" mode without the laser;
- b. B-2, IFCS used in the "STAB READY" mode without the laser; or
- c. C-2, IFCS used in the "OBSERVATION" mode without the laser.

14. When operating in this degraded mode the commander should, where possible, employ a range that has been obtained from another tank's laser.

15. COAX ammo, like HESH, has a trajectory that is difficult to fit into manageable range bands. Due to its unique ballistics, the estimated range of each target must be applied to the sights of the COAX in order to increase the chance of a first round hit. Each engagement is a deliberate shoot and the application of ranges is as follows:

## Leopard C2 Application of Fire

- a. **IFCS.** The estimated range is set on the CCU and the gunner selects the “MANUAL” range;
- b. **IFCS.** Range of “1000 m” will be toggled in using EOO;
- c. **SFCS.** The estimated range is set on the range scale.

## COMMANDER INITIATED ENGAGEMENTS

16. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will initiate the engagement IAW the procedures for a HESH engagement as detailed in Chapter 4.
- b. When the gunner hears the commander's fire order, the gunner will:
  - (1) repeat the **RANGE**;
  - (2) look through the sight, identify the target then report **ON**;
  - (3) change the weapon selector switch on the gunner's control panel from “MAIN” to “COAX”;
  - (4) enter the range into the CCU;
  - (5) switch the “RANGE AUTO/ MANUAL” switch to “MANUAL”;
  - (6) lay the aiming mark onto the centre of the target;
  - (7) check the ammunition indicator display at the 12 o'clock position in the sight to

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ensure that the correct ammunition is selected;

- (8) on order from the commander, report **FIRING NOW** and fire;
  - (9) re-lay centrally onto the target; and
  - (10) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

### **GUNNER INITIATED ENGAGEMENTS**

17. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into the sight, identify the target and report **CONTACT** and what the target is (**TANK, APC, MEN**, etc.) or **CONTACT** if he does not recognize the target;
  - (2) report the general range to the target as follows: **NEAR / MIDDLE / FAR**;
  - (3) lay the centre of the graticule onto the target and wait for the commander to issue the fire order;
  - (4) on order, change the weapon selector switch on the gunner's control panel from "MAIN" to "COAX";

## Leopard C2 Application of Fire

- (5) enter the range into the CCU;
  - (6) switch the “RANGE AUTO/ MANUAL” switch to “MANUAL”;
  - (7) lay the aiming mark onto the centre of the target;
  - (8) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (9) on order from the commander, report **FIRING NOW** and fire;
  - (10) re-lay centrally onto the target; and
  - (11) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner report, **CONTACT** the commander will:
- (1) verify the target and estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition and the range in hundreds of metres; and
  - (3) issue the order to fire when ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

## SECTION 4

### SFCS—ESTIMATED TECHNIQUES

#### GENERAL

18. The commander wishes to engage a target with the COAX but the IFCS is not functioning. The commander considers that the range is within the range of the MG. The weapons and SFCS are operated in one of the following degraded modes as detailed in Chapter 1:

- a. A-3, SFCS used in the “FULLY STABILIZED” mode;
- b. B-3, SFCS used in the “STAB READY” mode;
- c. C-3, SFCS used in the “OBSERVATION” mode;  
or
- d. D-3, SFCS used in the “TURRET OFF” mode.

#### COMMANDER INITIATED ENGAGEMENTS

19. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will follow the same procedure as with the IFCS.
- b. When the gunner hears the commander's fire order, the gunner will:
  - (1) repeat the **RANGE**;
  - (2) change the weapon selector switch on the gunner's control panel from “MAIN” to “COAX”;
  - (3) look through the sight, identify the target then report **ON**;

## Leopard C2 Application of Fire

- (4) apply the range on the range scale;
  - (5) lay the centre of the graticule onto the target;
  - (6) on order from the commander, report **FIRING NOW** and fire;
  - (7) re-lay centrally onto the target; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is laid out for the IFCS engagements.

## GUNNER INITIATED ENGAGEMENTS

20. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into the sight, identify the target, report the target description and general range as detailed for IFCS engagements;
  - (2) lay the centre of the graticule onto the target and wait for the commander to issue the range;
  - (3) on order, change the weapon selector switch on the gunner's control panel from "MAIN" to "COAX";
  - (4) apply the range on the range scale;

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- (5) lay the centre of the graticule onto the target;
  - (6) on order from the commander, report **FIRING NOW** and fire;
  - (7) re-lay centrally onto the target; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner's report, the commander will:
- (1) verify the target and estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition and the range in hundreds of metres; and
  - (3) issue the order to fire when ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the IFCS engagements.

### **SECTION 5 CFCS—COMMANDER ENGAGEMENTS—LASING/ESTIMATED TECHNIQUE**

#### **GENERAL**

21. The IFCS sight extension combined with the laser firing button allows the commander to identify targets and to establish an accurate range. Because the commander does not have access to the weapon selector switch on the gunner's control panel, he cannot

## Leopard C2 Application of Fire

select "COAX" and therefore the ballistic solution cannot be fed into the computer and thus the gun, so he cannot conduct engagements with the IFCS.

22. Due to the following limitations, the commander's ability to engage targets is severely limited and should only be attempted in extreme emergencies:

- a. the lack of the laser range finder;
- b. the inaccuracy of the TRP 5A sight; and
- c. the fact that the sight does not have a COAX ammunition selection; therefore, the HESH scale must be used and the fire corrected with the tracer.

## SECTION 6 CUPOLA MACHINE-GUN TECHNIQUE

### GENERAL

23. The principles of firing the cupola MG against ground targets are the same as those with any MG. In addition, the cupola MG may be employed against aerial targets.

### CORRECTIONS

24. Corrections for engagements at all ranges are BOT.

### LENGTH OF BURST

25. When firing the cupola MG, the length of burst employed will depend on the type of target engaged. The following rules will apply:

- a. **Ground targets.** The length of ranging and killing bursts against ground targets will be the same as COAX engagements.



- b. **Aerial targets.** Firing against aerial targets does not usually follow the principles of ranging and killing bursts. Continuous fire is normally directed at a fixed point or with a given lead. Orders to commence and stop will be given by the commander or an observer.

## ENGAGEMENT OF AERIAL TARGETS

26. The probability of hitting and destroying aircraft is directly related to the volume of fire that is directed towards them. Because it is very difficult to estimate the correct lead, the following aiming methods will be employed:

- a. **Aiming Off.** When using this method the following leads are suggested:
  - (1) for head-on targets, slightly above the nose of the aircraft;
  - (2) for fast targets crossing left to right or right to left, one football field length in front of the aircraft; and
  - (3) for slow targets crossing left to right or right to left, half a football field in front of the aircraft.
- b. **Reference Point.** When using this method as the aircraft passes a previously named reference point, all guns will open fire at a previously selected aiming point. The aircraft will fly into a wall of fire.

## ENGAGEMENT TECHNIQUES FOR GROUND TARGETS

27. When the commander identifies the target, the engagement will be initiated as follows:

## Leopard C2 Application of Fire

- a. The commander will:
  - (1) estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating: the weapon, **MACHINE-GUN**; the range in hundreds of metres; the description of the target (**ANT, MEN**); and the direction to the target as follows: the direction from a reference point in metres; or the direction right/left of the present bearing of the main armament (using the clock-ray method);
  - (3) wait for the loader to identify the target and report **ON**;
  - (4) order the aim-off **AIM RIGHT/LEFT** for moving targets; and
  - (5) issue the order to fire when ready.
- b. When the loader hears the commander's fire order, the loader will:
  - (1) position himself to operate the cupola **MG**;
  - (2) ready the **MG** by cocking the action to the rear (initial burst); or by pressing the safety catch to the "FIRE" position and report **READY** (subsequent bursts);
  - (3) repeat the **RANGE** and apply it to the sight;
  - (4) identify the target and report **ON**;
  - (5) repeat the **AIM-OFF** and apply it if ordered;

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- (6) on order from the commander, report **FIRING NOW** and fire the MG (ranging bursts); and
- (7) correct the fire as necessary with ranging bursts;
- (8) when the rounds are in the target area, report **TARGET** and start firing killing bursts. **TARGET** is reported each time the burst is on target.

28. The commander may indicate fall of shot to the loader by reporting **LEFT** or **RIGHT**, **ADD** or **DROP**. Once the commander judges that the target has been neutralized, he orders **STOP** or **TARGET STOP**.



**ANNEX A  
SAMPLE FIRE ORDERS**

**IFCS—LASING TECHNIQUE**

1. There is a single return with a range that is less than TBO.  
First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>COAX LASE TRANSPORT ... ON</b>		
	<b>ON ... 800</b>	<b>COAX ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>ADD</b>	
	<b>FIRING NOW</b>	
	<b>TARGET ... FIRING NOW</b>	
	<b>TARGET ... FIRING NOW</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>COAX SAFE</b>

**IFCS—ESTIMATED TECHNIQUES**

2. The commander estimates the target to be at 1100 m.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>COAX 1000 MEN ... ON</b>		
	<b>1000 ... ON</b>	<b>COAX ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>RIGHT, ADD ... FIRING NOW</b>	
	<b>TARGET ... FIRING NOW</b>	
	<b>TARGET LEFT ... FIRING NOW</b>	

Leopard C2 Application of Fire

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>TARGET ... FIRING NOW</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>COAX SAFE</b>

3. The commander estimates the target to be beyond TBO.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>COAX 1500 MEN ... ON</b>		
	<b>1500 ... ON</b>	<b>COAX ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>RIGHT, DROP</b>	
<b>STOP, RIGHT, DROP 200</b>	<b>RIGHT, DROP 200</b>	
<b>GO ON</b>	<b>FIRING NOW ADD</b>	
	<b>TARGET ... FIRING NOW</b>	
	<b>TARGET ... FIRING NOW</b>	
<b>TARGET STOP</b>		
	<b>MANUAL 1500, MAIN, START MODE</b>	<b>COAX SAFE</b>

**SFCS ENGAGEMENTS**

4. The fire orders are the same as for IFCS Estimated Techniques.

**CUPOLA MACHINE-GUN ENGAGEMENTS**

5. The commander initiates an estimated engagement.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>MACHINE-GUN</b>		<b>MG ... READY</b>
<b>1000 ... HELICOPTER AT 3 O'CLOCK ... ON</b>		
		<b>1000 ... ON</b>
<b>AIM RIGHT</b>		
		<b>AIM RIGHT</b>
<b>FIRE</b>		
		<b>FIRING NOW</b>
		<b>ADD ... FIRING NOW</b>
		<b>TARGET ... FIRING NOW</b>
<b>TARGET STOP</b>		
		<b>MG SAFE</b>





## **CHAPTER 7 SHOOTING WHILE ON THE MOVE AND AT MOVING TARGETS**

### **SECTION 1 GENERAL**

#### **INTRODUCTION**

1. This chapter deals with shooting while *on* the move and while shooting *at* moving targets using the IFCS in daylight or night time conditions. Furthermore, it deals with shooting during the day using the SFCS and/or the CFCS or at night using indirect illumination.
2. Based on the design of the stabilization and fire control systems, the Leopard C2 must be operated in the “FULLY STABILIZED” mode (with laser) to fire accurately while on the move. Without the laser, targets below 1700 m (ONLY) can be engaged on the move with SABOT (the term SABOT refers to APFSDS ammunition). Due to the difficulty in applying an estimated range to the computer control unit (CCU), estimated engagements beyond 1700 m cannot be conducted while on the move. Engagements conducted in IFCS or SFCS degraded modes should only be conducted in an extreme emergency.
3. In the Leopard C2, the IFCS incorporates a system that computes the amount of lead angle required for the particular range and speed of a target, taking into account the ammunition being fired. In the “FULLY STABILIZED” mode, the IFCS keeps the sight on the target and sends the correct firing angles to the gun based on the range and environmental factors. The gunner need only keep the centre of the graticule on the centre of the visible mass. The computer continuously reads the changing input from the lead lock and utilizes the last two seconds of input to establish the correct lead angle; therefore, the lead lock switch must remain depressed throughout the entire engagement. The engagement techniques are very similar to those used against stationary targets and are covered in detail in the following sections.

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4. The SFCS, CFCS and IFCS (“STAB READY” and “OBSERVATION” modes) do not utilize the computer to measure the lead angle; therefore, the gunner must physically apply the appropriate aim-off for moving targets and since the gun is not stabilized in these modes they cannot be used on the move.

5. The techniques used to engage moving targets and to engage targets while on the move are detailed in the following sections:

- a. Section 2 and 3, Firing on the Move; and
- b. Section 4, Firing at Moving Targets.

## **RULES FOR SHOOTING AT MOVING TARGETS**

6. Since the lead lock and the IFCS are not always available, there are certain rules that will aid in determining whether to apply an aim-off and in which direction to apply it should the need arise. The rules are as follows:

- a. To decide whether to aim-off or aim-on:
  - (1) the target side is more visible than the front/rear of the target, aim-off; and
  - (2) if the target front/rear is more visible than the side of the target, aim-on.
- b. To decide in which direction to aim-off:
  - (1) if traversing right, to keep on target aim right; and
  - (2) if traversing left, to keep on target aim left.

7. If the target is not struck, it follows that:

- a. if the miss is to the left, aim further right; and

- b. if the miss is to the right, aim further left.

## **CORRECTIONS**

8. **SABOT.** When engaging moving targets, the techniques and principles used for engaging static targets will be applied as follows:

- a. with the IFCS using the laser range finder, the laser will be fired before each round is fired using the laser aiming rules, as per shooting at stationary targets; and
- b. with the IFCS or SFCS using an estimated range:
  - (1) the gunner may employ the BOT correction; or
  - (2) the commander may order the gunner to apply a commander's correction using estimated technique with SABOT.

9. **HESH/WP.** When engaging moving targets, the techniques and principles used for engaging static targets will be applied, except the commander will no longer employ the commander's line correction.

10. **COAX.** When engaging moving targets, the techniques and principles used for engaging static targets will be applied, except the commander will no longer employ the commander's line correction.

## **POINT OF AIM**

11. Depending upon the fire control system (FCS) in use, there may or may not be a requirement to physically apply an aim-off as follows:

- a. **IFCS.** When engaging a moving target with the IFCS, the commander will modify the fire order as follows:
- (1) **“STABILIZED” Mode.** For all stabilized engagements, the commander will indicate a moving target to the gunner by including **TANK MOVING LEFT/RIGHT** in the target description of the fire order. This will tell the gunner that the target is moving and indicate that he is to press and hold the lead lock switch throughout the engagement. Since the lead lock compensates for the lead angle, the point of aim for firing will remain the centre of the visible mass.
  - (2) **“STAB READY” and “OBSERVATION” Modes.** For all engagements conducted in a degraded mode, the commander will need to consider an aim-off and order it as necessary. He will indicate a moving target to the gunner by including the order **AIM LEFT/ RIGHT/ON** in the fire order. When the gunner hears the order, the gunner will apply the appropriate aim-off depending upon the weapon and ammunition type as follows: for SABOT, the gunner will place the “5 mil” mark of the graticule onto the centre of the visible mass; and for HESH and COAX, the gunner will place the “7.5 mil” mark of the graticule onto the centre of the visible mass.
- b. **SFCS.** When engaging moving targets, since the lead lock does not function with the SFCS, the commander will indicate to the gunner the direction in which he wants the aim-off applied. The gunner will apply the same aim-off that is used for the IFCS.

- c. **CFCS.** When engaging moving targets, since the same situation exists with the CFCS as with the SFCS, the commander must apply the same aim-off when engaging moving targets.

## **RANGE LIMITATIONS**

12. When engaging moving targets from a static tank, the range limitations are the same as for static engagements.

13. When engaging from a moving tank, the problems resulting from dispersion and the increased error related to moving reduce the probability of hitting static or moving targets. The following limitations apply when firing from a moving tank:

- a. **SABOT:**

- (1) lasing technique—2000 m for all targets;
- (2) estimated technique—1700 m as follows:  
battle range (“E00”) for targets below 1300 m; and “1500 m” set on the CCU for targets between 1300 m and 1700 m; and
- (3) for the SFCS the range limitation for shooting on the move will be restricted to 1000 m.

- b. **HESH:**

- (1) lasing technique—1500 m for all targets; and
- (2) estimated technique—1500 m for moving targets only.

- c. **COAX:** Lasing / estimated technique—trace burn out (TBO) for all targets.

**SECTION 2**  
**FIRING ON THE MOVE**  
**(“STABILIZED” MODE)—IFCS—LASING TECHNIQUES**

14. The commander wishes to engage a target with SABOT, HESH, or WP. The commander considers that the range is within the range band for the desired ammunition. The weapons and IFCS are operated in the “FULLY STABILIZED” (A-1) mode with the laser functioning (as detailed in Chapter 1).

15. To maximize the accuracy of the weapon and the FCS, the computer must be given an accurate range. During the engagement procedure, there may be a time delay between the initial lase and the firing of the weapon. This delay causes a change in the range and reduces the overall accuracy. To minimize this error, the laser will be fired at the following times:

- a. at the start of the engagement; and
- b. just prior to the firing of the weapon.

**COMMANDER INITIATED ENGAGEMENTS**

16. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) initiate a fire order by designating the weapon/ammunition, the range by ordering **LASE** and the target description;
  - (2) align the gun/sight onto the target using the commander's controller or by ordering the gunner to traverse left/right;
  - (3) when laid onto the target, report **ON**;
  - (4) wait for the gunner's laser response; and
  - (5) issue the order to fire when ready.

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b. When the gunner hears the commander's fire order, the gunner will:

- (1) look through the sight, identify the target and report **ON**;
- (2) lay the graticule onto the target, track for two seconds, then press and hold the lead lock switch;
- (3) lay the graticule onto the target using the laser aiming rules;
- (4) fire the laser;
- (5) follow the procedures based on the laser return;
- (6) report the range displayed at the 12 o'clock position in the sight;
- (7) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected.
- (8) on order from the commander, using the laser aiming rules, lay the graticule onto the target, fire the laser, report **FIRING NOW** and fire;
- (9) re-lay centrally onto the target; and
- (10) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.

c. When the loader hears the commander's fire order, the loader will:

- (1) load the ammunition ordered;

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- (2) ensure that the correct ammunition is selected on the loader's control box;
- (3) press the "LOADED" button on the loader's control box;
- (4) report the ammunition type followed by ready, **SABOT/HESH/COAX, READY**; and
- (5) continue loading the same ammunition until told to **STOP** or a change in ammunition is ordered.

## GUNNER INITIATED ENGAGEMENTS

17. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into the sight, identify the target and report **CONTACT** and what the target is (**TANK, APC, MEN**, etc.) or **CONTACT** if he does not recognize the target;
  - (2) lay the graticule onto the target, track for two seconds, then press and hold the lead lock switch;
  - (3) lay the graticule onto the target using the laser aiming rules;
  - (4) fire the laser;
  - (5) follow the procedures based on the laser return;
  - (6) report the range displayed at the 12 o'clock position in the sight;



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- (7) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (8) on order from the commander, using the laser aiming rules, lay the graticule onto the target, fire the laser, report **FIRING NOW** and fire;
  - (9) re-lay centrally onto the target; and
  - (10) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner report, **CONTACT** the commander will:
- (1) listen for the gunner's laser response;
  - (2) verify the target and range as required;
  - (3) order the ammunition; and
  - (4) issue the order to fire when ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for the commander initiated engagements.

**SECTION 3**  
**FIRING ON THE MOVE**  
**(“STABILIZED” MODE)—IFCS / SFCS—ESTIMATED**  
**TECHNIQUE**

**GENERAL**

18. The commander wishes to engage a target with SABOT but the laser range finder is not functioning or the IFCS is not

functioning. The commander considers that the range is less than 1700 m for all targets. The weapons are operated in the “FULLY STABILIZED” (A-2) mode without the laser functioning (as detailed in Chapter 1).

## COMMANDER INITIATED ENGAGEMENTS

19. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) estimate the range of the target to be below 1700 m for the IFCS and 1000 m for the SFCS;
  - (2) initiate a fire order by designating the weapon/ammunition, the range (**BATTLE** for targets below 1300 m or **1500** for targets between 1300 m and 1700 m) and the target description;
  - (3) align the gun/sight onto the target using the commander’s controller or by ordering the gunner to traverse left/right;
  - (4) when laid onto the target, report **ON**;
  - (5) wait for the gunner to report **ON**; and
  - (6) issue the order to fire when ready.
- b. When the gunner hears the commander’s fire order, the gunner will:
  - (1) press and hold the lead lock switch;
  - (2) repeat the range or **BATTLE** if ordered;
  - (3) look through the sight, identify the target and then report **ON**;

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- (4) apply the range by pushing the laser trigger toward the inside (“E00”) or switching the “RANGE AUTO/MANUAL” switch to “MANUAL” (“999”);
  - (5) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (6) on order from the commander, report **FIRING NOW** and fire;
  - (7) re-lay centrally onto the target; and
  - (8) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- c. When the loader hears the commander’s fire order, the loader will follow the same sequence that is detailed for the lasing engagements.

## GUNNER INITIATED ENGAGEMENTS

20. When the gunner identifies the target, the engagement will be initiated as follows:

- a. The gunner will:
  - (1) look into the sight, identify the target and report **CONTACT** and what the target is (**TANK, APC, MEN**, etc.) or just **CONTACT** if he does not recognize the target;
  - (2) report the general range to the target as follows: **NEAR / MIDDLE / FAR**;

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- (3) lay the centre of the graticule onto the target and wait for the commander to issue the fire order;
  - (4) apply the range and lay the centre of the graticule onto the target, as ordered;
  - (5) press and hold the lead lock switch;
  - (6) check the ammunition indicator display at the 12 o'clock position in the sight to ensure that the correct ammunition is selected;
  - (7) on order from the commander, report **FIRING NOW** and fire;
  - (8) re-lay centrally onto the target; and
  - (9) observe the fall of shot and carry out the applicable corrections until the target is destroyed or the commander stops the engagement.
- b. When the commander hears the gunner's report, the commander will:
- (1) verify the target and estimate the range of the target to be within the direct fire range band;
  - (2) initiate a fire order by designating the weapon/ammunition and the range as detailed in the commander initiated engagements; and
  - (3) issue the order to fire when ready.
- c. When the loader hears the commander's fire order, the loader will follow the same sequence that is detailed for lasing engagements.

## SECTION 4 FIRING AT MOVING TARGETS

### IFCS—STABILIZED MODE

21. **Operating Modes.** The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. A-1, IFCS used in the “FULLY STABILIZED” mode; or
- b. A-2, IFCS used in the “STAB READY” mode.

22. **Lasing technique.** The engagement procedures are the same as those used to engage targets on the move.

23. **Estimated technique.** The engagement procedures are the same as those used to engage targets on the move with the following exceptions:

- a. all ammunition types can be used;
- b. the gunner will press and hold the lead lock switch after the range is applied; and
- c. the range limitations previously described will apply.

### IFCS—STAB READY MODE

24. **Operating Modes.** The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. B-1, IFCS used in the “STAB READY” mode; or
- b. B-2, IFCS used in the “STAB READY” mode without laser.

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25. **Lasing technique.** The engagement procedures are the same as those used to engage static targets with the following exceptions:

- a. the commander will include the order **AIM LEFT/RIGHT/ON** in the fire order; and
- b. the gunner will apply the appropriate aim off.

26. **Estimated technique.** The engagement procedures are the same as those used to engage static targets with the following exceptions:

- a. the commander will include the order **AIM LEFT/RIGHT/ON** in the fire order; and
- b. the gunner will apply the appropriate aim off.

## SECTION 5 SFCS—ENGAGEMENTS

### GENERAL

27. **Operating Mode.** The weapons and secondary fire control system (SFCS) are operated in one of the following degraded modes as detailed in Chapter 1:

- a. A-3, SFCS used in the “FULLY STABILIZED” mode;
- b. B-3, SFCS used in the “STAB READY” mode;
- c. C-3, SFCS used in the “OBSERVATION” mode;  
or
- d. D-3, SFCS used in the turret off mode.

28. **Estimated technique.** The engagement procedures are the same as those used to engage static targets with the following exceptions:

Shooting at Moving Targets and While on the Move

- a. the commander will include the order **AIM LEFT/RIGHT/ON** in the fire order; and
- b. the gunner must apply the appropriate aim off.

**SECTION 6**  
**CFCS—ENGAGEMENTS**

**GENERAL**

29. **Operating Mode.** The weapons and IFCS are operated in one of the following modes as detailed in Chapter 1:

- a. Lasing Technique:
  - (1) A-1, IFCS used in the “FULLY STABILIZED” mode; or
  - (2) B-1, IFCS used in the “STAB READY” mode.
- b. Estimated Technique:
  - (1) A-1, CFCS used in the “FULLY STABILIZED” mode with the computer;
  - (2) A-3, CFCS used in the “FULLY STABILIZED” mode without the computer; or
  - (3) B-3, CFCS used in the “STAB READY” mode.

30. **Lasing and estimated techniques.** The engagement procedures are the same as those used to engage static targets except the commander must apply the appropriate aim off.





**ANNEX A  
SAMPLE FIRE ORDERS**

**FIRING ON THE MOVE, IFCS  
("STABILIZED" MODE)—LASING TECHNIQUES**

1. **Leopard C2 Application of Fire.** There is a single return with a range that is less than 2000 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT LASE TANK ... ON</b>		
	<b>ON</b>	<b>SABOT ... READY</b>
	<b>1200</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

2. There is a DOUBLE return with a range that is less than 2000 m. The commander selects the reported range. Second round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH LASE BUNKER ... ON</b>		
	<b>ON</b>	<b>HESH ... READY</b>
	<b>DOUBLE 1500</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>RIGHT AND ADD</b>	
		<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

3. **Gunner Initiated Engagements.** There is a SINGLE return with a range that is less than TBO. First burst misses the target.

Leopard C2 Application of Fire

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT ... MEN IN OPEN 1100</b>	
<b>COAX</b>		<b>COAX ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>ADD</b>	
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>COAX SAFE</b>

**FIRING ON THE MOVE, IFCS OR SFCS (“STABILIZED”  
MODE)—ESTIMATED TECHNIQUE**

4. **Commander Initiated Engagements.** The commander estimates the target to be at a range below 1300 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT BATTLE TANK ... ON</b>		
	<b>BATTLE ... ON</b>	
		<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET ... ADD</b>	
		<b>SABOT ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

5. **Gunner Initiated Engagements.** The commander estimates the target to be at a range below 1700 m. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT TANK ON CREST, MIDDLE</b>	
<b>SABOT 1500</b>		
	<b>1500</b>	<b>SABOT ... READY</b>
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL 1500 MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**FIRING AT MOVING TARGETS IFCS—(“STABILIZED”  
MODE)**

6. There is a SINGLE return with a range that is less than 2000 m. Stabilization mode, with a first round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT LASE TANK MOVING RIGHT ... ON</b>		
	<b>ON</b>	<b>SABOT ... READY</b>
	<b>1200</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**FIRING AT MOVING TARGETS IFCS—(“STAB READY” MODE)**

7. **Lasng Technique.** There is a double return with a range that is less than 3000 m. The commander selects the reported range. Stab ready mode. Second round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>HESH LASE TRANSPORT ... ON</b>		
	<b>ON</b>	
	<b>DOUBLE 1000</b>	<b>HESH ... READY</b>
<b>AIM RIGHT</b>	<b>AIM RIGHT</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>RIGHT AND ADD</b>	
		<b>HESH ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

8. **Estimated Technique.** Commander Initiated Engagement. The commander estimates the moving target to be at a range below 3000 m. Stab ready mode, with a first round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>SABOT 1700 TANK MOVING LEFT ... ON</b>		
	<b>1700 ... ON</b>	
<b>AIM LEFT</b>		<b>SABOT ... READY</b>
	<b>AIM LEFT</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>TARGET ... ADD</b>	
		<b>SABOT ... READY</b>
	<b>FIRING NOW</b>	
	<b>TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL 1500, MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

9. **Estimated Technique. Gunner Initiated Engagement.**

The commander estimates the moving target to be at a range below 2000 m. Stab ready mode, where the gunner does not identify the fall of shot of the first round.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
	<b>CONTACT ... TANK, MOVING RIGHT, MIDDLE GROUND</b>	
<b>SABOT 1500</b>		
	<b>1500</b>	
<b>AIM RIGHT</b>		<b>SABOT ... READY</b>
	<b>AIM RIGHT</b>	
<b>FIRE</b>		
	<b>FIRING NOW</b>	
	<b>NOT OBSERVED</b>	
<b>STOP ... DROP ONE TARGET</b>		<b>SABOT ... READY</b>
	<b>DROP ONE TARGET</b>	
<b>GO ON</b>		
	<b>FIRING NOW TARGET</b>	
<b>TARGET STOP</b>		
	<b>MANUAL 1500 MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

**SFCS ENGAGEMENTS**

10. The fire orders are the same as for IFCS Estimated Techniques.

**CFCS ENGAGEMENTS**

11. The commander initiates a lasing/estimated engagement. First round hit.

<b>Commander:</b>	<b>Gunner:</b>	<b>Loader:</b>
<b>READY SABOT</b>		
		<b>SABOT ... READY</b>
<b>FIRING NOW</b>		
		<b>SABOT ... READY</b>
<b>TARGET STOP</b>		
	<b>MAIN, START MODE</b>	<b>SABOT LOADED GUN SAFE</b>

## CHAPTER 8 SHOOTING WITH THE GUN LAYING INSTRUMENTS

### SECTION 1 GENERAL

#### INTRODUCTION

1. This chapter covers the techniques of semi-indirect shooting with HESH and WP ammunition. To employ these techniques requires the use of the GLI. Semi-indirect shooting means that either a target is engaged beyond the range of the direct fire control systems or the gunner cannot see the target but the commander can without using his/her sight. Semi-indirect shooting is categorized into the following techniques:

- a. **Sight Technique.** The sight technique is employed when:
  - (1) the gunner or commander can initially see the target through their respective sights; and
  - (2) the range to the target is beyond the capabilities of the fire control system being used which are limited to; IFCS 4000 m; and SFCS 3500 m.
- b. **Non-sight Technique.** The non-sight technique is employed when:
  - (1) Both the gunner and commander cannot see the target through their respective sights because the vehicle is in a turret down position or there is damage to the gunner's and/or commander's sights.
  - (2) The commander can, however, observe the target through his binoculars. The range may be any distance.

- (3) The non-sight technique is further divided into two categories: no chance exists that the round will foul the crest; or there is a chance that the round will foul the crest; in which case, crest clearance pre-fixing the commander's fire order with **TURRET DOWN**.

## **SECTION 2**

### **FACTORS AFFECTING SEMI-INDIRECT SHOOTING**

- 2. Semi-indirect fire is influenced by four factors. These factors call for the following actions by the commander:
  - a. establishing the initial line of the gun;
  - b. the position of the target in relation to the tank (angle of sight);
  - c. establishing the initial elevation of the gun (Tangent Elevation (TE) + Angle of Sight (A of S) = Quadrant Elevation (QE)); and
  - d. the position of the tank (determines requirement to check the crest clearance).

### **ESTABLISHING INITIAL LINE**

- 3. Establishing the initial line will be conducted as follows:
  - a. **Sight Technique.** When firing using the sight technique, the initial line will be established by the gunner or by the commander laying onto the target with the centre of the graticule.
  - b. **Non-Sight Technique.** When the sighting equipment cannot be used, the commander must establish the initial line by looking along the gun barrel and ordering the gunner to traverse left or right until the line is established.



4. The key to recording the line of the gun is the traverse indicator. This becomes the only record of where the gun was laid when a round was fired and is the only accurate means of applying line corrections. When employing the traverse indicator, the gunner must ensure that:
  - a. once the gun has been initially laid for line and the commander has ordered **ZERO INDICATOR**, the gunner zeroes the traverse indicator by rotating the outer ring and reports **ZEROED**;
  - b. after each round is fired, the gunner re-lays for line by zeroing the traverse indicator to the outer ring by using the gun controls; and
  - c. when a line correction has been applied, the gunner must again zero the traverse indicator by rotating the outer ring.

#### **POSITION OF THE TANK IN RELATION TO THE TARGET**

5. If the target is at a higher or lower elevation than your tank, it means that there is an angle of sight. To apply accurate fire, the commander must deal with the angle of sight before the engagement commences. The commander can deal with an angle of sight in the following ways:
  - a. measure it;
  - b. calculate it; or
  - c. allow for it.
6. **Measuring the Angle of Sight.** When the sight technique is used, the gunner on the command **SET ANGLE OF SIGHT** measures the angle of sight. The gunner uses his secondary sight to measure the angle of sight in the following manner:

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- a. he sets the range adjuster to the boresighting mark on the APDS scale of the secondary sight and lays onto the target with the centre of the graticule; and
- b. he then levels the gun clinometer's bubble by rotating the adjuster and reports the angle of sight to the commander.

7. If the commander is using his sight to measure the angle of sight, he proceeds as follows:

- a. the commander sets the ammunition selector to "0" (zero), selects "AUTOMATIC" on his sight control box and lays onto the target with the centre of the graticule pattern; and
- b. the gunner levels the gun clinometer's bubble by rotating the adjuster and reports the angle of sight to the commander.

8. **Calculating the Angle of Sight.** When using the non-sight technique, the angle of sight can be calculated. Using the map, the commander finds the difference in height and range between his own position and that of the target. The commander calculates the angle of sight by using the following formula (see Figure 8-1):

Angle of Sight (mils) =	$\frac{\text{Difference in elevation (m)}}{\text{Range (in thousands of m)}}$
Target Elevation =	270 m
Your Vehicle Elevation =	230 m
Range =	3500 m
Angle of Sight =	$\begin{aligned} & (270 - 230)/3.5 \\ & = 40/3.5 \\ & = 11.4 \text{ mils elevation} \\ & \text{(round off to nearest whole} \\ & \text{number)} \end{aligned}$
Angle of Sight =	11 mils elevation

**Figure 8-1: Calculating the Angle of Sight**

9. **Allowing for the Angle of Sight.** Having determined the initial range, the commander can do one of the following:
- a. add 1000 m to the range if the target is at a higher elevation than the tank; or
  - b. subtract 1000 m from the range if the target is at a lower elevation than the tank.
10. The commander then converts this corrected range to an angle of projection using range tables (see Annex A). This is a very inaccurate method and should be used only in an extreme emergency.

## ESTABLISHING THE INITIAL ELEVATION

11. The range to the target must be established by the most accurate means possible. The laser range finder should be used at all times when available. Measurement using a map is the next most accurate means, with estimation used only as a last resort.
12. **Tangent Elevation (TE).** The range to the target can be applied to the gun in terms of the angle at which the gun must be laid to achieve a hit on the horizontal plane on which the target sits. This is known as the TE. The commander finds this information in the range tables provided, listed under Angle of Projection, which includes the amount of jump (see Annex A).
13. **Quadrant Elevation (QE).** QE is equal to TE plus the angle of sight to the target. When QE is applied to the gun for a specific target, the gun has been laid to allow for not only the range to the target (TE), but also the position of the target above, below or on the horizontal plane (angle of sight).
14. **Determining the QE.** To determine the QE, the commander must know the range to the target and the angle of sight. If the angle of sight is positive, simply add it to the TE (in mils from range tables). If the angle of sight is negative, subtract it from the TE (in mils from range tables). The following examples show how the commander determines the QE in various situations. When performing calculations, it is important to note that the ranges and

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calculations are rounded off to the nearest hundred metres/mil as follows:

- a. 50 m is rounded off to the next higher hundred metres (e.g., 4250 becomes 4300); and
- b. the angle of sight is rounded off to the next whole number (e.g., 7.6 mils become 8 mils).

15. Examples of QE calculations are as follows:

- a. Angle of Sight Measured:
  - (1) A of S (as reported by the gunner) = 13 mils elevation;
  - (2) range = 4450 (becomes 4500 m);
  - (3) TE (from range tables) for HESH = 124 mils;
  - (4) therefore, QE = 13 + 124 = 137 mils elevation; and
  - (5) the commander orders **QUADRANT ELEVATION ONE THREE SEVEN ELEVATION**;
- b. Angle of Sight Calculated:
  - (1) your elevation = 140 m;
  - (2) target elevation = 118 m;
  - (3) range = 3350 m (becomes 3400 m);
  - (4) A of S =  $(118 - 140)/3.4 = -6.47$  (thus 6 mils depression);
  - (5) TE (from range tables) for HESH = 75 mils;

- (6) therefore, QE is  $75 - 6 = 69$  mils elevation; and
- (7) the commander orders **QUADRANT ELEVATION SIX NINE ELEVATION.**

c. Angle of Sight Allowed for:

- (1) target position = above your tank;
- (2) range = 4763 m (becomes 4800 m);
- (3) corrected range =  $4800 + 1000 = 5800$  m;
- (4) therefore, QE (from range tables) for HESH = 201 mils; and
- (5) the commander orders **QUADRANT ELEVATION TWO ZERO ONE ELEVATION.**

16. **Applying Elevation to the Gun.** Elevation is applied to the gun by using the gun controls. To lay the gun for elevation, the gunner will:

- a. set the QE ordered by the commander on the gun clinometer; and
- b. level the bubble in the clinometer by means of the gun controls and report **LEVEL.**

## **THE POSITION OF THE TANK**

17. When the fire position of the tank renders the possibility of a projectile striking a crest to the front, the commander will ensure that the crest clearance is checked before a round is fired. This situation usually occurs in a turret down fire position, but in any case

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where danger exists, the commander will preface his fire order with **TURRET DOWN**.

18. When the commander orders a turret down shoot, the loader will not load until the gun has been laid and the loader has checked crest clearance.

19. Once the gunner lays the gun and reports **LEVEL**, the commander will order **CHECK CREST CLEARANCE**. The loader will then look from the top of the open breech to the bottom of the muzzle. If the loader cannot see any obstruction beyond the muzzle, he will report **CREST CLEAR**. The commander will then order **HESH/SMOKE READY**. The weight of the round will change the balance of the gun and cause the lay to be disturbed. The gunner must, therefore, re-level the bubble with the gun controls and report **LEVEL**. The commander will then order **FIRE**.

20. If, when checking crest clearance, the loader sees an obstruction, he will report **CREST FOUL**. The commander must then either abandon the engagement or move the tank to a new position where there is a lesser chance of fouling the crest.

21. Crest clearance is checked only after the initial round when:

- a. a QE that is less than the initial QE is ordered; or
- b. when a line switch has been made.

22. When a commander expects to occupy a turret down fire position for a considerable amount of time, it is advisable for him to find the minimum safe elevation (MSE) at which targets can be engaged.

23. The procedure to find the MSE is as follows:

- a. The gunner levels the gun, and the loader opens the breech, looks along the bore from the top of the breech to the bottom of the muzzle and orders the gunner to elevate until the crest is clear.
- b. The gun is traversed through the arc of responsibility. Each time the crest is fouled, the

gun is elevated until it is cleared again. In this way the highest point is found at which the crest is clear throughout the arc.

- c. The gunner now levels the clinometer bubble using the adjuster. He reports the reading to the commander. This reading is the minimum safe elevation.
24. Commanders should go through a crest clearance drill even after the MSE has been established.

### **SECTION 3 FIRE ORDERS**

#### **GENERAL**

25. The fire orders for semi-indirect shooting differ somewhat from those for direct shooting. In addition, they differ between variants of semi-indirect engagements as follows:

- a. **Sight Technique:**
  - (1) If the engagement starts with an IFCS lasing technique and there is a long range displayed (“4010–9990”), the commander will order the gunner to switch to the SFCS if he wishes to continue the engagement. The order is **ZERO INDICATOR. SET ANGLE OF SIGHT.**
  - (2) The QE will be given to the gunner by the commander through the order **QUADRANT ELEVATION ... ELEVATION** (or **DEPRESSION**). The gunner will repeat the QE, apply it to the gun clinometer, level the bubble with the gun controls and report **LEVEL.**

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b. **Non-Sight Technique.** No possibility of a fouled crest:

- (1) Because neither the gunner nor the commander can see the target through their respective sights, the commander will order the weapon/ammunition only and then align the gun, reporting **ON** when the initial alignment is complete.
- (2) The commander will then order **ZERO INDICATOR**. The gunner will zero the traverse indicator and report **ZEROED**.
- (3) The commander will then determine and order the QE, which will be repeated by the gunner and applied to the gun clinometer. The gunner will report **LEVEL** when he has laid the gun.

c. **Non-Sight Technique.** Possibility of a fouled crest:

- (1) The fire order is preceded by **TURRET DOWN**, which warns the loader not to load immediately. The commander will then specify weapon/ammunition and align the gun, reporting **ON** when the initial alignment is complete.
- (2) The commander will then order **ZERO INDICATOR**. The gunner will zero the traverse indicator and report **ZEROED**.
- (3) The commander will order the QE, which will be repeated by the gunner and applied to the gun clinometer. The gunner will then report **LEVEL** when he has laid the gun.
- (4) The normal turret down drill will then be followed.



## SECTION 4 CORRECTIONS AND DISTRIBUTION OF FIRE

### CORRECTIONS AVAILABLE TO THE COMMANDER

26. The corrections that the commander may use to correct semi-indirect fire are:

- a. the commander's line correction; and
- b. the bracketing correction.

27. **Commander's Line Correction.** The commander must be prepared to correct for line error on the initial round primarily due to the effects of drift and wind. It is vital that this line error be eliminated immediately. The commander (using binoculars or the sight if it is available) will measure line corrections in mils, which will be applied by the gunner to the traverse indicator. If there is any doubt as to whether there is a need for an elevation correction, the commander will correct for line before correcting for elevation.

28. **Bracketing Correction.** The bracketing correction will be applied as follows:

- a. If the first round falls plus or minus of the target, a correction will be ordered by the commander with the intention of achieving a straddle with the second round. Suggested opening corrections are given in range tables (see Annex A) for all opening ranges, with or without the initial range having been established with a laser range finder.
- b. If the second round straddles the target, the opening correction will be successively halved in the direction of the target, until either the target is hit or the minimum correction is applied. The minimum corrections are also given in range tables (see Annex A) and are to be used with the opening range.

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- c. If the second or subsequent rounds fail to achieve a straddle, the opening correction (as a minimum) will be re-applied until a straddle is obtained. The commander may re-range if the initial error is very large.
- d. The commander will order corrections as quadrant elevations. For example, if the QE applied to the gun was 78 mils and the commander wishes to apply an 8-mil correction in elevation, he will order **QUADRANT ELEVATION EIGHT SIX ELEVATION**. If that correction achieves a straddle, the commander will halve the opening correction and order **QUADRANT ELEVATION EIGHT TWO ELEVATION** and so on.

## FIRE FOR EFFECT

29. Fire for effect is defined as firing one or more rounds to produce the desired effect on the target. It is applied when:
- a. the target is hit but not destroyed during ranging; and
  - b. the target has not been hit during ranging and the minimum correction has been applied to the gun clinometer.
30. Should the target be struck during the ranging process (i.e., bracketing onto the target), the commander will begin to fire for effect. If, after firing at least three rounds, the mean point of impact (MPI) of the fire for effect is either plus or minus of the target, the commander will add or drop the length of the minimum correction in the direction of the target. He will fire successive rounds, continuing to apply the minimum correction, until either the target is hit or the round falls on the opposite side of the target. Having done this, fire for effect may again be applied.
31. Once the minimum correction has been applied, smaller corrections cannot be made as they incur the risk of a contradiction. Fire for effect will then be applied and dispersion will ensure a hit.

32. To order fire for effect, the commander will order **FIRE** for each round he wishes fired. In an area target, the commander may order small line and elevation (not less than the minimum correction) changes.

33. For each round fired during fire for effect, the gunner will ensure that the traverse indicator is at zero and report **LEVEL** when the gun has been laid and is ready to be fired.

## **SECTION 5**

### **SIGHT ENGAGEMENT TECHNIQUES**

#### **SITUATION**

34. The commander wishes to engage a target with HESH or WP smoke for which the range is beyond the capabilities of his direct fire control systems.

#### **SIGHT TECHNIQUE—IFCS USED**

35. This technique implies that the gunner can see the target using his primary sight and his laser range finder is available but the range is beyond 4000 m. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will commence the engagement as for the lasing technique that is detailed in Chapter 2.
- b. When the gunner hears the commander's fire order, the gunner will:
  - (1) follow the sequence as detailed in Chapter 2; and
  - (2) react to the laser return of ("4 010-9 990") as detailed in Chapter 2.

## Leopard C2 Application of Fire

- c. When the loader hears the commander's fire order, the loader will:
  - (1) load the ammunition ordered;
  - (2) ensure the correct ammunition is selected on the loader's control box;
  - (3) press the "LOADED" button on the loader's control box;
  - (4) report the ammunition type followed by ready, e.g., **HESH/SMOKE READY**; and
  - (5) continue loading the same ammunition until told to **STOP** or until a change in ammunition is ordered.
  
- d. When the commander hears the gunner's laser return, the commander will decide whether to discontinue the engagement or to carry on using the semi-indirect sight technique as follows:
  - (1) When the commander decides to carry on the engagement, the commander will order **STOP, ZERO INDICATOR, SET ANGLE OF SIGHT**.
  - (2) On order, the gunner will: switch to his secondary sight and set the range adjuster to the boresight mark on the APDS scale; lay onto the target with the centre of his graticule; proceed to zero his traverse indicator by rotating the outer ring and report **ZEROED**; level the bubble of the gun clinometer with the adjuster; and report the angle of sight to the commander, e.g., **THREE ELEVATION**.

- (3) While the gunner is measuring the angle of sight, the commander will: convert the range from the range display to mils using the angle of projection column in the range tables provided; add (or subtract) the A of S to the angle of projection obtained from the range tables; and order the resulting QE to the gunner.
- (4) On order, the gunner will repeat the QE, apply it to the gun clinometer and level the bubble using the gun controls and report **LEVEL**.
- (5) The commander will then order **FIRE** when ready.
- (6) On order, the gunner will: ensure that the bubble is level and the traverse indicator is still at zero, report **FIRING NOW** and fire; and re-lay for line using his/her gun controls and traverse indicator, and await the commander's corrections.
- (7) The commander will observe and correct the fire using the corrections available to him. Line corrections are given first and all elevation corrections will be ordered as a new QE.
- (8) On order, the gunner will: repeat the complete correction; apply the line correction first ensuring he re-zeroes the outer ring of the traverse indicator; and set the new QE and level the bubble using the gun controls then report **LEVEL**.
- (9) The commander will then order every round fired and the gunner will react as previously mentioned. Once the round falls in the target area, the commander will order fire for effect.

- (10) The commander will indicate the end of the engagement by reporting **TARGET STOP**.

### **SIGHT TECHNIQUE—SFCS USED**

36. This technique implies the target is beyond 3500 m and the IFCS is not available. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) order weapon/ammunition and target description;
  - (2) align the gun onto the target using his/her power controller; and
  - (3) report **ON, ZERO INDICATOR, SET ANGLE OF SIGHT**.
- b. When the loader hears the commander's fire order, he will follow the sequence previously described in the IFCS sight technique.
- c. The gunner will:
  - (1) look through his secondary sight, identify the target and report **ON**;
  - (2) set the range adjuster to the boresight mark on the APDS scale;
  - (3) lay onto the target with the centre of the graticule;
  - (4) zero his traverse indicator by rotating the outer ring and report **ZEROED**;
  - (5) level the bubble of the gun clinometer with the adjuster; and

- (6) report the angle of sight to the commander.
- d. The shoot then proceeds.

### **SIGHT TECHNIQUE—CFCS USED**

- 37. The commander wishes to engage a target:
  - a. which the gunner cannot observe; and
  - b. for which the CFCS is operable but the range is beyond 3000 m.
- 38. When the commander identifies the target, the engagement will be initiated as follows:
  - a. The commander will:
    - (1) ensure that his CFCS control box is set at the following before commencing the engagement: the mode switch is on “AUTOMATIC”; and the ammunition selector switch is set to “0” (zero);
    - (2) order weapon/ammunition;
    - (3) traverse onto the target using his power controller; and
    - (4) report **ON, ZERO INDICATOR** and **SET ANGLE OF SIGHT**. He must ensure the centre of the graticule is on the centre of the visible mass.
  - b. When the loader hears the commander’s fire order, the loader will follow the sequence previously described in the IFCS sight techniques.

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- c. When the gunner hears that the initial alignment has been completed, the gunner will: zero his traverse indicator by rotating the outer ring and report **ZEROED**. Level the bubble of the gun clinometer with the adjuster and report the angle of sight to the commander.
- d. The shoot will then proceed.

## SECTION 6 NON-SIGHT ENGAGEMENT TECHNIQUES

### NO POSSIBILITY OF A FOULED CREST

39. This technique implies that the IFCS, SFCS and CFCS cannot be used but the commander can see the target and there is no danger of a round fouling a crest to his front.

40. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) determine the QE;
  - (2) order weapon/ammunition;
  - (3) traverse onto the target with his power controller using the barrel or any other available method to align the gun onto the target;
  - (4) report **ON** and **ZERO INDICATOR** once the alignment is complete; and
  - (5) order the QE.
- b. When the loader hears the commander's fire order, the loader will follow the sequence described previously.



- c. When the gunner hears that the initial alignment has been completed, the gunner will:
  - (1) zero his traverse indicator by rotating the outer ring and report **ZEROED**; and
  - (2) repeat the QE and set it on the gun clinometer.
- d. The shoot will then proceed.

### **POSSIBILITY OF A FOULED CREST**

41. This situation is the same as described above except that there is a danger of a round fouling a crest. When the commander identifies the target, the engagement will be initiated as follows:

- a. The commander will:
  - (1) determine the QE;
  - (2) order **TURRET DOWN** and the weapon/ammunition;
  - (3) traverse onto the target using his power controller, aligning the gun roughly onto the target;
  - (4) report **ON** and **ZERO INDICATOR** once the initial alignment is complete; and
  - (5) order the QE to the gunner.
- b. When the loader hears the order **TURRET DOWN**, the loader should realize that he cannot load the main armament until ordered to do so. This is his cue to check crest clearance.

## Leopard C2 Application of Fire

- c. When the gunner hears that the initial target alignment is complete, the gunner will:
  - (1) zero his traverse indicator by rotating the outer ring and report **ZEROED**;
  - (2) repeat the QE and set it on the gun clinometer; and
  - (3) level the bubble with the gun controls and report **LEVEL**.
- d. The commander will then order **CHECK CREST CLEARANCE**.
- e. When the loader hears the order, the loader will look through the breach and report **CREST CLEAR**.
- f. When the commander hears the loader report **CREST CLEAR**, he will order **READY HESH/SMOKE**.
- g. When the loader hears the commander's order, he will load the appropriate ammo and report **HESH/SMOKE READY**.
- h. When the gunner hears the loader's report, the gunner will:
  - (1) ensure that the bubble is level and report **LEVEL**; and
  - (2) ensure that the traverse indicator is still zeroed (using his controls to re-zero if necessary).
- i. When the commander hears the gunner's report, the commander will order **FIRE**.
- j. On order, the gunner will:

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- (1) report **FIRING NOW** and fire;
  - (2) re-lay for line using his gun controls and traverse indicator; and
  - (3) await the commander's corrections.
- k. The commander will observe and correct the fire using the corrections available to him.
- l. When the gunner hears the commander's correction, the gunner will:
- (1) repeat the complete correction;
  - (2) apply the line correction first, ensuring that he re-zeroes the traverse indicator; and
  - (3) set the new QE, level the bubble using the gun controls and report **LEVEL**.
- m. The shoot will then carry on in the same manner as the paragraphs above. The commander must check crest clearance for any round to be fired at a QE that is less than the initial QE or any time a line switch is made.
- n. The commander will indicate the end of the engagement by reporting **TARGET STOP**.



**ANNEX A**  
**SHELL, 105 MM, TK, HESH**

Range	Angle of Projection	Suggested Opening Correction		Minimum Correction
		Laser Used	No Laser	
(m)	mils	mils	mils	mils
100	1	0.5	2 / 4	
200	2	0.5	2 / 4	
300	3	0.5	2 / 4	
400	4	0.5	2 / 4	
500	5	0.5	2 / 4	
600	6	0.5	2 / 4	
700	8	0.5	2 / 4	
800	9	0.5	2 / 4	
900	10	0.5	2 / 4	
1000	12	0.5	4 / 8	
1100	13	1.0	4 / 8	
1200	15	1.0	4 / 8	
1300	17	1.0	4 / 8	
1400	18	1.0	4 / 8	
1500	20	1.0	4 / 8	
1600	22	1.0	4 / 8	
1700	24	1.0	4 / 8	
1800	26	1.0	4 / 8	

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Range	Angle of Projection	Suggested Opening Correction		Minimum Correction
		Laser Used	No Laser	
(m)	mils	mils	mils	mils
1900	28	1.0	4 / 8	
2000	31	2.0	8 / 16	1
2100	33	2.0	8 / 16	1
2200	36	2.0	8 / 16	1
2300	38	2.0	8 / 16	1
2400	41	2.0	8 / 16	1
2500	44	2.0	8 / 16	1
2600	47	2.0	8 / 16	1
2700	50	2.0	8 / 16	1
2800	53	2.0	8 / 16	1
2900	56	2.0	8 / 16	1
3000	60	2.0	8 / 16	2
3100	63	2.0	8 / 16	2
3200	67	2.0	8 / 16	2
3300	71	2.0	8 / 16	2
3400	75	2.0	8 / 16	2
3500	78	2.0	8 / 16	2
3600	83	2.0	8 / 16	2
3700	87	2.0	8 / 16	2

Range	Angle of Projection	Suggested Opening Correction		Minimum Correction
		Laser Used	No Laser	
(m)	mils	mils	mils	mils
3800	91	2.0	8 / 16	2
3900	96	2.0	8 / 16	2
4000	100	8.0	16 / 32	4
4100	105	8.0	16 / 32	4
4200	110	8.0	16 / 32	4
4300	114	8.0	16 / 32	4
4400	119	8.0	16 / 32	4
4500	124	8.0	16 / 32	4
4600	130	8.0	16 / 32	4
4700	135	8.0	16 / 32	4
4800	140	8.0	16 / 32	4
4900	146	8.0	16 / 32	4
5000	151	10.0	20 / 40	5
5100	157	10.0	20 / 40	5
5200	163	10.0	20 / 40	5
5300	169	10.0	20 / 40	5
5400	175	10.0	20 / 40	5
5500	181	10.0	20 / 40	5

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Range	Angle of Projection	Suggested Opening Correction		Minimum Correction
		Laser Used	No Laser	
(m)	mils	mils	mils	mils
5600	188	10.0	20 / 40	5
5700	194	10.0	20 / 40	5
5800	201	10.0	20 / 40	5
5900	207	10.0	20 / 40	5
6000	214	16.0	32 / 64	8
6100	221	16.0	32 / 64	8
6200	228	16.0	32 / 64	8
6300	235	16.0	32 / 64	8
6400	243	16.0	32 / 64	8
6500	250	16.0	32 / 64	8
6600	258	16.0	32 / 64	8
6700	266	16.0	32 / 64	8
6800	274	16.0	32 / 64	8
6900	282	16.0	32 / 64	8
7000	290	20.0	40 / 80	10
7100	299	20.0	40 / 80	10
7200	308	20.0	40 / 80	10
7300	317	20.0	40 / 80	10



Range	Angle of Projection	Suggested Opening Correction		Minimum Correction
		Laser Used	No Laser	
(m)	mils	mils	mils	mils
7400	326	20.0	40 / 80	10
7500	335	20.0	40 / 80	10
7600	345	20.0	40 / 80	10
7700	355	20.0	40 / 80	10
7800	366	20.0	40 / 80	10
7900	376	20.0	40 / 80	10
8000	386	20.0	40 / 80	10



**ANNEX B**  
**CARTRIDGE, WP-T, M416**

<b>Range</b>	<b>Angle of Projection</b>	<b>Range</b>	<b>Angle of Projection</b>
<b>(m)</b>	<b>mils</b>	<b>(m)</b>	<b>mils</b>
100	1.0	200	2.0
300	3.0	400	4.0
500	5.0	600	6.0
700	8.0	800	9.0
900	10.0	1000	12.0
1100	13.0	1200	15.0
1300	16.0	1400	18.0
1500	20.0	1600	21.0
1700	23.0	1800	25.0
1900	28.0	2000	30.0
2100	32.0	2200	34.0
2300	37.0	2400	40.0
2500	42.0	2600	45.0
2700	48.0	2800	51.0
2900	54.0	3000	58.0
3100	61.0	3200	65.0
3300	68.0	3400	72.0
3500	76.0	3600	80.0
3700	84.0	3800	88.0
3900	93.0	4000	97.0
4100	101.0	4200	106.0
4300	111.0	4400	116.0
4500	120.0	4600	125.0
4700	131.0	4800	136.0
4900	141.0	5000	146.0
5100	152.0	5200	158.0
5300	163.0	5400	169.0
5500	175.0	5600	181.0
5700	187.0	5800	194.0

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<b>Range</b>	<b>Angle of Projection</b>	<b>Range</b>	<b>Angle of Projection</b>
<b>(m)</b>	<b>mils</b>	<b>(m)</b>	<b>mils</b>
5900	200.0	6000	206.0
6100	213.0	6200	220.0
6300	227.0	6400	234.0
6500	241.0	6600	248.0
6700	256.0	6800	263.0
6900	271.0	7000	279.0
7100	287.0	7200	295.0
7300	303.0	7400	312.0
7500	321.0	7600	330.0
7700	339.0	7800	348.0
7900	358.0	8000	368.0
8100	378.0	8200	388.0
8300	399.0	8400	410.0
8500	422.0	8600	434.0
8700	446.0	8800	459.0
8900	473.0	9000	487.0
9100	502.0	9200	518.0
9300	535.0	9400	553.0
9500	574.0	9600	597.0
9700	624.0	9800	659.0

## **CHAPTER 9 TROOP SHOOTING**

### **SECTION 1 GENERAL**

#### **INTRODUCTION**

1. This chapter deals with the aspects of troop shooting from the Leopard C2.
2. Targets that require a large volume of fire to be neutralized are usually tasked to the artillery. There are occasions, however, when artillery is neither available nor capable of performing the job, so tanks are then employed. For example, during the final stages of an assault, the artillery is forced to lift/switch its fire early because of the problems of split second control and the danger that results to the assaulting troops. Tanks, however, have the required control and can provide fire on the objective until the last possible moment.
3. This type of suppressive fire is applied by troop shooting, which is simply a framework under which the fire from two or more AFVs is controlled and directed onto a target for a specific amount of time. The mechanics of troop shooting are actually relatively simple. The difficult aspect is in determining the number of rounds required to complete the task and the type of fire to be put down. This, of course, depends upon the ammunition state, likely time of next ammunition resupply, and probable tasking/ammunition requirements until resupply occurs. The task may require the use of both smoke and HESH ammunition as well as both types of firing for effect. Also, the troop leader must be ready with contingency plans in case the attack is bogged down and suppressive fire is required for a longer period of time. Therefore, to properly carry out this tasking, the troop leader is faced with a considerable fire-planning problem.
4. Understanding the difference between troop shooting and the fire discipline used during contact drills is essential. When involved in a troop shooting task, a vehicle is not trying to hit a specific target: the rounds fall in the target area and the overall effect of the troop shoot neutralizes it - in effect, performing an artillery

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function. Dividing up a frontage into arcs of responsibility within which each vehicle uses aimed, direct fire to destroy individual targets is a contact drill. In this case, each individual vehicle commander controls the number and type of rounds that are needed to neutralize targets within his arc.

5. There is a requirement for both types of fire in support of an attack, and the commander of the fire support group should make an appreciation of the requirements and allocate sub-units to specific tasks. For example, if two troops are assigned to the fire support group, one could be tasked to perform a troop shoot and the other could be tasked to engage targets of opportunity. It is important to note, however, that troops committed to a troop-shooting task do not abandon their task to engage targets of opportunity.

6. Troop shooting may be conducted employing either direct or semi-indirect fire. In each case, the emphasis will be placed on control, accuracy and speed.

7. Although troop shooting is usually conducted at troop level, it may be used to control the fire from any number of vehicles.

## **PHASES OF A TROOP SHOOT**

8. A troop shoot is conducted in the following sequence:

- a. target indication and ranging;
- b. registration; and
- c. fire for effect.

9. Depending on the situation, one or more of these phases may not be required.

## **TARGET INDICATION AND RANGING**

10. This phase includes the initial fire order from the troop leader and the determination of the actual range to the target.

## REGISTRATION

11. All AFVs involved, fire one or more rounds, correcting their fire to achieve a hit in the centre of the target area.

## FIRE FOR EFFECT

12. This is the phase where a specified number of rounds are fired at the target to achieve the desired results. There are two types of fire for effect:

- a. **Gun Fire.** Each gun fires independently a specified number of rounds, the first as soon as the gun is loaded and laid. Subsequent rounds are fired at the interval ordered or, if no interval is ordered, as soon as the gun is loaded and laid. Gun fire is used when a large volume of fire is required for a short period of time.
- b. **Troop Fire.** Guns are fired in succession, usually in order of seniority of call sign at the interval ordered or, if no interval is ordered, at five-second intervals. Troop fire is used to spread fire for effect over a period of time or to identify an individual tank, which may be firing wild during gunfire.

13. When conducting fire for effect, the following should be considered:

- a. Both gun fire and troop fire may be used in the same shoot. For example, troop fire may be required for two or more minutes while the manoeuvre force is preparing for the assault. Then gunfire may be required for a short period while the manoeuvre force is completely exposed and on its final phase of the assault.
- b. A mix of ammunition may also be used. A troop may be called upon to provide a smoke screen

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prior to the assault, and then to change to HESH while the assaulting elements approach the objective. Two separate fire orders would be involved, and crew commanders must be alert to the situation. There is not sufficient time to register or distribute fire when the ammunition is changed. All that is required is to designate the number of rounds and type of fire for effect.

- c. If, during troop fire, a tank misses its turn for some reason (e.g., misfire), the remaining tanks carry on as if a round had actually been fired. The responsible crew commander reports the problem to the troop leader.
- d. Fire for effect does not need to be employed immediately after all tanks are prepared. The troop may be prepared well in advance of the time when their fire is actually required. The troop leader should tell his crew commanders to **STAND BY** and indicate to them approximately how long they will be waiting. If the tanks are in a hull down position, they should reverse into a turret down position so they do not expose themselves unnecessarily
- e. If, during gunfire, an interval of **ON ORDER** is given, this means that the troop leader individually orders each round of fire for effect (i.e., salvos). For example, if he ordered **FOUR ROUNDS GUN FIRE ON ORDER**, he would give the executive to **FIRE** four times. Crew commanders would fire one round each time the executive is given. This is especially useful for smoke shoots when the interval is difficult to assess.

## **FIRE DISCIPLINE**

14. The troop leader is usually responsible for control. This does not relieve each crew commander from the responsibility of observing and correcting the fire from his respective vehicle.



15. Control is maintained by radio or hand signals. The volume of radio traffic and dispersion of the vehicles will dictate which should be used. Hand signals, if used, must be simple and understood by all. A combination of radio and hand signals is also possible.

## **POSITION OF THE TANKS**

16. Crew commanders are responsible for choosing their own fire positions. The troop leader may wish to adjust these positions.

17. The dispersion of the vehicles depends on:

- a. the ground;
- b. the tactical situation; and
- c. the means of control (either hand or radio).

18. The troop leader is usually located centrally for control purposes and should be able to see the other tanks.

19. The troop leader must pay particular attention to the order of march left to right of his vehicle, so that when he distributes fire, the right hand tank receives the largest line switch to the right and so on. Otherwise, fire from the vehicles could be crossed; making it difficult to determine which vehicle is firing which round.

## **SECTION 2 DELIBERATE TROOP SHOOT—SEMI-INDIRECT**

### **SITUATION**

20. Semi-indirect fire is employed when:

- a. the range to the target is over the range of the direct fire control systems; or

## Leopard C2 Application of Fire

- b. due to retaliatory fire, the vehicles must adopt a turret down fire position.
21. Other considerations are:
- a. the availability of ammunition for registration;
  - b. that time is not a limiting factor; and
  - c. that sufficient radio time is available.

## TECHNIQUE

22. The troop leader will issue a fire order indicating weapon/ammunition, a range in hundreds of metres and a target description. He will prefix this order with **TROOP**, which indicates to the other vehicles that a troop shoot will be taking place.

23. The troop leader will end his radio transmission with **OVER**. The tanks will acknowledge his initial fire order, ending their transmissions with **OUT**. All subsequent transmissions from the troop leader will end with **OUT**.

24. The troop leader usually ranges to the target with his tank. He may, however, designate another tank to range for him. In any case, the ranging tank will calculate an initial QE to the target and, following the procedure outlined in Chapter 8; it will range onto the centre of the target area.

25. Once the ranging process has been completed, the ranging tank will report the final elevation to the remaining tanks by giving the final elevation in mils (QE), e.g., **FINAL ELEVATION EIGHT EIGHT ELEVATION**.

26. The troop leader will then order the remaining tanks to register onto the centre of the target. This consists of each tank firing in turn, usually in order of call sign seniority at five-second intervals.

27. If all tanks are properly prepared, they will not likely need more than one round to register. If the error is too large, they should fire a second registering round.

#### **NOTE**

The initial elevation will be given in metres. This will be done to aid crew commanders in identifying the target.

The final elevation will be given in mils (QE) since the GLI are being used.

Although individual tanks may have various angles of sight to the target (and therefore various QEs), there would have to be a difference in elevation of over 22.5 m between tanks to make a difference of 100 m in range. Therefore, small differences are accounted for since each tank is registering.

28. If a minimum correction is proposed, it will be done as a silent correction. The crew commander will obtain approval from the troop leader before passing it on to his gunner.

29. Any corrections for line or elevation, which are either proposed by crew commanders to the troop leader or are ordered by the troop leader, will be in mils.

30. Once all tanks are registered onto the centre of the target, the crew commanders will have their gunners zero their traverse indicators.

31. The troop leader will then order the number of rounds and the type of fire for effect to be employed. He will also distribute fire as necessary to cover the complete target.

32. The troop leader will then usually orders his troop to stand by a specific length of time until the fire for effect is required.

### **SECTION 3 DELIBERATE TROOP SHOOT—DIRECT**

#### **SITUATION**

33. The troop has been tasked to neutralize a target. The range to the target is within the capabilities of the direct fire control system and the prospect of retaliatory fire is small.

34. Although the deliberate procedure is relatively time consuming, individual vehicles need not remain unnecessarily exposed. During the ranging process and after having fired their registration rounds, they may reverse back into a turret down position. They should not jockey, but should simply move back to gain protection from the ground.

35. If there is a considerable pause between registration and fire for effect while the tactical situation develops, vehicles may remain in a turret down position until they are required to begin to fire for effect.

36. It must be stressed, however, that once fire for effect has commenced, all vehicles will remain in hull down positions and will not jockey, suffering casualties as necessary to provide the proper support for the assaulting troops.

#### **TECHNIQUE**

37. The technique employed in this situation is the same as that of semi-indirect which was described earlier except:

- a. final elevation will be given in metres; and
- b. elevation corrections will be made in metres, while line corrections are still given in mils.

38. Prior to the registration phase, tanks with operational laser range finders will lase to the target to determine the range. They will compare this range to that given by the troop leader over the radio. As long as the ranges are relatively close, the crew commander will

register using his laser range read-out. Tanks without laser range finders will apply the range ordered by the troop leader.

## **SECTION 4**

### **QUICK ACTION TROOP SHOOT**

#### **SITUATION**

39. A quick action shoot differs from a deliberate shoot in that the tanks do not register due to the following considerations:

- a. a desire to maintain the maximum element of surprise;
- b. the non-availability of ammunition for registration;
- c. insufficient time available on the radio;
- d. time is a major factor;
- e. retaliatory fire is expected; or
- f. individual targets within the target area have been previously engaged, therefore, the tanks have already registered.

#### **TECHNIQUE**

40. The troop leader will issue a fire order designating weapon/ammunition, a range in hundreds of metres, a target description, the number of rounds and the type of fire for effect. He will prefix the fire order with **TROOP** to warn all crew commanders of what is occurring.

41. The troop leader will usually range from his own tank, however, he may designate a tank to range for him. The ranging tank will determine the final elevation by ranging onto the centre of the target area. The final elevation will then be passed to the troop leader if he has designated a ranging tank.

## Leopard C2 Application of Fire

42. During ranging, the remaining tanks will use the ranging tank's final ranging round to indicate the initial line to their gunners. The gunners can then zero their traverse indicators.

43. The troop leader will then pass the final elevation to all tanks, distribute fire as necessary, and confirm the number of rounds and the type of fire for effect. He may give the executive to fire or have the tanks stand by until the fire is required.

44. Tanks that have a laser range finder available will lase to the centre of the target area. They will compare the range read-out to the final elevation given over the radio. As long as they are approximately the same, the crew commander will use the laser range to engage the target.

45. Tanks without laser range finders will use the final elevation as given by the troop leader on the radio.

46. If, in fact, all the tanks have already engaged individual targets within the target area and a prominent object exists either on or very close to the target area from which fire can be distributed, there will be no need to fire a ranging round. In this case, the troop leader must allow the crew commanders' sufficient time to prepare their vehicles. Crew commanders will then inform the troop leader when they are ready.

**ANNEX A  
SAMPLE FIRE ORDER**

**DELIBERATE TROOP SHOOT—SEMI-INDIRECT**

1. Due to likely retaliatory fire, the troop leader has chosen to conduct the troop shoot from a turret down position. He has been ordered to provide fire on the objective for three minutes.

**ALL STATIONS 13, THIS IS 13.  
TROOP HESH, TWO THREE  
HUNDRED, COMPANY  
POSITION ON CREST, OVER**

**13A ROGER OUT  
13B ROGER OUT  
13C ROGER OUT**

**ALL STATIONS 13, THIS IS 13.  
FINAL ELEVATION THREE  
NINE ELEVATION. REGISTER,  
STAND BY, OUT**

**13 THIS IS 13A READY OUT  
13 THIS IS 13B READY OUT  
13 THIS IS 13C READY OUT**

**ALL STATIONS 13, THIS IS 13.  
REGISTER NOW, OUT**

**13, THIS IS 13A, FROM LAST  
SHOT RIGHT SEVEN, ADD  
TWO, REGISTERED, OVER**

**13 ROGER OUT**

**13, THIS IS 13B,  
REGISTERED, OVER**

**13 ROGER OUT**

**13, THIS IS 13C, FROM LAST  
SHOT, LEFT FIVE, DROP  
FOUR, REGISTERED, OVER**

**13, NO, FROM LAST SHOT  
LEFT FIVE, DROP TWO,  
REGISTERED, OUT**

**ALL STATIONS 13, THIS IS 13.  
13A RIGHT EIGHT, 13B RIGHT  
TWO FIVE, 13C LEFT TWO  
FIVE. FIVE ROUNDS TROOP  
FIRE AT TEN SECOND  
INTERVALS, STAND BY, OUT**

**13 THIS IS 13A READY OUT  
13 THIS IS 13B READY OUT  
13 THIS IS 13C READY OUT**

**ALL STATIONS 13, THIS IS 13.  
FIRE, OUT**

**13 THIS IS 13A. ROUNDS  
COMPLETE, OUT  
13 THIS IS 13B. ROUNDS  
COMPLETE, OUT  
13 THIS IS 13C. ROUNDS  
COMPLETE, OUT**

## **DELIBERATE TROOP SHOOT—DIRECT**

2. The troop leader has been tasked to provide smoke on the objective from H-5 to H-1 and suppressive fire from H-hour to H + 1. He elects to range and register with HESH to conserve the element of surprise for the smoke.

**ALL STATIONS 24, THIS IS 24.  
TROOP SMOKE TWO SEVEN  
HUNDRED, TRENCHES ON  
CREST, OVER**

**24A ROGER OUT  
24B ROGER OUT  
24C ROGER OUT**

**ALL STATIONS 24 THIS IS 24.  
FINAL ELEVATION TWO SIX  
HUNDRED, REGISTER WITH  
HESH, STAND BY, OUT**

**24 THIS IS 24A. READY OUT  
24 THIS IS 24B. READY OUT  
24 THIS IS 24C. READY OUT**



**ALL STATIONS 24, THIS IS 24.  
REGISTER WITH HESH NOW  
OUT**

**24 THIS IS 24A, REGISTERED  
OVER**

**24 ROGER OUT**

**24 THIS IS 24B, FROM LAST  
SHOT, LEFT FIVE, ADD ONE  
HUNDRED, REGISTERED  
OVER**

**24 ROGER OUT**

**24 THIS IS 24C, REGISTERED  
OVER**

**24 ROGER OUT**

**ALL STATIONS 24, THIS IS 24.  
24A RIGHT ONE ZERO, 24B  
RIGHT TWO ZERO, 24C LEFT  
ONE FIVE. THREE ROUNDS  
TROOP FIRE AT TWENTY  
SECOND INTERVALS, STAND  
BY TWO FIVE MINUTES, OUT**

**24 THIS IS 24A. READY OUT**

**24 THIS IS 24B. READY OUT**

**24 THIS IS 24C. READY OUT**

**ALL STATIONS 24, THIS IS 24.  
ONCE SMOKE ROUNDS  
COMPLETE, ENSURE YOU  
HAVE SIX HESH AVAILABLE.  
STAND BY AND AWAIT  
FURTHER ORDERS, OUT**

**ALL STATIONS 24, THIS IS 24.  
FIRE, OUT**

**24 THIS IS 24A. ROUNDS  
COMPLETE, OUT**

**24 THIS IS 24B. ROUNDS  
COMPLETE, OUT**

**24 THIS IS 24C. ROUNDS  
COMPLETE, OUT**

**ALL STATIONS 24, THIS IS 24.  
TROOP HESH, TWO SIX  
HUNDRED, SAME TARGET AS  
PREVIOUSLY ENGAGED.  
RETAIN PREVIOUSLY  
ORDERED LINE SWITCHES.  
SIX ROUNDS GUN FIRE AT  
TEN SECOND INTERVALS,  
STAND BY, OUT**

**24 THIS IS 24A. READY OUT**

**24 THIS IS 24B. READY OUT**

**24 THIS IS 24C. READY OUT**

**ALL STATIONS 24, THIS IS 24.  
FIRE, OUT**

**24 THIS IS 24A. ROUNDS  
COMPLETE, OUT**

**24 THIS IS 24B. ROUNDS  
COMPLETE, OUT**

**24 THIS IS 24C. ROUNDS  
COMPLETE, OUT**

### **QUICK ACTION TROOP SHOOT**

3. Troop leader ranges. Fire for effect is required as soon as possible.

**ALL STATIONS 31, THIS IS 31.  
TROOP HESH, TWO ONE  
HUNDRED, PLATOON IN  
WOOD LINE. THREE ROUNDS  
GUN FIRE, STAND BY,  
WATCH MY FIRE, OVER**

**31A ROGER OUT**

**31B ROGER OUT**

**31C ROGER OUT**

**ALL STATIONS 31, THIS IS 31.  
FINAL ELEVATION TWO ONE  
HUNDRED, 31A RIGHT  
SEVEN, 31B RIGHT ONE FIVE,  
31C LEFT EIGHT. THREE  
ROUNDS GUN FIRE NOW,  
OUT**

4. The troop leader nominates a ranging tank. Fire for effect is not required immediately.

**ALL STATIONS 12 THIS IS 12,  
TROOP HESH, THREE ONE  
HUNDRED, TRENCHES ON  
CREST. FOUR ROUNDS  
TROOP FIRE, 12A RANGING.  
REMAINDER STAND BY,  
OVER**

**12A ROGER OUT  
12B ROGER OUT  
12C ROGER OUT  
12 THIS IS 12A. FINAL  
ELEVATION TWO NINE  
HUNDRED, OUT**

**ALL STATIONS 12, THIS IS 12.  
12A AIM ON, 12B RIGHT ONE  
ZERO, 12C LEFT ONE FIVE.  
STAND BY ONE ZERO  
MINUTES, OUT**

**ALL STATIONS 12, THIS IS 12.  
FOUR ROUNDS, TROOP FIRE  
NOW, OUT**

5. The troop has engaged several individual targets in an area. Subsequently, a quick attack has been ordered with the troop designated as the firebase.

**ALL STATIONS 23, THIS IS 23.  
TROOP SMOKE, ONE NINE  
HUNDRED, GRID 135 464  
TANKS AND INFANTRY IN  
WOOD LINE. REFERENCE  
BURNING VEHICLE, 23A  
RIGHT TWO FIVE, 23B RIGHT  
ONE FIVE, 23C RIGHT FIVE.  
THREE ROUNDS, GUN FIRE  
ON ORDER, STAND BY, OVER**

**23A ROGER OUT  
23B ROGER OUT  
23C ROGER OUT**

**23 THIS IS 23A. READY OUT**

**23 THIS IS 23B. READY OUT**

**23 THIS IS 23C. READY OUT**

**ALL STATIONS 23 THIS IS 23.  
FIRE OUT**

**ALL STATIONS 23 THIS IS 23.  
FIRE OUT**

**ALL STATIONS 23 THIS IS 23.  
FIRE OUT**

## GLOSSARY

For the purposes of this publication, the following definitions apply:

Angle of Sight	The angle, between the line of sight to the target and the horizontal plane. The angle is positive (one of elevation) when the line of sight is above, and negative (one of depression) when the line of sight is below the horizontal plane.
Coaxial	A weapon mounted on the same trunnions as the main armament of an AFV. Both weapons are therefore moved the same amount by the same controls.
Direct Fire	Fire applied when the gunner and commander can both see the target and tangent elevation is applied by means of an aiming mark in the sight.
Dispersion	A measure of the spread of a number of strikes about the mean point of impact (MPI) from rounds fired under identical conditions.
Fixed Line Fire	An engagement using the gun laying instruments (GLI) and previously recorded information for line and elevation.
Fire for Effect (FFE).	One or more rounds fired to have the desired effect on the target.
Hard Target	Any target which requires an armour piercing or defeating round to destroy it.
High Velocity	Muzzle velocities between 750 and 1000 m per second.

## Leopard C2 Application of Fire

HCE or HC	Hexachlorophene—a smoke producing compound.
Indirect Fire	Fire applied when no member of the crew can see the target. The Forward Observation Officer (FOO) controls it.
Laying	The process of applying the necessary line and elevation to a gun (with the correct point of aim) before opening fire at a target.
Line of Sight	A line (either real or imaginary) drawn between the sight and a target.
Long Range	Any range over 2000 m.
Low Velocity	Muzzle velocities under 500 m per sec.
Mean Point of Impact (MPI)	The centre of a pattern of shots. A point, which represents the mean position of the points of impact of a number of projectiles, fired at a constant line and elevation.
Medium Range	Any range between 1000 m and 2000 m.
Medium Velocity	Muzzle velocities between 500 and 750 m per sec.
Minimum Correction	The smallest correction that can be made, at longer ranges, without incurring the risk of contradiction.
Muzzle Velocity	The velocity of the projectile two feet beyond the muzzle of gun.
Percentage Zone (of dispersion).	An area within which the percentage of rounds may be expected to fall.

Quadrant Elevation	The angle between the axis of the bore and the horizontal plane when the gun is laid with the required elevation to hit a target (the sum of tangent elevation [TE] and angle of sight [A of S]).
SABOT:	(1) The “shoe” of an armour piercing discarding SABOT (APDS) projectile; and  (2) The term referring to all discarding SABOT rounds APDS and APFSDS.
Short Range	Any range below 1000 m.
Soft Target	A target, which can be destroyed by high explosive (HE) or machine-gun (MG) fire.
Tangent Elevation	The angle between the line of sight (real or imaginary) and the axis of the bore.
Zero Line	A reference line used in range cards and in indirect fire, from which line switches to targets are measured.





## TERMS USED DURING CREW DRILLS

The following terms are used during crew drills:

Action	When used as a single word, this is the order given by the AFV commander to the crew to prepare the AFV for contact with the enemy.
Add	Used during correction of fire by the commander to order the gunner to increase the elevation by a specified amount, e.g., <b>ADD TWO HUNDRED</b> , or by the gunner to report a burst on target (BOT) or standard correction.
Aim (Left/Right/On)	The order given by the commander and response by the gunner to indicate the point of aim when engaging a moving target.
Aim-Off	The amount by which the gun is laid off laterally from the centre of the target, usually to allow for the movement of the target or of the vehicle from which the gun is fired.
Angle of Sight	Followed by the angle in mils and whether the angle is in elevation or depression, tells the gunner to set an angle of sight on the gun clinometer, e.g., <b>ANGLE OF SIGHT TWO ZERO DEPRESSION</b> .
Ant	Used in a fire order to describe an anti-tank gun.
APC	Armoured Personnel Carrier. Used in a fire order to describe a tracked armoured vehicle, other than a tank.

## Leopard C2 Application of Fire

Battle	Follows the designation of weapon/ammunition in a fire order if the commander wishes to engage a target using the IFCS Battle range sight setting, e.g., <b>SABOT, BATTLE, TANK, ON.</b>
Canister	The term used to specify canister ammunition in a fire order.
Check Crest Clearance	The order used in turret down fire for the loader and gunner to carry out crest clearance drills.
Clear Guns	The order given by the commander to indicate that all weapons are to be unloaded.
COAX	The pro-word of a fire order for using the coaxially mounted machine-gun (MG).
Crest Clear	Reported by the loader when checking crest clearance and the crest is clear.
Crest Foul	Reported by the loader when checking crest clearance and the crest is fouled.
Depression	See Angle of Sight.
Drop	Used during correction of fire (see Add).
Elevation	See Angle of Sight.
Fire	The order to fire the gun. Also signifies that the AFV commander retains control of the shoot and orders any corrections necessary.
Firing Now	The report made by either the gunner or commander (for AFVs with commander's firing switches) as the firing switch is pressed.

Go On	The order given by the commander to the gunner to continue firing at a target and to be responsible for observation and correction of fire, e.g., <b>STOP, ADD THREE HUNDRED, GO ON.</b>
HESH	The term used to specify high explosive squashed head (HESH) or high explosive plastic (HEP) ammunition in a fire order.
Left	The order to make a correction for line to the left or the report by the gunner that he is making a line correction to the left.
Level	Reported by the gunner once he has laid the gun by levelling the bubble in the gun clinometer.
Machine-Gun	The pro-word of a fire order for using the cupola-mounted MG.
Maggie	Target description of an MG post.
Make Safe	The order given when weapons are to be made safe but not unloaded.
Men	Target description of dismounted troops in the open.
My Side	The order given by the commander to indicate that he is conducting an engagement. It is usually employed if the gunner reports, <b>NOT OBSERVED</b> when the commander issues a fire order.
Not observed	The report made when a gunner fails to observe the target or fails to observe the fall of shot when he is responsible for the observation and correction of fire. The commander must then step in and assist.

## Leopard C2 Application of Fire

On	<p>(1) When used by the commander, this word signifies that the gun is laid for line on the target either by the commander or by his ordering the gunner to traverse.</p> <p>(2) When used by the gunner, this word signifies that he has identified the target.</p>
Ready	<p>(1) The report from the loader indicating the weapon is ready to be fired.</p> <p>(2) The executive order to load the gun. Normally used in turret down fire, during a night engagement, or when using the CFCS.</p>
Release	Ordered by the commander at any time he wishes to confirm the range to a target. The gunner repeats, <b>RELEASE</b> to confirm the commander's intention.
Register	Given during troop shooting, this order means that each of the AFVs, less the ranging AFV, confirms the final elevation by firing at the target. Their fire can then be adjusted if necessary before all AFVs fire for effect.
Repeat	Ordered by the commander when he wants the gunner to fire another round using the same point of aim and the same nature of ammunition.

Replenish	(1) Ordered by the commander when he wishes the loader to restock the ready rack.  (2) Reported by the loader when there are only two main armament rounds in the ready rack, or less than fifty rounds of COAX ammunition remaining.
Right	As in Left.
SABOT	The term used to specify armour piercing discarding sabot ammunition in a fire order.
Set Angle of Sight	The order, used in semi-indirect fire, for the gunner to set the angle of sight on the gun clinometer.
Smoke	The term to specify smoke ammunition in a fire order.
Stand-by	An order given to the crew to hold the fire of weapons until either other AFVs are also ready to fire or a commander/troop leader gives the executive order to fire.
Start Mode	Term used by the gunner when he is completed with one shoot and is ready to go on with the next.
Steady	The order given by the commander to the gunner during the traversing of the turret to traverse the turret slowly.

Leopard C2 Application of Fire

Stop	<p>The order given to the gunner to:</p> <p>(1) Stop firing at a target and engage a new one at the same range, e.g., <b>STOP, NEXT TARGET RIGHT, GO ON/FIRE.</b></p> <p>(2) Stop applying a correction, and go back to the last point of aim and be ready to apply one given by the commander, e.g., <b>STOP, RIGHT ONE TARGET, DROP TWO, GO ON/FIRE.</b></p>
Tank	<p>The target description for a tank target.</p>
Transport	<p>The target description for any unarmoured wheeled vehicle.</p>
Traverse	<p>The order given to the gunner to traverse the turret in a specified direction, e.g., <b>TRAVERSE LEFT.</b> If not given with the word <b>STEADY</b>, the gunner traverses in the appropriate direction as fast as possible.</p>
Trench	<p>The target description of any fieldworks with no overhead cover.</p>
Troop fire	<p>The command given to a group of AFVs to fire one or more rounds in turn at a given interval. If no interval is specified the guns are fired every five seconds, e.g., <b>ONE ROUND TROOP FIRE, STAND-BY.</b> AFVs fire either in call sign order (during troop shooting) or from the right (in indirect fire).</p>
Turret down	<p>The order given as part of a fire order, indicating that turret down fire will be applied. This indicates to the crew that crest clearance drills will be carried out before the gun is loaded.</p>

Wait	<p>The order given by the commander to the gunner to hold the point of aim for a period before being given the order <b>FIRE</b>.</p> <p>The response by the gunner informing the commander that he is unable to fire due to point of aim or a line of sight delay. He will hold his point of aim and once ready will fire.</p>
Wrong Lay	<p>Reported by the gunner if he fires the gun when it is not correctly laid (usually when firing on the move).</p>
Zero	<p>Ordered by the commander and repeated by the gunner during fixed line shoot. This tells the gunner to go to the zero line.</p>
Zeroed	<p>Reported by the gunner on the initial alignment once he has zeroed the traverse indicator, by rotating the outer ring on the initial alignment.</p>
Zero Indicator	<p>Ordered by the commander during a semi-indirect shoot once he has laid the gun for line. This tells the gunner to zero the outer scale of the traverse indicator.</p>